Social and Cultural Dimensions of Innovation in Knowledge Societies

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Introduction

Introductions to publications on innovations usually open with a statement describing them as fundamental driving force of contemporary societies as well as a pivotal theme in economic, political, and scientific public policies and discourses. Such theses can hardly be disputed. Innovation research advances with intensity comparable to the real innovation processes themselves. The fact that in innovation research there is a lot that still remains unclear only attests to the dynamics and creative character of innovation processes, where new problems, meanings and links constantly arise and previously isolated factors enter into new mutual interactions.

This book focuses on social and cultural dimensions of innovations. It is not surprising that this aspect of innovations attracts growing attention. For one thing, it is the innovation process itself that develops, articulates, diversifies and, in the course of its expansion, absorbs new agents, fields and processes, within which new bonds and interactions emerge. These additional sources and drivers impart previously unknown dynamics and depth to innovations. And, for another thing, it is a reaction to the fact that innovation research has been dominated by economic approach for long period of time; in the past decades, economic aspects were studied with all due rigour and sophistication. The economic nature of innovation surely deserves and demands it, however, the complex character of contemporary innovation processes directs attention to other aspects as well. Nevertheless, it is not two parallel – one economic, the other social and cultural – streams of analysis running side by side what is at stake here but rather an interactive process full of feedbacks and overlaps reflecting the reality of innovation processes. Under the circumstances of changing social and cultural capacities of society it is the economic contents of innovation that changes as well.

Innovations also transform in connection with social trends that have been labeled as the making of knowledge societies. Knowledge economy is based on invention and innovation – these are the only paths leading to economic success. Knowledge is highly appreciated in a society, where both knowledge-demand and knowledge-supply are strong, where tens of percents of population gain university education and thus large groups of people acquire the ability to orient themselves in complex processes, gain analytical skills and the power to solve complex problems.

Knowledge societies open new ways of both individual and social development but also brings new risks, imbalances, traps and paradoxes. This fact is related to the ambivalent nature of knowing – every knowledge gain also means the emergence of new questions and uncertainties; increased activity of social actors can bring to the fore the unpredictability of creative human action. Increasing abstraction of human activities and large global interconnectivity make knowledge society fragile and vulnerable in a new and distinct way – the recent financial crisis is a case in point. This all accounts for future challenges – among others to innovations, chiefly for their nontraditional forms, especially non-technological and non-economic ones.

Concepts of non-technological and non-economic innovation, not to say social innovation, attest to the ferment that reigns in the field of innovation studies today. As the real innovation activities reconfigure and diversify vis-à-vis new challenges, as their particular currents assume different meaning and weight and "mutate" in the course of new interactions, innovation research searches new definitions, notions and methods, its concepts both differentiate and synthesize.

The relationship of technological and social innovation becomes prominent. Recent decades have been marked by the primacy of technological innovation, which was based on its undeniable success. Social dimension has been treated mainly as a "social context" – social prerequisites and consequences of technological progress. The aim of social intervention – social innovation in fact – was then to compensate for or to balance the impacts of technology or to optimize the social and cultural conditions for the development of technology.

Nowadays, social innovation emancipates itself as an autonomous entity. Its new status is in essence derived from the urgent nature of social problems, which humanity faces – poverty, hunger, inequality, ageing, immigration. These ailments arise, persist and some of them even worsen sharply in spite of the vast technological accomplishments. That means that these problems are not solvable through technology – at least not if it will proceed in the same way as it had, so far.

What needs to be changed is social practice – and the change of social practice is a largely accepted definition of social innovation.

The relationship between social and technological innovation is also being reconceptualized. Undoubtedly, the dominant trend is emancipation and the strengthening of social innovation as a distinct human action with its own specific field of intervention. On the other side, the fact that there is no necessary antagonism between social and technological innovations is being emphasized. Social innovations often aim at changing the means of practice: what is being changed is how people do things – e.g., the instrumental, technical dimension of action is targeted. Technological innovations make sense only when they change something in social or personal lives of people. Some new technical systems

are so tightly interconnected with specific social practices that a borderline between them can be hardly detected, they really build a seamless entity. "Social networks" are enabled by electronic networks.

Close to social innovation is the cultural dimension of innovation. Culture may be understood as a set of values and practices distinctive for a specific group of people. Social practice has its strong cultural dimension and social change is also cultural change.

Within innovation research, a "cultural turn" has taken place recently. Global standardization of economic, financial and organizational schemes and incentives did not lead to the standardization of innovation performance of individual – supranational, national, private, public – actors. This fact motivated a search for new explanations. More subtle and sophisticated instruments for boosting innovations were also sought after. Such new resources – but also new barriers to be removed – were found in the sphere of culture.

One could even witness emergence of the concept of cultural determinism, which understands culture as a crucial factor in both the innovation dynamics and the persisting innovation differences. This brings us closer to the idea of cultural transfer – the imitation and adoption of the cultural patterns of innovation leaders. This concept has proved viable in the case of the highly specific "best practices", although it is a very sophisticated and delicate endeavor. To bring local traditions and cultural innovation import into accord is a demanding and complicated task. If the course of action is insensitive and too vigorous, cultural resistance on the side of recipients can arise and, in addition, the innovation potential of the local cultural tradition can be lost. However it may seem less promising at the time, it may prove beneficial in the future.

On the road to knowledge societies, with increasing "scientification" of all human activities, we can also distinguish two kinds of innovation activities according to their attitude to research. The first one is a research-intensive, theory-laden, exclusive sort of innovations. Here new technologies and new practices are derived from research excellence, some of them representing radical breakthroughs. The other innovation stream is more empirical, inclusive and diffused, not research-related but still possibly knowledge-intensive. This type of innovation largely includes a broad current of minor changes that, however, in the sum, may induce major changes in the conditions of life. (This classification may resemble the "technology-push/demand-pull" model but, in our view, this concept is too narrowly linked to technology and market and is too linear.) The ethical context of both types of innovation is also different: the contributions of the former are more far-reaching yet at the same time more risky. The key ethical considerations are then related to risk assessment. The empirically oriented innovations are not so ethically ambivalent; the task "to make things better" often lies in its very roots.

Many of contemporary analyses of innovations make advantage of the evolutionary concept, in which they emphasize the role of accidental variations. Chaos theory has become another popular explanatory model. It is an adequate reflection of the unpredictability of human creativity and the complex nature of innovation processes. However, what is largely recommended at the same time, is to build and implement innovation strategy that is directed at the factors which can be deliberately influenced. If we take innovation as an evolutionary process, then – as Werner Rammert points out – we must take into account the fact that unlike biological evolution, the selection process is guided here by social interests and values.

The ambition of the authors of individual contributions was to demonstrate sensitivity and openness towards these new moments of both innovation reality and research and at the same time to show an allegiance to the Central-European tradition of social thought, which was always characterized by great theoretical erudition. Whether this ambition succeeded can be judged on the basis on the following texts, divided into three basic sections: the first one deals with the ways society and social and cultural processes influence and form innovation activities; the second one analyzes the ways innovations affect society; the third section tackles current problems of international cooperation and the cultural innovation transfer.

* * *

This book was conceived within a project of international cooperation of the Academy of Sciences of the Czech Republic, "Transition from imitation to innovation as social and cultural process". Collaborating partners were the Centre for Science, Technology and Society Studies at the Institute of Philosophy (AS CR) in Prague and the Centre for Social Innovation in Vienna.

Jiří Loudín – Josef Hochgerner

Part I

Social and Cultural Sources of Innovation

Contributions included into the first part of this book essentially deal with the ways by which society encourages, regulates and effects innovation processes.

To detach the innovation sector from society as such is, of course, a theoretical abstraction. However, in the interest of clarifying the nature of innovation activities it is a useful and justified abstraction. The very generation of new ideas, thought and knowledge is determined from one side by the biological capacities of the human brain and from the other side by the existence of society and communication, without which it would be neither possible nor meaningful. Even technology as such makes no sense unless it is projected into something non-technological, into the social world. It always serves to someone or something that acts and takes place within society.

The concept of the social construction of technology (SCOT – Bijker, Pinch) describes how social agents enter the process of creating new technologies. The supplies of new technological solutions generated by accidental variations are subjected to a selection through negotiation of relevant social actors (producers, users, politicians), the result of which is the stabilization of technology: particular technological options become technological standards. However, on the basis of "interpretative flexibility" of technical artifacts the relevant social actors retain the possibility to participate in their future transformations and developments.

However, the social, "external" interventions into innovation activities are neither arbitrary nor omnipotent – the development of innovations has undoubtedly its obdurate character with the "inner" autonomous trajectory of technological succession (one technology produces another one) or the spontaneous nature of human creativity and distinct innovation community with a specific set of values and practices. Entry points for social action are more open at the starting phase of the innovation cycle (setting priorities) and at the final phases of acceptance and institutionalization.

The tendency to strengthen the social dimension of innovation leads to the establishment of the concept of social innovation. *Josef Hochgener* takes on this issue in his contribution.

Hochgerner argues that the discourse around social innovation should lead to a wider notion of innovation, which would include a social dimension of all

kinds of innovations and the identifying of particularities of innovations in all sectors of society – in the public sector and the business and civil sectors as well. Should social innovation be a specifically defined concept with its own and delimitable field, Hochgerner claims that the foundations of sustainable and productive scientific analysis still need to be created. To this end, he presents two central elements of such foundation: a general definition of social innovation and a concept of operable categories for recording, describing and analyzing different types of social innovation derived from action theory.

The core of social innovation is the idea of changed social practice; social innovation constitutes a new meaning of action in its relation to others. Social innovations are part of social change and continuous change is a prerequisite for the survival and long-term stability of societies. The impact of social innovations on society at large may be of narrow range but of major importance to those affected. Drawing on Parson's concept, Hochgerner also suggests a typology of social innovations with roles, relations, norms and values as its varieties.

Values and practices are a constitutive part of culture. Globalized knowledge society sets also the cultural factors of innovations into motion. The civilization dynamics based on knowledge and innovations carries with itself a latent danger of polarizing cultures, some are subjected to pressure, some tend to imitate others.

These questions are tackled in *Jiří Loudín's* paper. The "cultural thesis", which deals with the cultural conditions of economic activities, is not a brand new idea and can be traced back to Max Weber at least. It is revived today within the new context of the globalized innovation market, the forming of trans-national scientific community, the overall intensive intercultural mobility and the fast and easy circulation of knowledge and information.

Loudín centers his considerations on assessing the problem of functioning of the triangle knowledge-culture-innovation in emerging knowledge societies. In order to provide a basic delimitation of knowledge societies, he departs from the Stehr's definition, which sees the essence of knowledge societies in the possibility of enlarged social action – thus it clearly avoids the perspective of a uniform rational type of society. On the contrary, wherever the spectrum of possible actions enlarges, the action becomes more creative and the self-formation of one's own development becomes more accessible to higher number of social actors. The functioning of the entire society becomes less predictable and bears more risks. Even the effects of knowledge as the prime agent of knowledge societies are accomplished through new antagonisms and paradoxes. New knowledge creates new questions and uncertainities. Tensions are revealed between knowledge as private and public good, between abstraction and the need for specific knowledge-based solutions, between innovations based on exclusive research and innovations based on inclusive knowledge. Even at the point of

interface between society and the research and innovation sphere, tensions become evident. These contradictions and tensions have a strong cultural charge – their individual elements relate to differing values and practices.

Special attention in this contribution is devoted to the question of cultural transfer (in connection with innovation transfer). It is very difficult to raise barriers against the movement of knowledge, however, it is equally challenging to disseminate knowledge effectively. Much of the knowledge is stuck in the heads of particular people and bonds with unique cultural conditions, which are difficult to be transferred. In the course of such transfer, knowledge and innovations must be culturally re-coded.

The question whether cultural homogeneity or heterogeneity of territorial units contributes to the innovation performance is being analyzed.

The development of safety dimensions of innovation activities can be regarded as a cultural change. The growing quality of life includes increased demands on safety, however, the innovation economy and the globalized knowledge society bring along new risks and dangers. These are the questions studied by *Lucia Belyová* and *Gerhard Banse*.

Belyová and Banse claim that despite the fact that safety belongs to one of the fundamental needs of human beings, safety requirements are only partially met by the existing normative approaches. Its importance is often stressed only when safety guarantees have failed or are in the process of failing. Within the innovation process the consideration of safety aspects is of overwhelming importance, e.g. when a newly introduced product or process bears a significant risk of danger. Due to the absence of application knowledge and experience regarding newly introduced technologies, the importance of qualitative safety assessment plays a pivotal role. Within this framework, the values, beliefs and attitudes, thus the safety culture of an organization and its members towards the fulfillment of safety requirements, are considered as one of the key elements in ensuring safe innovations.

In their paper, Belyová and Banse present an approach to analysis of safety culture that is based on the continuous improvement process. It is presented in order to evaluate the ability of organizations to account for the safe and secure setup and the use of innovative products and processes.

An extensive public engagement in the questions of innovation development demonstrates that society cares about them. *Adolf Filáček* deals with this problem within European context in general and in within Czech context in particular.

Filáček notices that among the European public there are increasing expectations of favorable impacts from the development and financial support granted to science and research. This social climate has posed major changes and challenges both to the research sector as a whole and to individual research-

ers. In the context of financial crisis, the efforts aimed at establishing austerity measures and cuts in public budgets are gaining ground, which is reflected in actual expenditures earmarked for research and development.

There is a considerable rise in the number of managerial and decision-making subjects who actively assert their influence on the research focus of scientific programs. Filáček describes the prevailing situation in the relationship between society and science in the Czech Republic, while analyzing the content and thematic focus of public debates as well as procedures of their implementation in the Czech context. Science communication and journalism are also discussed.

Preparing for the Big Shift
The Capacity of Social Innovations in 21st Century's World Society

Josef Hochgerner

Petty innovations to meet grand challenges?

It has become common sense to demonstrate awareness of *grand challenges.* Though different in content, but in widespread consonance policy makers, all sorts of institutions, everyday debates, letters to the editor in the yellow press as well as feature pages are full of moaning about *crisis*: The terms 'challenge' and 'crisis' seem interchangeable. However, the notion of challenges is comparatively positive as it inclines the conceivability of solutions ahead, whereas crisis evokes the notion of a threatening bundle of *problems* that no one wants to have nor seems capable to resolve. Problems mount to crisis, crisis are turned into challenges, and here we are, dependants of the knowledge society: Research is needed and innovation required to meet the challenges of today – and in particular the grand challenges of the future.

> "At a time of public budget constraints, major demographic changes and increasing global competition, Europe's competitiveness, our capacity to create millions of new jobs to replace those lost in the crisis and, overall, our future standard of living depends on our ability to drive innovation in products, services, business and social processes and models. This is why innovation has been placed at the heart of the Europe 2020 strategy. Innovation is also our best means of successfully tackling major societal challenges, such as climate change, energy and resource scarcity, health and ageing, which are becoming more urgent by the day."[1]

This opening paragraph of the EC Communication on the Europe 2020 Flagship Initiative 'Innovation Union' lists a number of severe problems, men-

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[1] *Europe 2020. Flagship Initiative: Innovation Union*, COM(2010) 546 final, European Commission, Brussels 2010, p. 2, available at http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=keydocs, accessed in October 2010.

tions '*the crisis*', and states nothing less than the future standard of living will depend on driving innovation. Moreover, *innovation i*s attributed 'our *best means* of tackling societal challenges'. Exemplary challenges named are big enough to prompt the provocative question whether innovation will indeed be best means to cope with climate change, energy and resource scarcity – and even to match the longer list of crucial challenges to the world society listed in the UN Millennium Development Goals.[2] Of course, being a promoter of innovation (and in particular of social innovation) myself, I will not deny the *necessity* and inalienability of innovation in meeting whatever challenges and problems under scrutiny. Yet like in other cases of thought and action, the difference remains between necessity and sufficiency. Science, research and innovation are most effective if ambition is balanced by an appropriate degree of modesty – i.e. to apprehend their potential and limitations alike. If innovation is to help remedy the perils of climate change, it will be capable to play its role only in perennial interplay with political will, political and economic power asserted in dedicated structures of governance, the media, an open minded public and active civil society organisations: Innovation cannot substitute knowledge at large and comprehension of what should be done, and who might take action.

To make a clear statement: Innovation certainly is needed more than ever, but hopes and expectations should not tip over to end up in sheer speculation. Innovations are ideas tested and approved in operation. Therefore assessment and measurement of scope and quality of innovation must be based on results instead of forecasts. Methodologies to fulfil this requirement have been developed during the past decades in very rich scientific literature, statistical indicators and benchmarks taking account of innovations with prime economic – yet also social – impact.[3]

Innovation without a prefix mainly refers to new products or processes based on advanced technology, new combinations or design of technical components successfully employed in existing or new markets. In discussions and programmatic declarations on national, European and international levels, the greatest significance is attached to the acceleration and reinforcement – and also the continuous alteration – of innovation processes. Frequently innovation is regarded as the final product of the scientific generation of new knowledge and its economic application. Indeed, by deliberate promotion of research, technology

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[2] See http://www.un.org/millenniumgoals/, accessed in June 2011.

[3] *Europe 2020. Flagship Initiative: Innovation Union*, op. cit. (European Innovation Scoreboard: http://ec.europa.eu/enterprise/newsroom/cf/itemlongdetail.cfm?item_id=4139&lang=de, accessed in October 2010); *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, a joint publication of OECD and Eurostat, third edition, OECD Publishing, Paris 2005, available at http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/OSLO/EN/OSLO-EN.PDF, accessed in October 2010.

and innovation, present society has considerably expanded the potentials for improving current and future living conditions. These developments continue and lead to overwhelming lots of new products and consumer goods, novel infrastructures for transport and communication, longer life spans, yet also to individual and social stress in case of unexpected and disputed effects. Moreover, changes in innovation processes themselves trigger new characteristics of innovations.[4] On the one hand, new methods are being employed to increase the technological and economic development and effectiveness of innovations (‘*user-driven innovation’*, ‘*open innovation*’);[5] on the other hand, concepts are gaining in influence stating that the social dimensions of technical innovations and the special qualities of social innovations should no longer be neglected.[6]

While the concept of social innovation is not new, it has only recently been recognised as a key component of innovation in scientific and policy circles in Europe and beyond. Yet despite the fact of its recognition there is still a long way ahead to move from the already relatively high awareness to systematic promotion and implementation of social innovations in the private and public sectors. For example, the Austrian government’s “Innovation Strategy”[7] highlights social innovation, but there is no indication of instruments and programmes to be established. If the term ‘social’ occurs in existing programmes supporting research and innovation, these programmes continue to aim primarily at promoting technology and economic growth – with the side expectation of *also* supporting social development.[8] An explicit programmatic forcing of specific social

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[4] Rosted, J. et al., *New Nature of Innovation*, Study report to the OECD Committee for Industry, Innovation, and Entrepreneurship (CIIE), jointly funded by the Danish and Finnish governments, FORA, Copenhagen 2009.

[5] Cf. Franke, N., Hippel, E. von, Schreier, M., ‘Finding commercially attractive user innovations. A test of lead user theory’, *Journal of Product Innovation Management*, Vol. 23, 2006, pp. 301–315; Chesbrough, H. W., Vanhaverbeke, W., West, J. (eds.), *Open Innovation. Researching a New Paradigm*, Oxford University Press, Oxford 2006; Reichwald, R., Meyer, A., Engelmann, M., Walcher, D., *Der Kunde als Innovationspartner*, Gabler, Wiesbaden 2007.

[6] Cf. Howaldt, J., Schwarz, M., ‘Soziale Innovation – Konzepte, Forschungsfelder und Perspektive’, in: J. Howaldt, H. Jacobsen (eds.), *Soziale Innovation. Auf dem Weg zu einem postindustriellen Innovationsparadigma*, VS (Verlag für Sozialwissenschaften), Wiesbaden 2010, pp. 87–108.

[7] *Der Weg zum Innovation Leader. Strategie der Bundesregierung für Forschung, Technologie und Innovation*, BKA (Bundeskanzleramt) et al. (five ministries), Vienna 2011, available at http://www.bmvit.gv.at/service/publikationen/innovation/forschungspolitik/downloads/fti_strategie.pdf (March 2011).

[8] On European level the promotion of social innovation in the Flagship Initiative ‘Innovation Union’ reveals at the same time unimpaired trust in technology to resolve social issues: “Europe has a strong potential in technological inventions for societal challenges and new global growth areas, which could be successfully brought to the market by implementing the comprehensive and integrated approach set out in Innovation Union” (http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=executive-summary&section=competitiveness-report&year=2011, accessed in June 2011).

innovations does not yet appear to be in sight. In parallel, business enterprises progressively become interested in social innovations as an additional means to boost competitiveness, often considering social innovations secondary if it comes to the crunch.

Thus social innovation neither is on par with, nor integrated in the classical notion of innovation. In real life social innovation still remains kind of second choice, predominantly unobtrusive and undervalued concerning impact and effectiveness. In fact social innovations appear petty compared to the grand challenges for which new and promising levers to provide solutions are sought. In order to live up to realistically modified anticipations of functions and efficacy of social innovations, in first place clarification of the concept is required, followed by the establishment of reliable indicators and approaches to measure resources used in the process of social innovation generation, and to make impacts accountable.

The concept of social innovation

Despite the fact that social innovation currently becomes – almost world-wide – popular in strategic papers,[9] public debates[10] and research,[11] the term still needs clarification. Social innovation is not a concept separated or even in opposition to what is traditionally called innovation and understood to constitute economic value and satisfy customer demands, resulting most frequently from new technologies and change in entrepreneurial settings: Products, processes, marketing and organisational innovations. It not only is obvious, but a fundamental principle that by definition these types of innovations are considered

[9] Most relevant in the context of the EU strategy "Europe 2020" and its Flagship Initiative "Innovation Union" (*Europe 2020. Flagship Initiative: Innovation Union*, op. cit.), yet also e.g. on national level in the Austrian government's Strategy on Research, Technology and Innovation (*Der Weg zum Innovation Leader. Strategie der Bundesregierung für Forschung, Technologie und Innovation*, op. cit.).

[10] An expert panel, appointed by DG Enterprise and Industry, proposed "*to base EU action around compelling social challenges, to finance venture and social innovation funds, to incentivise large scale community level innovations, to transform the public sector and to unlock the potential of new infrastructure and new types of partnerships.*" (Vasconcelos, D. et al., *Reinvent Europe through Innovation. From a Knowledge Society to an Innovation Society*, Business Panel on future EU innovation policy (Directorate-General for Enterprise and Industry of European Commission), Brussels 2009, available at http://ec.europa. eu/enterprise/policies/innovation/files/panel_report_en.pdf, accessed in October 2010).

[11] In 2010 for the first time the research programme Social Sciences and Humanities (SSH) explicitly mentioned social innovation in research topics in its Call for Proposals (Work Programme 2011).

part of the business sector: All information available, including facts and figures from national and international statistics pertaining to 'innovation' are within the limits of data gathered from enterprises and framed according to the four main categories indicated above.[12] Therefore social innovation amends the given concept of innovation, whereby theoretical comprehension and empirical operationalisation need to grasp the specific features of types of social innovations (as compared to the four types established), and in addition to take account of the overlaps in the wider spectrum of innovations.

The most important of such overlaps is that innovations in the business sector, driven by economic factors, feature social dimensions since they emerge under social conditions in different contexts, and they have social effects. These should be paid more attention to than has in the past. At the same time social innovations which do not aim primarily at economic objectives, may also result in economic impact that should not be neglected.[13] In a nutshell, the discourse aroused around social innovation should lead to a wider notion of innovation, on the one hand including social dimensions in all kinds of innovation, and identifying on the other hand particularities of innovations in all sectors of the society: the public, the business and civil society ('third') sector as well.

Under conditions of constant expansion and growing power of the capitalist system since the Second World War, globally and unchecked since the collapse of the Soviet Union in 1991 and the disappearance of the competition between the systems, it is not surprising that economic categories and expectations have *also* dominated the innovation discourse. But in the light of rising awareness and concerns of unprecedented global challenges at the beginning of the 21st century the interest in social innovations rapidly increased in recent years. A post-industrial innovation paradigm is beginning to emerge.[14] In such a new paradigm, social innovations as well as technological and economic innovations could be integratively comprehended as components of social change in a 'holistic' interpretation of innovation.[15]

Until this recent development in perception, social innovations hardly were thematised even "in social scientific innovation research, which is heavily focused on the social prerequisites, consequences and processes in the context of techni-

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[12] *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, op. cit.

[13] Cf. Kesselring, A., Leitner, M., *Soziale Innovation in Unternehmen*, Studie erstellt im Auftrag der Unruhe-Privatstiftung, ZSI (Zentrum für Soziale Innovation), Vienna 2008, available at https://www.zsi.at/object/publication/1444, accessed in October 2010.

[14] Howaldt, J., Jacobsen, H. (eds.), *Soziale Innovation. Auf dem Weg zu einem postindustriellen Innovationsparadigma*, Dortmunder Beiträge zur Sozialforschung, VS (Verlag für Sozialwissenschaften), Wiesbaden 2010.

[15] Hochgerner, J., 'Innovation Processes in the Dynamics of Social Change', in J. Loudin, K. Schuch (eds.), *Innovation Cultures. Challenge and Learning Strategy*, Filosofia, Prague 2009, p. 40.

cal innovations. Here, social innovations are not so much used as a specifically defined concept with its own and delimitable field, but rather as a descriptive metaphor in the context of phenomena of social and technological change."[16]

For this reason, it must be established that, notwithstanding the popular boom of the topic and the increasingly recognized relevance of social innovations, the foundations of sustainable and productive scientific analysis still need to be created, at any rate standardised. To this end, two central elements of such a foundation are presented for discussion here: first, a general definition of social innovations, the core of which is the idea of changed social practice; second, a concept of operable categories for recording, describing and analysing different types of social innovations, derived from action theory.

"Social innovations are new concepts and measures to resolve societal challenges, adopted and utilised by social groups concerned."[17] This definition applies the fundamental criteria of innovations in business (the only ones clearly defined) to conceive innovations beyond the economic determination. In short, business type innovations are new products or services, processes, marketing and organisational measures which are successfully commercialised. The uptake of new and improved offers by markets and its commercial result (sales, turnover, return on investment, profits ...) is *the* decisive criterion that turns an *idea* and its result in the forms of products, etc. into an *innovation*. A new gadget, device or trading good that may – judged by its technological features – be superior to older or other new products, but for some reason does not 'deliver' in markets, will not be regarded an innovation (it only may become an interesting case of study as 'failed innovation').

Because by definition the prime objective of social innovations is not commercial success (though some social innovations may facilitate such an outcome indirectly) another determinant is required to indicate success. In the definition proposed and explicated here, this determinant is the adoption and utilisation of the novel practice by the social group (or groups) concerned: Their acceptance signifies, as 'the market' does in the case of commercial innovations, that an idea functions in practice. As in the case of innovative technologies, an innovative social practice or measure suggested to solve a social problem (be it in regard to education, social inclusion or other domains of social issues) may seem in principle superior to current or other practices; yet if it is not met with acceptance *and utilised*, it remains an idea and cannot be regarded an innovation. Nevertheless, an idea and solution suggested that is not adopted at a

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[16] Howaldt, J., Schwarz, M., 'Soziale Innovation – Konzepte, Forschungsfelder und Perspektive' op. cit., p. 88 (translated).

[17] *Stimulating Social Development*, ZSI Discussion Paper 10, ZSI (Zentrum für Soziale Innovation), Vienna 2008, p. 2, available at https://www.zsi.at/object/publication/1390, accessed in October 2010.

certain time in a particular region or culture, may still bear excellent qualities and may become a successful innovation later, in different places or in another social setting.

Social innovations are not solely determined by the potential of an idea, but by further stages of the process which makes an idea becoming an innovation. This may be called and memorised as '*4-I process*': The *Idea* (starting with precise identification of the issue and potential solution) must be transformed to an *Intervention* (taking action towards the proposed solution) and *Implementation* (that means to establish the solution in the social environment concerned; in many cases of social innovations this leads to formal institutionalisation). Finally this process generates *Impact* (outcomes that may – just as any innovation – be assessed differently in one or the other social milieu, and may affect small or large parts of the society, in various age groups etc.).

> "That ... implies that society as a whole need not be convinced of the benefit of a new practice. Innovation, both technological and social, need not be regarded as beneficial by all. It remains controversial, and has nothing whatever to do with good or evil. The focus is directed at interests and viewpoints."[18]

Under the conditions of globalisation, innovations of all kinds affect growing sections of society. They shape not only processes and trends in civil society, but also in public administration, in political institutions, in the economy, and in the professional associations of the social partners. The behaviour of individuals in small groups, families and neighbourhoods can be affected (*micro level* of society) just as much as e.g. organisational development in enterprises, teaching and learning in education, and various societal institutions (*meso level*), or structurally effective regulations in the social constitution (social legislation, health care, pension and taxation systems, etc. at the *macro level*).[19]

The features of innovations in general and of social innovations as defined here can be observed in the actions and behaviour of individuals, groups and institutions, and are hence accessible to empirical research. Theoretical approaches

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[18] Franz, H.-W., 'Qualitäts-Management als soziale Innovation', in: J. Howaldt, H. Jacobsen (eds.), *Soziale Innovation. Auf dem Weg zu einem postindustriellen Innovationsparadigma*, VS (Verlag für Sozialwissenschaften), Wiesbaden 2010, pp. 338 (translated).

[19] Pertinent variants of social innovation impact are identified by the so-called 'BEPA-Report' (*Empowering People, Driving Change: Social Innovation in the European Union*, European Commission, Bureau of European Policy Advisers (BEPA), Brussels 2010, available at http://ec.europa.eu/bepa/pdf/publications_pdf/social_innovation.pdf, accessed in October 2010), where "three complimentary approaches to the social dimension of social innovation" are presented (26ff.): "The social demand perspective"; "The societal challenge perspective"; and "The systemic changes perspective".

are offered by the concept of social action by Max Weber[20] and the analysis of action systems based on it by Talcott Parsons.[21] At the centre of Weber's theory of social action stands the subjectively meant 'meaning' of action, i.e. the intention, aim and purpose of an intervention and the reference of this action to or orientation according to 'others' (persons, groups, institutions, the social environment): "'Social action' [...] intends to refer to such actions that in terms of the actor or actors relate to the behaviour of *others* and take their bearings from it."[22]

Whenever social innovations manifest themselves in social practices, in the diction of action theory, it follows that they either lead to new forms of social action or presuppose new social action. At any rate, social innovations constitute a new meaning of action in its relation to others (to the social ambience). Social action in families, school classes, working groups, and also in large social systems (administrative entities, states, major concerns, etc.), is determined by given roles and functions. A recasting of these very roles and functions can change the social systems themselves, under circumstances affecting general processes of social change. The latter depends on the form and range of concrete innovations.

It is necessary here to refer to the difference between *incremental* innovation (in itself less spectacular innovations, yet most relevant as part of ongoing innovation processes) and what is labeled '*radical*' innovation (major changes in a variety of dimensions such as objectives, methods, resources used, with great potential to initiate follow-up innovations). At present social innovations on the one hand appear 'unobtrusive',[23] because they are *embedded in a continuous process of social change*, while on the other hand expectations in social innovation quite often are of paramount scope, associated with anticipated hopes to meet grand challenges and *deviating the direction of social change*.[24]

The vast majority of social innovations, just like product innovations, are of minor scale and do not have any significant effect on social change, or even 'change the world'. Immediate impact at large in society may be of narrow range, but nonetheless of major importance to those affected. However, social innovations may have the capacity of fundamental ('basic') impact on society (as had e.g. the implementation of compulsory schooling, social security and health systems), whereupon similarities in comparison between technological and societal developments are notable:

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[20] Weber, M., *Wirtschaft und Gesellschaft*, Zweitausendeins, Frankfurt am Main 2005.

[21] Parsons, T., *Zur Theorie des Sozialsystems*, Westdeutscher Verlag, Opladen 1976.

[22] Weber, M., *Wirtschaft und Gesellschaft*, op. cit., p. 3 (translated).

[23] Aderhold, J., 'Probleme mit der Unscheinbarkeit sozialer Innovationen in Wissenschaft und Gesellschaft', in: J. Howaldt, H. Jacobsen (eds.), *Soziale Innovation. Auf dem Weg zu einem postindustriellen Innovationsparadigma*, VS (Verlag für Sozialwissenschaften), Wiesbaden 2010, pp. 109–126

[24] As expressed by Zapf, W., *Modernisierung, Wohlfahrtsentwicklung und Transformation*, WZB (Wissenschaftszentrum Berlin für Sozialforschung), Berlin 1994.

> [The evolution of] "human beings ... repeatedly shows forks and sprouting branches. A fork stands for the opening of a new path, a new work method ... . I term such a change in direction from the previously customary practice a basic innovation. Technological basic innovations create new trades or branches of industry, non-technological basic innovations open up new fields of activity in the sphere of culture, in public administration and in social services, etc. Basic innovations create new terrain for human activity".[25]

To open up the entire spectrum of social innovations to scientific analysis, small-scale changes (affecting individuals) as well as large-scale ones (affecting social structures) in any of the functional systems of society must be defined in coherent categories. Suitable is a slightly adapted recourse to some of the elements of Parsons' structural function theory.[26] This is despite, or perhaps even because this theory of social systems understands *function* to be "the effect of a social component making a contribution towards realizing a specific system status and *maintaining and integrating* a social system".[27]

It may seem a contradiction to apply terms and categories from a theory conceived to explain the persistence of social systems to a concept of change. However, there is no social system in the modern world, especially under the conditions of accelerated economic and social dynamics, that could survive without ongoing change. Social innovations are fragments of what is considered social change, a more extensive, general and rather contingent process than intended social innovation. Good ideas to react in case of disapproved changes, successful interventions and implementation may make a difference, named social innovation, towards *stabilising* small or large systems. 'Stability' can be achieved by safeguarding the status quo *or* by change, although change may again lead to instability up to complete system collapse and the demolition of old and building up of new systems. In these processes, which often occur in parallel in society, innovations have a special significance.

As was already explained in Schumpeter's innovation theory,[28] innovations support the survival of enterprises (maintenance of stability), but keep the more comprehensive capitalistic process of 'creative destruction' in motion: In this theory, innovations in enterprises are required to cope with economic imbalances, because there is no 'natural' tendency of the economy towards equilib-

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[25] Mensch, G., *Das technologische Patt. Innovationen überwinden die Depression*, Fischer TBV, Frankfurt am Main 1975, pp. 56f. (translated).

[26] Parsons, T., *Zur Theorie des Sozialsystems*, op. cit.

[27] Hurrelmann, K., *Einführung in die Sozialisationstheorie*, Beltz, Weinheim – Basel 1990, p. 41 (translated, my *emphasis*).

[28] Schumpeter, J. A., *Kapitalismus, Sozialismus und Demokratie*, UTB, Tübingen 2005, pp. 134ff.

rium. The same applies to the overarching dynamics in human society: It exists and persists *because of constant change* – as there are changes with new-born and dying individuals side by side, groupings formed and dissolved, migration, integration, dis-integration, institutions established and re-arranged, onto the rise and fall of empires.

All innovations are socially relevant, those aimed at objectives and rationality criteria to change economic parameters as well as those with social intentions and effects in the field of social practices. But this also implies that, irrespective of the kind of innovation, meanings and impact of innovations are not restricted to the respectively evident functional system: technological and economic innovations affect or change not only the functional system of the 'economy', but also the other functional systems dealt with by Parsons,[29] i.e. 'politics', 'law' and 'culture'. It equally applies that social innovations by no means exert an influence only on *culture* or *politics*, but also on the functional systems of *law* and the *economy*. Within these systems, the function of 'integration'[30] has major importance for maintaining the system, but at the same time also for change.

According to Parsons,[31] four *structural categories* come together in all social systems, i.e. 'role', 'collective', 'norms' and 'values'. *Roles* refer to the personal assignment or assumption of assignments; the *collective* stands for social relations abstracting from personal attributes; *norms* are rules of the most varied kinds (from house rules to laws, state treaties and international agreements); *values* express general patterns of desirable modes of behaviour and attitudes which usually have the character of orientation, but to a certain extent also normative significance. These structural categories – from the roles of individuals to fundamental values in society – can be used to identify or designate different *types of social innovations*. The comprehensive typology of innovation activities, which has hitherto only covered *products*, *processes*, *marketing* and *organisation,* and exclusively in the sector of the economy, would then include *roles*, *relations*,[32] *norms* and *values* as varieties of social innovations.[33]

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[29] Parsons, T., *Zur Theorie des Sozialsystems*, op. cit.

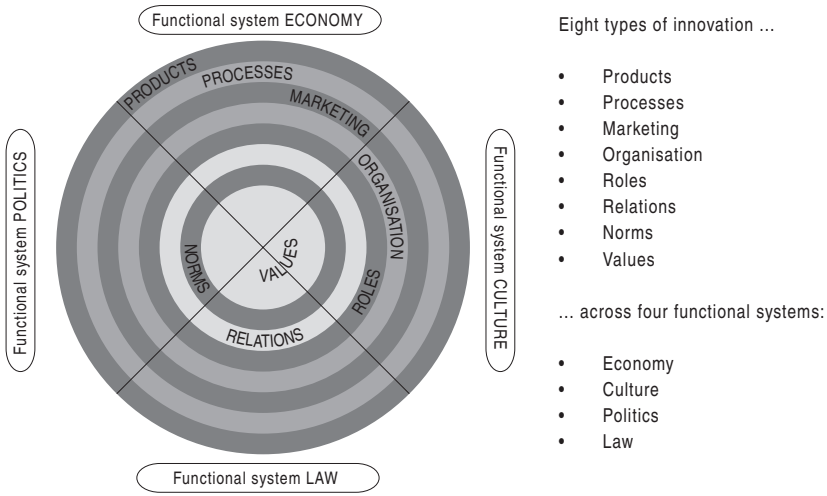
[30] Parsons in *Zur Theorie des Sozialsystems*, op, cit., describes four necessary basic functions, summarised in the so-called 'AGIL Scheme': Adaptation, Goal attainment, Integration and Latency.

[31] Ibid., pp. 176ff.

[32] Instead of Parsons' structural category 'collective', I here choose the term 'relations', for Parsons (ibid., p. 181) is also primarily concerned with interactions (based on expectations, achievements, rights and duties) that become effective in a collective.

[33] Innovations in the business sector with prime economic objectives and impact depend to a wide extent on technology or become manifest as technology (in the form of technical devices, new materials, etc.). Yet concerning organisational innovations or new services, technologies may only be of supportive nature, not representing the source of novelty. Henceforth this sort of innovations may be characterised along a range from dominant technological to non-technical features. In case of social innovations variants can be differentiated from informal adoption to formal institutionalisation.

Figure 1: Types of innovations in social functional systems



Source: Author's chart, 2011

Such an amended typology of innovations goes beyond the sector of the economy: it makes *all innovations* in the sectors of business, public administration, and in civil society organisations (the 'Third Sector') the objects of empirical research. Of course, the technical and non-technical economic innovations are and remain of salient significance for the functional system of the economy, just as innovations in the form of values may primarily be situated in the functional system of culture.

A possibility of representing innovations of different kinds in relation to one another and in Parsons' functional systems is a circular chart (Fig. 1), in which innovations are arranged from outside to inside according to the degree of their ordinary plasticity. The sequence goes from outside, the material environment of society or the most quickly changeable 'surface' of social systems,[34] to the inside, to social structures most difficult to change and relatively more resistant to innovations. Testing this assumption is possible by studying model cases of the different types of innovations and measuring the pace of creation and dissemination as well as efforts required for development and implementation.

Fig. 1 illustrates that different types of innovations not only interact with one

[34] "The material environment of human life [...] forms a relatively unsteady foundation [...] for social conditions. But in the weakness of this structure lie its meanings: if it bursts, a lot is at stake; to prevent this, [...] long-term, more stable elements help to shape social conditions." (Hochgerner, J., *Arbeit und Technik. Einführung in die Techniksoziologie*, Kohlhammer, Stuttgart 1986, p. 63, translated).

another, but may also occur and operate in all social functional systems. Such theoretical considerations pertaining to the definition and typology of social innovations intend to facilitate future scientific research on social innovations. In doing so, grounds should be better prepared to identify social innovations needed to meet the grand challenges and to record, comprehend and evaluate relevant activities in this context. This places great demands on interdisciplinary and transdisciplinary research in the social and economic sciences and on their ability not only to develop adequate methods and research programmes, but also to reflect on their relation to social practice and deliberately to utilise own organisational competences.

The big shift ahead in the 21st century: The emergence of a world society

Globalisation is a process, mainly driven by the dominance and potential of the 'system of market economy',[35] unleashed by the termination of the former 'systems competition' (capitalistic turn in the former Soviet block, yet also of the Communist Party in China) and neo-liberal ideology taking command in economic policy world-wide. Besides such major forces, and partly as results of these, the gigantic growth of capacities in communication, transportation and intercultural diversity contribute to globalisation as well, accompanied by many other developments accelerating and modifying previously known modes of (on average: slower) social change. As a consequence the process of globalisation (multi-facetted in itself) provokes the demand to comprehend societal manifestations *and requirements* on world level as a social system that may be qualified 'world society'. The emergence of a world society[36] should not be misinterpreted as any uniform society or as community of mankind. *Society* is not conceived a *community* sharing more or less the same patterns of interest, opinions or nearness (in communication, values, manners ...). In fact, myriads of communities are embedded and dependent on nonpersonal structures and functions that constitute society:

> [Society is a] "highest-order social system, one which fulfills the prerequisites of a level of order that permits a relatively complete and stable de-

[35] "Whereas History and Anthropology know of different economic forms, most of which contain the setting up of markets, they do not know of any economy before ours that was even remotely so dominated and controlled by markets." (Polanyi, K., *The Great Transformation. Politische und ökonomische Ursprünge von Gesellschaften und Wirtschaftssystemen*, Suhrkamp, Frankfurt am Main 1978, p. 72, translated).

[36] Cf. Heintz, B., Münch, R., Tyrell, H. (eds.), *Weltgesellschaft. Theoretische Zugänge und empirische Problemlagen*, Zeitschrift für Soziologie – Sonderheft, Lucius & Lucius, Stuttgart 2005.

> velopment, within its boundaries, of all the important types of structure and process with which the analyst of social systems is concerned."[37]

"In Talcott Parsons there is a strong disposition towards understanding society in terms of territoriality, the territorial control of physical force and in terms of nationality. ... [Whereas Luhmann] ... interprets society consistently as the most extensive social system. For Luhmann in present-day society this can only be realized as system of a world society."[38] Of course, there are crucial obstacles to establish what may be seen as a comprehensive social system with generic normative rules on world level. This is why Parsons considered the concept of a world society rather improbable:

> "At one extreme, the principal content of the normative order may be considered more or less universal to all men. However, this raises acute problems of how far such highly universalistic norms can be effectively institutionalized in the actual operations of so extensive a community."[39]

Nevertheless and as a matter of fact, globalisation expands the 'boundaries' in which 'prerequisites of a level of order that permits a relatively complete and stable development' are required, to world level. Thus the severe question arises whether or not mankind will be able to shape an emerging world society capable to cope with grand challenges on world level. *Continuity*, in the sense of living conditions in a 'relatively complete and stable development', and *change* are properties of social as well as of biological life. Forms of organic and social life continue just the same through variations, by shifting their appearance, properties, features – in terms of social systems: their structures and functions.

Challenges like climate change, poverty next to impudent wealth, abundance, waste of human and natural resources, population growth and ageing societies necessitate novel modes of collaboration on world level among states, civil society organisations and international bodies. Solutions to counter global threats as well as to obtain appreciated effects of the positive potential of globalisation require social and political structures beyond the traditional boundaries of nation states. Their capacity becomes insufficient as is the equalisation of nation state with national society (and its in many cases still presumed ethnic homo-

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[37] Parsons, T., "Order and Community in the International Social System", in J. N. Rosenau (ed.), *International Politics and Foreign Policy*, The Free Press, Glencoe, Ill., 1961, pp. 121 f,

[38] Stichweh, R., 'Zum Gesellschaftsbegriff der Systemtheorie: Parsons und Luhmann und die Hypothese der Weltgesellschaft', in: B. Heintz et al. (eds.), *Weltgesellschaft. Theoretische Zugänge und empirische Problemlagen*. Zeitschrift für Soziologie – Sonderheft, Lucius & Lucius, Stuttgart 2005, pp. 174.

[39] Ibid., op. cit., p 20.

geneity). Societies in nation states become ever more diverse – an instance that should be considered an option to gain additional resources instead of merely a source of instability and potential conflict.

To meet grand challenges an adequate big shift in conceptualising and shaping human society on local, national, and global levels becomes imperative. With reference to these challenges and the diagnosis of society as an appendix to the economy,[40] the most urgent basic innovation of the 21st century can be formulated as the *re-integration of the economy in society*.[41]

To this end and to begin with first, economic indicators (serving the purpose of guiding and justifying economic, labour-market and social policy measures) must in future measure *not only productivity, but above all prosperity* (enabling to indicate improvements as well as degradation of quality of life). There are important approaches to this, including the start of the "Better life initiavive" by OECD,[42] to the systematisation of which the commission of Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi (Commission on the Measurement of Economic Performance and Social Progress) has already made important contributions since 2009.[43] Secondly, apart from eliminating shortages (in terms of satisfying real needs, insufficient access to water, energy, etc.), it is high time to establish strategies for *surplus management* ('management of abundance') as an equally salient task of the economy and economic policy (instead of continuing to push private surplus economy next to public social deficit administration). In short, there is no crisis of production, yet a disastrous crisis of distribution – creating further cleavages between the world's islands of affluence as opposed to tailback regions[44] that are prevented from catching up.

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[40] Polanyi, K., *The Great Transformation. Politische und ökonomische Ursprünge von Gesellschaften und Wirtschaftssystemen*, op. cit., p. 88.

[41] The fact that the 'economy' need not be conceived of as being external to society is shown, for instance, by Parsons' *Zur Theorie des Sozialsystems*, op. cit., theoretical concept, used in this article to form categories, which describes the economy *as one of four social functional systems*.

[42] See http://www.oecd.org/document/0/0,3746,en_2649_201185_47837376_1_1_1_1,00.html, accessed in May 2011.

[43] "While many of our measures are directed at ascertaining short-run movements in the level of market activity, the Commission considers that the time has come to make a clear move from measuring production to measuring welfare, to try to close the gap between our measures of economic performance and widespread perceptions of well-being." Stiglitz, J. E., Sen, A., Fitoussi, J.-P., *The Measurement of Economic Performance and Social Progress Revisited. Reflections and Overview*, Commission on the Measurement of Economic Performance and Social Progress, September 16, 2009, p. 63, available at http://stiglitz-sen-fitoussi.fr/documents/overview-eng.pdf, accessed in October 2010.

[44] I consider 'Islands of Affluence' (as kind of an analogue to the so-called 'G20') the 'Top20' countries of the world with highest GDP/capita – the classical measure of prosperity, whereas 'Tailback Regions' are considered the Least Developed Countries (LDC) according to the same index. This kind of measurement is based solely on a few economic indicators that neglect human factors and depletion of resources, yet it shows which countries fare best under existing preconditions, leaving

Components that seem essential to make a difference are

- a "state that is in the position effectively to supervise and sustainably to tax the profits skimmed off on money markets",[45]
- preferential treatment of the production and services sectors over critical sections of the financial sector,[46]
- secure funds for a global Marshall Plan,[47] and
- a ban on speculation with foodstuffs.

In the EU, such and further measures could be clustered in a *New Deal for Europe*,[48] i.e. policy measures established on clear objectives to form and preserve an inclusive society on national and international levels alike.

To develop and implement such measures, political will is imperative as well as a critical and participating public, supported (not substituted) by science, research, technology and innovation including massive efforts towards the creation and implementation of social innovations. At present and in the future times to come, apart from technical and economic innovations, a multiplicity of minor and major social innovations up to basic (or 'systemic') social innovations will become indispensable. Otherwise, peace and development – in keeping with the standards of industrial potentials – will remain extremely at risk in a world society of eight to ten billion people in the light of problems such as climate change and the threatening growing gap between the rich and the poor.

> "The most urgent and important innovation advance in the 21st century will take place in the social field. Technical innovations will continue, of course, and bring about a materially and immaterially utterly changed environment and new living conditions in comparison with previous possibilities; but the social innovations will be those that the inhabitants of this planet must first produce or ensure."[49]

Returning to theory and the concept of social innovation as outlined in the previous chapter: How to locate social innovations in the functional systems

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them (a) with the highest potential to make a change, and (b) the highest degree of responsibility to do so.

[45] Bourdieu, P., *Praktische Vernunft. Zur Theorie des Handelns*, Suhrkamp, Frankfurt am Main 1998, p. 119.

[46] Cf. "Die Entgrenzung des Finanzsektors – das Problem hinter den Problemen", Radermacher, F. J., *Die Zukunft unserer Welt. Navigieren in schwierigem Gelände*, Edition Stifterverband, Essen 2010, p. 70ff.

[47] www.globalmarshallplan.org

[48] Schulmeister, S., *Mitten in der großen Krise. Ein "New Deal" für Europa.* Wiener Vorlesungen, Edition Gesellschaftskritik, Vol. 7, Picus, Vienna 2010.

[49] Hochgerner, J., *Jenseits der großen Transformation. Arbeit, Technik und Wissen in der Informationsgesellschaft*, Löcker, Vienna 1999, p. 37 (translated).

existent within the 'collective singular *society*', which may be the most needed social innovations and which variants may be most likely to prevail? And, last but not least, how to deepen the comprehension of processes involved in the making and realisation of social innovations, and how to mobilise social actors to turn knowledge into action? These are very demanding questions of which I think they must be asked and I may try here a first sketch to suggest provisional directions of answers.

Society makes its members subject to normative rules – whether all appreciate or not – for providing "the highest level of self-sufficiency as a system in relation to its environments. [Whereby] ... the criterion of self-sufficiency can be divided into five sub-criteria, each relating to one of the five environments of social systems – Ultimate Reality, Cultural Systems, Personality Systems, Behavioral Organisms, the Physical-Organic Environment. The *self-sufficiency* of a society is a function of the *balanced combination of its controls over its relations with these five environments* and of its own state of internal integration."[50]

According to Parsons 'self-sufficieny' indicates more than availability of resources, namely the capacity of a social system (the society considered) to develop, shape and change if necessary the structures and functions it needs to get along. In this regard analysis of the current state of human society in general, and that of the many nation-based societies coexisting across world regions and continents has to acknowledge two crucial changes pertaining to the human condition compared to times when Parsons introduced his theory of social systems:

- Globalisation, by ways of trans-national economic, social and cultural interaction, creates (in part mutual, yet in many cases uni-lateral) dependencies and thus "a patterned normative order through which the life of a population is collectively organized".[51] From there it follows that a world society is emerging, and new *normative structures are required to shape and control the conditions and quality of life in a society on world level*. If there is global impact driven by economic forces, global control and guidance of such processes are needed as well.
- Resulting from the daunting success of industry, modernisation, research and development in technology, shifting social structures from that of an industrial society towards a knowledge society,[52] the 'five environments of

[50] Parsons, T., *Societies. Evolutionary and Comparative Perspectives*, Prentice Hall, Englewood Cliffs, N.J., 1966, p. 9, my *emphasis*.

[51] Ibid., p. 10.

[52] Cf. Stehr, N.,, *Knowledge Societies*, Sage, London – Thousand Oaks 1994; Castells, M., *The Information Age. Economy, Society and Culture*. Vol. 3. *End of Millennium*, Blackwell, Malden, MA, 1998; Heidenreich, M., 'Die Debatte um die Wissensgesellschaft', in S. Böschen, I. Schulz-Schaeffner (eds.), *Wissenschaft in der Wissensgesellschaft*, Westdeutscher Verlag, Opladen 2003.

Figure 2: Most needed social innovations in Parsons' four functional systems

Functional system	Area of systemic social innovations	Dominant types of social innovations
Economy	Management of abundance – society to rule economic processes	Values
Culture	Use diversity as resource in inter-cultural frameworks	Roles
Politics	Constitute the rationale of collaborative statehood instead of competition as business location	Relations
Law	Control of man-made external environs to balance real and potential impact	Norms

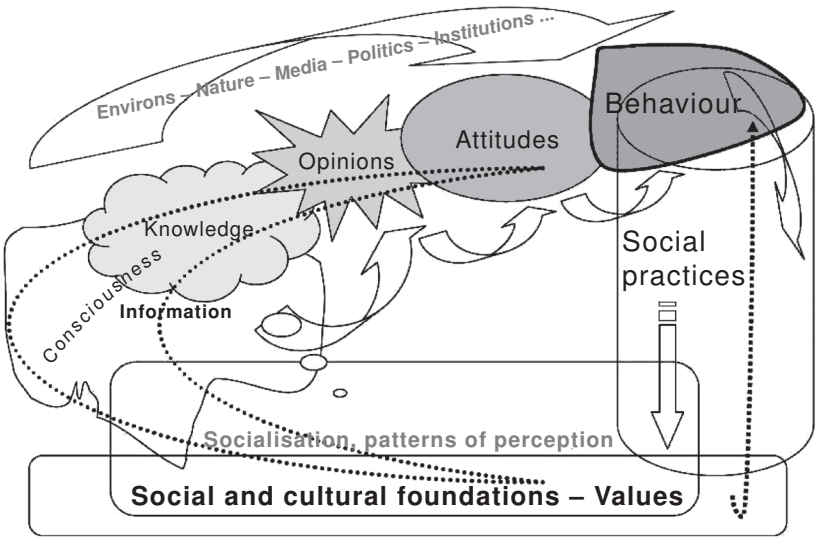
social systems' call for a supplement. The potential of mankind to produce threatening impacts on global scale (from nuclear overkill and related disasters, on to climate change, the financial capital 'making money' beyond the real economy and out of control, and in fact the production of hunger, making hundreds of millions of people starving in extreme poverty) form a specific *man-made external environment.* This is neither territorially fixed, nor in the range of potential measures to be determined by nation states or national societies.

Referring to the functional systems and the typology of social innovations presented above, and dealing with the grand challenges and related social objectives under the preconditions indicated here, my personal shortlist of most needed areas and types of social innovations is presented here for further discussion and elaboration (Fig. 2).

Any particular innovation activity resulting in a successfully implemented new (and, in operational terms: better) social practice is part of one or more functional system(s). In addition, its ambitions as well as concrete realisation are embedded in the narrower context of the social actors involved, either in favour or in opposition to the establishment of new or alteration of existing practices. In such processes (depicted in Fig. 3 as 'Learning Cycle') quite a number of intra- and interpersonal factors, social, cultural and external features have an impact on what may finally become an empirical 'social fact'[53] in the form of behaviour and innovative social practice.

[53] That is "any more or less laid down form of action with the capacity to exert an external compulsion on the individual; or also generally appearing in the field of a given society and possessing a life of its own, independent of its individual expressions" (translated from Durkheim 1984, 5).

Figure 3: The socio-cultural learning cycle



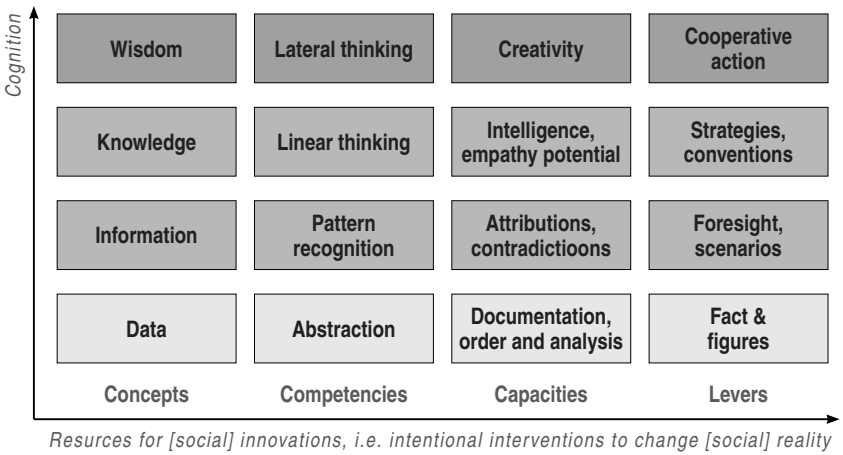
An essential contribution to conduct studies of change in the learning cycle should consist in the *search of tipping points* concerning individual concepts, attitudes and behaviour, as well as changing frameworks of reference and shifting baselines with fundamental impact on patterns of perception and selective take-up (and use) of information and knowledge.[54]

When considering the notion of the *Knowledge Society*, immaterial and specific intangible properties of innovation come to the fore: Innovation may be social innovation, it may allow for new uses of knowledge, it may take advantage of tacit knowledge. Identification of knowledge gaps and of lost knowledge could enable the development of very relevant innovations. Instead of permanently generating 'new knowledge', specialising on hidden knowledge might become a very relevant field of innovation management.

Data, information and knowledge constitute different levels of cognition, which on top may reach what in general debates about the knowledge society seems ignored, namely wisdom. Thereby I look at data as formal facts, whereas

[54] Cf. Goffman, E., *Frame Analysis: An Essay on the Organization of Experience*, Harper & Row, New York, NY, et al. 1974; Neitzel, S., Welzer, H., *Soldaten. Protokolle vom Kämpfen, Töten und Sterben*, S. Fischer, Frankfurt am Main 2011; Casti, J. L., *Mood Matters. From Rising Skirt Lengths to the Collapse of World Powers*, Copernicus Books, New York 2010; Sáenz-Arroyo, A., Roberts, C. M., et al., 'Rapidly Shifting Environmental Baselines among Fishers of the Gulf of California', *Proceedings of the Royal Society of London, Series B - Biological Sciences* 272, 2005, pp. 1957–1962.

Figure 4: From knowledge to action



information consists of structured data, and knowledge bears the competence to decode, analyse and construe the content of information. Wisdom additionally includes the capacity to reflect on knowledge even to the extent of accepting varieties of knowledge and truth – on to the Socratic confession of not knowing.

The decisive criterion of the knowledge society in its fuzzy distinction from the industrial society is not sheer lots of 'more knowledge'. Of course, more and genuinely new knowledge is required, but this nothing basically new. Knowledge was crucial at any stage of human development to survive and to make what later generations usually call progress, which sometimes appears radical enough to find a new term for an era. In case of the knowledge society it is critical to understand *knowledge* as *capability to act*.[55] Thus social innovation in this context may be considered any activity that meets the criteria of the definition, and expands not only the capacity to act, but enables and leads to concrete action.

In Fig. 4 the 'stairway to cognition' is put in relation to 'resources of innovation', allowing for analysis of steps to move up and to the right, bringing in conjunction increasingly sophisticated components to finally facilitate the most intelligent collaborative social action.

[55] Stehr, N., *Knowledge Societies*, op. cit., p. 208.

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The Cultural Thesis in Knowledge Societies

Jiří Loudín

Culture is an important dimension of knowledge and innovation activities and it has recently rightfully become a prominent focus of attention of innovation research. It is a part of a more general "cultural turn" that took place in social sciences towards the end of the last century. However, there are also reasons inherent to the innovation field itself. Reasons for the differences in innovation performance of subjects endowed with comparable financial, institutional and organizational infrastructure began to be sought in the cultural factors. Besides, the cultural dimension is also beginning to be seen as an additional, previously insufficiently addressed "soft" source of innovation.

Culture is characterized by a large number of definitions,[1] however, all of them somehow relate it to a certain specifically defined community. In this text focused on knowledge and innovation we understand by culture a distinct set of values and practices shared by collective actors.

The so-called "cultural thesis" applied in economy – i.e., the idea that cultural factors are seminal for the performance and dynamics of economic activities – is not a new phenomenon. The spiritual father of this stream of thought is Max Weber, who laid its grounds in his work on protestant ethic. In this respect, Weber was followed by a number of other scholars (some being critical to some of Weber's theses). Even broad public is familiar with the works of contemporary authors Landes, Fukuyama or Stark, who analyze and emphasize the role of culture – especially religious systems – in economy.[2]

In the globalized knowledge society the cultural dimensions of economy and innovation appear in new contexts and meanings. Cultures, which previously developed in relative autonomy, are now interconnected. This holds true for both

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[1] Karel Müller differentiates between two basic theoretical approaches to culture: the functional approach and the value-based approach. For the relationship of culture and institutions see K. Müller, Institutional Changes of National Innovation Systems: an Indicator of Innovation Culture?, in: J. Loudín, K. Schuch, *Innovation Cultures: Challenge and Learning Strategy,* Filosofia, Praha 2009, p. 47–68.

[2] Landes, D., *The Wealth and Poverty of Nations. Why Are Some So Rich and Others So Poor*, W. W. Norton, New York 1998; Fukuyama, F., *The End of History and the Last Man,* Free Press, New York 1992; Stark, R., *The Victory of Reason: How Christiniaty Led to Freedom, Capitalism, and Success*, Random House, New York 2005.

horizontally, mainly geographically localized cultures (for example national, ethnic, religious) and cross-sectoral cultures (for example the interpenetration of scientific and business culture). Connecting of the previously disconnected and the intense interaction of cultures leads to the emergence of new sources and meanings of knowledge and innovation activities.

Knowledge and cultural tensions in knowledge societies

"Knowledge society" is undoubtedly one of the most influential contemporary concepts of society, which resonates widely in social research, political circles and the general public. It is not the purpose of this paper to determine whether these ongoing changes are distinctive enough to proclaim the birth of a new society and whether this society is specific enough to deserve a new name. The discussions on this topic differ greatly: some consider knowledge society to be an established reality, some consider it a myth or mistake, some claim we are only on the way to this type of society.[3] (It is worth mentioning that while speaking about real social organisms, one should use the term in plural – knowledge societies – since we are not dealing with uniform societies but rather with highly culturally diversified ones. In similar way, industrial societies differed in applied practices and values.)

The growing relevance of knowledge processes is so convincing and generally accepted that we can safely use the concept of knowledge society as a model expressing tendencies, as a heuristic tool, with which we can analyze the social and cultural contexts of knowledge processes in today's societies.[4]

Knowledge societies are organically connected to globalization – sometimes we can hear about the "global knowledge society". The global exchange of knowledge is a constitutive feature of both knowledge society and globalization. Knowl-

[3] Especially within the German speaking academia many authors have paid attention to this problem. See the following recent contributions: Bittlingmayer, U., Bauer, U., *Die "Wissensgesellschaft": Mythos, Ideologie oder Realität?*, VS (Verlag für Sozialwissenschaften),Wiesbaden 2006; Kübler, H.-D., *Mythos Wissensgesellschaft: gesellschaftlicher Wandel zwischen Information, Medien und Wissen. Eine Einführung*, VS (Verlag für Sozialwissenschaften), Wiesbaden 2009; Rohrbach, D., *Wissensgesellschaft und soziale Ungleichheit: Ein Zeit- und Ländervergleich*, VS (Verlag für Sozialwissenschaften), Wiesbaden 2008; Engelhardt, A., Kajetzke, L. (eds.), *Handbuch Wissensgesellschaft. Theorien, Themen und Probleme*, Transcript, Bielefeld 2010; Tänzler, D., Knoblauch, H., Soeffner, H.-G. (eds.), *Zur Kritik der Wissensgesellschaft,* UVK, Konstanz 2006; Steinbicker, J., *Pfade in die Informationsgesellschaft. Eine historisch-komparative Analyse der Entwicklung zur Informationsgesellschaft in Europa*, Weilerswist, Velbrück 2011; Steinbicker, J., *Zur Theorie der Informationsgesellschaft. Ein Vergleich der Ansätze von Peter Drucker, Daniel Bell und Manuel Castells*, VS (Verlag für Sozialwissenschaften),Wiesbaden 2011.

[4] The concept of knowledge society has its intellectual relatives and allies: it undoubtedly draws on the theory of post-industrial society by Daniel Bell and the various visions of information society.

edge plays its part in the interconnection of the world in two respects: first, it circulates because there is a global thirst for it, a perpetual and unsatisfied demand, and second, because it really connects the world through its technical products.

The effects of knowledge in economy are most conclusive and empirically grounded. For decades economists have witnessed the growing share of knowledge sector in economy. It manifests itself in growing – and in developed economies even in dominant – share in GDP, employment rates and economic growth.

However, the concept of knowledge society also means that in this kind of society other sectors of society transform as well – the character of social action and social structure changes, new political agenda appears, new cultural possibilities and conflicts as well as previously unknown moral dilemmas emerge.

For one of the intellectual fathers of the theory of knowledge society, Nico Stehr, knowledge society is not a project that originated within technological or scientistic determinism. The transition to knowledge society is a process of modernization driven by knowledge and science and technology and its result and essence is a new quality of social action, the enlargement of social action.[5]

In knowledge society, science and technology do not only give rise to the possibility of new forms of action, they also assure the "'survival' (in the sense of continued relevance) of existing forms of action and, in some sense, even generating occasions which affirm traditional action".[6] Enhanced action therefore does not relate only to the future, it does not mean only the widening of possibilities of potential action, but also to the past: thanks to our better knowledge of past practices even seemingly outdated forms of action can be brought up to date. Knowledge societies allow "for the co-existence, even interdependence, of historically distinct forms of social organization and thought. Knowledge societies do not spell the end of ideology and irrationality."[7] Knowledge society is not a "rational" society of an enlightenment kind, "any extension of knowledge may be accompanied by an enlargement of the area of ignorance".[8]

We can also find many links with some thoughts of Beck, Giddens and Lash about reflexive modernization, with post-modernist theories and the idea of post-material society by Ronald Inglehart. It is also inspired by the works of Amitai Etzioni and Manuel Castells and their ideas of active society and network society. The concept of knowledge society overlaps with the concept of learning society (Bengt-Åke Lundvall) in many respects.

[5] "Past theories of society, ... choose to designate, quite properly, those attributes of social relations which are constitutive of the specific natureof that society as identifying labels. ... I choose to label the now emerging form of society as a 'knowledge' society because the constitutive mechanism or the identity of modern society is increasingly driven by 'knowledge'." Stehr, N., *Knowledge Societies*, Sage Publications, London – Thousand Oaks 1994, p. 6.

[6] Ibid., p. 12–13.

[7] Ibid., p. 13.

[8] Ibid., p. 31.

As knowledge activities gain in scope and dynamics, they also diversify, ramify and between their individual trends certain tension emerges, which has also cultural character due to the differences in given practices.

In knowledge society, knowledge enters new interactions; gains new forms; new dichotomies and cultural tensions emerge. In the following, I will shortly specify some of them.

Abstractification and potentiality

The primacy of the world of symbols and abstractions in contemporary economy was stressed already in the 1970s by Daniel Bell, writing about his model of postindustrial society. The centrality of theoretical knowledge is characteristic for the postindustrial society – the primacy of theory over empiricism and the codification of knowledge into abstract symbolic systems.[9]

In similar terms, Robert Reich describes contemporary progressive economy as a game with abstract symbols, in which "symbolic analysts" play leading role since they are able to grasp reality in new ways and manipulate it, use their abstracting skills, systemic thinking, experiments and collaboration.[10]

Knowledge was always present in all historical forms of economic activities, it gradually played more and more important role even at the (self)regulation of the whole economic system in the form of a market tending towards higher abstractions by means of money, capital, stock property and financial markets. The history of 20th century industry is a remarkable witness of the growing mutual cooperation of two abstractions: capital and knowledge. Schumpeter stressed the role of stock market as a key institutional innovation, which stimulated the rapid growth of the 1920s.

The concept of potentiality has come to the centre of attention as well; it is given preference over actuality in the context of the "new economic rationality", in which abstraction, speculation, openness, human expectations and anticipation play larger role than ever before.[11]

The focus on the abstract and potential belongs among the constitutive elements of modern natural sciences, where science and technology become a project, a construction of possible states of nature. This trend has later expanded into the sphere of economic and social strategies. The recommended

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[9] Bell, D., *The Coming of Post-Industrial Society: A Venture in Social Forecasting*, Basic Books, New York 1973.

[10] Reich, R., The *Work of Nations*, Vintage Press, New York 1992.

[11] Nowotny, H., Scott, P., Gibbons, M., *Re-thinking Science: Knowledge and the Public in an Age of Uncertainty*, Polity Press, Cambridge 2001.

life strategy is to build-up a universal (basically educational) potential that will produce rich and specific results in the future.

Abstraction and potentiality are considerably employed also in the sphere of finances. Since 1980s many financial innovations have been produced that with the help of sophisticated mathematical models speculate upon the future development of financial markets (derivates). The scope and significance of the sphere of intellectual property rights (IPR) also develops rapidly. Patent rights (their quantitative indicators are considered to be the most accurate measures of innovation performance) are potential property rights, valorizing possible future uses of new ideas. However, most of them are never realized.

Most analysts have pointed out for quite some time that the overly abstract financial constructs entail in themselves a considerable destructive and toxic charge, especially when individual financial packets are composed from products of different nature and they are distantiated from their original holders by a chain of business operations on a global scale. This situation was one of the main triggers of the financial crisis of 2008.

Public and private

Thanks to its immateriality, communicability and social character (it emerges through cooperation of different knowledge actors), and more recently thanks to information technologies, knowledge has an inherent quality of disseminating itself, of connecting itself to other knowledge and its bearers (although there are also heavy barriers to knowledge transfer). It is not easy to fix knowledge and bind it to specific subjects, it is difficult to make its ownership exclusive – that's why economic theory speaks of market failure.

Economists have already noted that knowledge as an economic factor constantly balances on the border between private and public goods. Knowledge as such manifests qualities of public goods: it lacks the basic qualities of private goods such as are rivalry or excludability. The knowledge product – a book for example – does not cease to exist by being read by someone, it can be consumed practically *ad infinitum*. Unlimited is also the access of others to the given commodity. Also the third basic quality of market activities – transparency – is threatened by the existence of information asymmetry between the seller and the buyer. Knowledge, information as the content of the product must not to be disclosed before the moment of business transaction, otherwise the buyer would not be interested in the transaction at all.[12]

[12] Soete, L., 'The New Economy: A European Perspective', in: D. Archibugi, B.-A. Lundvall (eds.), *The Globalizing Learning Economy*, Oxford University Press, Oxford 2001.

Stefan Beck and Nico Stehr aptly point out that there is no so-called "tragedy of the commons" in knowledge production, a situation when freely accessible commodities are soon exhausted.[13] The more difficult it is to secure excludability by technical means – as is the case with information technologies – the more effort different subjects pursue to enforce their exclusive property rights by legal means and the legal protection is becoming more severe. Luc Soete claims that when the protection of property becomes almost absolute, competition in economy is restricted and the development of economy inhibited.[14]

It is difficult to maintain when free circulation (knowledge as public good) and when proprietary fixation (knowledge as private good) contribute to the generation and diffusion of knowledge. Scholarly literature often recalls the role of Bayh-Dole amendment to the US Patent and Trademark Law from 1980, which allowed public research institutions to patent and trade the results of their research, funded by public means (it is possible to patent both products and research methods). This inhibits the free circulation and public availability of knowledge but encourages business with knowledge that should lead to the stimulation of knowledge dynamics.

Knowledge and uncertainty

It is among the paradoxes of knowledge society that the status of science and technology is being increasingly exposed to criticism and doubts at exactly the moment when science and technology assert themselves as the strongest driver of economic and social dynamics.

Towards the end of the 1960s and in the 1970s, after two decades of utter sciento- and techno-optimism, one can hear more and more accounts of the negative impacts of the techno-scientific progress. Ecological problems and their impacts on human health emerge and are understood to be the result of the application of science and technology in industry and agriculture. The problems brought about by the rapid development of science and technology into the social and economic fields (the substitution of human labor by technology) and into political decision-making (democracy versus expertocracy) are widely discussed. The developments of science and technology pose radically new risks of ethical nature.

Together with the rising public criticism towards science and technology and their social effects a conceptual and methodological discourse takes place

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[13] Stehr, N., 'Grenzenlose Wissenswelten'; Beck, S., 'Probleme von Privatisierung von Wissen'; both in: G. Koch (ed.), *Internationalisierung von Wissen. Multudisziplinäre Beiträge zu neuen Praxen des Wissenstransfers*, Röhrig Universitätsverlag, St. Ingbert 2006.

[14] Soete, L., 'The New Economy: A European Perspective', op. cit.

within science resulting in the withdrawal of science's claim to objective and universally valid truth. This all leads to the loss of a cultural monopoly of science to a certain and socially beneficial knowledge, a crisis of the cultural legitimacy of science appears and science tends to be connected with the dissemination of uncertainty rather than with the production of new and verified knowledge.

Karl Popper introduced the idea that science can falsify rather than verify. Scientific knowledge stands on shifting grounds, scientific claims are but hypotheses that cannot be verified once and for all. It seems that such a widespread feeling of uncertainty is directly produced by knowledge – in both its content and its dynamic innovational effects. The experiences of contemporaries tell us that scientific knowledge does not only solve problems (and thus increases our certainty) but also opens up new problems and thus creates new uncertainty. Epistemology generally believes that the most creative step towards knowledge is finding and formulating a problem, challenging established assumptions and making them uncertain. Although it is true that human always lived in an uncertain environment, what is new and to a certain degree paradoxical about the uncertainty of contemporary man is that it is caused by powers that were originally meant to increase certainty and safety.

Inclusive non-research knowledge and innovation

Inclusive non-research knowledge is not grounded in exclusivity and excellence of research but rather in the activity of a large number of individual and collective social actors. The goal of these activities is not the production of new knowledge as such but rather the actual enlargement of capacity for action, which is necessary for solving certain problems or specific social action.

The fact that it does not arise from research does not mean that these activities are not highly knowledge-intensive. The actors can make advantage of many different information and knowledge sources of knowledge society, gained knowledge of structuring and rearranging for their purposes, tailoring to local contexts, knowledge of verifying, correcting, specifying and experimenting and so acquire new knowledge. This knowledge potential is then transformed into social action, which usually has the character of innovation activities.

The actors of these knowledge and innovation activities are the members of various public institutions and agencies, civic activities, political and social movements, small entrepreneurs, members of reformist circles..., basically whoever who wants to participate in tackling any kind of problems.

Today, tens of percents of population acquire college or university education so a large number of people are skilled in dealing with data and information, can analyze and evaluate complex situations, are acquainted with research

methods and the basics of theoretical work and can make advantage of these new skills in various practically oriented activities.

Innovation activities related with non-research knowledge basically belong to minor innovation work, mostly of non-technological character. Minor innovations emerge everywhere, they are dispersed, decentralized, inconspicuous, basically anonymous and their overall effect is very strong. Some analysts stress the horizontal, lateral, pervasive character of these innovations.[15]

This stream of knowledge and innovation production consists in the support of the broadly-undertaken effort toward an improvement of things in general, an enhancement of the quality of life. Oftentimes it consists in solving partial, seemingly banal issues whose solution nevertheless shift people's lives onto a higher level and influences in a decisive fashion – regarding the scope and breadth of the activities – the social atmosphere (already by pointing out that many issues can be solved). It is essentially grounded culturally and ethically – upon the ethos to make the world a better place and not to settle for imperfections, upon responsibility and courage. Here, the crucial role is played by culture, value orientations and social agents' modes of action.

Social innovation develops into a specific kind of innovation; it is directly concerned with solving particular problems and needs through conscious and goal-oriented reconfiguration of social practices.[16]

Interface knowledge community-society: unease and negotiation

Nico Stehr points out that if the stream of knowledge and innovation is to be ample and lasting, there needs to be an autonomy of community of their practitioners within society. This holds true also for the past when universities or learned societies enjoyed privileges that were not common; also in the modern period when the international scientific community was established. Today, the borders between science and non-science are blurred and porous, however, in these fuzzy and fluid structures these communities manage to affirm their identity.

Several conceptions that understand science and technology as a determining model for the whole of society emerged during the 20th century. Karl Popper expressed this credo in his conception of the open society, which is supposed to be the most advanced type of society, for its stability and dynamics are based not on violence and oppression but on openness, discussion and criticism, on values and practices that are commonly applied within the scientific community.

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[15] Tödling, F., Trippl, M., 'One Size Fits All? Towards a Differentiated Regional Innovation Policy Approach', *Research Policy* 34 (8), 2005, pp. 1203–1219.

[16] Howaldt, J., Schwarz, M., 'Soziale Innovation – Konzepte, Forschungsfelder und -perspektiven', in: J. Howaldt, H. Jacobsen (eds.), *Soziale Innovation. Auf dem Weg zu einem postindustriellen Innovationsparadigma*, VS (Verlag für Sozialwissenschaften), Wiesbaden 2010.

Popper doesn't share the possibility of a more enduringly valid objective knowledge of truth as a cognitive norm. For Popper, science is the paradigm of a developed society in the sense of the shared culture and institutional functioning of the scientific community – the institutional framework of the growth of scientific knowledge is criticism, freedom of thought and discussion, and it is in these points that the open society evolves as well.[17] Science, therefore, cannot offer society a truthful understanding or a stable knowledge-norm (Popper has already challenged that by means of his concept of falsifiability), but a cultural and institutional norm, a set of values and practices.

Critics tend to challenge Popper on the grounds that he scientizes society at the expense of its depolitization and substitutes the plurality of opinions in scientific debates for the plurality of interests in politics. Not even the identification of the scientific community with the paradigmatic "open society" hasn't been left unchallenged: the opponents demur that the scientific community is open on the inside and closed on the outside.[18]

Similarly, Robert K. Merton models the distinct culture of scientific community with the specifically defined norms of scientist's conduct. According to Merton, scientists in their research activities act objectively and impartially, their only interest is to acquire new knowledge of the highest quality possible and they unselfishly cooperate towards this goal (Merton's norms: universalism, organized skepticism, disinterestedness, communism). The most common criticism towards this model states that it idealizes scientists and isolates them from their social and cultural embeddedness that necessarily manifests itself also in their scientific activities. It is also necessary to take into account that both Popper and Merton in their conceptions reflect on a development phase of science, when the scientific community was smaller, more exclusive and relatively immune to outside social influences.

Even technology found itself in the role of a kind of a model of society, at least in the sense that technological development determines the conditions of life and the development of society as far as future options and modes of action are concerned. Technological determinism proclaims that technology is the field that develops most dynamically and that the other spheres of society have to accommodate to it in one way or another.

One of the founders of technological determinism, William Ogburn, came with the concept of "cultural lag". It takes place when one segment of culture develops faster than other ones.[19] Ogburn admits that the illustrations of the independent variable of cultural gap from the modern times are mainly of a

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[17] Popper, K., *Conjectures and Refutations*, Routledge, London 1972.

[18] Spinner, H., *Popper und Politik*, Berlin-Bonn-Bad Godesberg 1978.

[19] Ogburn, W., *On Culture and Social Change,* University of Chicago Press, Chicago – London 1964.

technological kind; cultural lags accumulate because of the great rapidity and volume of technological change.[20]

In the past decades of the 20th century this relationship turns around and the influence of social actors on science and technology dominates. For the Kuhnian line of thought about science and for the various conceptions of the social shaping of technology, it is typical to understand their object of analysis in terms of a specific kind of social practice.

The concept of socially constructed technology (SCOT) is committed to raising the question of the ability of social subjects to consciously enter into techno-science and to shape its products. The trajectory of the artifact cannot be strictly and deterministically defined by the autonomous logic of cognitive and functional relations – it is rather composed of a series of historically specific choices, it is rather the result of a negotiation regarding conflicting interests and ideas of the individual "relevant social groups." These, in turn, come to be defined as groups sharing and co-creating the meaning of the artifact. [21] Various relevant social groups (technicians, producers, different user groups) can attribute a different meaning to the given artifact. Technical choices are determined by configurations of social agents and their culturally specific needs.

Along with the growing scope and impact of knowledge and innovation activities the borders between their practitioners and others becomes blurry, porous, more fluid and cluttered. A "hybridization" of the worlds of science, politics, entrepreneurship and culture takes place, politics becomes scientific and science political (Peter Weingart). At the overlaps of these spheres negotiations take place, conflicts occur, compromises are made. Science becomes diversified (new modes of knowledge production are established) and opens itself to economic and social demands and possibilities, yet manages to keep its cultural identity based in its distinctive cognitive culture, a system of cognitive norms.

Science and politics meet most intensely when formulating science and technological policies, especially when formulating their priorities. Here the interests and goals of the scientific community and the preferences and visions of the general public and other interest groups collide – and sometimes also synchronize. Participation of as many stakeholders as possible is also desirable when dealing with complex problems with a high degree of uncertainty.

S. Funtowitz and J. Ravetz describe this situation with their concept of "post-normal science".[22] While in the case of the common applied science sys-

[20] "... in our times in the Western world, technology and science are the great prime movers of social change" (Ibid., p. 91).

[21] Kline, R., Pinch, T., 'The Social Construction of Technology', in: D. Mackenzie, J. Wajcman (eds.), *The Social Shaping of Technology*, Open University Press, Buckingham (Philadelphia) 1999.

[22] Funtowitz, S., Ravetz, J., 'Science for the Post-Normal Age', *Futures* 25 (7), 1993, pp. 739–755.

tems uncertainty and decision stakes are low, in the case of post-normal science both these factors are very high.

This happens in cases when research questions are very complex and multifaceted (for example ecology, climate) and data are scarce. Or when there is a large number of data available but they contradict one another. An adequate evaluation of a problem is important because great human, ecological or economic values are at stake. Ecological questions are a case in point.

As a treatment for the complex problems of post-normal science Ravetz and Funtowitz suggest the participation of as many stakeholders and interest groups as possible and to negotiate the solution. For these new complex problems, quality depends on an open dialogue between all those affected. This is what Funtowitz and Ravetz call an "extended peer community".

At the interface of science and technology activities and the public many controversies of various kinds and intensity emerge. Some can be reconciled and the conflicting interests harmonized, other transform into chronic tension and conflicts. Even in theoretical and media reflection the public appears in ambivalent position: on one side, it is treated as a resource for supporting science and technology, on the other it is cast as an obstacle to progress.[23] Citizens feel that some of the scientific and technological projects deny their moral beliefs, damage health and violate civil rights.

Transfers of knowledge, innovations, and cultures

In the globalized knowledge society, multitude of transfers of knowledge and innovation takes place continuously, with bigger or lesser success. Even technological material artifacts contain – although in varying degrees – a cultural trace and any effective adoption of technology presupposes its cultural appropriation.

If artifacts can be placed into cultural context, the same applies even more to practices. The latter make up an inherent part of culture, and transfer of practices – including those related to knowledge, technology, and innovation – is actually a cultural transfer. Transfer of practices, processes, activities (processuality being the substance of both knowledge and innovation) has more value than transfer of individual artifacts, technologies, or knowledge solutions. It comes with a great potential for learning and establishes a possibility for autonomous production of knowledge and innovation. It is also, however, much more complex and overall more demanding. A successful transfer of practices

[23] *Taking European Knowledge Society Seriously*, Report of the Expert Group on Science and Governance to the Science, Economy and Society Directorate, Directorate-General for Research, European Commission, Brussels 2007.

occurs only rarely, in actuality, and if it does, it is happens exclusively in the case of well-defined and highly-developed strategies.

At first sight, it may seem that knowledge can be transferred very easily, that its simple dissemination inherently belongs to it, as its very attribute. It is, however, only one side of the issue and a misleading one at that. Unimpeded dissemination of knowledge is, in fact, a result of high level of technological, social, and cultural development and of elaborate infrastructure that, in combination, make such a liberation of knowledge possible.[24] With regards to the possibilities of a transfer, knowledge is marked by strong ambivalence and tension: it is as if its essential characteristics include free circulation and unwillingness to be bound on the one hand, while on the other hand knowledge transfer proves to be very difficult and often fails. [25]

A part of desired knowledge is localized and contextualized knowledge, which is not freely available on the market. If it was and knowledge would be easily transferable, then scientific, technological, and educational levels of collective social actors would undoubtedly get equalized on regular basis, yet this is not the case. Knowledge protects itself from theft (Nico Stehr[26]), it is deposited in people's heads (tacit knowledge) and in certain cultural and social contexts, which are usually resulting from long and unique development. In practice, then, these contexts cannot be simply reproduced under different conditions.

Knowledge as such is an inherent element of culture. Gertraud Koch notes that production and diffusion of each knowledge is culturally codified and symbol-laden, tied to specific action- and habitus forms; each new knowledge also produces new meanings and contexts that reformulate cultural traditions and provides them with new interpretations.[27]

A great obstacle to the transfer of knowledge is posed by tacit knowledge, which cannot be codified at all, or only with immense difficulties, and thus remains nontransferable. At the outset of the IT boom, many had thought that the significance of codified knowledge is rising in this respect at the expense of tacit

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[24] Beck, S., 'Probleme der Privatisierung von Wissen', in: G. Koch (ed.), *Internationalisierung von Wissen. Multudisziplinäre Beiträge zu neuen Praxen des Wissenstransfers*, Röhrig Universitätsverlag, St. Ingbert 2006, p. 92.

[25] Koch, G., 'Internationalisierung von Wissen', in: G. Koch (ed.), *Internationalisierung von Wissen. Multudisziplinäre Beiträge zu neuen Praxen des Wissenstransfers*, Röhrig Universitätsverlag, St. Ingbert 2006, p. 11.

[26] Stehr, N., 'Grenzenlose Wissenswelten', in: G. Koch (ed.), *Internationalisierung von Wissen. Multudisziplinäre Beiträge zu neuen Praxen des Wissenstransfers*, Röhrig Universitätsverlag, St. Ingbert 2006, p. 50.

[27] Koch, G., 'Wissenstransfer zwischen Kulturen: Kulturanalytische Anmerkungen zu einer unternehmerischen Herausforderung', in: G. Koch, B. J. Warneken (eds.), *Region - Kultur - Innovation. Wege in die Wissensgesellschaft,* VS (Verlag für Sozialwissenschaften), Wiesbaden 2007, pp. 149–167.

knowledge. This trend, however, was not confirmed; rather the contrary bias has been observed. The effortless availability of data has only emphasized the importance of evaluation and interpretation of data and codified knowledge and electronic networks have not replaced the need of real face-to-face cooperation, in which tacit knowledge and shared meanings take shape.

The IT sector is sometimes considered as an illustrative example of a branch that manifests a global character without attachments to specific national, regional, or local culture. Gisela Welz, however, points out several studies that highlight the need of shared physical spaces and face-to-face communication in IT, as well as new form of synchronous and simultaneous collaboration ("collaborative engineering") in this branch, in which specific tacit knowledge is created and this occurs with the help of clients, namely the local ones. Development of new IT products flourishes in places where there is a strong spatial concentration of developmental, educational, and technological production capacities, which enable intensive cooperation, including the valorization of local context knowledge.

Welz also calls attention to the fact that (e.g. in software branches) tacit knowledge gets formed primarily at the micro-level, in work teams that create their own specific culture built upon shared knowledge, trust, and solidarity. The unification of global cooperative forms and local work contexts appears to be a decisive task for software companies and work teams.[28]

This observation can be generalized in the sense that the creation of team-specific "tacit cultures" ("we understand each other without words") is undoubtedly a source of team creativity and innovativeness, but it can also prevent the transfer of such competences into another environment. Failures in knowledge transfer thus occur at macro-level (transfer between large, e.g. national cultures), but also between individual sectors (research to business), as well as inside branches or firms.

Niels Behrmann elucidates this, again with tacit knowledge at the centre of attention, with the example of work with patents, which are generally a very effective resource and means of knowledge transfer.[29]

Behrmann tries to resolve the problem of why are patents as sources of knowledge in business sector used so little, although they consists of documents that are freely available around the world. They make a huge reservoir of explicit (codified) knowledge. Behrmann finds out that the problems with using knowl-

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[28] Welz, G., 'Vom Wandel der Kulturen zu den Kulturen des Wandels', in: G. Koch (ed.), *Internationalisierung von Wissen. Multidisziplinäre Beiträge zu neuen Praxen des Wissenstranfers*, Röhrig Universitätsverlag, St. Ingbert 2006, pp. 129–143.

[29] Behrmann, N., 'Patente als Quelle von Innovationen', in: G. Koch, B. J. Warneken (Hrsg.), *Region - Kultur - Innovation. Wege in die Wissensgesellschaft,* VS (Verlag für Sozialwissenschaften), Wiesbaden 2007, pp. 185–199.

edge included in patent documents – with their understanding, language, and acceptance – come up especially for employees without any tacit knowledge. Internalization of patent knowledge depends on the experience and pre-knowledge (Vorwissen) of an employee who deals with a given patent. Technical experts find in patent document concepts, analogies, and models that enable them to externalize their tacit capabilities and skills. Effective work with explicit, codified knowledge in patents therefore presupposes good tacit knowledge.

The dream of some politicians and entrepreneurs is to find out "what" causes innovativeness as such, what is the right environment and culture that stimulates the generation of novelties, and then to adopt such successful innovation culture. However, this can hardly be implemented in practice, because each culture is a part of a tradition and stems from unique – and often very protracted – development that cannot be reproduced in its entirety. In cultural evolution, there is a great deal of contingency and spontaneity. Emergence of new cultures is an unintended product of social practice[30] and a culture cannot be produced by design[31]. On top of that, each innovation culture contains – as Thomas Wieland explicitly put it in his concept of innovation culture – along with formal, normative institutions (codified in laws, technical norms, governmental programs) also institutions that are informal, implicit, tacit (group identities and research paradigms).[32]

Nonetheless, this does not mean that it would be rendered useless and ineffective to study individual innovation cultures in their uniqueness. Only by their analyses can one gain the necessary insight into given problematics and the understanding of what is universal in successful innovation cultures (typically, these are the framing conditions, infrastructure) as well as the understanding and a sense of what is particular to them. Competences acquired in such a fashion can then be applied in decision-making process and in formulation of innovation strategies.

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[30] Welz, G., 'Vom Wandel der Kulturen zu den Kulturen des Wandels', op. cit.

[31] The idea that it is possible to determine what it is precisely that stimulates the generation of innovations and then to implement it in one's own conditions is very appealing, but also quite resistant to application. Helga Nowotny tells a story of her meeting with a group of Swedish urbanists in the 1980s in order to inquire about the cause behind the situation in Vienna in 1900s, when the city was permeated by innovative, creative atmosphere with great international emanation. Her answer was that the cause lied in the tensions and conflicts of that time: rebellion of sons against their successful fathers, conflicts between growing multiethnic social groups and established Viennese bourgeoisie, conflicts between conservative "old" and active "new"; in short, a unique historical configuration. Nowotny, H., *Innovationskultur - zur Produktion neuen Wissens* (2007), available at (http://helga-nowotny.eu/downloads/helga_nowotny_b56.pdf), accessed on May 24, 2011.

[32] Wieland, T., "Innovationskultur: Theoretische und empirische Annäherungen an einen Begriff", in: R. Reith, R. Pichler, Ch. Dirninger (eds.), *Innovationskultur in historischer und ökonomischer Perspektive. Modelle, Indikatoren und regionale Entwicklungslinien,* StudienVerlag, Innsbruck – Vienna – Bozen 2006.

Culture is not closed and unchangeable. It is able to receive new stimuli and enrich itself through them. This is testified by the success of the concept of the best practices, which involves the implementation of certain time-proven work procedures across different cultures, both in the sense of their internationalization and their application in varying sectors and branches. These are, however, narrowly and minutely defined work procedures and organizational patterns, sophisticated and flexible.

Similar principle also applies to transfer of technology and culture at macro-level. Here, the examples include the achievements of modernization processes in some of the countries rooted in tradition. At the same time, the much longer list of modernization failures testifies to the fact that such a process is ridden with difficulties and that success is rare.

The modernization stories suggest that success can be achieved by those who are able to articulate external innovation impulses with their own tradition, to culturally recode, reprogram the imported practices, to attribute their own meaning to them, to absorb them and interpret them as a part and parcel of their own development, as an upgrading or rebranding of their own identity, which get reaffirmed through these very transformations.[33] Only developed, vital and viable cultures that uphold their own traditions belong to those successful in modernization. Whoever does not have an own, developed language, has nothing to translate the reports in foreign language into; and the reports get lost in translation. And whenever the usage of a foreign language gets imposed upon indigenous populations, communication falters and culture languishes.

Foreigners living for extended periods of time in countries which have recently undergone a successful modernization, e.g. in Japan, agree that these countries remain traditional in social, cultural, and mental forms of life, despite all the spectacular achievements in technology and civilization. (Here comes to mind the contribution of Jan Maršálek to this volume on "hot" and "cold" societies, in which he defends the idea that innovation need not to lead to social change.) It would, of course, be necessary to verify such observations and the result of observations depends much on the initial expectations. Observers are baffled by seeing the same technology everywhere on a global scope, and subconsciously expect to find the same society and culture. Another discussion concerns the possibility of separating values and practices; practices change and new ones appear, yet values remain or are subject to only partial reinterpretation and recoding. The Japanese have obviously managed to reprogram some

[33] Gisela Welz refers to the proposition of Mashall Sahlins, a cultural anthropologist who claimed that structural transformation is impossible without a reproduction of structures. Welz, G., "Vom Wandel der Kulturen zu den Kulturen des Wandels", in: G. Koch (ed.), *Internationalisierung von Wissen. Multidisziplinäre Beiträge zu neuen Praxen des Wissenstranfers,* Röhrig Universitätsverlag, St. Ingbert 2006.

segments of traditional Japanese culture and ethics for modern purposes, for example into a form of "economic nationalism" (Fukuyama).

The analysts of the process known as "catching-up", through which the less developed countries strive to catch up with the leaders, have found out that the success of the process can be greatly facilitated if the catching-up countries come up with their own organizational or social innovation. Alexander Gerschenkron calls these the "institutional instruments",[34] similarly, Moses Abramovitz uses the term "social capabilities".[35] These innovations then operate as optimal transmitters, receptors, and accelerators of general modernization changes and integrate the imported practices into native culture. Should we stick with the Japanese example, we can name quality circles, just-in-time system, or the Nonaka-Takeuchi model of knowledge creation.[36]

Another widely debated issue centers on the question whether creativity and innovation benefit more from cultural homogeneity or rather from heterogeneity. This concerns especially the cultural profile of places, regions, and cities. The initial concept of regional advantage proceeded from a sense of benefits on the part of cultural homogeneity. It rested on the presupposition that spatial proximity equates cultural proximity. Consequently, mutual interactions are not only more frequent, but also "deeper," more efficient. Regional actors share common habits and experience; their mutual trust reinforces their ability to cope with the uncertainties of the innovation process; transaction costs become lower. There are no semantic differences. Regional actors understand well the character and opportunities of their local economy and are able to optimize its indigenous potential.[37]

In contrast, Richard Florida derives his concept of Knowledge City or Creative City from the notion of cultural heterogeneity. Social and intellectual diversity fosters creativity and innovation, creativity is linked to openness and tolerance of the environment. Florida basically supports the "cultural thesis": "Our work finds a strong connection between successful technology – and talent-harnessing places and places that are open to immigrants, artists, gays, and racial integration."[38] The statement, however, makes it obvious that such requirements can only be met in large cities.

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[34] Gerschenkron, A., *Economic Backwardness in Historical Perspective. A Book of Essays,* Belknap Press, Cambridge 1962.

[35] Abramovitz, M., 'Catching Up, Forging Ahead, and Falling Behind', *Journal of Economic History* 66, 1986, pp. 385–406.

[36] Nonaka, I., Takeuchi, H., *The Knowledge-Creating Company. How Japanese Companies Create the Dynamics of Innovation,* Oxford University Press, New York – Oxford 1995.

[37] Asheim, B., Gertler, M., 'The Geography of Innovation: Regional Innovation Systems', in: J. Fagerberg, D. Mowery, R. Nelson (eds.), *The Oxford Handbook of Innovation,* Oxford University Press, Oxford, 2004, pp. 291–317; Porter, M., *The Competitive Advantage of Nations,* Routledge, New York 1990.

[38] Florida, R., *Cities and Creative Class*, Routledge, New York 2005, p. 7.

A sort of a middle ground with regards to the degree of cultural diversity is promoted by the authors of the model of "constructed regional advantage" who claim that regional advantage may be consciously and pro-actively shaped.[39] One of the main principles of this model is the "related variety" which is defined as sectors that are related in terms of shared or complementary knowledge bases and competences. In order for effective communication and interactive leasing to take place, some degree of cognitive proximity must exist. A desirable state of affairs is reached when differentiated knowledge bases – analytical, synthetic, and symbolic – are engaged in regional economy. Regional innovation policy should then emphasize capitalization upon region-specific assets, making connections between related sectors and fostering knowledge spillovers. Regions thus benefit from cultural diversity, but mainly under the condition that individual actors are "semantic" relatives so that interactive learning can take place among them.

Ulf Matthiesen advocates similar standpoint: the basic precondition for creation of attractive knowledge place with exciting learning cultures is the increase of heterogeneity in the local knowledge cultures. In reality, however, homogenization and heterogenization occur simultaneously.[40]

This principle is valid not only for regions, but also for research and innovation organizations as well as for the level of work teams: cultural heterogeneity (which includes not only international character, but encompasses also intersector diversity, such as when innovation organizations draw membership from research, education, business, and industry) is beneficial, but there should also be a shared platform on the basis of which communication and learning can take place.

Expert micro-survey

An expert micro-survey was conducted within the framework of the international cooperation project "Transition from imitation to innovation as social and cultural process". Twelve experts were asked about several social and cultural aspects of innovation processes. Participating experts work at research and

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[39] Asheim, B., Boschma, R., Cooke, P., 'Constructing Regional Advantage: Platform Policies Based on Related Variety and Differentiated Knowledge Bases', *Papers in Evolutionary Economic Geography,* Utrecht University, Utrecht 2007, available at (http://econ.geo.uu.nl/peeg/peeg.html), accessed on February 20, 2011; Tödling, F., Trippl, M., 'One Size Fits All? Towards a Differentiated Regional Innovation Policy Approach', op. cit., pp. 1203–1219.

[40] Matthiesen, U., 'Wissensmilieus in heterogenen stadtregionalen Räumen Ostdeutschlands – zwischen Innovationsressourcen und kulturellen Abschottungen', in: G. Koch, B. J. Warneken (Hrsg.), *Region – Kultur – Innovation. Wege in die Wissensgesellschaft,* VS (Verlag für Sozialwissenschaften), Wiesbaden 2007.

educational institutions and public administration bodies, some of them were managers of small innovation firms – all the participating institutions pursue their activities in the Czech Republic.

The experts were asked questions structured into five thematic spheres: innovation strategies on the road to knowledge society; cultural dimensions of innovation; transfer of knowledge, technology and culture; knowledge and innovation regions; knowledge and social media. The most important findings are the following:

Regarding the question whether Czech society is becoming a knowledge society (i.e., a society based on the employment of knowledge, education and innovation), the prevailing opinion is one of "moderate progress" – "yes, but ... slowly". However, some very critical attitudes were expressed as well: we are becoming rather a non-knowledge society because the quality of education is getting worse due to its massification. Material values prevail over the appreciation of more profound education and creative work. What attests to this tendency is the high frequency of the "cultural values and practices" factor employed while selecting the critical factor for innovation progress that deserve to be supported in the Czech Republic (other factors are: the quality of research, the quality of education, institutional setting, the support for innovate entrepreneurship, etc.). The opinion that individual factors – the general growth of education and qualification, the development of infrastructure – are growing but their "social synthesis" is lacking is also stimulating.[41]

Most participants agree that the weakness of the employees of Czech innovation and technological firms are "soft skills" – communication, cooperation, team building, negotiation. Again, with the diagnosis "piecemeal betterment". At the same time, we can hear voices arguing: this is a cliché, there is a much more relevant problem that the "hard skills", that means the expertise attained at the Czech universities, are disappearing, and the "soft skills" seem to be a marginal problem. Moreover, these should be acquired at the level of high schools (as in the case of American educational system), not at universities.

As regards the multicultural character of research and innovation teams, we can find many standpoints and dichotomies in terms of the overall contribution (the cultural diversity is defined here as the representation of men and women, theorists and practitioners of different nationalities, beliefs, habits). Those experts, who are not familiarized with this cultural diversity, do not pay too much attention to it. On the contrary, those who practice it, value it very much.

As their argument goes, the one who acts innovatively brings a new and fresh point of view, finds an alternative approach – this is what "other" cultures

[41] In the words of one of the respondents: "The cohesion of society is too low to enable another than very small dynamics of transformation changes (based on science and innovation)."

often bring to the table. To be culturally open is a great advantage. A director of a university workplace with an excellent research reputation claims that at their workplaces they create so-called "colorful teams", composed of graduates of different schools, theorists and practitioners, etc. They try to recruit graduates of different schools exactly because they bring new viewpoints and new knowledge. They want to be and are attractive for foreign researchers, "working in a team with a foreign researcher bring to the team a whole new dimension".

The differences in opinion towards new media are also quite striking – the experts were asked about using expert networks such as LinkedIn or ResearchGATE. Scholars are generally skeptical about them and the leaders don't like to see when the members of their teams spend too much time browsing on the internet because it interrupts their concentration and confidential information leak through the networks. One scholar called the social networks "hype". The academicians argue that it is possible to acquire an information about what one is doing, however, it does not contribute significantly to the quality of research, although it promises at least some clues orienting oneself at a given situation.

On the other hand, people from innovation companies are engaged in social networks and are enthusiastic about them and they use them to acquire partners and customers, for marketing, business activities. Most of them agree that electronic contacts cannot substitute a life contact that the cooperation may be initiated through the network, however, at a certain level – in order to be effective – it has to be transformed into real lively communication.

What refers the relationship between public and private element in innovation activities, it is no surprise that while representatives of the innovation firms are in favour of public support for the innovation entrepreneurship, most of the academic workers are resentful.

Overall, the expert micro-survey provides a plastic image of what could perhaps be called a tendency towards knowledge society, including its "cultural contradictions". Behind the hardly deniable penetration and permeation of knowledge throughout the entire fibre of society and its higher valuation, it is impossible not to see collateral shadows and regresses. Cultural values and practices with a negative attitude are asserted against a longterm strategy of development and application of knowledge and innovation. There are disputes over the conception of education. Increased access to tertiary education opens up new problems with regards to its quality and focus. Reaching a consensus concerning the relationship between public and private spheres in innovation activities proves to be difficult. One can only hope that such problems and tensions will be solved productively and dynamically.

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The results of the expert survey conform to what the theoretical proponents claim about knowledge societies – they are not uniform, detrrministically rationalist societies but rather highly culturally, socially and intellectually diverse and rich organisms. They are also – already during their nascent states – culturally fragile, sensitive and essentially dependent upon a certain kind of values and practices, which are, again, very diverse in their manifestations and which lend support to knowledge and action that is based upon it.

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Safe Innovations, Innovative Safety

Lucia Belyová, Gerhard Banse

Introduction

Innovations are often bound up with technological developments, economic significance, and social acceptance. The relationship between innovation(s) and (technological) safety has not been as thematised, however. Thus, with innovations, it is often the case that safety and security requirements are neither extensively examined nor fulfilled "in good faith and to the best of one's knowledge" – regardless of whether we are dealing with innovative processes or innovative objects. The events of this year and last year clearly demonstrate this. The accident at the Deepwater Horizon oil drilling rig on April 20, 2010 provides a perfect example:[1] "[...] BP was thus allowed to drill for oil at a depth of 1500 meters in the Gulf of Mexico – a great technological accomplishment, to be sure – without having to think about how these holes could eventually be shut. The result: what has now become the largest known maritime environmental catastrophe."[2]

With a tally of eleven dead workers, up to one million tons of leaked oil, an economic cost of 41 billion dollars to BP, and immeasurable environmental damage, the explosion at the Deepwater Horizon oil rig is now considered the worst oil disaster in history. According to the report published by British Petroleum, the accident, in which BP and other businesses were involved, was triggered by "a complex and interconnected sequence of technical failures, human errors, construction mistakes, operating procedures, and defective communication".[3]

The company points to the following as one cause among many behind the Deepwater Horizon explosion: "The negative results of a pressure test were

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[1] For general information, cf. http://de.wikipedia.org/wiki/Deepwater_Horizon.

[2] *Frankfurter Allgemeine Hochschulanzeiger*, June 2010, p. 3.

[3] http://www.bp.com/genericarticle.do?categoryId=9034856&contentId=7064944 [01.02.2011].
– This formulation is very similar to the conclusion that Charles Perrow drew as early as the mid-1980s in his study of technological disasters: The "catastrophic failures of complex systems are not usually the result of merely one component's failure [...]; more often, they are characterised by the conjunction of the failures of multiple parts of the system in a highly unpredictable manner" (Perrow, Ch., *Normale Katastrophen. Die unvermeidbaren Risiken der Großtechnik*, Campus Verlag, Frankfurt am Main – New York 1989, p. XII).

wrongly accepted by both BP and Transocean, even though the drill hole had not demonstrated the necessary stability."[4] Although the company, under the "Code of Conduct" heading on its website, calls attention to both the company values – forward-looking, innovative, responsible, and goal-oriented – and to the goal of producing energy that is "affordable and safe, and causes no environmental harm",[5] it is clear from the accident that even though these values exist formally, they are not being practically applied.

In this case, the topic of safety was obviously not addressed in such a way as to manage to prevent this catastrophe.[6]

The problem

Despite the fact that safety takes on an immensely important role in both human coexistence and business practises, it is by no means omnipresent. Its importance is often only stressed when safety guarantees have failed or are in the process of failing. As a result, undesired events arise – such as accidents, malfunctions, or recalls. Larger accidents, such as the Deepwater Horizon catastrophe in the Gulf of Mexico, which bring about an immense human cost as well as enormous material and environmental damage, crop up only at large intervals.[7] Whenever such an incident does occur, the safety consciousness of the company at fault along with that of the regulatory authorities, the politicians, and the general public is refined.[8] In such situations, the value and necessity of safety rises. At the same time, it is clear that the fulfilment of this requirement is no automatism, but rather arises through constant effort and continuously prioritised action. Constant improvement as well as guarding against complacency should be brought into close connection with the topic of safety, in order to avoid as many undesired occurrences and unsafe actions as possible. This connection is of particular significance with regard to technological innovations. However, it is often bound up with numerous unknown parameters. Owing to

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[4] http://www.bp.com/genericarticle.do?categoryId=9034856&contentId=7064944 [01.02.2011].

[5] Cf. http://www.bp.com/liveassets/bp_internet/austria/corporate_austria/STAGING/local_assets/downloads_pdfs/0_999/unternehmenswerte.pdf [01.02.1011].

[6] We again cite Perrow: "Systemic accidents are unusual, even rare: yet this fact is hardly comforting when these accidents entail catastrophe" (Perrow, Ch., *Normale Katastrophen*, op. cit., p. 18); also, cf. Hofmann, M., *Lernen aus Katastrophen. Nach den Unfällen von Harrisburg, Sevezo und Sandoz*, Verlag edition sigma, Berlin 2008.

[7] "Catastrophes are rare, yet this is cold comfort" (Perrow, Ch., *Normale Katastrophen*, op. cit., p. 13).

[8] This is apparent from the current – and once again central – public and political debate in Germany over the safety of nuclear power plants, which was triggered by the accident at the Fukushima nuclear plant in Japan following the March 2011 earthquake, and the resultant tsunami.

a lack of experience, to unknown dangers, and also to the absence of adequate norms for dealing with the unknown and the unexpected, the mechanisms for guaranteeing safety are (automatically) diminished. Above all, the lack of more-or-less measurable and documentable "hard" factors raises the risk associated with technological innovations. The Deepwater Horizon explosion demonstrates that safety represents a complex system, and that human factors (in the form of errors and lack of communication) – the so-called "soft" factors – also play a decisive role in ensuring safety.

Safety

Striving for safety and security is one of the fundamental needs of human behaviour.[9] According to studies conducted by the American psychologist Abraham H. Maslow, different hierarchically-arranged levels of human needs exist.[10] For this arrangement, he drafted the following illustration, which was later called "Maslow's hierarchy of needs" (or "Maslow's pyramid") and which takes five stages of human development as its starting point (see Figure 1).

Building upon the basic needs of humans, such as food or sleep (physiological needs), the need for safety forms the second most important level of the hierarchy. Feelings such as security, freedom from fear, and stability characterise this level. Maslow's hierarchy of needs is based on the thesis that, before the more highly ranked needs can become relevant and worthy of pursuit, the lower-standing needs must first be fulfilled. With the help of this concept, one can easily see that both the need for safety and feelings of safety form a central aspect of human coexistence. Complementing Maslow's theory, Frederick Herzberg, Bernard Mausner, and Barbara B. Snyderman describe factors that influence working life. Through a description of critical events relating to pleasant and unpleasant work situations, a theory of job satisfaction known as the two-factor theory was developed.[11] The results of these studies show that two independent sets of factors are important for employees in the organisations where they work:[12]

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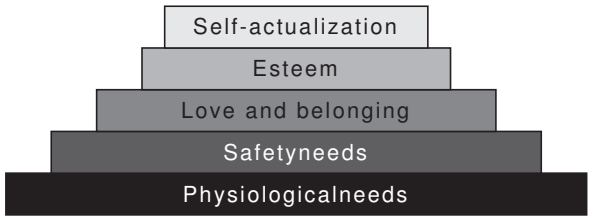
[9] Cf. Kaufmann, F.-X., *Sicherheit als soziologisches und sozialpolitisches Problem. Untersuchungen zu einer Wertidee hochdifferenzierter Gesellschaften*, 2. rev. edition, Enke Verlag, Stuttgart 1973.

[10] Cf. Maslow, A. H., 'A Theory of Human Motivation', *Psychological Review*, Vol. 50, 1943, pp. 370–396.

[11] Cf. Herzberg, F., Mausner, B., Snyderman, B. B., *The Motivation to Work*, 2. edition, Wiley, New York 1959.

[12] Cf. also Franken, S., *Verhaltensorientierte Führung. Individuen – Gruppen – Organisationen*, Gabler Verlag, Wiesbaden 2004, p. 97; Kirchler, E. (ed.), *Arbeits- und Organisationspsychologie*, Facultas WUV Universitätsverlag, Vienna 2008, p. 105.

Figure 1: Maslow's hierarchy of needs



Source: Bär, M., Krumm, R., Wiehle, H., *Unternehmen verstehen, gestalten, verändern*, Gabler Verlag Wiesbaden 2007; Keegan, W. J., Schlegelmilch, B., Stöttinger, B., *Globales Marketing-Management*, Oldenbourg Wissenschaftsverlag, München2002.

- *"Motivators",* with which job satisfaction and a willingness to perform can be attained (e.g., recognition, responsibility, the content of one's work), and
- *"Hygiene factors",* which have a negative effect if they are not satisfied (e.g., justice, safety, company policies).

In this concept as well, the fulfilment of hygiene factors such as safety is seen as the basis for fulfilling more "highly valued" motivators.

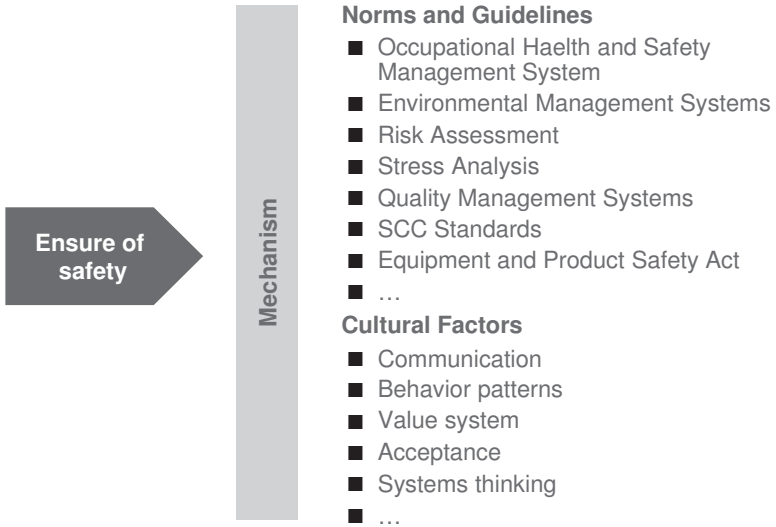
With regard to the aspect of safety, if both of these approaches are looked at from the point of view of a company or business, then they call for a consideration of those individuals who are affected by the company's actions. In addition to the safety interests of the employees and corporate management, the safety of the company's customers as well as that of other interest groups should be ensured.

In the corporate context, in which people are both the actual actors in the process of creating values and the target group of those values, safety represents one of the basic requirements posited with regard to products and processes within the framework of corporate value creation.

An entire range of mechanisms contributes to the fulfilment of safety requirements in a corporation (see Figure 2). *On the one hand*, it is necessary to fulfil guidelines, norms, or rules that are relevant to safety, and that are stipulated by law. Thus, for example, German companies are required to follow the Appliance and Product Safety Law (GPSG), or to carry out risk and danger assessments as well as stress analyses. *On the other hand*, companies introduce different standards (e.g., SCC standards)[13] and management systems with different focuses, which obligates them to fulfil different requirements. Depending

[13] The SCC (Safety Certificate Contractors) is an international standard for the safety, health, and environmental management of technological service providers that are employed at a client's operating site.

Figure 2: Mechanisms for ensuring safety



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on the focus, this takes up either health and safety management, environmental management, or quality management.

The described mechanisms tend to present the "hard", measurable, and documentable factors for ensuring safety in a company or business. Yet undesired events (such as accidents, occupational diseases, product recalls, etc.) and even catastrophes still crop up repeatedly, even in companies that have introduced these standards and regulations. This points to the fact (among other things) that these standards and regulations are not adequate to ensure safety, and that there are a host of other factors that also influence safety. The so-called "soft" or cultural factors – such as communication, behaviour, or value systems – are often cited as the reasons behind accidents, as the example of BP has shown. The description, analysis, and registration of these factors along with the influence they have on safety is the domain of research into safety culture(s).

Safety culture

The 1986 Chernobyl reactor disaster provided a crucial occasion to rethink safety – and especially the safety of nuclear power plants – in terms of the interaction between social and technological systems. In addition to purely technical safety criteria, there was also, starting at the end of the 1990s, an increase in discus-

sions about "cultural aspects" or "live safety". Within the framework of investigations into the accident at Chernobyl, the concept of "safety culture" was formed. The impulse behind a conceptual approach in the direction of safety culture was provided by the International Nuclear Safety Advisory Group (INSAG). In the so-called Safety Culture Programme, the group called attention to the fact that, in addition to technological measures, sociocultural aspects are also of crucial importance. Once it was recognised that safety depends not only on the reliability of technology but also on the interactions between man and machine, "there was an awareness that every group of people – every business – develops its own characteristic way of dealing with risks: its own individual safety culture".[14] In 1991 the concept of "safety culture" was defined in the following manner by an international advisory group and then put into practice: An "assembly of characteristics and attitudes in organisations and of individuals which establishes that, as an overriding priority, [nuclear] safety issues receive the attention warranted by their significance".[15] Certain culturally determined behavioural characteristics were also registered, named, and described – characteristics that are important for ensuring technological safety not only with regard to so-called "high-risk technologies" but also with factual systems including information and communication technologies (IT security). This definition of safety culture has to this day formed the foundation of further definitions, approaches, and programmes.[16] Despite the widespread nature of this topic (in industries other than atomic energy as well; cf. Weißbach et al.[17] as one example) and a whole host of definitions, the concept of safety culture is still "very vague in its understanding and its theoretical foundation".[18] It is located in the tension field that ranges from the dispositions and abilities of individuals to the results of the group processes and

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[14] Müller, S., Brauner, Ch., Grote, G., Künzler, C., *Sicherheitskultur: Spiegelbild des Risikobewusstsein*, Schweizer Rück, Zurich 1998, p. 10.

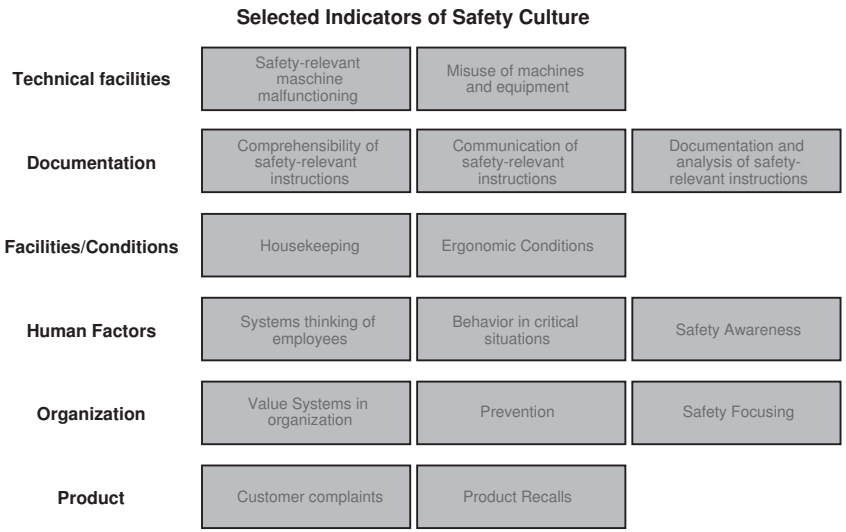
[15] INSAG (International Nuclear Safety Advisory Group), *Safety Culture*, International Atomic Energy Agency (IAEA), Vienna 1991, p. 1.

[16] Cf. Banse, G., 'Im Fokus der Sicherheitsforschung: Sicherheitskulturen', in: G. Banse, I. Krebs. (eds.): *Kulturelle Diversität und Neue Medien. Entwicklungen – Interdependenzen – Resonanzen*, trafo Wissenschaftsverlag, Berlin 2011, pp. 207–227; Belyová, L., 'Die Berücksichtigung von Sicherheitsaspekten in der Praxis', in: G. Banse, I. Krebs. (eds.): *Kulturelle Diversität und Neue Medien*, op. cit., pp. 253–268. We will here refrain from even beginning to list the vast literature on this topic. A review of existing definitions and approaches of safety culture is given by F. W. Guldemund (cf. Guldemund, F. W., 'The Nature of Safety Culture: A Review of Theory and Research', *Safety Science*, Vol. 34, 2000, pp. 215–257).

[17] Weißbach, H.-J., Florian, M., Illigen, E.-M., Möll, G., Poy, A., Weißbach, B., *Technikrisiken als Kulturdefizite. Die Systemsicherheit in der hochautomatisierten Produktion*, Verlag edition sigma, Berlin 1994.

[18] Fahlbruch, B., Meyer, I., Dubiel, J., *Einfluss menschlicher Faktoren auf Unfälle in der verfahrenstechnischen Industrie*, Umweltbundesamt (Forschungsbericht 206 48 300), Dessau-Roßlau 2008, p. 44

Figure 3: Examples of indicators relating to safety culture



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attitudes of organisations, and to the behaviour of all members of the system in the broader sense, including technologies and factors relating to national culture. The establishment of safety culture(s) represents a process that results from a constant focus on safety. Despite the many definitions of safety culture, "there is nevertheless a general consensus that safety culture is to be understood as a holistic and integrative concept".[19] Similarly, a consensus exists among numerous authors with regard to the difficulties involved in understanding safety culture: Due to its complexity, safety culture is difficult to grasp and measure, and cannot be described by hard facts and figures.[20] However, this understanding brings to light the key prerequisite for being able to influence existing safety cultures, which is of special interest with regard to the practical applicability – or rather application – of the concept of "safety culture".

Since safety culture cannot be directly measured,[21] it can only be registered and implemented with the help of indicators or factors. If something is "not measurable", then according to Reinhard Stockmann it is a question of an un-

[19] Ibid., p. 43.

[20] Cf. Franken, S., *Verhaltensorientierte Führung. Handeln, Lernen und Ethik in Unternehmen*, 2. rev. edition, Gabler Verlag, Wiesbaden 2007, p. 198.

[21] Hofinger, G., 'Sicherheitskultur im Krankenhaus', Vortrag auf dem Rahmenkongress *Medizintechnik und Patientensicherheit*, Münster 2008.

representable fact and its implementation. He defines implementation as a logical linking between the non-measurable fact and the indicator that is to be measured via a rule of correspondence that provides details about the type of relation at hand.[22] Indicators thus depict facts that are not directly measurable.

A broad spectrum of indicators relating to safety culture are listed in the literature on the topic. The understanding of these indicators varies from author to author. It is sometimes a matter of a single word, and sometimes a question, and sometimes an entire page of explanations. Figure 3 gives a few examples of indicators, which have been organised into six groups in order to provide a comprehensive list. Many of these refer to processes or products that are already present in businesses, and therefore refer to pre-existing processes (the so-called normal operational mode). The communication and comprehensibility of safety regulations can only be an indicator if these regulations are already present in the business or company under consideration. This is also true of claims and recall actions, which only represent an indicator if a business has already brought a product onto the market and has access to the feedback of customers and other stakeholders regarding unfulfilled demands. In the context of innovations, the following question comes to the fore: How can safety be ensured with regard to a process or a product that brings with it a high degree of uncertainty?

Safe innovations

The emergence of innovations is a condition that influences the long-term viability of a business. Due to the competition that dominates the market, innovations provide advantages that are necessary for a company.[23] Innovation is cited as the most important prerequisite for growth, and is a source of cost reductions and a means of standing out from the competition.[24] The orientation toward fulfilling consumer demands, which every business strives for, also leads to innovations. Innovations often represent a reaction to those constantly changing and newly emerging consumer needs and demands that are linked to a particular process or product. Jürgen Hauschildt defines innovations as "qualitatively new products or processes that noticeably distinguish themselves from the previous situation. The perceived novelty must consist in the means and ends being linked in a

[22] Cf. Stockmann, R. (ed.), *Handbuch zur Evaluation. Eine praktische Handlungsanleitung*, Waxmann Verlag, Münster 2007, p. 202.

[23] Cf., e.g., Kornwachs, K. (ed.), *Bedingungen und Triebkräfte technologischer Innovationen*, acatech (Deutsche Akademie der Technikwissenschaften), Munich 2007; Spur, G. (ed.), *Wachstum durch technologische Innovationen. Beiträge aus Wissenschaft und Wirtschaft*, acatech (Deutsche Akademie der Technikwissenschaften), Munich 2006.

[24] Cf. Gassmann O., Kobe, K. (eds.), *Management von Innovation und Risiko*, Springer Verlag, Berlin a. o. 2006.

Figure 4: Differences between normal operations and innovation from the point of view of safety

Process and Product Attributes	Normal Operations	Innovation
Experience (e.g. in Production)	✓	X
Costumer Feedback Information (Complaints, Recalls,..)	✓	X
Applied knowledge and competence of employees	✓	X
Normative regulations, defined rules, guidelines, instructions	✓	X
Known dangers	✓	X
Guidelines to handle dangerous situations	✓	X
Elaborated action plans for potential accidents	✓	X

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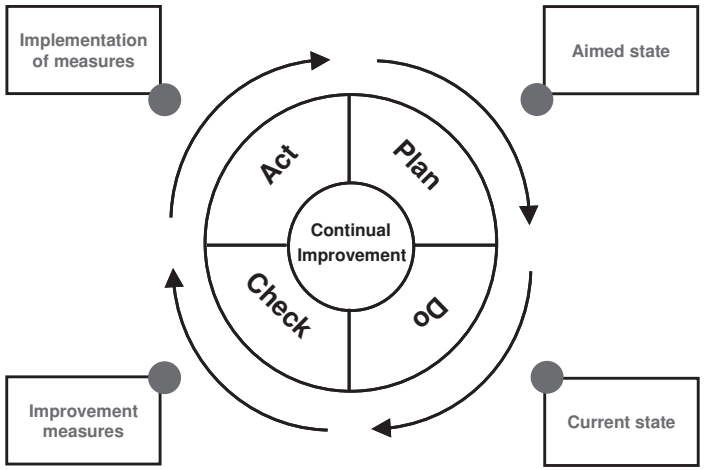
hitherto unknown form. In addition to this, this linking must prove itself on the market or in internal company use".[25] The distinction between product and process refers to the fact that innovations can be described as both the process of innovating and the result of this process. As the case may be, both the processes and the objects of innovation are observed.[26] In the definition cited above, the novelty of the linking of means and ends in a hitherto unknown form is emphasised. We are thus dealing with a new combination of production factors that are accompanied by other unknown factors (both opportunities and dangers, i.e. risks). A closer examination of the concrete characteristics that differentiate products and processes allows us to list the essential differences that have an influence on safety – these are depicted in Figure 4. Often, with innovations, there is no pre-existing experiential knowledge at hand. In this regard, legislators have no temporal "head start", for the basic legal conditions and regulations are either first developed after the fact, or are modified in the course of use. The dangers also represent an unknown quantity that can arise during innovative processes, as do the norms for dealing with those dangers. On account of altered or rather new basic conditions that are bound up with innovations (but also with new technologies and new employees), it is often extremely difficult to fulfil safety requirements and thereby to ensure safety. Increasing safety is something that demands constantly adapting to these changes in the basic conditions at hand.

[25] Hauschildt, J., *Innovationsmanagement*, Vahlen Verlag, München 1993, p. 7.
[26] Cf. Dietz, J.-W., *Gründung innovativer Unternehmen*, Gabler Verlag, Wiesbaden 1989.

Figure 5: Successive PDCA Cycle



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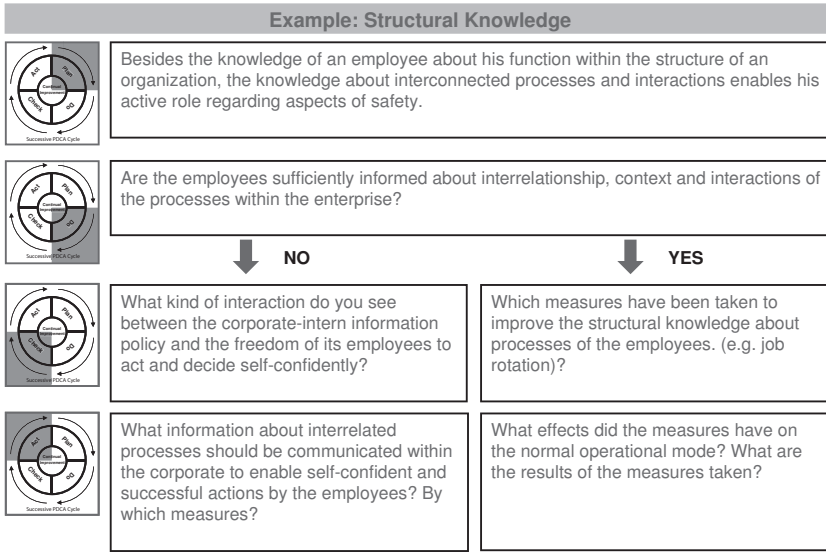
One way of achieving this is to continuously focus on the topic of safety. Toward this end, in the domain of quality management, a plan was developed that pursues the goal of constantly raising a previously attained level of safety. This approach of constant improvement goes back to Edward Deming, and it finds its equivalents in numerous established continuous improvement processes (CIP processes) of business practice. It is based on successively cycling through a closed loop that consists of the following four phases: planning a process (*P*lan), implementing it (*D*o), checking the results (*C*heck), and a concluding adjustment (*A*ct). The final action then initiates the next cycling through of the successive PDCA cycle (see Figure 5).

In relation to the topic of safety, this continuous focusing and improvement takes on an important role, since safety topics are subject to very cyclical attention curves. Thus, the topic often takes on a very prominent position after a serious event; but in times of no incidents or of smaller incidents with no serious consequences, the topic is often drowned out by day-to-day business. Mike Rother emphasises the necessity of clear goals that guide action in the context of a continuous improvement process, in order to prioritise the defined measures and to be able to align them in accordance with higher goals. A change in basic conditions thus also requires a re-examination of the goals.[27]

[27] Cf. Rother, M., *Toyota Kata. Managing People for Improvement, Adaptiveness, and Superior Results*, McGraw-Hill, New York 2010.

Figure 6: The "structural knowledge" indicator as the registration of a process



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The dynamic that is produced by virtue of the changes brought about by innovations also characterises safety and safety culture. This fact is reflected in the indicators through which safety culture can be registered and influenced. This difference can be clearly demonstrated by the example of the *structural knowledge* indicator, i.e. knowledge about the correlations of the operational process of the business at hand. The registration of structural knowledge is above all a question that concerns the punctiform condition of knowledge: Is the employee encouraged to have structural knowledge of the correlations of the operational process, or is his or her knowledge confined merely to current state of the system's affairs? In contrast, Figure 6 shows a registration of the same indicator, but which is oriented toward a continuous improvement process. In the first phase (*P*lan), we are dealing with the formulation of an ideal state of affairs. In the description of a target state, a goal is set for the business with regard to the indicator at hand: a goal that the business can – or rather, would like to – approach. (Achieving this goal is not possible owing to ever-changing basic conditions.) The second phase (*D*o) consists of the description of the actual state of the indicator at hand. This actual state corresponds to the situation in the business, and allows differences between the two states to be seen. The third phase (*C*heck) depends on the description of that actual state. If there are

only marginal differences between the two states, then the measures needed to bridge this gap are significant for this phase. In this case, the forth phase (*A*ct) contains the question of the implementation of these measure and that of the improvements that are brought about by them. If the actual state is further away from the ideal state, then one needs to examine where the differences lie and what causes can account for this. Accordingly, the forth phase is devoted to the measures that must be taken up and implemented in order to improve the actual state and be able to approach the ideal state. In this way, it is possible to observe not only the actual state of the indicator but also – by formulating the ideal state as the goal – the path needed to approach this goal, along with the results and improvements that are achieved here.

Conclusion

We have, in the present essay, described a method for analysing safety culture. Toward this end, an apparatus was developed with which to grasp safety culture with the aid of indicators. Since these indicators consider not only aspects of the actual state of affairs but also additional questions about the ideal state as well as questions about the measures that need to be taken up and implemented, they allow for the analysis of safety culture in its dynamic aspects. Contrary to prevailing approaches that are oriented toward a static focus on the indicators at hand, our method comprises the dynamic aspects, which is crucial for examining innovations. In order to be able to implement this apparatus for the analysis of safety culture in its relation to innovations in the future, these indicators must be further developed and evaluated with the aid of practical examples.

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Public Engagement in Science: Current Debates in the Czech Republic

Adolf Filáček

Introduction

The science and research community in the Czech Republic and in other European countries agrees that societal demand for science and research has been growing in recent years, with this trend continuing unabated. This may be seen, among other developments, in changes in the governance of science, which is reflected primarily in the introduction of new evaluation procedures in science that accentuate the competitive nature of scholarly research and lead to the allocation of financial support based on stricter criteria when assessing scientific production.

This is a wider phenomenon occurring in most advanced European countries. In the past few years, public pressure has been mounting on what is known as the social accountability of research, which asks – in a rational manner – how and which particular social and economic needs and goals research actually serves, what are the yields and benefits derived from the funds spent on research. The growing and diversifying requirements placed on directing mainly public-funded research towards social and economic needs have led, in many countries, to renewed efforts to redefine research priorities and improve their selection. By setting priorities, governments are striving for direct support for research trends relevant for the prevailing social and economic needs. There is also a growing pressure on introducing a purposeful and effective system of utilizing the limited public funds for research, while enhancing the transparency of research funding. Even in cases of faster growth in funding the public research sector in countries that have already managed to overcome the financial crisis and economic stagnation, pressure is being brought to bear on using the available funds in the most efficient manner.

The place of science in society

The overall volume of generated scientific knowledge has been sharply increasing all over the world. Furthermore, this knowledge is being diversified both

in terms of its nature and purpose, its institutional carrier (knowledge is today generated by a much greater number of variegated subjects than before) – the term "diffused" knowledge is used. The contexts and links of knowledge are becoming more comprehensive, variegated, more structured. An unprecedented upsurge in the assessment of science outputs is associated with an effort to reduce the considerable uncertainty, inevitably linked to the production of new knowledge, and to get a better bearing in what are often chaotic cognitive processes, with the ultimate aim of recognizing socially relevant knowledge.

Generally speaking, we can say that there is a strongly growing anticipation, among the general public, of favourable impacts of the development and funding of science and research. This societal climate, as perceived by the science sector itself, is undoubtedly favourable, posing to the research community and to individual researchers major contemporary changes and challenges.

1) The criteria for assessing scientific results that are currently gaining ground include – in addition to specialist criteria – also the criteria of social relevance at the national and regional level, with specific consideration given to the European context. Compliance with those criteria is expected primarily from research programmes and projects financed from public sources, while novel assessment and auditing procedures are now focused on both entire research programmes and on individual projects.
2) Seen against the background of the lingering financial crisis, efforts for introducing austerity measures and cuts in public spending are evident everywhere, being reflected in many countries in their R & D expenditures. However, the most industrially advanced countries are currently displaying their obvious intention not to curtail science and research spending and, on the contrary, are seeking to strengthen the role of research and advanced technologies in a bid to promote their future economic performance.
3) There is a considerable rise in the number of managerial and decision-making subjects (stakeholders) who actively assert their influence on the research focus of scientific programmes. These stakeholders are interested in economic and efficient spending of financial sources, thus bringing pressure to bear on the investments into research to yield demonstrably beneficial results.
4) Growing commercionalization of the research sector comes as a result of the need to obtain additional financial means from public tenders, called by grant agencies, research institutions, governments and universities as well as the business sector.

The above changes, known to be exercising a major impact on the overall position and functioning of science and research in society, are finding their reflection in the contexts pertaining to the academic freedom of the individual

researchers and the possibilities of autonomous behaviour of the universities. The research sector cannot formulate its thematic priorities in research quite independently; it is obliged to take into consideration societal demand, social relevance and economic-political interests of the stakeholders.

It was the MASIS project (Monitoring research and policy activities of science in society)[1] that mapped out the issues involving the relationship between science and society in broader European contexts. This is a service project being resolved at the order of the DG Research EC, as part of the activities evolved by the Programme Committee "Science in Society Configuration under the Capacities Specific Programme" (SiS) within the 7th EU Framework Programme. A system for mapping out the most important activities and actors in science across Europe has been devised so far. The project activities should contribute to formulating overall vision of a democratic European knowledge society, and the implementation of the European Research Area through the development of structural links and interactions between scientists, policymakers and society at large.

Generally speaking, in the FP7 the Science in Society (SiS) programme, initiated by the Commission, aims at building an effective and democratic knowledge-based European society and contributing to the implementation of the European Research Area. By stimulating harmonious integration of scientific and technological endeavours in Europe, SiS seeks to encourage broader public engagement and facilitate debate and policy development on science and its relation with society and culture.

With this objective, the SiS programme[2] aims at contributing to the establishment of:

- social and cultural environments for successful and exploitable research;
- integrating societal needs and concerns in research;
- increasing public debate about research and influence on scientific issues;
- ensuring participation and involvement of civil society and NGOs in research;
- establishing a climate favourable to scientific vocations and research investments;
- fully integrating women into the scientific world.

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[1] The project aims at providing relevant information about 38 countries – EU member states and countries associated to the seventh European Framework Programme (FP7). Co-ordinators are COWI A/S and the Danish Centre for Studies in Research and Research Policy (CFA) at Aarhus University, Faculty of Social Sciences. For more information see http://dev.contentcube.dk/masis/.

[2] See http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1221

Current debates in the Czech Republic

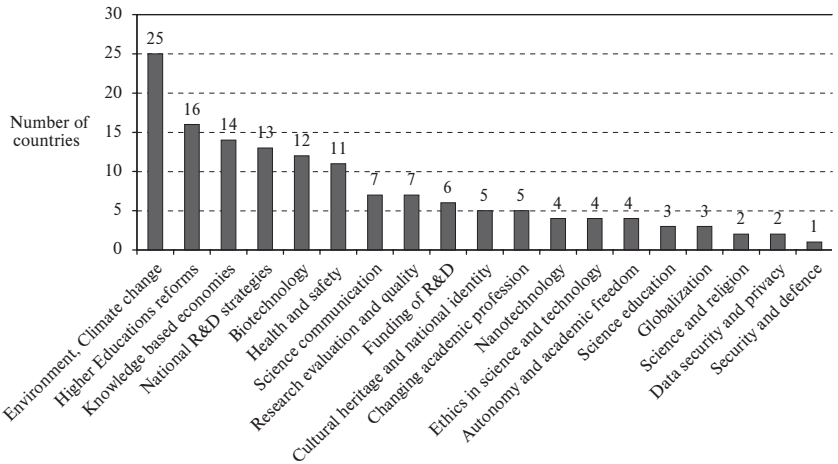
The overall intensity of the general public's interest in public or political debate on science, research and development in a given society varies in different European and associated countries. In most advanced countries, such debates are comparatively lively, in other states they are very sporadic, focused primarily on current topics.

A preliminary review of the accumulated MASIS national reports has shown that as many as 37 reports explicitly mentioned 144 specific debates that could be classified into a typology made up of 19 categories.[3] The most frequent topics included the following:

1. Climate change, the environment and energy technology. These topics and the active role played by science in solving current problems are often discussed not only in the professional circles but also by the lay public and the mass media alike. The other aspects of society's sustainable development (e.g. biodiversity, water and air pollution, waste disposal) are discussed, to a greater extent, in the academe and the science and research community;
2. Reforms of tertiary education and university institutions. This covers discussions about the establishment of new universities, changes in the university curricula, links between science and education, implementation of new legislation, and economic-political measures;
3. Broader national strategies for science and research development, primarily in connection with the reforms of university institutions. Debates are held primarily within the science and research community on the processes of setting long-term priorities for science and research, evaluating procedures in science, and methods of funding science, research, development and innovation.
4. Various issues connected with the development of a knowledge based economy. This broadly-based theme, discussed in all European countries, covers debates on national competitive advantages on international markets, the role of research in innovation processes, integration of scientific institutions with universities and industry, stimulation (including financial incentives) for innovation activities of companies, and last but not least, the European Union's Lisbon Strategy and the related Barcelona Declaration.

[3] Mejlgaard, N., Ravn, T., Degn, L., *Monitoring Policy and Research Activities on Science in Society in Europe (MASIS). Common Issues and Research Priorities (2010)*, available at http://dev.contentcube.dk/masis/files/reports/MASIS_common_issues_and_research_priorities.pdf.

Science in Society themes of public debates in European countries



5. Specifically focused debates are under way on the use of various technologies, e.g. biotechnologies and nanotechnologies, and the different risks posed by them, primarily health risks and impacts on the safety of their application. Debates on biotechnologies are being held in the political and academic spheres with the participation of the broad general public, while public interest in these and other sensitive technologies has also been reflected in the Eurobarometer surveys.[4]

The overall situation in the European and associated countries is depicted in the chart below. The broad range of themes and the frequency of debates held at professional as well as lay forums point to a high degree of democratization of science, research and technologies in most European countries. Public involvement in debates is institutionalized in the Scandinavian countries, utilizing what are now traditional formalized procedures; in most new EU member states such formalized procedures are unavailable.

Public debate about the role of science in society has been far-reaching and intense in the Czech Republic in recent years.[5] The reason behind it is that during the past three years the Czech government launched fundamental reforms in the research sector and in university education. The effects of these reforms are supposed to be profound and wide-ranging, and the ensuing expectations stimulate discussions in both academic and general publics.

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[4] Gaskell, G., Stares, S., Allansdottir, A., Allum, N., Castro, P., Jackson, J., *Europeans and Biotechnology in 2010: Winds of Change?* Publications Office of the European Union, Luxembourg 2010.

[5] Detailed National report of the Czech Republic see MASIS pages http://dev.contentcube.dk/masis/english/storage/publications/nationalreports/masisnationalreportczechrepublic/.

The discussion about particular instruments of science and educational policy has inevitably led to a wider debate on the *role and significance of science and education for society*. Should science and education have primarily practical significance, should they contribute to economic and social development of society, or do they also represent an important, autonomous cultural and humanistic value, since the whole human creative potential is developing together with science? Should universities primarily cultivate skills or provide a more general type of education? How should these basic dimensions of science's functioning in society be fine-tuned and their optimal proportions adjusted? At a more specific level, the discussion focuses on issues, such as the relationship of quality and quantity in science, evaluation and funding of science, or the ethics of science.

The relationship of *quantity and quality* in science is justifiably at the centre of public debate; expectations and interests of relevant social actors are bound to the solution of this problem. Should pominence be given to quality (i.e. strong support of excellent science that is recognized on top scientific and economic markets) or should science be supported more extensively and valorized as part of national culture and a fount of national intellectual potential? Science, scientific thinking and methods also play part in many other spheres of society outside the scientific community. It is also claimed that focus on excellence in science must arise from a much wider and heterogeneous research foundation; that top-notch science can grow only out of a more populous "average science" (there exists a specific "critical mass" effect, and small countries need a higher percentage of research and development to reach it).

The question of evaluation criteria for scientific work: the solution of this problem has been the main subject of many public and semi-public discussions between representatives of state administration and the scientific comunity approximately until the end of 2008. The original idea of a strict and monopolistic application of scientometric criteria (citation indexes, impact factors, etc.) gradually gave way to acknowleged need to employ other auxiliary techniques as well. In this way, the notion of a single "super-number", which would characterize any particular scientific institution, has slowly faded away. The vision of evaluating science in the Czech Republic in terms of world science was corrected by pointing out certain social benefits of studying many natural and social phenomena typical for the given region as well as studying national traditions and identity.

The question of evaluating and financing science: Evaluation and funding of science appear in public debates as essentially one topic. The reason is that these aspects are conceived as an integral whole in the reform of science and research, under the assumption that science funding is closely dependent upon the results of the new criteria for evaluation. It is this presumed close connection that is already disputed by many. The system of evaluation criteria seems

to be even more controversial. According to its authors, the reform is designed to push Czech science closer to excellent science and to practical innovative effects of science. The evaluation criteria are construed accordingly: they prefer publications in top impact-factor journals and with renowned scientific publishers, and innovative products of research, especially industrial patents. The specific form of the evaluation system that has been applied is criticized by most scientists as being too much across-the-board and as having the opposite effects than those intended, since it actually stimulates primarily quantity.

Considerable attention, coming both from the media and the general public, was paid to the discussion of validity of a new method applied by the Council for Research, Development and Innovation to the redistribution of finances among scientific institutions in the spring of 2009 (most journalists refer to the method as "a coffee-grinder"). The debate demonstrated that, in addition to the criteria for evaluation of scientific work, one also has to pay detailed attention to two other sets of questions: the mechanisms by means of which the evaluation of the actual efficiency of research centres should impact their funding, and the issue of mutual comparability of evaluations between different research fields (basic research in natural sciences, where one can apply scientometric criteria to a certain degree; basic research in social sciences and the humanities, where qualitative evaluation plays an important role; and applied research, development and innovations, where evaluation also has to take into account prevailing market aspects).

The question of relationship between basic and applied research: Increase in the support of applied research, development and innovations, which all governments declared as their goal in the given period, was accompanied by a media campaign explaining the necessity of subordinating research to production goals, and improving cooperation between basic and applied research. The scientific community responded in an accommodating fashion to the strengthening of applied research, and affirmed its willingness to help with establishment of a Technological Agency of the Czech Republic; at the same time, it also pointed out the varying degrees of quality in this field. Over the past two years, discussions about this theme have heated up. Public pronouncements by representatives of industrial lobbies (especially the Industry Association) and by some state administration officials began to defend reductions in the funding of basic research by emphasizing its small immediate economic benefits. On the other hand, the scientific community responded by pointing to what it called the inadequate measure of state subsidies to industrial research and nontransparency of the related financial flows.

The question of nature and competence of the state science policy institution: This issue has been discussed for quite a long time in the Czech press, especially in relation to the recurring idea of creating a Ministry of Science in the Czech

Republic. The prevalent opinion so far claims that such an organization is not necessary since science and research transcend particular governmental departments. Thus far, a science policy topic that proved to be most attractive for the Czech media came in 2009–2010 with the protests against the members of the Government's Council for Research, Development and Innovation. The main concerns raised by these protests questioned the following: which particular fields should be represented and by whom; the setup of the Council and the ratio of its members (leading scientists as opposed to representatives of state administration and industry); whether top managers of scientific institutions should be involved (head of the Academy of Sciences of the Czech Republic, head of the Scientific Foundation of the Czech Republic, university rectors, etc.); whether the Council should decide on both evaluation and funding of science, etc.?

The question of relationship of science and universities: This issue has been discussed especially in relation to the reform of Czech higher education, which is vehemently promoted by part of this country's political scene. Most representatives of the academe disagree with the proposed reform because it would, in their opinion, weaken basic research and the level of research pursued at universities. More recently, the possibility of dividing universities into educational and research universities has been discussed. Other common topics are the questions of "flying professors" (who guarantee quality of education at more than one university) and the methods of accreditation of doctoral studies. Another poignant and still unresolved issue is what is perceived as legislative discrimination against the Academy of Sciences of the Czech Republic with regard to the possibility of awarding doctoral degrees (training of doctoral students is pursued intensely by the Academy, however, its institutes cannot issue degrees, and financial contributions for training go to universities instead).

Procedures for citizen involvement

There are no formalized procedures of public engagement (grounded in legislation or in governmental structures) focused specifically on R & D &I in the Czech Republic; it is only possible to file specific petitions. Public debates (public hearings) oriented on the general public and civil organizations have not yet become part of public life in the country. However, there are initiatives stimulated from below trying to open public debates – see Forum 'Science Is Alive!'.[6] Generally speaking, public engagement is an important trend influenced by the

[6] Fórum *Věda žije!* (Forum *'Science Is Alive!'*) is a civic association whose mission is to promote communication between the scientific community, government and non-governmental organizations and the public, stimulate a public debate on science policy and reform of science and research in the Czech Republic, and popularize results of scientific and research work.

examples coming from the advanced European countries and – first and foremost – stemming from regional needs.

In the Czech Republic, there is a well-developed method for evaluating environmental impacts (hereafter EIA process, SEA process); this procedure is regulated by the Act No. 100/2001 Coll. on evaluation of environmental impacts. This law also includes a formalized procedure for taking opinions and comments from other stakeholders into account (bodies of state administration, expert institutions, non-governmental organizations, and the public).

Significant debates with the participation of the public took place in 2009 in response to the proposal of a new budget for the Academy of Sciences, which was 20 per cent lower in comparison with 2008 and was projected to be 50 per cent lower in 2012. There were many debates in the media involving officials representing scientific and educational institutions, the government and industry, which dealt with the actual ratio of institutional and project funding, basic and applied research, the levels of applicability of results in research and industry. New civic initiatives aimed at supporting science in society have come into being (Science Is Alive!).[7]

Forum *'Science Is Alive!'* is concerned not only with the current problems facing Czech science. It also sets its sights on the role of education, science and culture in a broader social context, and on the model of their public management. Political-economic pressures seem to be jeopardizing the independent and irreplaceable role of public space and can have deadly impact on the overall level of education and culture of the Czech society in the future. The forum is also engaged in adult education, publicity and media activities destined for a broad range of the public, and initiation of open public debates. It also contributes to popularizing science by means of leaflet campaigns, specialized as well as popular newspaper articles, blogs and discussions, by staging public rallies and theme happenings.

Many institutions focusing on R & D & I hold+ frequent conferences that present proposals in support of their interests (e.g. conference on European Research, organized by the Technological Centre of the Academy of Sciences, conference on structural funds, prepared by the Ministry of Education, etc.). The presidency of the Czech Republic of the European Union was prepared and widely consulted in conjunction with stakeholders from the governmental and entrepreneurial sectors. It should be stated that the "innovation" topic was a very frequent issue in the election campaign, but predominantly as a simple slogan appealing to public opinion.

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[7] The Forum *Science Is Alive!* was formed in the summer of 2009 by young scientists from a wide range of scientific disciplines (from the natural, technical, social sciences as well as the humanities) who had realized the need of assuming an active approach and displaying their interest in the issues of the Czech Republic's science policy.

The general public is informed via the mass media. Citizens learn about S & T decisions and developments. As regards the scientific community, it may be said that citizens are consulted, and their opinions are considered in S & T decision-making.

The structure of the scientific community is democratic, reflecting the country's parliamentary, democratic principles. Students and a number of scientists are represented by university delegates; there is also an extensive representation of the scientific community in the Academy of Sciences. The Academy Assembly is the highest body of the Academy of Sciences of the Czech Republic. It consists of representatives of the Academy's institutes, their directors and other members of the academic and industrial community. The Academy Assembly is responsible for the decisions on top priorities related to the Czech Republic's Academy of Sciences, the structure of its institutes, their evaluations as well as their everyday scientific life.

The usage of public resources in science, research, and development has to be documented, explained and presented to the general public (e.g. in annual reports). A law guaranteeing citizens' free access to information is in force in the Czech Republic. As for the democratization of decision-making in science, research, and development, these processes have been significantly influenced by the activities of social sciences and the humanities.

Public debates, happenings, manifestations, etc., organized mostly by the forum 'Science Is Alive!',[8] were and still are something unusual in the rather tacit Czech political culture. It is, nevertheless, difficult to say how important these issues have been, as compared to other societal debates. True to say, they have managed to achieve considerable public visibility; however, they have not yet succeeded in the transformation of these particular issues into recognized themes of general interest. While the applied sciences enjoy a considerable level of public esteem, highly specialized basic research and, first of all, the humanities still remain largely underestimated.

Research related to science in society

Generally speaking, the SiS research that would target, in particular, public understanding of science, governance of science, science policy, science education and science communication, is not explicitly covered by any specifically focused Czech project. However, there are some projects that target women in science, ethics in science and technology, the relations of science and innovation culture, young people and science.

[8] See http://www.vedazije.cz/en.

The Open Science and Open Science II projects are among the well-known ventures. The first was approved for funding under the Single Programming Document (NUTS 2 region objective 3 Prague [SPD 3]), which had been implemented by the Ministry of Labour and Social Affairs of the Czech Republic. It was funded by the European Social Fund. Additional funding also came from the ESF, the state budget of the Czech Republic and the budget of the City of Prague. The two-year project began on September 1, 2005 and was concluded on August 31, 2007. The Project Open Science II has similar funding from the Ministry of Education, Youth and Sports; this three-year project began on September 1, 2009 and will be finished on August 31, 2012.

The Science in Society issue is important as a set of evaluative elements for national research programmes and academic institutions. Some SiS issues function directly as a criterion for the evaluation of science and research. The research proposals for the Czech Science Foundation (and, likewise, the research outcomes) are evaluated under the criterion of *each project's social relevance.* This criterion is one of the four criteria in the main framework for assessment of scientific and practical value of the proposed project, and functions as an actual gatekeeping element. Assessment of social relevance evaluates how much the evaluated standard project proposal could contribute to development in other branches of science and technology, and whether it could help in solving other societal problems (introduce innovation or new solutions with positive social impact, e.g. on unemployment, etc.). There are, of course, special grant programmes for young and post-doctoral researchers, too. In addition, gender balance is also taken into account when evaluating research proposals, but mostly as a 'check box' item along with other indexes (age, education).

Priorities setting

The process of setting priorities for science and research is closely associated with the evaluation procedure in science. Delineation of fundamental or rather priority trends in research and development constitutes a key issue of any science or innovation policy.[9] The main role in this process is played by the decision whether or at which particular level to set the specific nature of priorities, which particular values and notions (future outlooks, overall visions) to use in deriving selected research trends (societal goals, economic parameters, etc.). It should also be clearly stipulated who is to decide about priorities (which par-

[9] Filáček, A., Loudín, J. et al., *Přehled hodnocení zahraničních metod výběru základních směrů výzkumu* (Overview and Assessment of Research Priorities Setting Methods Abroad), Research Study for the Research and Development Council of the Czech Republic, Prague, Institute of Philosophy of the Academy of Sciences of the Czech Republic, v.v.i., 2004.

ticular administrator, institution) and which particular methods and procedures are to be employed. Seen in this light, the nature of the whole process lies deeply anchored in the level of culture and the traditions of the given society in terms of its economic (and generally civilizational) advancement, type of application of its economic policy, its political and cultural (including research) traditions.

The trend in selecting research priorities in the Czech Republic is aimed at expanding the field of stakeholders involved in this procedure. In addition to the traditional representatives of the scientific community and state administration authorities, also people representing the entrepreneurial sector, bankers and representatives of the civil society (e.g. those representing civic associations) are invited to take part on a growing scale. A well-founded process of priority setting is seen in the involvement of social groups with different vested interests, and in deliberately setting a conflict of interest among – a group of stakeholders participating in priority setting that argues for greater participation of public research in social and economic needs on the one hand – and a group seeking to maintain academic freedom in the selection of research topics and to ensure methodological justification of the selected research procedures, on the other hand. Coming to the forefront in setting research priorities is, therefore, its special interest and institutional aspect. A salient feature of this particular concept is support of the involvement of the civil society that has an important role to play in formulating research priorities.

Priority setting may also be perceived from the position to which extent the adopted priorities result from ad hoc negotiations and clashes of interest of the main stakeholders concerned (in most cases, these are selection processes connected with the drafting of a new national research and innovation policy) and to which extent they result from specific coherent analytical processes, backed up by a permanent specialized background provided by specialist agencies and institutions (promoting also their own priority setting methodology). Systematic preparation of analytical and forward-looking documents is focused on regular updating of the previously identified national priorities and strategically important trends in research and development. The actual quality of priority setting thus becomes dependent on an ability to create a fragile balance between the process of reconciling many different – sometimes even conflicting – social interests and accumulating and utilizing highly specialized skills.

This close integration of academic science into the state and entrepreneurial structures has been given many different descriptions ranging from a “new social contract” to a “new alliance”. Possibly the most influential theoretical model in this context is the concept presented by the Gibbons team[10] distinguishing two basic modes of knowledge production (”traditional” and “new – Modus 2”); very

[10] Gibbons, M. et al., *Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, Sage, London 1994.

frequent is also the concept of "technoscience".[11] In principle, these theoretical models claim that in today's heightened global competition marked success may be scored solely thanks to cutting-edge innovations, which predominantly result from basic research. The need of enhanced support of basic research is being provided in the conditions of concentrated pressures on the efficiency and speed of solutions, which, in turn, lays claims on the managerial skills of senior executives in science and research; at the bottom line, this involves the necessity of managing "know-how" in its economic aspects, in commercial law, in the protection of intellectual property, etc.

Science assessment in the Academy of Sciences

The first evaluation of the institutes of the Academy of Sciences after 1989 was launched in the autumn of 1992 and completed in 1993; it resulted in the abolition of 18 scientific institutes and 4 service centres, while the total staff of the Academy of Sciences was cut by half as compared with 1989. This first evaluation already reflected efforts for delineating the subjects of assessment, for setting evaluating criteria as well as evaluating methods and procedures, comparable with similar activities in advanced European countries. Having yielded necessary results, the evaluating procedure was further developed in the following years into much more mature forms in what was called The System of Independent Assessment of the Scientific Institutes of the Academy of Sciences of the Czech Republic, adopted by the Academy's democratically elected bodies in 1993.

Throughout the transformation process, evaluation has followed, since its very beginning, a dual basic goal: to ensure the quality of research work of the individual teams and institutes as a basis for personnel changes but also to serve for the elaboration of an optimum structure of scientific institutions for the future, and the formulation of a concept of their activities. The need of combining both tasks belonging to different levels has eventually determined both the methods and criteria to be used for assessment. In protracted debates between the proponents of the quantitative (scientometric) and qualitative (peer review) evaluating methods, there eventually crystallized the opinion that assessment performed by leading experts in the individual branches is a fundamental and well-tried method since the responsibility of competent scientists for the given scientific branch cannot be replaced by anything else.

When conceiving each evaluating system, it is vital to take into account the fact that an efficient evaluating system cannot be found at the level of meth-

[11] Loudín, J., 'Věda ve společnosti vědění – koncepce a trendy' (Science in a Knowledge Society – Concepts and Trends), *Teorie vědy (Věda, technika a společnost)* 6 (24), No. 3, 2002, pp. 41–86.

odologies and techniques, at the instrumental level, but, after all, solely in the relationship between science and society, and in the foundation of an efficiently functioning scientific community. Expert boards may also distinguish different levels of assessment and implement both goals of evaluation given above. In their evaluaiton, expert boards should use methods and approaches according at their own discretion, naturally complete with scientometric methods and techniques. However, science assessment should be, basically, a multi-criteria process. This gave rise, in evaluating activities, to an effort for constant harmonization of qualitative and quantitative methods. Its significance also lay in that the application of scientometric analyses enhanced the objectiveness of evaluation and weakend the strength of those arguments stemming from apprehensions of any bias of a subjective peer review.

Following the evaluation performed in the years 1992–1993, the Academy of Sciences of the Czech Republic carried out the first round of regular assessments in the years 1994–1996, and the second cycle between 2000 and 2001. The first of these evaluations was performed by the Academy of Sciences at its own decision, the second one in 2000–2001 was implemented on the basis of the Rules of Assessment of Research Plans and Results of Academy Institutes, adopted by the Resolution of the Government of the Czech Republic No. 281 of April 22, 1998. These rules laid down the mode of assessment in all the research and development sectors; the steering and coordinating role was played by the Government Council for Research and Development, which paid attention to the implementation of the then National Research and Development Policy of the Czech Republic.

The following factors may be given as positive aspects of the process, namely that:

i) the Academy of Sciences itself introduced a system of external and independent periodic assessment. The actual evaluating procedure had been publicly discussed and comments were sent in both by specialist groups at the institutes of the Academy of Sciences and from the deliberations of the democratically elected Assembly of the Academy of Sciences.

ii) ongoing assessment at all the levels (including certifications of scientists) is an organic constituent of managerial work, encompassing also differentiated allocation of funds to individual institutes and, inside the institutes, to individual scientific teams.

Foreign analyses of the transformation processes in the academies of sciences in the countries of Central and Eastern Europe usually appreciate the fact[12] that the Academy of Sciences of the Czech Republic succeeded in employing

[12] Mayntz, R., Schimank, U., Weingart, P. (eds.), *East European Academies in Transition*, Kluwer Academic Publishers, Dordrecht 1998.

the funding restrictions for raising the productivity of its scientific work, and that scientists and researchers of the Academy of Sciences themselves readily opened themselves to international evaluation, accepting the value system giving preference to freedom and autonomy of research even at the cost of greater existential uncertainties.

In terms of allocation of funds from the government budget it may be noted that the assessment in the years 2000–2001 yielded sufficient amount of data on the scientific performance of the individual institutions of the Academy of Sciences since the previous round of evaluation, having thus provided the Academic Council with up-to-date guidelines for future differentiated distribution of institutional funding to the individual institutes. It was for the first that the actual evaluation results were taken into consideration when fixing budgetary funds for 2002.

The latest detailed assessment of the institutes of the Academy of Sciences is currently under way, running from the summer of 2010 to the middle of 2011. The aim of this evaluation is to describe and assess the current status, the international and domestic context of the scientific branches under scrutiny, complete with the possibilities and perspectives of their future development. Assessment will be carried out in a way to be able to implement, in advance, any eventual proposals for organizational changes in the institutes of the Academy of Sciences of the Czech Republic, and to fix the amount of their financial support from the institutional funding mechanism starting in 2012. Assessment is to be carried out by evaluating commissions for research activities of the institutes of the Academy of Sciences of the Czech Republic for the years 2005–2009. Foreign reviewers were also involved in the expert evaluation process (3–6 reviewers depending on the size of institute).

National science communication

The field of science communication in the Czech Republic is in the process of dynamic development. The present state is felt to be rather unsatisfactory and below average; new approaches and ways of communicating science are, therefore, being devised. Many traditional platforms for the popularization of science (namely newspaper sections and journals) ceased to exist because they could not survive in the new market economy. The transformed or new media are sometimes criticized by scientists for being too shallow and entertainment-biased rather than informative, whereas scientists are criticized by journalists for being unable to do any kind of systematic popularization on their part. Clearly, there is a middle link missing (which would include both professionals popularizing science or venues for their education, and funds for these types of activities).

Table

Means	Much less	Less	Same	More	Much more
Science TV programmes				x	
Radio				x	
Newspapers					x
Magazines				x	
Large-scale festivals				x	
Web-based communication					x
Museums, exhibitions					x
Citizen- or CSO initiatives					x

Looking back over the last ten years, it is possible to find some positive trends in influencing the public by all means of science communication. The intensity and complexity of science communication activities are growing and becoming more influential (see the following table)[13].

The most successful examples of good science communication include the Week of Science and Technology of the Academy of Sciences,[14] the Techmania Science Centre in Pilsen, and the Czech Radio's programme called Meteor, etc. The main criteria are ratings (of visitors, listeners, readers).

The motto of the 9th Week of Science and Technology (November 2–8, 2009) was "What Is Our World Like?" Biologists, philosophers, physicists, archaeologists, ethnologists, astronomers, geologists, historians, and linguists took part in as many as 75 lectures, 13 exhibitions, 6 science cafés, 5 presentations, 3 seminars, and 2 conferences in 7 cities (Prague, Brno, Ostrava, České Budějovice, Pilsen, Olomouc, and Hradec Králové).

Scientists from the Biological Centre in České Budějovice gave a total of 26 lectures in secondary schools. Brno organized the Week in 17 different venues, České Budějovice in 6, Ostrava and Olomouc in 1 each, and Prague in 55. The Library of the Academy of Sciences was open to the public, and so were 16 power plants of ČEZ, the Czech Republic's largest electricity producer.

Most of the lectures were available in online streams thanks to the Week's partner CESNET. The 9th Week of Science and Technology had 30,550 visitors.

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[13] Expert estimates originated during the elaboration of the National report MASIS, http://dev.contentcube.dk/masis/english/storage/publications/nationalreports/masisnationalreportczechrepublic/.

[14] See http://www.tydenvedy.cz/index.jsp?channel=hlavni-stranka (in Czech only).

The Techmania Science Centre in Pilsen drew approximately 70,000 visitors in 2009. The main category of visitors were groups of schoolchildren for whom the Centre serves as an educational tool. Techmania has permanent exhibitions presenting experiments in physics and a permanent display on the history and present of the car manufacturer Škoda.

Czech Radio 2 has the second best ratings among the Czech public radio stations. The Academy of Sciences is the station's main collaborator in preparing the programme Meteor – a popular scientific series for general audience. Each week, it presents information and news about the natural sciences as well as applications of science in today's society. The station's share of listeners declined to the average of 4,8 percent from October 1, 2009 to March 31, 2010, nonetheless, the share of the Meteor programme is very high, standing at 7.4 percent. It has an audience of 152,000 listeners (approximately 1.52 percent of the total population).

Science journalism

A Science Journalists' Club was established on the occasion of the presentation of the Descartes Awards in December 2004. The club is a member of the European Union Science Journalist Association. Membership is not obligatory and even non-members pursue science journalism in the Czech Republic. The members take part in various activities and foreign residencies. The present scientific community is open to collaboration, and there is enough of information available so it is not a problem to establish and maintain contacts. The Czech Club has not succeeded so far in organizing the so-called "Study Trip", which is obligatory for the members of EUSJA. However, it joined the European project "My Science" in 2010. Members take part in foreign residencies, ESOF festivals, study trips (CERN, ISPRA, etc.). Some of the members attended the EICOS in Gottingen, Germany, and in other participating centres.

"Project Medial Accentuation of Usefulness of Exact Science and Perspectives of Studies of Natural Sciences"[15] of the Faculty of Sciences in Olomouc issued a Manual for Universities and Research Centres that should serve as a practical handbook for communication with the general public, and provide ideas for popularizing these activities in a long-term perspective.

Recent activities relating to science education in schools, and other activities aimed at fostering science skills, stimulating interest and attracting young people to education and careers in natural science and technology are not systematically monitored. They are occasional and organized throughout the

[15] *MedVěd*, http://www.projektmedved.eu/

Czech Republic by schools and universities and by the research institutes of the Academy of Sciences (for example, the activities of the Biological Centre in České Budějovice or the summer school for students and teachers in Nové Hrady).

Unfortunately, well-conceived supplementary education for journalists and promoters of science is only exceptional (in 2010 there was only one such training event in Pilsen with approximately 100 attendees).

Young people and science education in schools

The Centre of Administration and Operations of the Academy of Sciences attempts to pave the way to better communication of science and research to the general public by organizing seminars, workshops, and exhibitions. Projects "Open Science" and "Don't Be Afraid of Science," both aimed primarily at secondary school teachers and students, are particularly successful.

"Open Science"[16] is a project aimed at attracting especially secondary schools students to pursue scientific careers, namely in natural and technical sciences. It organizes lectures for students at the Academy and summer workshops for schoolteachers. It also organizes two-year residencies for students in Academy of Sciences research centres – 150 students can, under professional supervision, directly engage in scientific research, meet top experts in different fields, and gain excellent knowledge about the present state of science and the perspectives of its development. Best students will publish their works in scientific journals, attend student conferences in the Czech Republic, or present their papers at international conferences (EUSCEA and ESOF). Scientific residencies will last two years (January 2010–January 2012). The main goal of the project is to establish long-lasting collaboration between secondary schools and scientific centres and thus motivate talented students to study technical and natural sciences.

The Centre of Administration and Operations of the Academy of Sciences also organizes a series of popular lectures about science and research called "Don't Be Afraid of Science." It is aimed, once again, primarily at secondary school students. The main fields include biology, chemistry, physics, and computer science. The lectures are not regular, albeit they are held monthly at least.

In the framework of the international project CASC (*Cities and science communication: innovative approaches to engaging the public*) a successful science event took place: Earth Day with the Academy of Sciences (April 19–22, 2010). It is financially supported by the European Commission in the 7th Framework

[16] Otevřená věda (Open Science), http://www.otevrena-veda.cz/

Programme and presented a series of lectures, presentations, meetings with scholars and an exhibition of photographs.

"Project Media Emphasis of Science Needs and Prospects of Scientific Subject Studies" of the Faculty of Sciences in Olomouc participates in the educational process at primary and secondary schools and encourages children and students to perceive science as a promising future career.

Concluding remarks

The contemporary value orientation of the process of financing science and research in advanced European countries and in other parts of the world has been laying accent on innovation effects and the social relevance of research. In actual fact, there comes to the forefront an effort for science and technology to stimulate more distinctly social needs or market demand, to rationalize research and development, and to attain higher social and economic benefits.

This is accompanied by interpenetration and overlapping of the prevailing scientific, economic and political concerns and considerations in science policy, which is duly reflected in a higher number and greater diversification of the actors concerned – so-called stakeholders (scientific experts, politicians, people from the business community, citizens), involved in the decision-making on research priorities. Greater requirements are placed on the interconnection and coordination of science and innovation policy with other institutional strategies: with educational policy, national economic policy, production strategy, marketing, PR, personnel strategies, etc. or – at the national level – coordination with the other national priorities (environmental protection, health, knowledge society). This enormously raises demands for negotiations, harmonization and accommodation of different interests, for reaching consensus; in this sense, the setting of research priorities grows to be a variegated and comprehensive political process.

The Czech Republic's ability to cope in worldwide and globalized competition depends, to a large extent, on the quality of functioning of these relationships within the triangle "research – education – innovation". Indeed, these three areas, three groups of activities, and each of them on its own, have to be well-structured and intertwined, the public as well as the private sector should be involved in each of them, while the interrelations of the three areas should be rid of any formalities and barriers restricting efficiency of the system as a whole.

Generally speaking, the national systems of science and research in the EU may differ (and this plurality in the democratic conditions may prove to be a distinct comparative advantage of the EU) but there should be a common vision

and concept of the European Research Area. This concept represents a crucial decision for Europe that is finding itself at the crossroads of its integrational developments.

All the European nation states need to raise their competitiveness, a task that requires an active approach on the part of their citizens in solving problems at the European, national and regional level. Citizens are required to become active actors contributing to European development, while respecting the existing cultural, nationality and language differences. A major role in this is played by social science and humanities research, which naturally invests its new findings into lifelong education of citizens and markedly affects the population's value-related attitudes.

In the public opinion in Czech society (but also elsewhere in Europe) one can observe mounting interest in issues of the spiritual, philosophical, cultural and ethical nature, associated with a higher evaluation of the significance of cultural and moral values and human dimensions in all walks of life. Furthermore, in our country these are linked with an urgent need of restoring the domestic cultural historical traditions, while guaranteeing the development of the unique (irreplaceable) Czech studies. These particular issues are primarily in the remit of the humanities and today's upsurge of interest in these branches – particularly among young and well-educated people – in Czech society is both remarkable and desirable.

There has been growing public interest in the study of social sciences and the humanities. The transformation of society constitutes a unique historical process calling for a more profound understanding as well more detailed expert comprehension and, therefore, poses a major challenge both to the humanities and to such social science disciplines as economics, psychology, sociology, political science, law, etc. After the Velvet Revolution of 1989 the numbers of newly enrolled students in the social, economic and humanities branches rose from 18 per cent to 30 per cent (year 1996) of all new entrants. A similar shift could be seen in the numbers of university teachers. During the second half of the 1990s, 30 per cent of all the successful applicants to universities were admitted into first-year courses in these branches.

Currently (in the 2000–2007 period) this marked interest persists. Every year, about 60–70 per cent of perspective students apply for admission (full-time studies and extramural studies) in either social sciences or the humanities; and about 60 per cent of the newly admitted students enrol in these disciplines. The overall numbers of students also reflect this trend, with about half of them studying the social science or humanities branches. As regards private tertiary education institutions, the figure is actually as high as 95 per cent of the students enrolled in them. Hence, the social scientific focus prevails in the Czech private tertiary education sector.

A very serious issue is the relationship between expert opinions and democratic decisions. An abyss opened up between the expert and democratic aspects during the previous communist regime in this country. At present, scientific expert opinions are known to have only a limited impact on political decision-making (even though it is precisely democracy that provides a suitable framework for utilizing expert opinions); in any case, this impact is smaller than is customary in the advanced countries of the European Union. The issue of compatibility of science and democracy is undoubtedly a worldwide issue. In response to the signs of tension building up between science and democracy, this particular tension seems to be creeping into the very foundations of European culture where scientific rationality and democracy constitute two inseparable mainstays.

The pace of scientific, technological and economic development and subsequently the social changes stimulated by that have posed a serious problem of incorporating that kind of development into society, of coping with its undesirable consequences and searching for a balance between quantitative economic growth and the quality of human life. Accent is being increasingly placed on the sustainability of development, which should succeed in satisfying the needs of the present, without undermining possibilities of future generations to meet their own needs. Together with this, there arises the problem of cooperation among the natural sciences, the humanities and social sciences in studying and solving all the major issues of the present-day world. The system of research priorities in natural sciences cannot be isolated from the global priorities, i.e. human, humanitarian, value-related, ethical ones, which have the nature of cognitive decisions and decision-making processes. A process taking into consideration the social dimension and construction of natural science knowledge and helping in eliminating the former sharp contrasts of the "two cultures" has got under way in natural sciences as well.

Dialogue between science and society still figures prominently as a key task. Present-day Europe is well aware of the paramount significance of this issue; there is frequent talk of the need of forging a new alliance between society and science. In the Czech Republic, vital dialogue on that isses has, so far, been replaced by popularization of science, a well-meant effort for the general public to understand science and its procedures. But a genuine dialogue calls for a two-way model. In it, an aspiration of the scientific community to win public understanding for science must be supplemented with an effort on the part of scientists to understand attitudes of the general public as well.

The Czech society does not perceive "science" in all its relevant factors but rather considers individually the various unique aspects connected to it. In public opinion polls, a "scientist" belongs traditionally among the most prestigious occupations (ranking second behind medical doctors, while university teachers

rank third). According to a poll carried out in August 2009, the Czech Academy of Sciences figures among the most credible institutions in the country, and 60 percent of the respondents were convinced about its usefulness. Universities with long traditions enjoy similar esteem (especially Charles University in Prague and Masaryk University in Brno). Until recently, the questions of science policy and science funding were not subjects of serious public debates. We could say that until the spring of 2009 these were "not important at all" for most of the media. A change of heart was brought about by turbulent reactions of the academic community towards the proposed changes and reforms, the subsequent negotiations with the government and the newly established civic associations, such as 'Science Is Alive!' Under these circumstances, the questions of science policy and science funding became serious issues, which are being regularly discussed at roundtables initiated by the Prime Minister, Parliament, as well as in the print media, radio, television, and the electronic media. They also came to be topics for electoral campaigns. In the middle of 2010 we could say that these issues made up an "important" agenda, however, this is being pushed aside by the social and economic problems caused by the economic depression.

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Part II

Reflections on Innovation in Societal Dynamics

This section of the book focuses on the "inner logic" of the development of innovations, on the questions of the kinds of actors and processes which take place in it and also on the "outer" effects of innovation activities, on their impacts on other sectors of society. The essential theoretical concern here touches upon the theme of developing possibilities and persisting limits of the workings of innovations within society.

The crucial problem is the relationship of dynamics and stability. The central thought of the concept of innovation can be expressed in the following way: if modern societies shall maintain stability over long periods of time, they must be dynamic, capable of continually performing changes, and live in a regime of permanent transformation of sorts. Once humankind stepped out of living in isolated and stationery communities and individual cultures began to interact more often, new civilization dynamics was instigated as well as new risks, rivalry, dangers of instability and decline. Since then the only sustainable form of stability seems to be its dynamic form. (The bicycle metaphor may apply here: a cyclist doesn't fall of the bike only when riding it but he will topple if the bike stops.) The founder of innovation theory Joseph Schumpeter has formulated an economic dictum claiming that in economic competition only the entrepreneur who constantly innovates can survive.

The euphoria, which surrounds innovations and appeals for the highest dynamics possible, often loses sight of the other pole – stability. (Even the cyclist who rides too fast can fall down.) Without stable social structures, even innovations cannot flourish that is why many entrepreneurs call for stable environment.

The theoretical analysis of innovation by *Alexander Degelsegger* and *Alexander Kesselring* addresses the relationship of dynamics and stability within the context of innovation.

By relating the theoretical perspectives of Bruno Latour's Actor-Network-Theory and Alfred Schütz's Lifeworld theory, Degelsegger and Kesselring want to contribute to a theory of innovation that comprises technological as well as

social innovation. Instead of elaborating a separate theory on "social innovation" they point to the basic elements that all innovation processes share. In this perspective actor-networks become visible as the prerequisite, process medium, target and outcome of innovation. Actor-networks stabilize and transform current products, services, practices and structures – the relation between stabilization and transformation thus becomes the main focus of innovation theory.

While following Latour's inspiring idea of conceptualizing the social as a form of connection between non-human and human actors, Degelsegger and Kesselring also discuss the inconsistencies related to his concept of human actors and human accounts. The authors arrive at the conclusion that what seems to be missing in Actor-Network-Theory is a sociological language that would enable to appropriately analyze human accounts and the underlying cognitive and physical structures and to relate them more directly to the external non-human actors that Latour identifies.

Jan Maršálek contributes to the discussion on the macro-level effects of innovations in a provocative, dissenting way. He questions the essential paradigmatic thesis of innovation theory that innovation is the key driver of social dynamics. He does so with the help of Lévi-Strauss's concept of "cold" and "hot" societies. Unlike modern "hot" societies *primitive* "cold" societies produce extremely little disorder and tend to preserve themselves in their initial state. They cannot avoid changes and new things but are able to "annul the possible effects of historical factors on their equilibrium and continuity". That's why in "cold" societies innovations don't immediately turn into social change.

This particular skill of primitive societies to preserve their inner structure despite the ongoing changes consists mainly in their mythological thought – an instrument for the destruction of time. Through this way of thinking, these societies are able to neutralize the social effects of innovations. Between innovations and social change, there is room for our mind and practice – whether and how are innovation accepted at all. By way of conclusion, Maršálek suggests to focus sociological research on changes that are denied by society.

A (latent rather than openly outspoken) critical stance against a possible correlation between the ailments of modern societies and the effects of innovations emanates from Maršálek's text. Such an approach is legitimate and inspiring and it is not a coincidence that it is raised from the outside perspective of a sociologist and anthropologist. The concept of innovation should not become an idle cult, that is why the innovation community should regain the ability of self-reflection and self-criticism.

The acceptance of new technology belongs among the significant questions of the workings of technological innovations. Any new technology needs to be culturally appropriated to catch on and become established. This is the key problem tackled by *Petr Machleidt.*

Machleidt analyzes the cultural dimension of technology. He treats technology as a cultural phenomenon and points to the mutually conditioned relationship between technology and culture. His example is the development of technology in the Czech Lands at the turn of the 19th and 20th centuries, when cultural development, together with the rise of national awareness, was distinctly interconnected with the development of science and technology.

In the modern Czech history one can find a very specific current of technocratic thought, which almost gained the character of a cultural movement based on a sort of "humanistic technocratism". The distinctive understanding of the philosophy of technology in the Czech cultural milieu was also distinguished by the use of artistic means (namely fiction and drama) and is exemplified especially by the figure of Karel Čapek and his drama *R.U.R.*

Innovation from the Outside in: How Relating the Concepts of "Actor-Network" and "Lifeworld" Can Help us to Better Describe Innovation Processes

Alexander Degelsegger, Alexander Kesselring

Introduction

Currently, we witness attempts to broaden the discourse on innovation, in particular through the introduction of the concept of "social innovation". Social innovation – as a working definition – is seen as an activity designed to meet social needs and/or tackle social problems in new and better ways than former solutions.[1] Individuals, groups, organisations and networks of different kinds identify their activities with social innovation, while the concept is at the same time being promoted by the European Commission, the UK and US governments and other "macro" agents.[2] Social innovation is considered a solution for

[1] Howaldt, J.,, Jacobsen, H., *Soziale Innovation. Auf dem Weg zu einem postindustriellen Innovationsparadigma*, VS (Verlag für Sozialwissenschaften), Wiesbaden 2010; Kesselring, A., Leitner, M., *Soziale Innovation in Unternehmen. Endbericht* (2008), Zentrum für Soziale Innovation, available at http://www.zsi.at/attach/1Soziale_Innovation_in_Unternehmen_ENDBERICHT.pdf, last accessed on May 30, 2011; Harrison, D., Szell, G., Bourque, R. (eds.), *Social Innovation, the Social Economy and World Economic Development. Democracy and Labour Rights in an Era of Globalisation*, Peter Lang Verlag, Frankfurt am Main 2010; Howaldt, J., Kopp, R., Schwarz, M., 'Innovationen (forschend) gestalten. Zur neuen Rolle der Sozialwissenschaften', *WSI Mitteilungen*, 2, 2008; Zapf, W., *Modernisierung, Wohlfahrtsentwicklung und Transformation*, WZB (Wissenschaftszentrum Berlin für Sozialforschung), Berlin 1994.

[2] European Union: In 2009 the bureau of European policy advisers (BEPA) organised a workshop on social innovation with an expert meeting together with EU president Barroso. See: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/81&format=HTML&aged=0&language=DE&guiLanguage=en). Great Britain: The National Endowment for Science, Technology and the Arts (NESTA) funds and implements different programmes for the support of national innovation capacity, among these are also programmes on social innovation. See http://www.nesta.org.uk and http://www.youngfoundation.org.uk/. United States: Under President Obama the White House established an "Office of Social Innovation and Civic Participation", see: http://www.whitehouse.gov/administration/eop/.

addressing needs in our knowledge societies that are unmet by the markets and states. Its relevance is diagnosed to be rising and expected to keep doing so.[3]

Empirically, social innovation might be relatively easy to grasp in its concrete instances such as micro-finance, ethical banks, social businesses or regional currencies, but it is much more difficult to understand within the context of innovation theory. While social entrepreneurs and activists of all kinds know what they are working on and what they are promoting, social science seems to lag behind in its understanding of these processes. At the same time, the individuals and groups involved in social innovations do not necessarily refer to this concept, feeling no need of theoretically categorising what they are doing.

By linking to current concepts of innovation, this article contributes to a general theory of innovation processes, revealing parts of the distinction between social and technological innovation as problematic. By deciphering the process of innovation, we shed light on the fundamental symmetry between innovations that involve technical artefacts and those that do not. We thus not only criticise the innovation literature's "asymmetry" of treating technological innovation as paramount,[4] but the asymmetry that is involved in supposing that processes of technological and social innovation are fundamentally different. They cannot be distinguished in that one would be "more social" in its functioning than the other. The only line that can be drawn between them is that in "social innovation", as we understand it, the intention presumed to be behind the innovation (a distinctive feature to differentiate innovation from social and technological change) is directed towards the society and is inspired by explicit normative goals, not by the solving of a technical problem and/or commercial interest.

Social innovation and the social sciences

If social innovation is basically the promise of providing new ways to actively shape society[5] then this notion would be as old as sociology itself – a claim that has been criticised, dismissed and reinforced again throughout the history of this discipline. When thinking of classic reinforcements we might remember Donald Campbell's "experimenting society"[6] or Amitai Etzioni's "active soci-

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[3] Howaldt, J., Schwarz, M., *"Soziale Innovation" im Fokus*, Transcript Verlag, Bielefeld 2010.

[4] Ibid., p. 95.

[5] Zapf, W., *Modernisierung*, op. cit.; Mulgan, G. et al., *Transformers. How Local Areas Innovate to Address Changing Social Needs*, NESTA (National Endowment for Science, Technology and the Arts), London 2008.

[6] Dunn, W. N. (ed.), *The Experimenting Society: Essays in Honor of Donald T. Campbell*, Transaction Publishers, New Jersey 1998.

ety"[7] both models being characterised by a pragmatic, pluralistic and social science focused approach. They had the vision of a society with an enhanced capability of self-transformation through specific structural arrangements that would promote an active, responsive and experimental approach to social problems and the transformation of social arrangements in general. While some elements in these approaches may remind us of older forms of "social engineering" and a positivist orientation, they aim to be reflexive by orienting themselves at meta-values such as "activity", "participation", "responsiveness" or "experimentalism" instead of promoting an optimised model of society. Theorists such as Etzioni and Campbell seem to have anticipated elements of the current social innovation discourse. They however also tried to combine these elements, to relate them and to provide theoretical and methodological frameworks, whereas the social innovation discourse is pluralistic without a meta-theory and is more a discourse of empowerment than one of analysis.

For more pronounced normative theoretical positions such as Marxism, Habermas' theory of communicative action, the classic critical theory or feminist theory the current social innovation discourse might trigger immediate rejection – there is not much of "critical theory" or "critique of power" to find here.

We think however that the openness of the social innovation discourse offers the opportunity to create a new perception of the actors of innovation and to see the quantity and variety of their activities and of the contingencies and transformations involved in any innovation process. From the actors' perspective, compared to the grand narratives, the "large solution" is replaced by the manifold "small solutions", which have the positive aspect that they are much closer to the lifeworld of individuals creating many intermediary steps between micro-, meso-, and macro-level social change.

The question is how sociology should respond to the current discourse on social innovation. We will propose a first outline of an approach that tries to understand the meaning of social innovation within the larger complex of "innovation theory", which was until recently strongly dominated by the focus on technological innovation.

Traditional innovation theory is most often situated at a meso-level, with a frequent normative orientation in terms of promoting "optimal" organisational and managerial strategies. Authors try to figure out how societal subsystems (like the university system, science policy, the private sector research and development) would have to be constructed and linked if one wanted "innovation" (in the Schumpeterian sense of the development of new products and services, the opening of new markets, etc.) to happen. This is the case of both the triple

[7] Etzioni, A., *Die aktive Gesellschaft* (1968), VS (Verlag für Sozialwissenschaften), Wiesbaden 2009.

helix approach[8] and the older (national, regional, sectoral) systems of innovation theory.[9]

The sectoral systems of innovation approach, for instance, focuses on systems of firms interacting and cooperating in "artefact-technology" development.[10] While this perspective is certainly valid, it does neither look beyond business-related organisational agents (firms) and their ideal interactions, nor beyond technologically new artefacts. It also does not engage in discussing where "innovations" come from and what happens before the novel impulses attract the attention of firms.

Still sticking to technological innovation and the conviction that it is a form of innovation in its own right, Geels[11] tries to open up systems of innovation theory to what he calls the "user side", i.e. those human actors following and modifying rule systems who adopt (or reject) and adapt to novel technologies, without black-boxing the development of technologies. "Socio-technical systems", encompassing the production, diffusion and use of technology, fulfil social functions defined by social groups and their rule systems. Strangely, "[a]s technology is a crucial element in modern societies to fulfil those functions",[12] Geels only looks at the technological side of innovation.

He justifies this view with the argument that we live in a "technotope" rather than in a "biotope" with technologies shaping our perceptions and behaviour. In line with Actor-Network-Theory and distancing himself from the Social Construction of Technology approaches, he argues that there is a limit to the interpretive flexibility of artefacts. "Technical possibilities and scientific laws constrain the degree to which interpretations can be made."[13]

What Geels does not take into account is that none of these points contradicts the perspective proposed by us to look at the process of innovation as a social endeavour establishing a different way of doing things, involving or not involving artefacts. We can agree that technical artefacts and technological possibilities shape our way and scope of social activity. We can also agree that

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[8] Etzkowitz, H., *The Triple Helix. University-Industry-Government Innovation in Action*, Routledge, New York 2008.

[9] Freeman, C., 'The National System of Innovation in Historical Perspective', *Cambridge Journal of Economics*, 19, 1995, pp. 5–24; Lundvall, B.-Å. (ed.), *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*, Pinter, London 1992; Nelson, R. (ed.), *National Innovation Systems. A Comparative Analysis*, Oxford University Press, Oxford 1993.

[10] Breschi, S., Malerba, F., 'Sectoral Innovation Systems: Technological Regimes, Schumpeterian Dynamics, and Spatial Boundaries', in: Ch. Edquist (ed.), *Systems of Innovation: Technologies, Institutions and Organizations*, Pinter, London – Washington 1997.

[11] Geels, F. W., 'From sectoral systems of innovation to socio-technical systems. Insights about dynamics and change from sociology and institutional theory', *Research Policy*, 33, 2004.

[12] Ibid., p. 900.

[13] Ibid., p. 904.

artefacts have "scripts"[14] and are not entirely open and flexible towards interpretation. However, this does not mean that we can restrict our analytical gaze to innovation processes involving artefacts or that we can treat them differently from other "types" of innovation.

In addition to contributing to improve the comprehension of innovation in its diverse forms, embedding social innovation in this larger complex of literature could open up the opportunity to develop a common innovation research methodology.

Observing innovation within a more comprehensive framework will also emphasise a critical perspective on how innovation is perceived, promoted, supported and institutionalised in our society. It may furthermore shed light on the multiple hybrid forms of innovation, respectively the multiple relations between different types of innovation processes, innovation outcomes, spill-overs and (unintended) side-effects.

We would no longer have to discuss if for instance "facebook" is a technical innovation or a social innovation – Instead we could describe the specifics of the innovation process, the outcomes, the spill-overs and the side-effects as well as the *structural societal development* and the *social change* that went along with all this.

We are not in the position to elaborate an integrated theory of innovation – but we will try in this article to bring forward some ideas and assumptions which could stimulate the discussion on a more comprehensive understanding of innovation.

From linearity to complexity or: Changing the innovation imagery

When we think of innovation we usually refer to "successful" innovation. In the case of market-oriented technological innovation, successful innovation processes – at least from an outside perspective – may appear as a succession of stages, one building upon the other: From problem definition to innovative solution, to design and conceptualisation, to proto-typing or piloting, to industrial production, to marketing and promotion, to market entry or institutionalisation. This is certainly a strong image which also seems to characterise the mind-set of promoters of innovation (from private companies to the European Union). The stage process is framed by a linear, rational way of thinking. There is problem A and solution B and there are defined means and a defined trajectory. This

[14] Latour, B., 'Technology is Society Made Durable', in: J. Law (ed.), *A Sociology of Monsters: Essays on Power, Technology and Domination*, Routledge, London 1991; Akrich, M., 'The De-Scription of Technical Objects', in: W. Bijker, J. Law (eds.), *Shaping Technology / Building Society: Studies in Sociotechnical Change*, MIT Press, Cambridge (Mass.) 1992.

approach also assumes that innovation is something that can be "made" and managed, thus also supported.

Empirical studies[15] picture however much more complex processes – we see parallel activities, feedback loops between different stages of innovation, discontinuities and complete failure of innovation initiatives, unanticipated side-effects of "rational" management and complex network dynamics. Rationalistically framed endeavours like the establishment of large industrial infrastructures, firm strategies, etc. develop more and more complexity in often unintended ways. Doors of opportunities open and close again, networks build up and fragment, people are hired and fired, technological trajectories develop in unanticipated ways, etc. Innovation processes are thus to be described as non-linear and "chaotic".[16] In tracing them, analysts would have to look for myriads of "events" marking and making a difference in the process.

In our attempt to present some elements of a comprehensive innovation theory that uses the same sociological language for "technological" and "social" innovation we will follow these traces of complexity.

Bruno Latour and "Actor-Network-Theory" (ANT) will offer the basis and set the perspective for this endeavour. Latour states that "any thing that does modify a state of affairs by making a difference is an actor".[17] This radically changes our view on who acts in innovation processes. It also means that actors may be very different regarding their characteristics, but that they all can be observed and traced under the same general perspective. Ironically, as we shall see, despite the fact that his mission is to re-introduce the material realm into sociological theorising, the symmetry that Latour proposes directly supports our attempt to break with the exclusive focus on technological innovation.

What appears problematic to us is Latour's shifting between complete rejection and partial acknowledgement in his critique of interpretative *and* structural sociology. It is not always clear whether Latour is rejecting these perspectives as such or simply the misuse and/or overemphasis of their main concepts "individual" and "context". We partly follow his critique on misuse and overemphasis, but we will argue against a complete exclusion of these perspectives from the scope of sociology. In this case Latour would simply avoid the difficult confrontation between the "outside" and the "inside" perspective respectively an object-related approach to society and a subject-related approach to society.

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[15] Van de Ven, A., Polley, D. E., Garud, R., Venkataraman, S., *The Innovation Journey*, Oxford University Press, Oxford 2008; Braun-Thürmann, H., *Innovation*, Transcript Verlag, Bielefeld 2005.

[16] Braun-Thürmann, H., *Innovation*, op. cit., p. 81

[17] Latour, B., 'Krieg und Frieden. Starke Mikroben – schwache Hygieniker', in: P. Sarasin et al. (eds.), *Bakteriologie und Moderne. Studien zur Biopolitik des Unsichtbaren 1870–1920*, Suhrkamp, Frankfurt am Main 2007, p. 71.

Latour actually seems to do so: "Human accounts" are at the centre of his approach[18], but at the same time he seems to reject perspectives that try to develop sociological languages to understand human accounts.

Instead of avoiding this confrontation, we would like to move "from the outside in" as the title of this article suggests – From Latour's description of actor-networks to Schütz' description of the Lifeworld. It is however not our intention to lead Latour back into the realms of the "sociology of the social", but to follow the path he laid out into new territory.

Actor-networks

We have already indicated that one of the most characteristic premises in the approach of Bruno Latour and other ANT theorists is the symmetry between humans and non-human artefacts in terms of treating them as actors. Everything that makes a difference to a network of actors (in the account of actors) is to be considered an actor. For ANT, the relevant difference is thus not between human or non-human, but between actors associated (or not) in different ways to other actors. Each actor in an actor-network, independently whether human or not, can be either an *intermediary* or a *mediator*. Intermediaries produce a constant output, that is, the output is defined by the input. Mediators, by comparison, modify the input in an unpredictable way. They transform, translate and distort elements circulating in the network.[19] Intermediaries can turn into mediators any time and vice versa. It is these moments or events when an intermediary associated to an actor-network suddenly becomes a mediator that are relevant in tracing innovations. Mediators are the cause of uncertainty and discontinuity within an innovation process. They lead to the branching of the innovation trajectory and make even retrospective allegations of causality problematic.

Inspired by Actor-Network-Theory[20] innovation has then to be looked at as a process constantly transforming intermediaries into mediators and viceversa, integrating new actors into actor-networks, excluding others and/or establishing new associations between different actors, transforming an existing network into a different one. Following his definition of the actor, innovation is about new "things" (material and immaterial) making a difference, new actors in a network of actors, modified networks of actors, new associations between actors.

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[18] Large parts of his argumentation in *Reassembling the Social* concerns how sociology should deal or should not deal with human accounts (Latour, ibid.).

[19] Latour, B., 'Krieg und Frieden. Starke Mikroben – schwache Hygieniker', op. cit., p. 39.

[20] Law, J., Hassard, J. (eds.), *Actor Network Theory and After*, Blackwell, Oxford 1999.

When referring to ANT in describing innovation as a *network* process, the metaphor is not as obvious as it seems, however. It has to be taken into account that ANT is, above all, a theory of agency with its own very peculiar ontological underpinnings. A network in Latour's or Callon's sense is not a network in the everyday sense of the word. It links not only people or organisations or computers. It is a fluid assemblage of human and non-human actors (or "actants" as Latour calls actors that have no figuration yet in the actor-network) responsible for ascribing agency to the elements it comprises and for translating, not only transmitting new impulses.

Transformations in an actor-network might involve the appearance of new relevant actors in an existing actor-network: Imagine a group of friends and their interactions before and after the "facebook" phenomenon. The group of friends might have physically met more often in the pre-facebook era, but may have had less exchange on everyday details of their lives. They might talk about different things on the phone or face-to-face now they can exchange certain kinds of information virtually. The innovation has introduced a novel mediator for the personal relationships among the group and their individual members. Actor-Network-Theory is claiming the symmetric treatment of this new kind of non-human actors with the relevant human actors involved in the network.

An innovation might also be conceived of as creating a "new" network in the sense that it links actors that have not been linked before by introducing a relevant new actor to a previously existing network that can now "reach out": The availability of a local currency might make me frequent other shops and markets. Thus, I enter into relationships and networks with people I have never met before. Columbus' arrival in America, based on a network involving humans, ships, geographic knowledge, nautic measurement tools, etc. can be interpreted as establishing a "new" network.

While a change in networks might also simply mean its extension to a wider group of similar actors, this would not be considered innovative. That is, the growth of the facebook community should not be considered an innovation, while its reaching a certain amount of people initially indicated its status as an innovation.

One of the goals of this article is to contribute to the dismantling of the dominance of the study of technological innovations and establish a more symmetrical account of social and technological innovation as social processes. Curiously, as a result of discussions of earlier versions of this work, we have found unexpected support for this endeavour precisely from Actor-Network-Theory, a theoretical approach that has particularly inspired Science and Technology Studies with this peculiar demand of including non-human matter on an equal footing with human actors into analyses of technological developments.

This becomes clear when we look at Latour's[21] example of the **actor-quality** of the metal weight on a room key in a hotel. While all the adverting signs and verbal requests of the hotel manager to his/her guests could not achieve that they leave their room keys at the front desk when leaving the hotel, the attaching of a metal weight to the keys did. The statement[22] "Please leave your room keys at the front desk" was 'loaded' by verbal accounts and other signs, but it was the material condition of the key that countered the 'anti-programs' of the guests. In this process, the statement and order itself as well as all the actors involved have changed, they have been translated. For instance, the guest is no longer just a guest leaving with his or her key, it is a person that wants to get rid of this metal weight in the pocket. The key changed as well, so did the hotel manager.

De Laet and Mol[23] gave a fascinating account how a water pump performs its actor-role when introduced in Zimbabwean villages.

Precisely this symmetry also suggests dealing with social and technological innovations in the same analytical way. If artefacts are not simple tools and passive matter introduced into and transformed in social relations, but are relevant to the network as actors, then the introduction of a new artefact into an actor-network is nothing substantially different (or separate) from the adoption of new ways of doing things, i.e. the establishment of different links between human and non-human elements in the actor-network. It does not change the actor-network in a qualitatively different way.

Latour's approach also points to the impossibility of innovation being a straight process from an ingenious idea to diffusion and implementation in a market or other organised forms of social interaction. Innovations link statements and speakers/actors in a chain. Their programmes and anti-programmes transform both speakers and statements along the way. "Innovations show us that we never work in a world filled with actors to which fixed contours may be granted. It is not merely that their degree of attachment to a statement varies; their competence, and even their definition, can be transformed".[24] Actors are continuously transformed and "the fate of a statement is in the hands of others".[25] Expressed differently, more in line with innovation theory's vocabulary: "the movement of adoption is a movement of adaptation".[26]

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[21] Latour, B., "Technology is Society Made Durable", in: J. Law (ed.), *A Sociology of Monsters: Essays on Power, Technology and Domination*, Routledge, London 1991, pp. 103–131.

[22] A 'statement' is "anything that is thrown, sent, or delegated by an enunciator" (Latour, B., 'Technology is Society Made Durable', op. cit., p. 106), both material or non-material.

[23] Laet, M. de, Mol, A., 'The Zimbabwe Bush Pump: Mechanics of a Fluid Technology', *Social Studies of Science*, 30 (2), 2000, pp. 225–263.

[24] Latour, B., 'Technology is Society Made Durable', op. cit., p. 109.

[25] Ibid., p. 106.

[26] Akrich, M., Callon, M., Latour, B., 'The Key to Success in Innovation'. Part I: 'The Art of Choosing Good Spokespersons', *International Journal of Innovation Management* 6 (2), 2002, p. 209.

This critique on linear models of innovation includes two arguments that Latour most prominently elaborated in his seminal critique of the reception of Louis Pasteur:[27] It is not individual humans that invent or drive the fate of their inventions. It is only in retrospect that individuals are identified as the source of particular inventions. Any intent to follow innovations to their roots will have to take that into account.

Secondly and relatedly, the content of an idea or innovation defines its fate just as little as a supposed inventor does. "We still have the diffusionist's [...] bad habit of considering that one particular segment of a program of action is the essence of an innovation, and that the others are merely context [...]. But the only essence of a project or of a knowledge's claims is its total existence."[28] That means that it is not because an idea is in itself worthwhile, responding to users' needs, consumers' wishes or a society's problems that it is kept and implemented. Rather, it is the total construct of statements and actors associated at a given moment that define what is kept and what is dismissed. Even a brilliant idea does not "move alone".[29] It needs a force that comes looking for it, out of own motivations, and that probably transforms it.

"The unity of an innovation is not given by something [some kind of 'content' or 'essence'] which would remain constant over time, but by the moving translation of what we call, with Serres, a quasi-object".[30] Latour, ironically: "The three Graces of Truth, Efficiency, and Profitability, so handy for providing causes in science, technology, and economics, are obviously unusable [for explaining the shape of a particular innovation trajectory], as they are the result and not the cause of these displays".[31] If a market-oriented innovation proves profitable, this profitability was not innate to any original idea, but surged as a result of the associations of all actors involved. And with regard to the attribute 'truth': In his study on Pasteur, Latour[32] opines that it is meaningless to say that people believed Pasteur because of his convincing discoveries. The findings have become convincing because the Hygienists believed in them and they believed in them because of their position in existing actor-networks and their stake in disputing their programme of action with others' anti-programmes.

His quest for treating human and non-human actors symmetrically, let Latour remain quite silent about a possibly relevant difference between the intentional programmes of action and resistance of human actors and the programmes and anti-programmes of non-human actors (an example for the latter being that, for instance, the metal weight attached to the key with a ring cannot be simply sepa-

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[27] Latour, B., 'Krieg und Frieden. Starke Mikroben – schwache Hygieniker', op. cit., p. 71.
[28] Latour, B., 'Technology is Society Made Durable', op. cit., p. 115.
[29] Latour, B., 'Krieg und Frieden. Starke Mikroben – schwache Hygieniker', op. cit., p. 114.
[30] Ibid., p. 117.
[31] Ibid., p. 120
[32] Ibid., p. 170.

rated from the key). "They [the (in this case) mediating actors] actively sorted the proposed innovations, but they also were altered [...]. What we observe is a group of variable geometry entering into a relationship with an object of variable geometry. Both get transformed. We observe a process of translation – not one of reception, rejection, resistance, or acceptance".[33]

Actually, Latour actively criticises the context-content duality. He has no need for any of these concepts in his theoretical edifice. With regard to scientific knowledge, Latour negated that it "fits" its context. Both the content of a type of knowledge and its supposed context associate each other and negotiate and re-negotiate their alliance, a process that makes the distinction of context and content useless.[34] In view of the example with the hotel room key mentioned above, he claims that "we are not to follow a given statement through a context. We are to follow the simultaneous production of a 'text' and a 'context'. In other words, any division we make between society on the one hand and scientific or technical content [or the content of an innovation] on the other is necessarily arbitrary. The only non-arbitrary division is the succession of distinctions between 'naked' and 'loaded' statements".[35] With a "loaded" statement, Latour refers to an actor's enunciation or impulse that is inspired by a programme of action. A statement is "naked", by contrast, if it is coming from an actor who does not follow a programme of action. In the example with the hotel key, the verbal (or then the objectified) invitation from the hotel owner to the guests to bring the key back is a loaded statement. If a guest incidentally loses a key, then this is an unloaded statement. In Latour's view, it is the succession of such loaded and unloaded statements that counts: the hotel manager wants the keys back, which is why he attaches a weight, which is why keys also get lost less frequently, which is why the manager does not have to make a guest pay if he or she incidentally ("unloadedly") loses a key.

Ontologically speaking, this is a curious return to distinct qualities of human actors, probably in defense of Latour's early critics forcing him to take a position on the question of intentionality. In our context, the return is curious because Latour avoids the question where the programmes of action of human actors come from (and what role individual frames and relevance structures play, here) and what role they could play in stability, innovation and change. This might be consistent with his self-limitation of staying on the surface of a flat, non-hierarchical social world, but it seems problematic to just assume that programmes of action do not follow themselves underlying structures which are part of the actor-network.

In methodological terms, the consequence of this approach reads, again in Latour's words: "The analyst should never pre-determine the weight of what

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[33] Ibid., p. 116.

[34] Latour, B., 'Krieg und Frieden. Starke Mikroben – schwache Hygieniker', op. cit., p. 163.

[35] Latour, B., 'Technology is Society Made Durable', op. cit., p. 106.

counts and what does not, of what is rhetoric and what is essential [...]. The weight of these factors must be calculated as a function of the movement of [associations] and they will be different in each story."[36]

It is the symmetry between the human and non-human, the insistence on networks of flat hierarchy, and the openness regarding the decision of what is relevant in an innovation process that makes Latour's perspective a central part of our own. His symmetrical understanding of human and non-human actors can contribute to our argument of a "symmetry" between technological, social and other forms of innovation. We hold that the difference between either more or less institutionalised forms of innovation is bigger than the one between institutionalised/rationalised forms of technological (involving artefacts) and service or social innovation (not involving artefacts).

From actor-networks to lifeworlds

There are then two tracks that lead us from Actor-Network-Theory to the theory of the lifeworld when trying to adequately describe innovation processes:

1. The problem of social stability: Latour appears not to be able to fully account for social stability in terms of the regulation and standardisation of many aspects of "social life". We experience this stability in our daily lives, characterised by routines and regularities, and in our observation of "social institutions". Latour himself acknowledges this high degree of social stability that societies are able to produce, but he insists that "whenever we discover a stable social relation, it is the introduction of some non-humans that accounts for this relative durability".[37] He does not reflect upon the idea that human actors' programmes of ideas, which "load" their statements, could impose some degree of stability on an actor-network. We think that the relatively stable individually embodied cognitive structures of the lifeworld that are produced and re-produced in our daily lives from birth to death must also be part of the explanation of social stability. Maybe Latour should do justice to its own claim for symmetry, here: material and immaterial structures account for stability in social relations. Latour almost reaches this point when he writes that we "are never faced with objects or social relations, we are faced with chains which are associations of humans [...] and non-humans".[38] However, as he does not see the contribution to stability of cognitive structures created and enacted in individuals' lifeworlds, we propose to turn to the theory of the lifeworld to close this gap.

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[36] Ibid., p. 116.
[37] Latour, B., 'Technology is Society Made Durable', op. cit. p. 111.
[38] Ibid., p. 11.

2. The problem of constitution of actors and attribution of agency: The second track starts from the impression that Latour is not confronting the problem of how agency is constituted respectively attributed – human accounts matter a lot to Latour,[39] but he seems to have no sociological language to describe these attribution processes. The simple differentiation between human and non-human actors does not grasp the complexity of actor constitution – To use a technical metaphor: Latour seems to have a high resolution image of man-made non-human actors, but a much lower resolution image of human actors and their "internal differentiation".

We believe that following both tracks will broaden our understanding of innovation processes and in particular innovation processes related to changes in social practices and structures (what is commonly referred to as "social innovation"). Innovation is about "change", but this change always relates to existing practices and structures – or, speaking with Latour, existing actor-networks.

Without understanding the former stabilisation of these actor-networks it is hardly possible to describe the innovation process – how innovations build on existing practices and structures, how existing practices and structures become barriers for innovation, how innovations adapt to these barriers, transform or replace practices and structures, cause intended as well as unintended impacts etc.

Schumpeter's "creative destruction" is in this sense a simplified image of innovation – it suggests that innovation would simply "destruct" former practices and structures. The image does not acknowledge the significance of these practices and structures for the innovation process and the outcome of the innovation and it does not acknowledge the fact that old and new practices and structures will often exist synchronously so that the interaction between them will remain a factor for further developments.

Also the de-contextualised image of innovations that are simply being introduced into the market partly disguises their temporal development, their intended and unintended impacts and their existence "within" or "as" actor-networks. Innovations are perceived as "singularities" and "new additions" to the existing mass of products and services, but not as being "networked" respectively as being part of a larger system of practices and structures.

Actor constitution and attribution are important aspects of the process of innovation and again, particularly when observing forms of innovations that are directed at social practices and structures. Attribution of agency is not only relevant for identifying the actors that "drive" an innovation, but also the actors that stabilise former practices and structures – How do they "behave" when a

[39] For instance when he invites us to follow the track of programmes of action.

new practice is introduced? How do they connect? How do they adapt? How do they restrict? Before discussing these two aspects in more detail, we would like to introduce Alfred Schütz' theory of the lifeworld.

Structures of the lifeworld

The "Lifeworld" concept as developed by Alfred Schütz[40] is simple and abstract at the same time and actually carries two somewhat different meanings. In its "simple" meaning, the term describes **reality as experienced by human beings** – the everyday world that surrounds us, that "speaks" to our senses and is resistant as well as malleable. We have to think of the presence of a human being who is consciously experiencing the world around her/him in a specific situation. This includes the experience of oneself as consciousness and body, of one's impulses and actions, the presence of others as similar beings (based on the idealising presupposition of similarity) and of the material world. In this first meaning we therefore have to think of the lifeworld in a very concrete sense, the world of everyday life.[41]

When we turn attention to the "deeper" meaning of the lifeworld we have to make the assumption that human experience is never just plain experience but constantly structured by former experience, and further, that former experience is **generalised** and **structured into typifications**[42] – a cognitive ability which seems quite unique to humans.

Processes of generalisation and typification are based on the regular occurrence of situations – in particular social situations which are characterised by reciprocal attention and interaction that become more and more complex with the development of cognitive capabilities and in particular language skills that enable and foster processes of communication and mutual understanding.[43]

In this more complex sense, we may actually speak of the "lifeworld" as a (mainly implicit) **structure of typifications** – in specific situations elements of this structure are activated, which guide the individuals interpretations, expectations and actions (usually routine). Typifications are related and form more complex **interpretive schemes**. For Schütz all these cognitive elements are basically **knowledge** and the lifeworld therefore a system of knowledge elements.

When we accept these fundamental insights into human and social life we do not need to go much further to see that these internalised structures, sedi-

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[40] E.g. Schütz, A., Luckmann, T., *Strukturen der Lebenswelt*, UVK (Universitätsverlag Konstanz), Konstanz 2003.

[41] Ibid., 27ff.

[42] Ibid., p. 316.

[43] Mead, G., *Geist, Identität und Gesellschaft*, Suhrkamp Verlag, Frankfurt am Main 1973.

ments of former experiences, must at least be a part of the answer to the question how social order is possible. And playing with a metaphor by Latour we could say that "If a dancer stops dancing, the dance is [indeed] finished",[44] but that the dancer still remembers what it means to be a dancer as well as the context which allows him or her to act as a dancer and how dancing is done.[45] This is also relevant when looking at innovation from a lifeworld perspective.

Interestingly, the human memory (as the not completely consciously controllable capability to collect experiences in the form of memories and to "store" or "cluster" these memories) is never introduced by Latour as a "non-human actor" in his own definition. "Memory" obviously is a construct that in itself can be described as a highly complicated actor-network – seldom intermediary and mostly mediator when it comes to "storing" or "recalling" former experiences.

It is the necessity of consistent individual identity and orientation that partly maintains social structures. "Social structure" is not impacting social action as a "world behind", but as a "world inside", full of typifications that impose a constant control on our actions.

Why do so many people behave the same way when they are for instance at school, at university, at work? An actor-network perspective would at least have to acknowledge that not only the "external" assembling of actors is responsible for this standardisation but also the "internal" actor-networks that construct the surprisingly stable structure of the lifeworld.

Such a short detour via the question of stability can teach us a great deal about the processes of programme-of-action-based social and material change, i.e. innovation.

Relevance

The lifeworld is not only structured, it is also structuring. According to Schütz, "relevance" is the key concept for understanding how this structuring works and he states that "all experiences and all actions are based on relevance structures".[46] We could describe "relevance" as a mode of **connecting** elements of a situation with elements of the lifeworld – but "relevance" also **constitutes** elements of a situation.

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[44] Latour, B., *Reassembling the Social. An Introduction to Actor-Network-Theory*, Oxford University Press, Oxford 2007, p. 37.

[45] This issue is related to the structure-agency debate between Anthony Giddens and Margaret Archer together with Critical Realists like Bob Jessop (Archer, M. et al. (eds.), *Critical Realism: Essential Readings*, Routledge, London 1998; Archer, M., *Realist Social Theory: The Morphogenetic Approach*, Cambridge University Press, Cambridge 1995).

[46] Schütz, A., Luckmann, T., *Strukturen der Lebenswelt*, op. cit., p. 253.

An example: I'm sitting in my house reading a novel. My attention is focused on the scene where the murderer is likely to be revealed. I notice the sound of the raindrops and look to the window – It is raining (It seems I did not notice this at first) – I read on – Suddenly I remember: "My clothes are still hanging in the garden to dry." My attention is now focused on a new situation: "The rain will make my clothes wet." I hesitate however to stand up, because I feel a strong impulse to continue reading until I know the identity of the murderer – but suddenly another thought disrupts my current activity: "I need these clothes for the dinner tonight!" I finally stop reading and go outside to collect my clothes.

This simple example comprises several shifts in relevance structures which "constitute" new situations and new elements of situations. Schütz differentiates three main types of relevancies. **"Thematic relevancies"** are the most basic form of relevancies – they direct our attention at elements of situations or new situations.[47] This thematic attention can be "motivated" when attention is consciously directed at a certain situation (reading a book) or "forced", for instance by a sudden event (a loud thunder stroke). In our example the thematic relevance is present in the moment the perception of the starting rain connects with the thought on the drying clothes creating a new situation.

Thematic relevancies will however be much more explicit and detailed when a situation is unknown and non-routine – Schütz argues that humans in their every day lives are usually trying to transform non-routine into routine situations for pragmatic reasons. We are trying to find the right interpretive scheme to make sense of what we experience and to find an adequate reaction. In non-routine situations or situations that confront us with some kind of risk, thematic relevancies will attach to almost every detail of this situation and will try to clarify one after the other. In less demanding situations the thematic relevancy may remain more general. The "rain" did not create a non-routine situation in our example therefore the first perception of rain did not create a strong thematic relevance – the thematic relevance of reading a book was stronger.

The thematic focus is further elaborated by **"interpretation relevancies"**, which guide the process of comparing and connecting elements of the situation with elements of the lifeworld (knowledge) corresponding to similar situations.[48] We usually try to find a pragmatic matching between the new and the old – and if a simple matching is not possible and the situation still requires some framing we adapt our framings creating new relations between knowledge elements (learning) until the situation is sufficiently framed for pragmatic orientation and action. In our example the interpretation relevance is present in the thoughts "The rain will make my clothes wet" and "I need these clothes for the dinner tonight!".

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[47] Schütz, A., Luckmann, T., *Strukturen der Lebenswelt*, op. cit., p. 258ff.

[48] Ibid., p. 272ff.

"Motivation relevancies" guide the mostly present pragmatic motivation that keeps our every day lives going[49] – Themes and interpretations are embedded in courses of action which confront us with "problems" (from small to big, from routine to non-routine) that have to be solved. Without further elaborating on the scope of both concepts, motivation relevancies can be related to Latour's notion of programmes of action introduced above. Motivation relevancies connect means with aims – thus, determine which means I will use to solve a problem in a given situation. Motivation relevancies determine if and how I act and if and how I will actually objectivate my knowledge.

Objectivation

Another important term in Schütz' theoretical edifice is "objectivation". **Objectivation** means an individual's expression of subjective elements of knowledge through processes and objects which may potentially (!) be interpreted by other individuals. There exist four types of objectivations: Elements of knowledge can be "objectivated" in *(inter-)action* allowing for observation of actual learning processes, in *indications* as the results of others' past learning processes, in *products* or in *signs*.[50]

This typology of objectivations is important to understand different types of interaction, knowledge transfer, mutual understanding and learning. Innovation processes will probably have to deal with all of them: Communication between developers, managers, cooperation partners, customers and users (interactions and indications); design and development of products and services: writing of reports (signs) etc. The innovation process basically consists of the objectivation of knowledge and the internalisation of objectivated knowledge. This cyclic process will continue no matter how chaotic an innovation initiative might become.

Individuals continuously objectivate internalised knowledge in their course of action, some elements of this objectivated knowledge will be interpreted and taken up by others (on basis of their relevance structures), other elements will simply disappear again in the constant flux of situations and relations without making any difference. A key question for social processes as such, but innovation processes in particular, is which objectivated knowledge elements become relevant enough to be interpreted, which interpretations become relevant enough to stimulate the re-objectivation of the knowledge elements in new situations, and which objectivations become diffused wide enough to make up a successful innovation process? In Latour's terms: Which objectivations are linked to and carried further by actor-networks?

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[49] Ibid., p. 286ff.

[50] Schütz, A., Luckmann, T., *Strukturen der Lebenswelt*, op. cit., p. 355ff.

Relating actor-networks to lifeworlds

What happens when we confront this phenomenological perspective with the language of actor-networks? The example showed how relevancies constitute "rain" as an "actor" – "rain" became something that makes a difference for us, something that makes others "act" (Latour's definition). "Rain" would be a part of my account if I would have to explain my actions (going outside, collecting the clothes).

The constitution of "rain" as an actor is obviously a co-constitution involving different "material" and "cognitive" elements – the rain, my perception of rain, the typification "rain makes clothes wet", etc. This constellation allowed the rain to "act on me", to become an actor, first in interrupting my reading routine, then in "forcing" me to go outside and collect the clothes.

Following this track we could ask whether this constellation is an actor-network comprising human and non-human, "material" and "immaterial" actors. We could try to extend Latour's concept of the "actor" in its generality not only to non-human and "material" actors such as the "rain", but also to actors such as "thoughts" and "impulses". Treating human and non-human actors symmetrically also points to a necessity to think about the constitution of actors in a phenomenological sense. "Thoughts" and "impulses" are actors **for** a human that are constituted **through relevance structures.**

The relevance structures or "frames" of humans[51] influence how a human actor responds to an impulse coming from another actor in the network (human or not). Human actors reflect upon their relevancies and framings and give active account of them, while non-human actors usually **manifest** relevancies and framings of human actors (We live in a world full of man-made non-human actors). One could say that an intermediary – for instance a functioning screwdriver – manifests framings of human-actors both in being constructed[52] and used in a specific and predetermined way.

In this regard, relevance structures and framings that are latent/manifest in non-human actors can be reconstructed by interviewing the toolmaker, by observing the use of tools, by observing the larger setting in which the tools are

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[51] Degelsegger, A., *"Frames" in sozialwissenschaftlichen Theorieansätzen. Ein Vergleich aus der Perspektive der Technikforschung*, ITA-manu:script 08_01, Institut für Technikfolgen-Abschätzung (ITA), Vienna 2008. Available at http://epub.oeaw.ac.at/ita/ita-manuscript/ITA_08_01.pdf, last access on July 17, 2011.

[52] Indirectly, Latour admits the "relevance of relevancies" and frames when he says that man-made artefacts embody scripts and cannot be interpreted freely. However, he again does not pose the question of the source of the scripts (that would precisely lie in the frames and relevancies of humans, in our account). Latour might object that already the matter out of which humans form artefacts embody scripts. However, while we agree to this, we also insist that the frames of humans shaping the scripted material also matter.

embedded or simply by imagining the functioning of a tool (for instance when toolmakers and users do not exist anymore) – Also the relevancies and framings of human actors can be reconstructed from observation or testing (e.g. by asking somebody for a dance to see whether he/she accepts or resists inclusion in the actor-network "Waltz"), but contrary to non-human actors human actors may give reflexive accounts of their relevancies. Interestingly, Latour primarily focuses on man-made, non-human actors in *Reassembling the Social*[53] without discussing how relevance structures of human actors are manifest in their function or use. Humans attribute agency to other "things" in a reflexive way. Relevance structures guide our attention and determine what becomes relevant for us and therefore constitute actors that enter our accounts. Latour is however right in emphasising that man-made, non-human actors (a computer for instance) that are human objectivations and manifest human relevance structures can turn from intermediaries to mediators that produce unexpected outputs (a computer that crashes). But rather than developing their own relevance structure these mediators seem to manifest a disrupted human relevance structure (We exclude artificial intelligence here). Relevance structures and their specific way of constituting and attributing agency therefore seem to be a special characteristic of human actors and not **actors in general.**

The problem of social stability and Latour's blind spot

Latour defines the "social" as a "peculiar movement of re-association and re-assembling"[54] that spins connections between human and non-human actors – "Social action" seems always to be "intermediated" or "mediated" by non-human actors which occur in such quantity and variety that the overemphasis on human actors as he ascribes it to interpretative sociology in his perspective disguises more about the "social" and "social action" than it reveals. At the same time Latour criticises "structural sociology" for its overemphasis on the "context"[55] – for him the "context" is primarily a scientific construct, a world behind the real world that is supposed to exercise a power on social actors and action which can not be directly observed and which impacts can not be proofed causally. For the "sociology of the social"[56] – in Latour's view this is conventional sociology that treats the "social" as an independent force rather than as actor-networks – this power is actually the main factor in stabilising social order.

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[53] Latour, B., *Reassembling the Social. An Introduction to Actor-Network-Theory*, Oxford University Press, Oxford 2007.

[54] Ibid., p. 5.

[55] Ibid., p. 48, 167; Latour, B., 'Technology is Society Made Durable', op. cit., pp. 101ff.

[56] Latour, B., *Reassembling the Social. An Introduction to Actor-Network-Theory*, op. cit., pp. 236ff.

Thus, Latour moves between two traditional paradigms of sociology in order to establish a sociology that he promotes as being more concrete, more inclusive (non-human actors), and in the end even more sensitive towards human actors. While we think that Latour presents an appealing alternative or addition to conventional approaches in particular in the field of innovation research, it is obvious that he exploits the theoretical gap between structural and interpretive positions to undermine both of them.

In not fully acknowledging their specific accomplishments and the relations between them, Latour however runs the risk to become as one-sided as his predecessors.

This becomes noticeable in Latour's discussion of the problem of social order. Rejecting the notion of the "social" in terms of invisible yet highly effective "social forces" (comprising phenomena like habitus, institution, social system, milieu, etc.) he turns to what he calls "social skills", as for instance face-to-face interactions, and rhetorically asks whether these skills are sufficient to maintain social stability. Latour refers to baboon societies[57] which he describes as societies that are stabilised solely on basis of social skills – social order in these societies has to be re-established continuously in face-to-face interaction, which in Latour's account appears to be the reason why these societies apparently do not develop as human societies do.

Latour concludes that social skills are much too ephemeral to be able to maintain social order. According to Latour, social order should instead be explained by turning attention to the physical environment, the non-human actors which populate the world and which are necessary for establishing longer lasting connections between actors (including human actors).[58]

Latour lets us imagine a world of continuous mobilisation – the structures are not simply there, they have to be maintained through actor-networks and primarily through man-made non-human actors. Someone or something, somewhere, somehow has to invest energy to create a movement between actors respectively a certain assemblage of actors. This is not possible without "transaction costs"[59] – thus, structures in Latour's perspective do not act on their own through invisible forces, but rely on a concrete process of movement and translation that is difficult but not impossible to trace. Through this simple, but very effective change of perspective Latour reminds sociology that impacts have to be "transported" by intermediaries and mediators and that they are transformed along the way, changing the way we think about innovation. In sociology, a simple assumption of causality between cause A and consequence B or, more frequently, of a correlation between A and B often "skips" the complex processes in-between that make for instance "gender" influence "job aspiration".

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[57] Ibid., p. 69f.

[58] Latour, B., 'Technology is Society Made Durable', op. cit., p. 111.

[59] Latour, B., *Reassembling the Social. An Introduction to Actor-Network-Theory*, op. cit., pp. 180, 192.

The question is whether this world of continuous mobilisation of actors fully accounts for social stability and social order or whether it has to be extended. It is interesting to contrast Latour's image with the more conventional image of "the context" as for instance in the definition of "institution". The neo-institutionalist Jepperson provides the following definition:

> "Institutions are those social patterns that, when chronically reproduced, owe their survival to relatively self-activating social processes. Their persistence is not dependent, notably, upon recurrent collective mobilisation, mobilisation repetitively reengineered and reactivated in order to secure the reproduction of a pattern. That is, institutions are not reproduced by 'action' in this strict sense of collective intervention in a social convention."[60]

Institution is here defined by "non-mobilisation" – but someone/something definitely has to act to reproduce a "social pattern". The difference seems to be how this "action" is "activated" – by "collective intervention" or "self-activating social processes". Neither of the terms is well defined in this quotation, but in particular a term such as "self-activating" seems to disguise much of the difficulty in understanding the maintenance of social patterns and it becomes particularly suspicious from Latour's perspective – someone or something has to act! Someone or something has to stabilise or destabilise!

Latour primarily refers to man-made non-human actors when explaining stabilisation, but we think that stabilisation is actually the result of a constellation of different "types" of actors respectively actor-networks.

Constellations and environments

Latour seems to resolve the structure/agency differentiation in saying that "action" as well as "structure" consist in actor-networks. His solution to the problem of how to explain social stability seems however to be one-sided in primarily emphasising the role of man-made, non-human actors in maintaining stability. This one-sidedness seems to restrict Latour in fully extending **his own** general definition of "actor" – "Any thing that does modify a state of affairs by making a difference is an actor."[61] To fully **extend** this definition would mean to include for instance "cognitive actors" (thoughts, memories) or "bodily actors" (im-

[60] Jepperson, R., 'Institutions, Institutional Effects, and Institutionalism', in: W. Powell, P. DiMaggio (eds.), *The New Institutionalism in Organizational Analysis*, University of Chicago Press, Chicago 1991, p. 145.

[61] Latour, B., *Reassembling the Social. An Introduction to Actor-Network-Theory*, op. cit., p. 71.

pulses, needs). This would allow us to explain social stability more comprehensively and to see the connection between the "internal" differentiation of human actors and "external" actors.

Latour is emphasising the relevance of non-human actors for understanding social stability and social transformation distancing his position from conventional sociology that in his view is obsessed with either "humans" and "interactions" or "contexts" and "structures". "Objects" therefore gain importance as does a perspective that focuses on "objects". ANT owes much of its (empirical) concreteness to this object-focus. At the same time Latour is much concerned about human accounts and the right scientific approach to human accounts – and there the subject-related side of ANT comes in: ANT often relies on human accounts respectively human objectivations (letters, documents, mails, etc.). The sociological language to analyse the cognitive structures underlying these accounts seems to be missing, however.

We will now propose steps to connect the object-focus of ANT with the subject-focus of the lifeworld theory. We argue that **actor-networks must be understood from a lifeworld perspective – From this perspective the differences between types of actors, the differences in how they relate to us and the way we – as humans – attribute agency come into play.** A phenomenological perspective – which is the fundament of the lifeworld theory – would let us differentiate "environments" based on the way humans experience reality in their every day lives, which is the basic mode of human experience that Schütz called "natural attitude".[62]

In a first attempt to describe this perspective we could differentiate four "environments". The environments represent different modes of relating to actors and different modes of how actors are constituted.

In addition to the "material environment" (in Latour's words the multitude of non-human actors that create and maintain an actor-network) we also want to discuss the lifeworld as a "cognitive environment" (knowledge, typifications, expectations), the "bodily environment" (impulses, emotions, needs) and finally the "interaction environment" (observable action/interaction). We use the term "environment" also for cognitive processes because the reflexive individual is always distanced from cognitive elements that he/she comprehends as soon as she/he reflects upon them.

Every situation in our every day life consists of a specific constellation of actor-networks. "Constellation" here means that actor-networks span across different environments in a specific way, a specific pattern, connecting different types of actors. Some of these constellations seem to re-appear with puzzling regularity. Contrary to turn to "structure" or "context" to explain this regularity,

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[62] Schütz, A., Luckmann, T., *Strukturen der Lebenswelt*, op. cit., p. 29.

we will remain in the realm of "action" just as Latour proposes. But actor-networks are stabilised in different forms, by different types of actors, some more visible than others. From the viewpoint of the individual, stabilisation in material objects is more directly visible than stabilisation in biological processes or cognitive processes for instance. But bodily and cognitive environments are as important for stabilising constellations as my material environment. When my cognitive actor-network breaks down (I fall asleep for a second) than the traffic sign will no longer "act" on me and will no longer stabilise a constellation that avoids accidents. This would be similar for many constellations involving cognitive and material actors – which lets us understand that social stability (in terms of regulation and standardisation of human action) relies to a large degree on cognitive stability – a fact that Latour does not seem to fully acknowledge.

When assuming that situations consist of a specific constellation of actor-networks we stop to isolate the "individual" from the "context" – the individual becomes much more permeable – It is not this closed unit that stands against the "outside world" or that confronts a "context", but a part of the constellation that is co-produced and re-produced and thus stabilised by different types of actors. The regular re-occurrence of stabilised constellations then accounts for "social stability".

An example: The fence and the "entrance not allowed" sign in front of a building are two non-human, man-made actors – someone, somehow, somewhere invests energy to transport their meaning and function that is to keep persons from entering a specific area. This is an enforcement of a specific constellation that is expected to occur and re-occur every time a person comes close to the building.

A person being confronted with the actors in this material environment will actually *become part of that actor-network*. She will probably feel uncomfortable, insecure, misplaced (bodily environment); the situation will immediately trigger typifications as for instance "a place that I am not allowed to enter", "a situation where non-conformity definitively will be sanctioned" and the relevance structures will build up and will focus her attention (cognitive environment).

The elements of these environments become "actors" which are connected to each other and influence each other to different degrees – a barking watchdog might trigger different feelings than a Chihuahua, a feeling of discomfort and danger will call forth different typifications compared to a feeling of comfort and safety, a four metre high fence restricts movement in a different way than a one metre high fence.

In our example, the constellation is enforced by the emotions and typifications that were triggered by the material environment. There is complementarity between the material, the emotional and the cognitive environment. For instance, the material environment acts on us, but we can also act on it based on

our programmes of action. We can also act to a certain extent on our emotional and cognitive environments, but we cannot simply change them or walk away from them.

Now the interaction environment comes into play. While the passer-by thinks about the building and the meaning of all these security measures the security officer approaches and tells her in a rather unfriendly way: "Please move or you will be removed by force".

This objectivation further enforces the constellation and the connections between the environments from the viewpoint of the passer-by. Non-conformity and the consequences of non-conformity are now relatively precisely defined; the possible sanctions have now a "face" (the security officer) and a content – to be removed by force (the cognitive environment becomes more explicit). In many other situations we control our actions through the anticipation of expectations of others, sometimes anticipating sanctions – but it makes a significant difference when these expectations and sanctions are objectivated. They further enforce a constellation creating a "real" external force that we have to deal with.

Now we can imagine some alternations: What if the passer-by would sit down and say "I'm here to join the campaign against the transportation of nuclear waste. I did not enter this building. This is public space and I'm staying!" – This objectivation would have a whole different history of typifications and relevancies and would also transform the constellation.

Another alteration: Would it make a difference whether the passer-by is standing in front of this material environment in her European home town, middle class district, or as a reporter in war territory. The same material setting will connect in a completely different way with the other environments.

Thus, a situation becomes what it is only through a particular constellation of actor-networks that are perceived as belonging to different environments from the viewpoint of an individual. What is important to see is that material environment, bodily environment, cognitive environment and interactive environment are connected and each can comprise relatively stable structures that may enforce each other.

Thus, from the individual's viewpoint there are different environments that "comprise" different types of actors. While the actor as a unit is difficult to identify for some environments (the constitution of a thought as an actor for instance) the assumption that "something acts on something" still holds. This perspective becomes interesting when environments are not perceived isolated: Actor-networks span across environments and connect different types of actors. The actor-network therefore creates the situation and the course of action. But while Latour seems to see a world of constant mobilisation, we pointed out that all these environments comprise relatively stable structures (respectively actor-networks) that will re-produce (or re-activate) certain constellations in a regular way – the more stable the actors in different environments and the more

stably they connect, the more regular and standardised a constellation will be actualised.

Stabilised constellations of actor-networks can however depend on different balances between environments and can be dominated by a specific environment. Some constellations might work primarily through cognitive actors, others might work through material actors. It is imaginable that one of the environments is strong enough to actually standardise the objectivation of the individual to a large degree as long as the actor network is maintained. An example: Prison walls enforce a constellation independent of other environments – You can interact with it how you want, you can think of the four walls what you want, you can feel about it how you want – the constellation of being imprisoned that standardises actions to a large degree will be actualised every day. But such dominant environments can be confronted with targeted interventions – maybe someone tears down the wall to free the prisoner. Seeing him standing up and leaving the prison would reveal the weakness of "prison" as constellation. Seeing him still sitting, thinking about his crimes, full of remorse, with the wish for re-socialisation would reveal the strength of "prison" as constellation and would reveal a connection of environments that probably was not visible at first.

Every innovation process has constellations of actor-networks as its prerequisite, process medium, target and outcome. These constellations will change in unforeseen and unforeseeable ways and can not be fully analysed in advance – the true strength of a constellation might for instance be revealed only after the first "walls" have been torn down. Actor-networks can not be completely identified and investigated – We all rely on the "low resolution" of human accounts when it comes to identifying actors and their relations – Which actors can be identified by humans, which are beyond their possibilities of perception or simply beyond conventional perception? The "resolution" itself can however become an element of a constellation (as a part of the cognitive environment) – Innovations might allow humans to identify different and new "things" as actors and to behave differently towards them. Latour is confronted with his own criticism of critical sociology that he describes as being so obsessed with concepts that do not appear in the human actors' accounts – but Latour would have to acknowledge that also most of the non-human and human actors that his method reveals do not appear in human accounts, at least not in the accounts of the humans that are part of the actor-networks of interest to the observer. Are they therefore less real, less effective? Latour is not entirely clear in answering the question whether and when to stop extending or complementing the accounts of the human actors. Latour confronts humans with actors that are not part of their own original accounts. And in particular when we talk about innovation the aim is actually to introduce new actors! Innovation is all about the introduction of new actors and these actors may cause irritation, may be ignored or may contradict the accounts of humans.

Conclusion

We talked lengthily about social stability, whereas innovation actually concerns *an intended change* in technological and social structures (following programmes of action that are however constantly transformed in the translation of actors). Classic innovation theory always emphasised the "change" element – creative destruction – while not much attention has been put on the enabling/restricting element of what we call constellation. We think that a reason for this might be the discourse of technological innovation – society as a whole paved the way for technological innovation and still tries to "institutionalise innovation" (a partly paradoxical endeavour) with the management of innovation, the monitoring of innovation systems, the implementation of innovation programmes, innovation clusters, innovation incubators, etc. Furthermore, technological innovation has been designed as a one-way-road to ever better technologies and infrastructures for the development of new technology.

Innovation theory must critically reflect on **constellations of actor-networks as prerequisite, process medium, target and outcome of innovation!** The constellation of actor-networks that enables/restricts innovation primarily directed at technological innovation has been investigated by conventional research on innovation to some degree, and for social structures partly by research on social movements, but it seems that still much work has to be done to understand these enabling and restricting constellations with a perspective that symmetrises and traces the actors who actually enable and restrict, trying to reconstruct this "seamless web" of actors who act on each other.

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Innovations and Temporality: Reflections on Lévi-Strauss' "Cold Societies" and Our "Warming" Science

Jan Maršálek

Problem

In this short essay, I would like to challenge the consensus underlying the present collection of texts about the tight relationship between innovation and social dynamics. Skeptics say, not without some reason, that to promote innovations is a tricky way of promoting consumer society, which was in the past so severely criticized that it can be nowadays hardly openly encouraged (with the notable exception of the Treasury, of course). Yet the proponents of innovations could answer back claiming that innovations are essential to our society because they make it move. Let me start with a thesis that seems perfectly innocuous; I take the liberty to borrow it from my colleague Jiří Loudín:

> The fact that knowledge, technology, and innovation play a crucial role in economic and social dynamics of society is obvious.[1]

My aim in this paper is to show that it is not obvious at all. Or, to be more precise, that innovation is not *necessarily* tied with the dynamics of society. For this purpose I will make use of anthropology, which has always been helpful in this sort of critical enterprise. Instead of asking how innovations can be generated and spread, using anthropology will allow me to lay emphasis on the manner we treat innovations (in our practices and discourse). In doing so, I hope contribute to open a more sociological way of addressing the topic of innovations. The theoretical stance at the background of the present book will come out somehow impeached. For recompense, the field of our investigations will gain in scope.

I will proceed in three steps. First, I will summarize Claude Lévi-Strauss' distinction between "cold" and "hot" societies. In my second step, I will tease the readers' patience with a reflection on the mythical thought and its time-breaking

[1] Loudín, J., 'Editorial', *Theory of Science / Teorie vědy*, Vol. 31, 2009, No. 3–4, p. 5.

function. What do these two subjects have to do with the topic of innovation and its presumably obvious role in social dynamics? Should this not be evident by then, I will make the connection explicit in my last, third section.

Claude Lévi-Strauss' "hot" and "cold societies"

In 1959, Claude Lévi-Strauss was asked about the major difference between the so-called *primitive societies*, investigated traditionally by anthropology, and our *modern societies*. His answer was peremptory:

> I would say societies studied by ethnologists, compared to our large society, our large modern societies, are a little bit like "cold" societies opposed to "hot" societies, something like horologe compared with a steam engine. These "cold societies" produce extremely little disorder, that physicists call "entropy", and they tend to preserve themselves in their initial state. Incidentally, it explains why they seem to us as societies without history or without progress.[2]

If cold societies *seem to us* to be in a manner outside of time, modern societies, on the other hand, are regarded as historical. Unlike primitive societies they do not resemble the horologe, which is a cold and inert mechanism. Rather, they resemble the steam engine based on the internal differences of temperature, on the differences between their inner parts. According to Lévi-Strauss, this difference between two types of mechanisms he uses as models *explains* our perception of these societies as far as their dynamics is concerned.

To compare societies to a machine, a mechanism, is in itself courageous. Not so much because of its dehumanizing effect, but rather because the image is too old-fashioned, so old-fashioned that even the analogy with organism it was substituted by sounds nowadays as an archaism. We will shortly return to this conceptual remark later, now let us consider Lévi-Strauss' general idea, which is usually partly neglected and partly misunderstood (at least Lévi-Strauss' commentators always say that): The main difference between primitive and modern societies, says Lévi-Strauss, has to do with their *inner structures* and with their *temporality* (these two features being connected). Or to say it better – and here is an important nuance – it has to do with their temporality as it is *perceived* by themselves.

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[2] My quotations come from video recording published by INA (www.ina.fr). The interview is transcribed and translated in English in Charbonnier, G. (ed.), *Conversations with Claude Lévi-Strauss*, translated by John and Doreen Weightman, Cape, London 1969.

Indeed, as these two aspects are concerned, i.e. the inner structure and the relation to historicity, we may tend to link them intuitively up. It is because a horologe, despite its living heart, is something motionless beside a steam engine figured as a speeding steam locomotive – and this is the image I am sure my readers have hitherto in mind. In fact, the conceptual couple cold/hot provides no ground for that of immobility/motion; a steam engine is not necessarily a vehicle. What then is the difference, from the point of view of their structure, or principle as we could better say, between a "cold" machine (as a horologe) and a "hot" one (as a steam engine)? Lévi-Strauss frequently uses the words "order" and "entropy" in his account of the difference between "cold" and "hot", whether speaking of machines or societies. As for the *society* itself, what is at stake are relationships between individuals. "Cold" societies produce little entropy, whereas increased entropy is something characteristic for 'hot' societies. The word "entropy" here stands for "disorder" which means social conflict, political fights, social inequality, etc. Our societies, says Lévi-Strauss, "use for their operation a difference in potential being incarnated in different forms of social hierarchy, whether we call it slavery, serfdom or whether it means class division – as we are considering things from such a distance and in such a panoramic perspective, this has no major importance." Contrary to what our first impression could be, Lévi-Strauss' analysis has nothing to do with what Jean-Claude Passeron calls "nostalgia of the dialectical logic" which seeks the *engine* or the *program* of historical development in tensions, oppositions or conflicts internal to social systems.[3] Lévi-Strauss doesn't speak about social change. Instead, he looks at the functioning of society *as a society*. The word "entropy", borrowed from physics where it is the title for the phenomenon of "degradation" of energy, is used by him in order to suggest that modern societies might be very effective, having at the same time, so to say, a very low efficiency. Modern societies consume a huge part of energy they produce to conserve themselves as societies, i. e. to maintain their unity.

We can now appreciate why Lévi-Strauss preferred using the machine metaphor rather than the organicist one (or some other) that would be certainly less astonishing. The nature of variability associated with organisms is different from that of variability associated with machines. We think Lévi-Strauss wished to avoid the concept of "pathology", which would be misleading for his thought. In physics and mechanics, there is no room for the distinction between normality and pathology. One could think that Lévi-Strauss' preference of the mechanical analogy was for him a way of renouncing criticism. However, the opposite could be said without incoherence. An organism, as G. Canguilhem remarks, is endowed with a "larger latitude of action" than a machine. "Machine, which is a

[3] See Passeron, J.-C., *Le raisonnement sociologique. Un espace non poppérien de l'argumentation*, Albin Michel, Paris 2006, p. 169.

product of calculation, verifies the calculation norms, rational norms of identity, constancy and prevision, whereas organism acts according to empirism. Life is an experience, which means improvisation, taking advantage of occurrences; it is trying in all senses. Hence this massive and often overlooked fact that life tolerates monstrosity. There is no machine monster."[4] In short, life is multiform, its variability is off the criticism; all forms of life are respectable. When Lévi-Strauss deserts organism as metaphor for society in favor of mechanistic rhetoric, he sets up a base for social criticism, which is compatible with his culturally relativistic position. As living beings, societies resemble; as mechanisms, they can be judged according to the criterion of *efficiency.*

This clarification of Lévi-Strauss' thought on the conceptual couple "cold"/ "hot" was necessary in order to spare ourselves of taking the epithet "cold" as the carrier of the idea of a-historicity, so to say, analytically from within. It needs to be said, nevertheless, that Lévi-Strauss didn't seem to be disappointed about the later eclipsing of the mechanicist origin of his concept though. If this feature is now attached to the cold society it is not on its account that the cold society is called "cold". And if it makes things more complicated, it makes them also more interesting. How does it come that our societies, based on the differences of potential, on inequalities, are also historical? We won't forget this question.

Whatever, "cold" societies, says Lévi-Strauss, tend to preserve themselves in their initial state and they seem (to us and to themselves) to be successful, at least to a certain extent. Not only do *we* call these societies "primitive". *They* indeed aspire to keep a close relationship to their original state. Their ideal is the society their ancestors and gods have created at the beginning of times. The "problem" is, however, that even as they profess the ideal of an infinite persistence of the system resistant to external influences, these "primitive" societies can't elude changes, events, and, let's say, *innovation*. Thus, as Lévi-Strauss affirms, they fall into an illusion about themselves.

Such an illusion costs nevertheless some effort and can't be therefore seen as something negligible. Thus, even though the difference between modern and "primitive" societies doesn't lay primarily in being – *de facto* – either historical or without history, some difference remains. Namely, the *relation* entertained with historicity. If the historicity is in our culture readily assumed, interiorized, it is *denied* by the "primitive" man. "Primitive" societies have developed particular skills preventing history to "make irruption" inside them – the expression is Lévi-Strauss':

> I have suggested elsewhere that the clumsy distinction between 'peoples without history' and others could be fruitfully replaced by the distinc-

[4] Canguilhem, G., *La connaissance de la vie,* Librairie philosophique J. Vrin, Paris 2009, p. 152.

> tion between what for convenience I called 'cold' and 'hot' societies: the former seeking through the institutions they gave themselves to annul the possible effects of historical factors on their equilibrium and continuity in a quasi-automatic fashion; the latter resolutely internalizing the historical process and making it the moving power of their development.[5]

These words, which have been extracted from *The Savage Mind* exclude any ambiguity. The difference between "cold" and "hot" societies lies in the *manner they handle* "historical factors" and not in the existence (or absence) of these "historical factors" themselves. The misunderstanding is so regrettable that Lévi-Strauss later prefers deserting the distinction between societies without and with history that he declares "clumsy". But there is more. The *relation* both types of societies have to historicity has its own social efficacy. When internalizing historical process, our societies "make it the moving power of their development". Reciprocally, Lévi-Strauss affirms that the procedures "cold" societies employ "are more efficacious than some contemporary ethnologists are willing to admit", even if the "real question is not what genuine results they obtain but rather by what lasting purpose they are guided, for their image of themselves is an essential part of their reality."[6]

The question of the social efficacy of this particular relation that "cold" societies have to their historical process will be treated in more detail in the next section. But it is already sufficiently clear that in their case innovation doesn't seem to play a crucial role in the social dynamics. Or, to be more precise, that within them innovations don't immediately turn into social change. The question nevertheless remains: How is it possible to stay unchanged despite the changes?

The destruction of time

Despite the changes they undergo, affirms Lévi-Strauss, primitive societies developed particular skills in order to preserve their inner structure.[7] This "particular wisdom" which is peculiar to them consists mainly of their mythological thought. Along with rituals or kinship, that it permeates, mythology is an instrument *for the destruction of time*.

Yet speaking about "time-destruction" could be misguiding. It calls up a seemingly corny as well as useless question whether the time *itself* can or cannot be annihilated. In fact Lévi-Strauss is rather clear about this. What is at stake

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[5] Lévi-Strauss, C., *The Savage Mind*, The University of Chicago Press, Chicago 1966, pp. 233–234.

[6] Ibid., p. 234.

[7] Of course the intentionality here expressed by the term "in order to" is to be understood in its weak sense.

is not the denying of the historical process but "admitting it as a form without content".[8] The time destroyed has to be figured as an empty time; to destroy it is to make it blank by denying the event, by disclaiming the change. And the best way to do that is to dissolve it. An example evoked by Michael E. Harkin and borrowed from the domain of kinship will provide us a firsthand insight into this mechanism. As a gesture of resistance to demographic and structural changes, it seems that societies can add or delete a clan in order to maintain symmetry. "In one instance, based loosely on ethnographic fact, Lévi-Strauss imagines a society that has three clans – bear, eagle and turtle, representing earth, air and water – losing population on to the point that bear clan becomes extinct. At this point, in order to maintain the tripartite nature of society, the turtle clan must be subdivided. Although the earth/air/water distinction is lost, it may be replicated in a lower level (in the opposition between grey and yellow turtle, in this example)."[9]

Mythology is a powerful instrument of such an event-nullifying. It is generally known that Lévi-Strauss began his career of an anthropologist by a remarkable work on the system of kinship he studied between 1935 and 1939 in Amazon rainforest in Brazil.[10] Shortly after that, in the 1950's, he became interested in the mythologies of "primitive" societies, without abandoning the linguistic approach he already used in his earlier work.[11] As we already said, according to Lévi-Strauss mythology is a powerful machine for destroying time. Before we look better at this thesis, at least a minimalist introduction to Lévi-Strauss' approach to myths is necessary.

Lévi-Strauss started afresh. His theoretical background induced him to come back to the question of what the myth actually is. According to him, not particular narrations but their corpus – within which particular stories have the status of *variants* – is that what a "myth" should be in fact called. For Lévi-Strauss it is possible to move between different particular narrations, from one story to another, provided that certain principles of transformation are respected. Thus different variants of the same myth can be seen as reducible and their elements as complementary. The myth itself is based on the manipulation of some few logical structures of oppositions and inversions.

The striking thing about the myths recounted by Brazilian Indians is their apparent lack of logic. Their elements seem to come and go without any ap-

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[8] Lévi-Strauss, C., *The Savage Mind*, op. cit., p. 235.

[9] Harkin, M. E., 'Lévi-Strauss and History', in: B. Wiseman (ed.), *The Cambridge Companion to Lévi-Strauss*, Cambridge University Press, Cambridge 2009, pp. 39–58.

[10] Lévi-Strauss C., *Les structures élémentaires de la parenté*, Mouton, Paris – La Haye 1981.

[11] This linguistic turn in anthropology is sufficiently known to be presented here in details, for a concise introduction see Lévi-Strauss, C., 'Structural Analysis in Linguistics and in Anthropology', in: Lévi-Strauss, C., *Structural Anthropology*, Basic Books, New York 1963, pp. 31–54.

parent order, as if things, humans and animals were dropped randomly in. Not only do we tend to find the relationships among them fantastic, more often they appear to us senseless. Lévi-Strauss helps us to understand them using his structural method. Nevertheless, he does not provide us with understanding of the *sense* of these myths. Levi-Strauss understands the myth as an *instrument of sense*. Without having sense in itself, myth is a matrix of the world's intelligibility. This is why Lévi-Strauss can say that the myth, similar in this to a musical work, is a language which transcends the level of articulated language.[12] In myth, human mind manifests itself as a *problem resolution*.[13] Mythical thought deals with "problems", with all that could disturb the order established. And innovations clearly fall in this category. The myth annihilates time as it links the present to a heroic and founding past. When it is accompanied by the ritual, in which ancestors are supposed to participate, the past is evoked and recalled. As Lévi-Strauss puts it, the past is conceived as a timeless model rather than as a stage in the historical process and if the before and the after haven't been completely suppressed, "their sole significance lies in reflecting each other."[14]

> The gurra ancestor hunts, kills, and eats bandicoots; and his sons are always engaged upon the same quest (...) In [these] myths we see the native at his daily task of hunting, fishing, gathering vegetable food, cooking, and fashioning his implements. All occupations originated with the totemic ancestors; and here, too, the native follows the tradition blindly: he clings to the primitive weapons used by his forefathers, and no thought of improving them ever enters his mind.[15]

But mythology is also an instrument of time destruction as it deals with historical events from the point of view of their logical function. This is different to the manner we deal with historical events inasmuch as modern societies insert

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[12] Lévi-Strauss, C., *The Raw and the Cooked. Mythologiques*, Vol. I, translated by John and Doreen Weightman, The University of Chicago Press, Chicago 1983, pp. 15–16: "...myth and music share of both being languages which, in their different ways, transcend articulate expression, while at the same time – like articulate speech, but unlike painting – requiring a temporal dimension in which to unfold. But this relation to time is of a rather special nature: it is as if music and mythology needed time only in order to deny it. Both, indeed, are instruments for the obliteration of time." For the analogy between myth and musical work, see Fulka, J., 'Lévi-Strauss, Schaeffer, Wagner: hudební struktura mýtu', *Teorie vědy / Theory of Science*, Vol. 31, 2009, No. 1, pp. 119–140. More specifically about the misunderstanding between structural anthropology and the contemporary music see Nicolaset, D., Keck, F., 'Claude Lévi-Strauss et "la musique". Dissonances dans le structuralisme', *Revue d'Histoire des Sciences sociales*, Vol. 14, 2006, No. 1, pp. 101–136.

[13] See Keck, F., *Claude Lévi-Strauss, une introduction*, Pocket – La Découverte, Paris 2005, p. 137.

[14] Lévi-Strauss, C., *The Savage Mind*, op. cit., p. 235.

[15] T. G. H. Strehlow quoted by Claude Lévi-Strauss in *The Savage Mind*, op. cit., p. 235.

them in a chain of other historical events that help in their interpretation. In mythical thought, an event represents basically a logical instability that it tries to "domesticate":

> The mythical thought aspires to give sense to an event, in order to restore its integral memory on some timeless level. The mythical thought perceives an event as a threat, because, analogous to a machine, it tends to maintain the order of its structure against the disorder that an event introduces.[16]

The mythical thought isn't a "problem resolution" in the sense that a myth would be constructed in reaction of disturbing events. Rather it could be said that the already existing myth captures events, assumes them, and in doing so it relegates them to the creative and in some ways undifferentiated epoch of ancestors. At the same time, if not first of all, the myth attributes them their place in the logical world. As we have said above the myth hasn't got sense, it is an instrument of sense. The "true" sense of the myths *bororo* and *gé* (in the *The Raw and the Cooked*) isn't the explication of the introduction of the practice of cooking aliments, despite the fact that it is their main narrative motif. The myths express reciprocally each other; they have no ultimate *signifié* but aspire somewhat higher as they are patterns of all sense.[17]

Techniques of invisibility

Lévi-Strauss' idea of time-destruction (or of the consciousness of it) didn't escape criticism. Does the resistance against social change really stop time or does it rather entail a repetition of the identical, carried notwithstanding by a linear temporality?[18] Our perspective in this essay was, however, different. It is less temporality as a form, but rather its content, which can be, as we have observed with Lévi-Strauss, cancelled. And this is what provides the non-evident angle to our approach to innovations that is our ultimate concern.

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[16] Keck, F., *Claude Lévi-Strauss, une introduction*, op. cit., p. 145.

[17] In *The Raw and the Cooked*, Lévi-Strauss suggests that the ultimate sense of the myth, if there is some, is that of human mind. We think that François André Isambert was right when wondering, in his review of the book, whether such a "sense" is the one we thought about when raising the question. We don't share however Isambert's skepticism about the gain of intelligibility that Lévi-Strauss' theory of myth produces. See Isambert, F. A., 'Lévi-Strauss Claude, Mythologiques, Le cru et le cuit', *Revue française de sociologie*, 1996, No. 6–3, pp. 392–394.

[18] The positions of some of these critics (and first of all that of Alfred Gell) are displayed in Šubrt, J., 'Claude Lévi-Strauss a problém tzv. synchronického času', *Teorie vědy / Theory of Science*, Vol. 31, 2009, No. 1, pp. 49–64.

We have seen that innovation doesn't necessary mean (social) change; innovation without change is conceivable. Of course, the thesis we quoted at the beginning of our reflection isn't hereby invalidated. It deserves nevertheless interpretation. In social dynamics, the important role of innovation may be obvious. Yet what is not obvious is that innovation directly leads to social dynamics. Between innovation and (social) change *there is room for our mind and our practice*. In other words, alongside the question of how the innovation is produced and its production encouraged, how the innovation spreads, what are its consequences, there is room for asking how – that is also by what means – it is assumed (or not) by our collective mind. The innovation culture is not only about producing innovations, but also about accepting (or refusing) them – with more or less visibility.

This thesis opens, as we believe, large possibilities to the sociology of innovation. Michael E. Harkin is certainly right when noting that "it would be surprising if [the] desire for changelessness [observed in "cold" societies] did not exist in all societies, albeit in different forms".[19] After all Lévi-Strauss' distinction is a product of refining, real societies always combine the two distinguished postures. But what are these "different forms" of the effort our societies pursue in order to stop the time?[20] What are our techniques of time-destruction? And which features of our societies are protected in this manner?

In fact, such a research field is in some respects very familiar to sociology, which is traditionally occupied with social rigidity (sociology of education, with its focus on school institution displayed as an agent of social reproduction is a good example of this category of sociological research[21]). Our reflection about "cold" societies suggests nevertheless a shift in the sociologist's research design. It invites him to focus less on these parts of social body which are hostile to any change, but to actual changes which are by the society denied. The paradox of such a program consists in its focus on changes that society seeks to keep out of our regards. Not the changes it hides, but the techniques of hiding are what we are inviting sociologists to focus on.

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[19] Harkin infers this hypothesis, quite unnecessarily, from Lévi-Strauss' "insistence on a cognitive universalism". See Harkin, M. E., 'Lévi-Strauss and History', op. cit., p. 47.

[20] Michel Foucault's observation of what he calls "heterotopias" are of great interest in this context: "...the huts of Djerba are in a sense relatives of libraries and museums, for the rediscovery of Polynesian life abolishes time; yet the experience is just as much the rediscovery of time, it is as if the entire history of humanity reaching back to its origin were accessible in a sort of immediate knowledge." (Foucault, M., 'Des espaces autres', in: *Dits et écrits II, 1976-1988*, Éditions Gallimard, Paris 2001, p. 1579. The translation is from Jay Miskowiec)

[21] "The diffused education proper to archaic societies or to groups of traditional societies where the script is missing would also be the principle of cultural continuity, supposed to be stronger, more conservative and more self-reproducing. But it would be in fact to give too much credence, as the 'force of the tradition' is concerned, to what the tradition says about itself." (Passeron, J.-C., *Le raisonnement sociologique*, op. cit., p. 181)

The question of the relation between the inner structure of societies and the way they deal with historical process – we have seen that this issue was outlined in Lévi-Strauss' first formulation of the "cold"/"hot" societies distinction – is worthy to be refreshed. The access to innovation is, there is no doubt, socially conditioned. But could the cult of innovation which is characteristic in our modern societies, be consequently said to be (co)responsible for their structuration? Only empirical studies can bring to us some elements of response.

As a sort of a prologue to any empirical work we may examine the chastity of the research instruments we used in our book. Haven't we chosen our subject matter with a firm conviction about the crucial role of innovation in social dynamics? We should ask ourselves if we are epistemologically sufficiently equipped to assure that our research program, before it fulfills its heuristic function, won't turn into an instrument for "warming" our society.

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Relationships between Technology and Culture in the Czech Tradition of Thought

Petr Machleidt

In the first half of last century the tradition was established, which analysed the development of technology in close connection with its social consequences and, in particular, as an important means of social progress. In the Czech intellectual environment, like in Germany, the idea of the close relationship between science and technology to culture has its nearly century-old tradition. In Germany, for example, in the 1920s of the 20th century Friedrich Dessauer,[1] emphasized that technology is a cultural phenomenon closely tied with ethics and aesthetics.[2] At the same time it was Jindřich Fleischner[3] in our country with his concept of "technological culture"; or Václav Verunáč with his concept of "laboretism". For the Czech environment is also typical the theme of consequences of scientific and technical conduct, portrayed in art; here we can name, for example, Karel Čapek. Many ideas from that period – e.g. that science and technology should be perceived and considered as a cultural phenomenon – is currently appearing again in other contexts, most recently for example in relation to innovative cultures.

In 1916 the above-mentioned Jindřich Fleischner published in Prague his book: *Technická kultura* (Technical Culture) subtitled *Sociálně-filosofické a kulturně-politické úvahy o dějinách technické práce* (Socio-philosophical, Cultural and Political Reflections on the History of the Technical Work). In introduction he expressed his complaint to the fact that much greater attention to the subject is given in foreign countries. For a great debt of the Czech press towards Czech public he regarded its lack of effort on disposal of contemporary prejudices about the nature and objectives of technical activity. The book is a collection of

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[1] For ethics of technology see Dessauer, F., *Streit um die Technik*, Herder, Freiburg 1959, p. 96.

[2] Confer introduction to his book from the year 1927 *Philosophie der Technik* (Dessauer, F., *Philosophie der Technik. Das Problem der Realisierung*, Cohen, Bonn 1927).

[3] Fleischner, J., *Technická kultura. Sociálně-filosofické a kulturně-politické úvahy o dějinách technické práce* (Technical Culture. Socio-philosophical, Cultural and Political Reflections on the History of the Technical Work), F. Borový, Prague 1916. Author began to formulate his thoughts on technology already earlier; in 1914 he published an essay 'Filosofie techniky' (Philosophy of Technology), *Technický obzor* (Prague), August 22, 1914.

various essays, which have one in common – according to his statement – "... the only one ardent desire: economic and cultural advancement of the nation with the participation of technicians".[4] Fleischner then responds to the romantically-minded optimism of the technical anthropologism (E. Kapp, and others) – he does not want just highlight the advantages of technicians and technology conveniences, but first of all, he believes in the future of technological culture. Tone of his work is at times pathetic – popularising results of scientific activities and addressing general Czech public by flame challenges in an attempt to activate it. K. Čapek appreciate very favourably the Fleischner's extensive work on the history and cultural objectives of the engineering techniques, namely for its dual aim- according to Čapek the book has both educational target (toward the general public) and at the same time motivation target (especially towards the technical intelligence).[5]

Fleischner's aim is to encourage optimism of technicians; he considers technical progress as a scientific method of humanization. In the course of this process, the technological culture (for the time being still imperfect) will be enriched by the humanistic culture. Fleischner sees great cultural task in increasing number of technicians who are aware of the urgency of social and ethical responsibilities. He also takes sides of those technicians who want to "... know the eternal, ideal value to which they can contribute by their work; know future of their activity; know their goal; adapt their work to this goal and thus create the technical culture".[6] He notes with satisfaction that ranks of engineers, who in addition to their professional work deal also with philosophy and apply their critical speculations into their profession, are constantly swelling.

Fleischner's standpoint can be characterized as a clean-cut technocratic, his work became the foundation and mainstay of the Czech technocratism and strongly influenced in the last twenties and thirties not only the technical intelligentsia in Czechoslovakia, but also some artists and cultural climate as a whole. It contained several typical technocratic principles: Any solutions to social problems must be consistent with the modern natural science and technical rationality. The technique is to provide methods enabling rational management of society. In accordance with the radical ideas of technocrats, democracy and market economy according Fleischner represent obstacles that prevent technically mediated rule of reason.[7]

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[4] Fleischner, J., *Technická kultura. Sociálně-filosofické a kulturně-politické úvahy o dějinách technické práce* (Technological Culture. Socio-philosophical, Cultural and Political Reflections on the History of the Technical Work) 2. edition, A. Svěcený, Prague 1922, p. 6.

[5] Čapek, K., 'Opomenutý referát' (Omited report), *Národní listy* (Prague), December 20, 1917 and Januar 1, 1918.

[6] Fleischner, J., *Technická kultura* 2. editon, c. d., p. 43.

[7] See more Janko, J., *Technokratické tendence v českých zemích* (Technocratical Tendences in the Czech Lands), Institut základů vzdělanosti Univerzity Karlovy, Prague 1996.

A specific way of the Czech philosophical, ethical and economic thinkingin the first half of the 20th century was so called "laboretism". Term laboretism was based on composition of two words – labour and ethos (moral). It represented stream of thoughts of many authors espousing to the theses first published by Václav Verunáč in his work *Laboretismus. Zásady a směrnice* (Laboretism. Principles and Guidelines), published in 1928.[8] Laboretism combined principles of technical thinking with moral and scientific concept of work organization. It was to be contribution to the technical, moral and economic progress, it should accelerate natural development and improve environment and cultural level of mankind. It also reflected findings in the field of technology and work organization, as they were developing since the end of the19th century up to the twenties of the 20th century, with special attention devoted to the concept of work.

Laboretism pointed out relations between morality and technological development. It was an attempt to predict techno-economic processes based on "moral progress" and on morality requirements. Some authors take the laboretism as an original Czech attempt to interconnect technocratism and ethics, and so, in this sense, as a specific contribution of the Czech technical and ethical thinking to the philosophy of technology: Edvard Beneš highly rated laboretism in his lecture 'On the sense and importance of modern technology' in Brno on March 16, 1937, where (among other things) he said: "The modern technology will be necessarily developed in the spirit of new morality, new culture and new sociality. Technicians and graduate engineers are beginning to think lately not only technically but also socially and morally. Laboretism is an example of these new trends".[9]

Development of the Czech science and technology in the course and namely at the end of the19th century was taken as a precondition for national development, as a form of national emancipation in the Czech lands. Czech philosophical thinking of this period was characterized by pragmatism and openness to European thinking – especially to German and French thinking. The Czech philosophical thinking at that time was influenced mainly by positivism and took over this line of thinking and beliefs about the importance of scientific and technical progress. Philosophical romance appears in the Czech theoretical production very modestly – despite a strong German influence on our philosophy.

Let us return to the reality of the Czech lands in the late 19th century. Since 1868 Polytechnic Institute of the Czech Kingdom has been functioning in Prague, which followed the first public engineering school in the Central Europe, founded already in 1707 as an Estates Engineering School. In 1892 Prague

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[8] Verunáč, V., *Laboretismus. Zásady a směrnice* (Laboretism. Principles and Guidelines), Čin, Prague 1928.

[9] Quoted by Mansfeld, B., *Průvodce světem techniky* (Vademecum Through the World of Technology), Národní informační služba technická, Prague 1937, p. 14.

Charles-Ferdinand University was divided into German and Czech part – only since then it has been possible to obtain university education in Czech. Even a little earlier – in 1869 – was divided into Czech and German part also the above mentioned Prague Polytechnic Institute. After 1866 in Bohemia, Moravia and Silesia was concentrated more than 60 per cent industrial production of the Austro-Hungarian Empire, as well as almost 90 per cent of the mechanical engineering and 75 per cent of chemical production. In addition to these facts, there was tendency to shift the centre of industrialisation to the Czech inland. At that time there was a conscious reflection of the rich, fertile but also problematic coexistence of Czechs and Germans. Around 1880, there were 37 percent of German population and in addition to it there lived a large Jewish community. Population of the Czech lands formed a peculiar conglomerate, but this peculiarity represented a distinctive source of dynamics. The growth of nationalism on both sides made more dynamic impact on technological development – it created a distinctive kind of national competition. It turned out that the Czech technical production served as a means to increase a sense of national identity. Increasing cultural, economic and technical levels of Czech society played an important role in shaping its structure.

Positively understood competitiveness in science and technology, associated with cooperation, synthesis, and finding common values – this all created from the Czech lands an important cultural centre. Czech and German traditions were reflected in integration processes in science, culture and technical fields. It shows that diversity is a prerequisite and starting point of integration. It can then result into something what is known as European cultural, economic, industrial and intellectual renaissance. It is associated with the need for new syntheses of scientific, technical and humanistic rationality.

In the period after WW I, movements arose that sought to address contradictions and problems of the time with scientific and technical methods and means. In 1923, Václav Verunáč formulated the need of new ideas on technical – economic – ethical basis, which in 1926 resulted in publishing of the laboretism principles as a movement aimed to "techno-economic and moral progress". An important pillar of laboretism was technical thinking – that should lead society to rational decision making. The laboretism differed from technocratism by its emphasis on ethics, without which the technology could do more harm than good to mankind.

Laboretism wasn't intended only as a theoretical model, but especially in the years 1929–1933 it was conceived in the Czechoslovak Republic as a practical way of managing the national economy through new forms of work organization. It also represented, without any doubts, an attempt to harmonize the highly developed technology with needs and challenges of socialism, based on rational use of technical thinking, while respecting private property of the means of pro-

duction and sustaining class collaboration. According to its founder V. Verunáč, the laboretism was oriented to reach – through its natural development, or by its acceleration through technology means (while respecting ethic requirements), by using scientific methods of work (involving management, analyses, plans, initiatives, systems, controls), and by cooperation of all components of economy – enhancement of the moral conception of work and thus increase the overall cultural level of mankind.

Verunáč writes: "Technology by its progress hit very deeply into the structure of human society, the pace of technological progress was ahead of the pace of the organization. Consequences culmination of economic, social, political and moral crises."[10] Overall, laboretism can be evaluated rather as a discussion activity of some tens of Czech intellectuals, though it achieved some international acclaim. It was a peculiar Czech attempt to interconnect technocratism and ethics.

Anthropological approach to the issue of technology returns as an echo in various forms even in the present. Using of different images of man and human life as a metaphor for the images of technology and technical artefacts is not yet fully exhausted. Comparison of human lives and destinies of technical works is proving to be reasonable and appropriate. You may recall the recovery of technical creations in various legends and myths – here is perhaps the most famous legend about Golem of Prague. L. Tondl writes to this issue: "It can be stated that various elements or units of technical world have their own destinies. It can not be overlooked that these stories have their own specific rhythm of time, that many of these fates may be considered in terms which are marked as biological metaphors. This means that in a metaphorical sense the birth, youth, full life cycle, illnesses, aging, annihilation and death of most types and forms of technical works can be considered. The same is therefore valid for projects, plans, realised processes and fully functional technical works."[11]

Czech population ceased to be an object and it became the subject in the development of technology. Around 1880, there was 37 percent of German population and in addition to it there lived a numerous Jewish community. Population of the Czech lands formed a peculiar conglomerate, but this peculiarity represented a distinctive source of internal dynamics. A peculiar national competition arose, which also took place in the field of technical production. This is probably the reverse effect of technology on the overall social, cultural and spiritual life of society, as described by Friedrich Rapp: "Technical acting

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[10] Verunáč, V., 'Dnešní doba a laboretismus' (Today's time and Laboretism), in: *Laboretismus: soubor přednášek a statí* (Laboretismus: Collection of Lectures and Articles), Práce intelektu, Prague 1934.

[11] Tondl, L., *Sociální hodnocení techniky* (Technology Assessment), Ediční středisko Západočeské Univerzity, Plzeň 1992, p. 37.

and technical artefacts has back-to-human effect as a creative force, and one of the most important questions arises, how it would be possible to distinguish this influence against other social, cultural and spiritual factors."[12]

Far-reaching discoveries in science and revolutionary inventions in the field of technology in the first two decades of the 20th century, causing some philosophers (E. Kapp, F. Dessauer) to outpour boundless technological optimism were phenomena that on the contrary disturbed K. Čapek. Though he was critical to overvaluation of the role of technology in human life, his overall attitude was not definitely anti technical or even technophobial. His works show more concern about the uncontrolled techniques, which in the form of industrialization without borders threaten the basic human values. Defence against it should be harmonious *development of spiritual culture, along with the development of technology*. Karel Čapek escalated in his utopian science fiction drama *RUR* (Rossums-Universal Robots)[13], the role of technology in society to direct conflict between Humanoids (so called Robots) and people. According to Čapek's vision the robot was compiled as a mechanism, but it was not a purely technical artefact – it had a form of "a biological machine". Robots reproduction had characteristics both technical and biological processes. The current genetic engineering with its reproductive procedure – "cloning" – is very close to the concept of robots from the RUR play. The drama goes by its form from utopia to dystopia and vice versa. In spite of the fact that from the performance of the drama on the stage of the National Theatre elapsed more than 90 years (1921), only due to the latest technology development the work gains its new and current context. The play has been translated into more then 30 languages and the word "robot" is used in many of them. Although the authorship of the word robot is mostly attributed to Karel Čapek, there is a newspaper article in which K. Čapek himself points out that author of this word is his brother Josef Čapek.[14]

Josef Hochgerner at his work *Arbeit und Technik*, subtitled *Einführung in die Techniksoziologie* in Chapter 9, Technicalization of biological matters" in relation to "control mechanisms" notes the dangers that stem from the fact that "biological becomes machine-like": "Drawing of biological processes into technology system structures – to form a functional part of "machine elements" – raises urgently today than ever the question of the definition and criteria by which it would be possible to determine what is defective and what requires correction".

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[12] „Das technische Handeln und technische Artefakte wirkt als prägende Kraft auf den Menschen zurück, wobei eine der wesentlichen Fragen darin besteht, wie dieser Einfluss gegenüber anderen sozialen, kulturellen und geistigen Faktoren abzugrenzen ist." Rapp, F., *Analytische Technikphilosophie*, Verlag Karl Alber, Freiburg – München 1978, p. 81.

[13] First night of the play *R.U.R.* (Rossumovy univerzální roboti) on Januar 25, 1921 on the stage of the National Theatre. Pre-view performed by Jednota divadelních ochotníků Klicpera at Hradec Králové on Januar 2, 1921.

[14] Čapek, K., 'O slově robot' (About the word robot), *Lidové noviny* (Prague), December 24, 1933.

Hochgerner further develops his warnings, in the similar sense as Karel Čapek in his dystopia about the biological structure of Robots: "Control by itself becomes to be an invisible technosystem, one giant abstract machine ..."[15]

In spite of the fact that masterpieces of Čapek brothers came into being from 20s to 30s years of the 20th century, the development of modern science and technology made them even more understandable to us now: our present reveals new messages hidden in their literary and artistic legacy. In the early part of the 20th century there was also very agile development of technology thanks to inventions coming from the preceding century. The whole process was hastened by the First World War. New technologies, modernization of life and production automation have been one of the biggest events of the early 20th century and Čapek perceived the risks associated with them very sensitively. He regarded them as dangerous for the future of humanity. Society as a whole began to transform itself due to new inventions. Interpersonal relationships started to be changed, a new relationship between man and technology arose. In his works, in addition to distinct philosophical starting points, the author strongly advocates humanism which represented not only his understanding and deep feeling for people, but also the centre of his creative thinking and literary activity

K. Čapek created more works of art with the theme of warning against threats arising from abused techniques – such as *The Factory for the Absolute* and *Krakatit*. In particular, the novel *Krakatit* shows urgently – in the form of utopia on the border between reality and feverish dream – the dangers of uncontrolled technological discovery in a complex web of social relations of desire for power, wealth, fame, but also for love and understanding. The point of the novel is typically that of Čapek: Krakatit's inventor finally comes to understanding that he would stand mankind in good stead by making minor technical inventions, which could alleviate the lives of common man.

Although K. Čapek is perceived both at home and abroad primarily as a play writer, writer and journalist, his philosophical studies, establishing his overall attitude to life, he rightly belongs to the rank of important Czech philosophers. Importance of dealing with topics of technology in society in K. Čapek's works is evident from the following realistic evaluation: "Čapek's philosophical orientation and weltanschauung was born from the search of modern philosophical views, overcoming positivism, mechanical materialism and determinism, as well as from reflection of the crisis of unilateral technical society."[16]

Overall, it can be stated that behind the rapid development of practical techniques in the Czech countries somewhat lagged theoretical and philosophical

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[15] Hochgerner, J., *Arbeit und Technik. Einführung in die Techniksoziologie*, Verlag W. Kohlhammer GmbH, Stuttgart 1986, p. 111.

[16] Gabriel, J., Nový, L., Zouhar, J., *Česká filozofie ve 20. století* (Czech Philosophy in the 20th Century), Vol. I, Masarykova univerzita, Brno 1995, p. 303.

reflection of far-reaching industrial and technological changes – the Czech philosophical thought lacked a systematic and theoretically more deeply processed topics dealing with philosophy of technology. After the First World War the technology as a subject of philosophical reflection appeared in the directions of thoughts of positivists and pragmatics and in other philosophical and sociological concepts, which dealt with the position of people in the development of techniques and under the influence of technology. More attention had been paid to technology in popularising literature without deeper philosophical and theoretical aspirations. Only in the sixties of the 20th century, at a time when society began to recognize the enormous potency of the growth of science and technology has been developed a philosophical reflection corresponding to technical changes. Along with criticism of the current state of the art of technology, already mentioned traditional attitudes and currents of thoughts were reflected in it. Stimulating effects had also former Anglo-Saxon, French, and especially German philosophical production, in which philosophy of technology occupied very important place.

Reasons for refusing technology are in their substance non-technical. They are not directed against the technology, which is in the first place represented by technical artefacts, but against uncontrolled social phenomena that brings inappropriate use of technology. Technology and the social process of its implementation, i.e. mechanization, cannot be grasped otherwise than as a duality of hope and fear associated with it. Every other newly discovered and implemented technology only expands the duality by adding new elements, but does not solve the main problem with this duality. "In some contexts, human evolution is interpreted as a process of mechanisation, and on the other hand, just the opposite – as a process of emancipation from mechanisation. It differs in different cultures and therefore the concept of culture has its irreplaceable role in cognitive functions when we are trying to analyse the process of mechanisation. But neither detailed analysis of the technology in various cultures, solves fully this duality of perception of technology and process of mechanisation." [17]

Mechanisation is in its negative connotation often identified with the loss of autonomy and increasing dependence on technical devices or systems. It is possible to observe growing chances to control behaviour of an individual enabled by new technologies – up to total control of an individual and threat or loss of his privacy. Rationality of mechanisation and its monotony suppresses spontaneity and emotivity. On the other hand, there are no doubts that scientific and technical progress leads to expansion of space for human actions and heads towards human emancipation. Technical progress decreases fateful area, prede-

[17] Grunwald, A., 'Technisierung als Bedingung und Gefährdung von Kultur', in: G. Banse, A. Grunwald (eds.), *Technik und Kultur. Bedingungs- und Beeinflussungsverhältnisse*, KIT Scientific Publishing, Karlsruhe 2010, p. 113.

termined by God or nature – mechanisation can even be considered as a way to extend man's autonomy. This concept of mechanisation, expanding area for free human being, is directly in opposition to the concept of limiting the autonomy of human by technology. The concept of mechanisation shows ambivalence of this process. Čapek doesn't take as a dangerous fact the mere production and use of robots. It can be interpreted even as a success or triumph of human ingenuity, but a warning moment is when production of robots produces new relationships in society.

The term "style of technique" ("technological style") was introduced by an American historian of technology Thomas P. Hughes[18] – this term referred to a phenomenon which was described earlier: *the different formation of technology at approximately the same level of technical knowledge and skills.* Technical particularities, traits of specific techniques were developed by "cultural factors". Hughes ranked to these factors geographic, economic, organizational, legislative, historical and business conditions. Advantages of the Hughes's concept lie firstly in the fact that they turn attention to the structure and function of a technical artefact, and secondly, the technique is clearly marked as a socio-cultural phenomenon. Thirdly they show the individuality and differences in techniques and thus stimulate comparative analysis. The concept of the style of technique, as developed by Hughes, marks variants of what is technically analogous. According to him, a globally available technical knowledge and skills lead in principle to the same technical solution, but you may get different regional or national forms as a result of the given socio-cultural conditions.

The terms "style of technique" and "technological culture" emphasised relationship between technology and its social and natural environment. In general, they followed conception of "reasonable, adapted technology", "appropriate technology". This means that a given, existing technology is always the result of adaptation to the environment. It is also possible to derive reaction of technology on environment, or create models of the mutual interaction between technology and culture. Thus we can return to the initial hypothesis about the interaction between growth of national consciousness and development of technology in the Czech lands at the end of the 19th and beginning of the 20th centuries. Stormy development of technology in this period had undoubtedly, apart from economic incentives, also its resources in the field of culture.

What would be opportunity to work with the term "style of technique", when analysing Karel Čapek's play *R.U.R.*? The invention of robots represented undoubtedly a certain "style of technique" and meant a revolutionary innovation – what other conditions would have lead to another use of this epochal news?

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[18] Hughes, T. P., *American Genesis: A Century of Invention and Technological Enthusiasm (1870–1970)*, University of Chicago Press, Chicago 2004; Hughes, T. P., *Human-Built World: How to Think about Technology and Culture*, University of Chicago Press, Chicago 2005.

What would have to be the socio-cultural conditions making plot of *R.U.R.* to be unfolded differently than in the drama?

Harro Segeberg in his work *Technik in der Literatur*,[19] writes about manifestation of inflamed imagination caused by Prague's environment, which cannot be overlooked in letters written by Franz Kafka in 1912, sent to his fiancée Felice Bauer in Berlin. In the letters Kafka describes typewriters, which are linked together, as well as other reproductive apparatuses, connected with a telephone and allowing remote contact.[20] It is difficult to interpret correctly these Kafka's associations. Some explanation provides Kafka's esoteric nature, which enabled him to move on the border of dreams and reality. Literary scholars are trying to bring near to cultural sites, defining "the Prague's territory" and pay attention to the cultural practices of the Kafka's time.

Technology is not only strongly influenced by cultural context, but it itself has a cultural form. The relationships between culture and technology are mutually conditional. By using technology is the culture materialised and vice versa – a technical environment is cultivated by the culture.

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[19] Segeberg, H., *Technik in der Literatur. Ein Forschungsbericht und zwölf Aufsätze*, Suhrkamp, Frankfurt am Main 1987.

[20] Kafka, F., *Briefe an Felice Bauer und andere Korrespondenz aus der Verlobungszeit*, Fischer, Frankfurt am Main 1976, pp. 165, 233.

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Part III

Transnational and Transcultural: Transfers and Interactions

Most of social scientists agree that the contemporary world is characterized by two major trends: globalization and emerging knowledge societies, while both trends permeate and condition each other.

Globalized knowledge economy is distinguished by intense and increasing exchange of people, goods, information. It is the time of trans-national transfers: technology transfer, knowledge transfer, institutional transfer. Each of them has a strong cultural dimension; it is always also a transfer of specific values and practices., i.e. it is cultural transfer.

Cultural dimension of transfer is usually the toughest point of the operation. Culture is tightly rooted in tradition and human customs – modes of behavior and people are rather conservative regarding their change. On the other hand, when transfer is successful and imported practices are being embedded into genuine ones, it is very beneficial to innovation process. Cultural transfer is an integral part of the overall learning process.

It may appear paradoxical that in the period of globalization, when the geographical distances are easily to overcome, a space dimension of economy begins to play such a crucial role. The factor of spatial proximity gave rise to the concept of region. Regions do not represent autarchy – on the contrary, they arise in the context of globalization, as globalization and regionalization are two complementary, mutually interconnected processes (glocalization). As Ulrich Beck notes, the global market is based on vital local cultures. Globalization and regionalization devaluates, to some extent, national spaces. Regions often cross national borders and so does cooperation in research and innovation. International R+D cooperation is a subject of article by *Klaus Schuch, Isabella Wagner* and *Elke Dall.*

Schuch, Wagner and Dall analyse the transfer potential of bilateral projects funded between 1998 and 2009 under the intergovernmental scientific and technological agreements (WTZ) towards multilateral project applications in the European Framework Programme (FP) for Research, Technological Development and Demonstration (RTD) based on a survey of Austrian WTZ-projects in the concerned time period. They discuss whether or not the transfer potential

depends upon either (1) the organisational background of the Austrian project co-ordinator of a bilateral project (from the university or non-university sector) or (2) the country of the partner with whom a joint bilateral WTZ-project has been conducted. In fact, both dependent variables seem to be influential in the potential transferability and follow-up towards the FPs.

The main difficulties in bridging WTZ-projects towards FP projects reside in the inherent design differences between the two programmes. The bilateral orientation of the intergovernmental bilateral S&T agreements combined with sub-critical funding, which causes or demands only a very light project management, is not suited to cope with the requirements of the FPs in terms of consortium size and variety, project application and project management skills. Rather ERA-NETs could be considered as a logical bridge between the small-sized, mostly bilateral, WTZ-projects and the truly European FP projects which are large both in scale and scope.

Japan has been recently the country with a great success in technology transfer and absorption. They were able to combine imported technology with genuine organizational innovations such as quality circles or just-in-time system. Also well-known and appreciated is the Japanese corporate practice of knowing how to work with tacit knowledge (Nonaka-Takeushi). Thus, nowadays, many countries learn from Japan how to learn. One specific Japanese practice in presented in the case study by *Balázs Borsi.*

Borsi aims at showing the management practices of Japanese Research and Technology Institutions (RTIs), for which a benchmarking framework – originally developed in the European Union Framework Programme project – is used. The so-called RECORD benchmarks were elaborated for research organizations located in the New Member States of the European Union with the aim of helping their managements to learn from best practices.

During Spring 2009, with a research fellowship from the Japan Foundation, empirical data were collected from five renowned Japanese RTIs to see if the best practices (and the related benchmarks) are present and can be applied in a totally different socio-economic and cultural context. The research has indicated that good practices are manifest in Japanese RTIs. The strategic orientation, which is implicitly present in the benchmarks, is strong in Japanese R&D management.

Several years ago, Central European transition countries became New Member States of EU. In the innovation field, the process was linked to a new system of assessment. *Karel Mráček* analyses European standards in the assessment of Czech innovation performance.

Mráček describes system of innovation performance assessment currently operating in EU that is based on the specific set of innovation indicators regularly published in European Innovation Scoreboard. Summary Innovation Index

– also its dynamic variant – should enable the comparison of individual European countries. The aim of such innovation benchmark is to identify the reasons for lagging-behind on the part of some countries and to find the best practices in innovation policies. Mráček also works with strategic document Europe 2020.

Regionalization of Europe opened up a possibility fro the regions to run rich international cooperations and to draw financial support from the EU funds. *Jakub Pechlát* describes how the Prague Region makes use of the EU funds and evaluates their efficiency in the innovation area.

Pechlát argues that the need to evaluate projects supported by public resources calls for innovative methods of assessment. European Commission requests detailed monitoring of progress and sustainability of supported projects. The study presents one possible approach to evaluating projects funded under a particular programme with a broader perspective. The projects that aspire to contribute to regional innovation environment are under scrutiny. Following the method and conclusions of another study on innovation potential, the outcomes of measuring the contribution of European-funded projects to Prague innovation environment are presented. While investment-oriented projects' contribution seems more versatile, human resources-oriented projects seem to have a somewhat limited scope of effects.

The Potential of Transfer of Bilateral R&D Projects towards the European Framework Programme for Research and Technological Development

Klaus Schuch, Isabella Wagner, Elke Dall

Introduction

International research and development (R&D) cooperation is often supported by bilateral intergovernmental science and technology agreements (in German: wissenschaftlich-technische Abkommen, abbreviated WTZ) concluded between different countries. In Austria, projects supported under such bilateral S&T agreements are financed by the Federal Ministry of Science and Research (BMWF). At the operational level, the grants are administered by the OeAD-GmbH, the Austrian agency for international mobility and cooperation in education, science and research. These grants cover mainly individual mobility costs of researchers.

In the period between 1998 and 2008 Austria financially supported bilateral S&T agreements with the following countries: China – Croatia – Czech Republic – France –Hungary – Israel – Italy – Korea – Macedonia – Poland – Russian Federation – Slovakia – Slovenia – Spain – Ukraine – United Kingdom.

The bilateral S&T agreements aim to intensify the international scientific cooperation of Austrian scientists with scientists from partner countries by financing, on a cost-sharing principle with the partner country, mobility costs within the framework of bilateral (and sometimes trilateral and multilateral) projects. The projects shall support the creation of scientific cooperation networks which should ideally lead into larger collaborative R&D projects financed by other multilateral funding programmes (mainly the EU Framework Programme).[1] With this intention to spark further follow-up projects, bilateral S&T agreements affect a few of the common rationales that are supposed to drive the internationalisation of R&D. These drivers include:[2]

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[1] Buzeczki, Ch., *Bericht über die Evaluation der Mobilitätsförderung wissenschaftlicher Kooperationsprojekte im Rahmen der bilateralen Abkommen für wissenschaftlichtechnische Zusammenarbeit*, Bundesministerium für Bildung, Wissenschaft und Kultur, Vienna 2004 (Oktober).

[2] Boekholt, P. et al., *Drivers of International Cooperation in Research. Final Report* (2009), available at http://ec.europa.eu/research/iscp/pdf/drivers_sti.pdf, accessed on June 5, 2010.

- achieving research excellence in a globalised world
- improving competitiveness of industries and firms
- competition for scarce (human) resources
- science and technology (S&T) capability building
- maintaining good and stable diplomatic climate
- tackling societal issues and challenges with research

If the objectives for bilateral intergovernmental S&T agreements would stem from policy domains of development aid or S&T diplomacy, probably other potential partner countries would move into the cooperation focus than for R&D cooperation based on intrinsic science and research drivers with a focus on excellence and/or national competitiveness. In principle, bilateral S&T agreements could be shaped and designed to meet different objectives, including the one to provide a bridge to the Framework Programme, if this is a particular focus of both partner countries negotiating a bilateral intergovernmental collaboration. In the Austrian context, however, a rather standardised 'one-size-fits-all' approach with the partner countries has been implemented, which is designed rather in a Mode 1 spirit.[3] Usually the fields of research are thematically open or based on major headlines (e.g. life sciences etc.) with the highest demand in natural sciences. The target group is mainly universities, but also non-university institutes participate.[4]

Boekholt et al. analysed that *"for new EU Member States, bilateral collaboration agreements are still an important additional measure to facilitate cooperation of their domestic researchers in order to access complementary expertise, improve capabilities in national institutions and create another funding source for research (for instance Poland, Slovenia); for older EU Member States, bilateral agreements within Europe have lost much of their significance (mostly due to the many EU networks) but are still in active use for collaboration with Third Countries"*.[5]

Austria's R&D internationalisation orientation is still mostly focused on Europe. New initiatives target key regions such as North America, China, India, and the Western Balkans (CREST Working Group 2007). Evidently, Austria as small country with limited resources is not in the position to cooperate with all countries on all topics and therefore selection procedures have to be applied. An effective international cooperation strategy requires a long-term commitment of resources and a strategic and institutionalised approach in terms of partnering, instruments and funding, which in Austria would depend upon the cooperation of several ministries.[6]

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[3] Schuch, K., 'Embedded Innovation Cultures? MODE 1 / MODE 2 in International RTD Programmes', in: Loudin, J., Schuch, K. (eds.), *Innovation Cultures. Challenge and Learning Strategy*, Filosofia, Praha 2009.

[4] Buzeczki, Ch., op. cit.

[5] Boekholt, P. et al., op. cit., p. 17.

[6] Schuch, K., *Bestandsaufnahme und Positionierung der international ausgerichteten FTE-Programme*

The Framework Programme itself also stipulates the objective (among others) to internationalise and structure European R&D and to open it up to the world. Reflecting the European subsidiarity principle and the division of labour between the European, national and regional levels, the European Commission welcomes the implementation of sustainable partnerships of EU Member States with third countries and supports the coordination of national efforts with other EU Member States and the European Commission in order to capitalise potential synergies and to add critical mass to isolated activities.[7]

Since 2004 many European projects in the field of R&D (especially ERA-NETs, INCO-NETs and BILATs) collected valuable information about existing bilateral S&T programmes and hereunder supported projects, but little was done to analyse in how far projects funded under such bilateral intergovernmental S&T agreements were able and/or ready to transfer their project partnerships and project substance to follow-up projects within the European Framework Programme.[8]

Our investigation starts exactly at this point and focuses on two leading research questions:

a) Is there a transfer of bilateral intergovernmental projects (i.e. WTZ-projects) into the European Framework Programme and, if yes, how intense are these transfer dynamics and what do they depend on?
b) How did the transfer of knowledge between the partnering institutions within the bilateral projects look like from the Austrian actors' point of view?

For answering these two questions, two independent variables were assumed:

(1) The first independent variable is the **institutional background of the Austrian WTZ-project coordinators**, depending on whether they were from the university sector or the non-university sector.

Our assumption concerning the institutional affiliation's influence is that, in general, the programmatic design of intergovernmental bilateral S&T agreements (WTZ-agreements) is more suitable for university cooperation than for

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Österreichs. Analytical Report, Rat für Forschung und Technologieentwicklung, Vienna 2008, available on http://www.rat-fte.at/tl_files/uploads/Studien/0812_ZSI_Bestandsaufnahme%20international%20ausgerichteter%20FTE-Programme.pdf, accessed on July 2, 2010.

[7] *A Strategic European Framework for International Science and Technology Cooperation*, Communication from the Commission to the Council and the European Parliament, Policy Paper, European Commission, Brussels 2008 (September 24), available at http://ec.europa.eu/research/iscp/pdf/com_2008_588_en.pdf, accessed on June 26, 2010; *Opening to the World: International Cooperation in Science and Technology*, Report of the ERA Expert Group, European Commission, Brussels 2008, available from http://ec.europa.eu/research/era/pdf/eg6-international-cooperation_en.pdf, accessed on June 26, 2010.

[8] With *European Framework Programme for Research and Technological Development* we refer to the totality of Framework Programmes released from the first (FP1) to the current seventh Framework Programme (FP7).

non-university research organisations. Bilateral projects are usually small, only modestly funded and provide mainly travel costs for the exchange of research results. Therefore, Austrian public universities with a comparatively high institutional block-funding for research (compared to non-university research organisations) are more likely to profit from such additional funding. They can much more easily align their own research work with the bilateral project, while Austrian non-university research organisations usually have to develop a coherence between an externally funded project and the bilateral project (in terms of timing, funding, thematic focus and expected output). On the other hand, we assumed that Austrian non-university research organisations would be more inclined to bridge to the European Framework Programme for Research and Technological Development (FP), because they existentially depend much more on competitive funding sources than universities.

(2) The second independent variable is the **geographic background of the bilateral project partner**.

Our hypothesis concerning the country groups' influence on our research questions was that transfer activities and their success will crucially depend on the regional provenance of the project partner with its specific systemic nature (in the sense of national innovation systems). To prove that we created three country groups related to recent European history:

i) "old" EU Member States from Western Europe (France, Italy and Spain);
ii) Central European "new" EU Member States (Czech Republic, Hungary, Poland, Slovenia, Slovakia) and one Candidate Country associated to the 7th European Framework Programme for Research and Technological Development (Croatia) and
iii) international "Third Countries"[9] (China, Russia, Ukraine).

In the following chapters of this paper we test these assumptions, present our statistical findings and draw conclusions on the suitability of bilateral projects as bridges to the European Framework programme for RTD.

Survey sample and methodology

To examine the correlation between participation within bilateral intergovernmental S&T agreements (WTZ) and the European Framework Programme for RTD (FP), a survey was conducted in 2009. Austrian project coordina-

[9] Due to humble return rate and number of cases, no bilateral projects with Israel or Korea as partner countries could be analysed. The Group of "Third Countries" consists of China, Russia and Ukraine – countries that anyway have a more homogeneous organisational structure in science when not being combined with Israel and Korea.

Table 1: Description of basic population and response rates per country

	Population (i.e. bilateral projects)	% University in the population	% Other R&D Institutions in the population	% Response Rate
China	154	80.5%	19.5%	12.3%
Croatia	99	97.0%	3.0%	14.1%
Czech Republic	208	88.9%	11.1%	9.6%
France	167	92.2%	7.8%	10.2%
Hungary	228	86.8%	13.2%	8.8%
Israel	10	100.0%	0.0%	0.0%
Italy	89	95.5%	4.5%	10.1%
Korea	6	83.3%	16.7%	0.0%
Poland	203	93.1%	6.9%	6.9%
Russia	119	70.6%	29.4%	7.6%
Slovakia	12	91.7%	8.3%	41.7%
Slovenia	106	84.9%	15.1%	10.4%
Spain	243	90.9%	9.1%	10.3%
Ukraine	9	100.0%	0.0%	22.2%
	1 653	88.4%	11.6%	10.0%

tors[10] in different WTZ-programmes (China, Croatia, Czech Republic, France, Hungary, Israel, Italy, Korea, Poland, Russian Federation, Slovakia, Slovenia, Spain, Ukraine) have received an online questionnaire asking for their assessment of their bilateral projects as regards their satisfaction, sustainability of the networks, creation of follow-up projects, etc. The standardised questionnaire was in German language, consisted of 31 questions and was analysed in quantitative way. Each survey case equals one project, independently from the number of people and partners involved. All 1,653 Austrian project coordinators that had participated in one or more bilateral WTZ-projects in the period of 1998–2008 were contacted. In sum 165 Austrian coordinators replied, which corresponds to a response rate of exactly 10%. Most recently funded projects have not been addressed as they are still running and their results and impact are difficult to ascertain. More details on the data set and response rates for different groups are provided in Table 1 above.

[10] In bilateral intergovernmental projects usually two coordinators, one from each partnering country, share project coordination efforts. In our sample we included only the project coordinators from the Austrian side.

Table 2: Response rates and description of population

Country Groups	**Countries**	**N**	**% response rate**
Western European	France Italy Spain	51	**10.2%**
Central European	Poland Slovakia Slovenia Czech Republic Hungary and Croatia	84	**9.8%**
Third Countries*	China Russia Ukraine	30	**10.1%**
		165	**10.0%**

* no response: Israel, Korea

As shown in Table 1, in total 88.4% participants from the basic population are from the public university sector and 11.6% from the other non-university sector. This strongly resembles the actual take-up of bilateral S&T agreements in Austria. For analytical reasons we created a bipolar variable merging all other non-university institutions, including universities of applied sciences ("Fachhochschulen"), which constitute 1.2% of the basic population, into one category as opposed to 'pure' public university background as another. The reason for the inclusion of universities of applied sciences into the group of non-university research organisations is of structural nature and not because we would believe that universities of applied sciences would not fulfil university functions. The group of "other" research organisations, in which "real" non-university research centres (such as the Austrian Institute of Technology or the Centre for Social Innovation) dominate by far, clearly differs from the public university sector with respect to its funding regime. While research funding is pre-dominantly allocated to public universities in Austria through institutional block funding, universities of applied sciences and most non-university research organisations have primarily to compete for research grants on a project-by-project basis.

Despite the fact that the response rates were quite different between the cooperation projects with the different countries, if the countries are clustered into groups we find that the response rates between country groups are comparable (see Table 2). As mentioned above, the countries have been grouped in three categories:

(1) Western European EU Member States (France, Italy, Spain) with a high penetration of the FP in terms of successful participations and average to good positions in European S&T scoreboards. [11]

(2) Central European Countries including Poland, Slovakia, Slovenia, Czech Republic, Hungary and also Croatia, because Croatia's S&T structure is rather similar to those of the new Central European EU Member States. Croatia also has concluded an association agreement for FP7 which allows researchers from Croatia to participate in the Framework Programme with the same rights and obligations as Member States. All these countries in this group are at medium or lower levels in terms of FP participation.[12]

(3) the "Third Countries" category includes China, Russia, Ukraine; i.e. countries who are not EU Member States but allowed to participate in the Framework Programme as "International Cooperation Partner Countries" and which have concluded S&T agreements with the European Union.[13]

Although there might be a bias of self-selection in the response behaviour in favour of rather successful projects over unsuccessful ones as respondents would be more inclined to be interested in showing their achievements rather than their shortcomings, no country group is overrepresented in the sample. The non-response bias and the way in which non-respondents differ from the respondents can hardly be assessed.

The main characteristics of the respondents to the questionnaires are summarised in Table 3 below.

Table 3 Section 1 shows the basic bias of the programme towards public universities which represent almost 90% of the respondents in our survey. Sections 2 and 3 illustrate the distribution per partner country in our sample.

In order to analyse the satisfaction with the bilateral projects and the potential of bilateral intergovernmental S&T programmes to lead into joint applications for larger projects in the European Framework Programme (FP) for Research and Technological Development (RTD), it is important to see that almost two thirds of the Austrian respondents have already participated in the FP and that a third of their bilateral project partners also has had already experience with the FP.[14]

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[11] According to recent FP7-participation data, France ranks third, Italy forth and Spain fifth in terms of successful FP7 participations (*7. EU-Rahmenprogramm für Forschung, technologische Entwicklung und Demonstration (2007–2013)*, Proviso-Überblicksbericht, Proviso, Vienna 2011 (Juni)).

[12] In terms of FP7-participation Poland ranks 13th (after much smaller countries such as the Netherlands, Belgium, Sweden, Greece, Austria, Finland and Denmark), Hungary ranks 16th, Czech Republic 17th, Slovenia 19th and Slovakia 22nd).

[13] There have not been any respondents from bilateral projects with partners from Korea and Israel. These countries are therefore not included in the analysis.

[14] However, it has to be emphasised that 27.3% of the Austrian coordinators did not know if the project partner had any experience in the FP.

Table 3: Main characteristics of sample population

	%	N
1. Type of organisation (grouped)		
University	87.3	144
Other R&D institutions	12.7	21
2. Country of partner institution (in alphabetical order)		
China	11.5	19
Croatia	8.5	14
Czech Republic	12.1	20
France	10.3	17
Hungary	12.1	20
Italy	5.5	9
Poland	8.5	14
Russia	5.5	9
Slovakia	3.0	5
Slovenia	6.7	11
Spain	15.2	25
Ukraine	1.2	2
3. Country groups of partner institution (grouped)		
Western Europe (France, Italy, Spain)	31.0	31
Central Europe (Poland, Slovakia, Slovenia, Czech Republic, Hungary and Croatia)	50.9	84
"Third Countries" (China, Russia, Ukraine)	18.2	30
4. Field of science		
Natural Sciences	64.8	107
Technical Sciences	18.8	31
Medical Research	5.5	9
Agricultural Research	4.2	7
Social and Economic Sciences	3.0	5
Humanities	3.6	6
5. Experience with the European Framework Programme (FP)		
Austrian institution has experience in FP	62.4	103
Foreign partner has experience in FP	33.3	55

Table 4: Correlation matrix between the dependent variables

Correlation (Pearson) for the dependent variables							
	1.	2.	3.	4.	5.	6.	7.
1. Willingness to participate again[1]	1	.361***	.366***	.271***	-.268***	.322***	-.120
2. Quality of Results[2]		1	.645***	.368***	-.280***	.435***	-.173**
3. Personal Knowledge Gain[2]			1	.491***	-.335***	.528***	-.270***
4. Organisation's Knowledge Gain[2]				1	-.254***	.573***	-.227***
5. Usefulness as bridge to FP?[3]					1	-.227***	.283***
6. Strategic value of WTZ[2]						1	-.189**
7. Follow-up[4]							1
N	165						

NOTE: * significant at level ≤0.1; ** significant at level ≤0.05;
*** significant at level ≤0.01.

[1] 1 = yes, 2 = rather yes, 3 = rather no, 4 = no.

[2] 1 = very high, 2 = fair, 3 = rather little, 4 = hardly any.

[3] 1 = not useful at all, 2 = hardly useful, 3 = rather useful, 4 = very useful

[4] 0 = participation has not been discussed, 1 = was discussed, 2 = was submitted, 3 = was funded

As regards the field of research, the respondents have been attributed to common research categories[15], showing that most projects are positioned in the fields of natural sciences.

Based on the above mentioned assumptions, the main independent variables for the analysis are *'country group of the partner'* (in three groups) and *'type of organisation'* (university or other), while important controls include the *'field of science'* and *'previous experience in the Framework Programme (FP)'*. For the regression analysis we recoded *'field of science'* (natural sciences or other), and the other main independent variables into variables with only 1 or 0 values. In the case of 'type of institution', the university sector has the value 1, all others are 0. This is accordingly applicable to the other independent variables that form our model within the regression table.

[15] *Revised Field of Science (FOS) Classification in the FRASCATI manual*, OECD, Committee for Scientific and Technological Policy, Paris 2007; available at http://www.oecd.org/dataoecd/36/44/38235147.pdf, accessed on July 28, 2011).

The **dependent variables** which are **used to assess the success of the project** (i.e. its subjectively assessed quality, the personal satisfaction and knowledge gain on organisational level) include *'Willingness to participate in another WTZ-project again*' measured through a direct question if Austrian coordinators of bilateral projects would participate again on a scale from (1) yes, (2) rather yes, (3) rather no, (4) no. The category *'Quality of WTZ-project results'* (for example quality of publications, applications, etc.) has also been measured on a scale from (1) very high to (4) hardly any. The *'Individual knowledge gain'* for the Austrian coordinator and the *'Organisational knowledge gain',* which result (or not) from the bilateral project, as well as the *'Strategic value of the WTZ-project'* have all been measured on the same scale from 1 to 4.

Since we are particularly interested in concrete follow-ups of bilateral collaboration in the European Framework Programme, we recoded questions, such as, if a possible submission in the Framework Programme has been discussed with the partner, if any proposal has been submitted and if any project resulting from these discussions has also been funded into a variable which we labelled *'Follow-up in the Framework Programme'* indicating (0) participation in FP has not been discussed, (1) was discussed, (2) was discussed and proposal submitted, (3) was discussed, submitted and also funded. Finally a direct question to the coordinators has been included in the survey asking about their *'Assessment of WTZ as a useful bridge to the FP'*, measured on the scale (1) "not useful at all" to (4) "very useful".

Table 4 shows a means based correlation matrix that combines our seven dependent variables. We find, that our assumption, that all variables have some significant meaning for assessing the bilateral project's success, may be right because nearly all values turn out to be significantly correlating.

Based on our sample, the undertaken measures and the assumptions we made, we applied four different analytical tools within four steps:

1. Description

   By creating several frequency tables and diagrams we gained a picture of the overall absolute or percentile distributions of our main independent variables and therefore could basically describe our sample and formed our first assumptions.

2. Correlation

   The correlation matrix was used as a bi-variate analysis tool to understand how those dependent variables that we identified as indicators for assessing the project's success interact.

3. Mean Comparison

   Within two sections we compared the means of our main dependent indicator variables with our grouped independent variables. In the case

of *'type of organisation'* (university / other), we added a simple ANOVA test as there were only two dimensions to compare. In the second mean comparison table of *'country groups'* (Western European / Central European / Third Countries), we tested our level of significance with a one-way ANOVA with post-hoc LSD. The ANOVA test analyses the variance and shows us if our groups representing the independent variables (university or other R&D institutions; groups of partner countries) differ significantly from one another in terms of the dependent variables and the extent to which the groups differ compared with the standard of random distribution.

4. Regression

   A multiple regression analysis was conducted to investigate the effect of the independent variables ('*type of organisation'* and partner *'country groups'*) on our dependent ones. In order to assess the conclusions drawn between the independent and dependent variables, we also controlled for a potential bias through the time periods (between 1998 and 2008), research fields (natural sciences or other) and previous experience in the Framework Programme.

Summary of main findings

Austria's bilateral WTZ-project coordinators are *very* or *adequately satisfied* with the quality of the results generated within the projects (96% approval). The comparatively highest rate of satisfaction was reached within collaborative projects with partners from Western European EU Member States. 93% of the Austrian WTZ-project coordinators claim to have had a *very high* or *adequately high* personal learning effect and ¾ of the respondents reported a *very high* or *adequately high* learning effect for their research organisation. Only 4.2% would never again participate in a WTZ-project due to their (negative) experience with the programme. The "worst case" of total absence of any knowledge transfer within a project tends to appear more likely in projects with "Third Country" partners, although such cases do hardly appear. All in all Austrian representatives of the non-university sector assess techno-scientific results produced within a bilateral project significantly more sceptically than their colleagues from the public universities.

84% of all bilateral projects were followed-up in one or the other way. Nearly 60% of the Austrian project coordinators considered the submission of a follow-up project within the European Framework Programme together with their partner. Altogether 22% finally conducted an FP submission resulting in an astonishingly high rate of approval. General speaking, however, other forms of

Table 5: Means comparison of success indicators by type of organisation

Dependent variables indicating success of the project	University	Other R&D Institutions	Mean Difference
1. Willingness to participate again[1]	**1.19**	**1.48**	**0.29****
2. Quality of Results[2]	**1.37**	**1.86**	**0.49*****
3. Personal Knowledge Gain[2]	**1.51**	**1.81**	**0.30***
4. Organisation's Knowledge Gain[2]	1.97	2.14	0.17
5. Usefulness as bridge to FP?[3]	3.13	2.90	–0.23
6. Strategic value of WTZ 2	1.96	2.19	0.23
7. Follow-up 4	0.89	1.05	0.16

NOTE: * significant at level ≤0.1; ** significant at level ≤0.05; *** significant at level ≤0.01.

[1] 1 = yes, 2 = rather yes, 3 = rather no, 4 = no.

[2] 1 = very high, 2 = fair, 3 = rather little, 4 = hardly any.

[3] 1 = not useful at all, 2 = hardly useful, 3 = rather useful, 4 = very useful

[4] 0 = participation has not been discussed, 1 = was discussed, 2 = was submitted, 3 = was funded; a higher number means a more concrete follow-up

follow-ups were preferred. In terms of the institutional affiliation we identified that nearly half of university-based coordinators make use of own resources for follow-ups. In contrast to their colleagues outside of the university system they tend to be less motivated to apply for a FP-project within the next two years. These different ways of using resources and affinities towards engagement in the FP may correlate with the different modes of funding of research institutions within and outside the university sector.

In Table 5 we summarised that researchers from non-university organisations are more sceptical towards the overall success of bilateral projects than their colleagues from universities. They are also significantly less willing to participate again in a bilateral project (line 1), less satisfied with the output of the project (line 2) and with their personal knowledge gain (line 3).

Nevertheless, non-university respondents also regard the bilateral projects as a useful bridge to FP-projects (line 5) and they are slightly more inclined to actually implement a follow up in the FP (line 7), although the arithmetic mean differences are not statistically significant.

"Old" Western European EU Member States enjoy more confidence to have the skills to steer an FP-project whereas partners from classic Third Countries tend to be less trusted in this respect. However, 90% of the foreign partners are rated to have good capacities for participation in an FP-project (but not necessarily to steer it as project coordinators).

Table 6: Means comparison of success and follow-up indicators by groups of countries

Dependent variables indicating success of the project	Western Europe [a]	Central Europe [b]	Third Countries [c]
1. Willingness to participate again[1]	**1.08**^{*b*c}	**1.29**^{*a}	**1.33**^{*a}
2. Quality of Results[2]	**1.24**^{**b***c}	**1.48**^{**a}	**1.63**^{***a}
3. Personal Knowledge Gain[2]	**1.31**^{***b**c}	**1.65**^{***a}	**1.67**^{**a}
4. Organisation's Knowledge Gain[2]	1.88	2.07	1.93
5. Usefulness as bridge to FP?[3]	**3.31**^{**b*c}	**3.01**^{**a}	**3.0**^{*a}
6. Strategic value of WTZ[2]	1.86	2.04	2.07
7. Follow-up[4]	**1.16**^{*b**c}	**0.86**^{*a}	**0.63**^{**a}

NOTE: * significant at level ≤0.1; ** significant at level ≤0.05; *** significant at level ≤0.01.

[1] 1 = yes, 2 = rather yes, 3 = rather no, 4 = no.

[2] 1 = very high, 2 = fair, 3 = rather little, 4 = hardly any.

[3] 1 = not useful at all, 2 = hardly useful, 3 = rather useful, 4 = very useful

[4] 0 = participation has not been discussed, 1 = was discussed, 2 = was submitted, 3 = was funded

Assessing the differences between the partner country groups computed, we see in Table 6 that the main difference, both in the variables indicating the success of the projects (lines 2, 3, 4) and in the possible follow up in the Framework Programme (lines 5, 7), relates to the partners from "old" Western European EU Member States, i.e. the cooperation with Italy, Spain and France. Obviously, the knowledge gains (particularly on personal level, line 3), the assessment of the quality of the results (line 2) and the willingness to participate again in a bilateral project (line 1) are higher in cooperation projects with these "old" Western European EU Member States than with the other country groups.

The bilateral S&T agreements are also significantly more likely assessed as a useful bridge to the Framework Programme in cooperation with Member States from Western European countries than in cooperation with Central European or third countries (line 5). Similarly, the implementation of a concrete follow-up in the FP was significantly more likely together with partners from the "old" Western European EU Member States (line 7).

In general, follow-up submissions for an FP-project are least considered with partners from Third Countries, but if once a serious discussion for a submission has taken place, 40% of those who discussed a joint submission to the FP also realised it. Only FP-submissions with "old" Western European EU Member States are more likely to be realised at that point (60%). Least effective in terms of follow-up realisation are FP-project submissions with partners from Central Europe (30%). However, if a project submission within the FP was actually realised, than no statistically significant differences in the success rates between the

Table 7: Regression analysis on the influence of independent variables

	1. Willingness to participate again 1	2. Assessed Quality of Results 2	3. Personal Knowledge Gain 2	4. Usefulness as a bridge to FP 3	5. Strategic value of WTZ 2	6. Follow up 4
1. Type of institution: **University**	.226	**.367*****	.217	–.172	.140	.155
2. Country group[1]: **Western Europe**	–.214	**–.305****	**–.298***	.190	–.165	**.440****
3. Country group[2]: **Central Europe**	–.016	–.136	–.004	.007	–.002	.224
4. Timeframe[6]	**–.074****	–.034	–.006	–.035	–.092*	–.055
5. Field of science: **Natural Sciences**	–.056	**–.256*****	–.064	–.073	–.038	–.223
6. Experience: **Austrian**[5]	.018	**.190****	.093	–.016	**.214***	**.265***
7. Experience: **Foreign partner**[5]	–.102	**–.124***	–.093	**.317*****	**–.154***	**.305*****
R^2	.098	.197	.089	.119	.078	.161
N	165	165	165	165	165	165

NOTE: * significant at level ≤0.1; ** significant at level ≤0.05; *** significant at level ≤0.01.

[1] 1 = yes, 2 = rather yes, 3 = rather no, 4 = no; a higher number means less likelihood to participate again.

[2] 1 = very high, 2 = fair, 3 = rather little, 4 = hardly any; a higher number means a lower quality of results, a lower personal knowledge gain or a lower strategic value.

[3] 1 = not useful at all, 2 = hardly useful, 3 = rather useful, 4 = very useful; a higher number means that WTZs are assessed as more useful to provide a bridge to the FP.

[4] 0 = participation has not been discussed, 1 = was discussed, 2 = was submitted, 3 = was funded; a higher number means a more concrete follow-up.

[5] within the European Framework Programme: 0 = I don't know, 1 = no, 2 = yes; a higher number means more experience in the FP.

[6] Biannual Periods from 1998–2008 (coded as 1–4); a higher number means a younger project.

different country groups exist anymore. This underlines the importance of the "mobilisation" factor, which was already influential for the level of participation of Central European countries in the 5th European Framework Programme for RTD, when these countries became the first time associated to the FP.[16]

In ⅔ of the cases, Austrian coordinators of bilateral projects perceived a balanced knowledge transfer between the Austrian and the foreign project partner. In most other cases, Austrian project coordinators stated a tendency of directional knowledge transfer that rather flows from the Austrian to the foreign partner institutions. Because Austria has a rather advanced research structure than most of her partnering countries, such a partially unbalanced transfer of knowledge is little surprising.

In the regression table 7, we have included the point of time when the bilateral project has been carried out (older projects started already in 1998, younger projects in 2006),[17] the field of science and the assessment of experience in the Framework Programme.

The quality of results is best explained through our model in Table 7 (column 2): Austrian coordinators of bilateral projects from universities perceive a higher satisfaction with the outputs than coordinators from the non-university sector (line 1). Satisfaction is also higher if the Austrian coordinator of a bilateral project cooperated with a partner from an "old" Western European EU Member States (line 2)[18], if the cooperation was carried out in the natural sciences (line 5) and if the partner has had already some experience in the Framework Programme (line 7). Contrary, the satisfaction with the output of the bilateral WTZ-project is actually lower if the Austrian partner has had already experience in the FP (line 6). We assume that Austrian bilateral project coordinators with experience in the European Framework Programme are more used to better funded and larger projects, which obviously yield also comparatively better results.

As regards the follow-up in the Framework Programme (column 6), we can identify again the partnership with an "old" Western European EU Member State (line 2) as a significant positive influence in the model, and the influence of previous experience in the FP is of utmost importance for another engagement in the FP (lines 6, 7).

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[16] Schuch, K., *The Integration of Central Europe into the European System of Research. An empirical Study of the Participation of Central European Countries in the 4th and 5th European Framework Programme for RTD*. Guthmann-Peterson, Vienna – Müllheim a.d. Ruhr 2005.

[17] Bilateral WTZ-projects usually last for two years, which is a standard of bilateral intergovernmental agreements in which Austria is involved.

[18] In other words, the cooperation with Western European countries such as France, Italy and Spain (line 2) is significantly yielding better outputs (column 2), a higher individual personal knowledge gain (column 3) and a more likely follow-up in the European Framework Programme (column 6).

The specific analysis of the previous experience of the Austrian project partner in the Framework Programme (line 6) shows us that the more experience a partner has in this respect, the less satisfied s/he is with the quality of the results of the bilateral project, the less strategic value is attributed to the WTZ but the more likely a concrete follow-up leads to a funded FP-project.

The attributed FP-experience of the partner (line 7) explains quite well the variance in our dependent variables, i.e. the more FP-experience a partner is assumed to have, the higher appreciated are the outputs of the bilateral project (column 2), the more useful the bilateral project is perceived as a bridge to the FP (column 4), the higher the strategic value of the bilateral project collaboration (column 5) and the more concrete the follow-up in the FP is (column 6).

We can conclude that the previous FP-experience of the foreign partner is also a very important pull factor for a further engagement of the Austrian project partner in an FP-project. We cautiously assume that – vice versa – the absence of foreign partners with FP-experience in a bilateral project will reduce the likelihood of follow-ups in the European Framework Programme and that different cooperation and funding modes in the sphere of international R&D cooperation might exist or emerge: one mode which is rather self-contained with the bilateral means available and probably endowed with some own resources (predominantly from the university sector), and the other mode which is offensive in transcending the narrow bilateral funding regime (and activity corridor) by outreaching towards the European Framework Programme.

The timeframe (line 4) influences in particular the willingness to participate again in a bilateral project, so that coordinators of older projects are actually less likely to participate again (column 1), and older projects are also assessed to have a lower strategic value for the research organisation (column 5).

Observing a very high percentage of Austrian WTZ-project partners from the university sector as institutional background (87,4%) as well as a nearly two thirds share of projects in the field of the natural sciences it might be assumed that the two variables explain similar issues in relation to our dependent variables. This however is not the case. A correlation table between the two independent variables shows no significant correlation and a quite evenly distributed amount of natural scientific projects in both institutional groups, university sector and non-university sector.

The WTZ-agreements' bias towards natural sciences therefore needs its own explanations for possible correlations with regards to transferability to the FP. Coded as a 1/0 variable (natural sciences / any other field of research) it does not significantly explain the models within our regression table except for the element of the assessed quality of the results of the bilateral projects. It seems that natural scientists are significantly more satisfied with the quality of their publications, application, and results of test series or else produced in the course of

the bilateral project than scientists from any other field. Predictions in terms of a higher transferability of natural scientific bilateral projects into the European Framework Programme, however, can not be made based on the present data.

What is remarkable, though, is the fact that the projects in the field of the natural sciences are significantly more likely to be continued with own funding than bilateral projects in all other fields. Although bilateral projects in the natural sciences seem to create very satisfying results and are basically dedicated to be continued, even with own money, there are no statistically significant indicators that they are more likely to be transferred into the FP.

In the following chapters we will go into detailed interpretations of the results achieved with focus on the connection between bilateral projects and the European Framework Programme, the influence of the countries of origin of the project partners and the knowledge transfer dynamics within the bilateral projects.

Connection between bilateral and European projects

More than 60% of the responding Austrian WTZ-project coordinators claim to already have taken part in one of the European Framework Programmes of which there are seven by now. There were few who could not say for sure whether or not they (their organisation) have had already participated in the FP (3%). Among the Austrian coordinators of bilateral projects who have not yet participated in a FP project are mainly respondents with university background, while only 14.3% of the WTZ-project coordinators from the non-university sector claim to have no FP-experience yet. Overall experience within the FP, accumulated by the number of project participations from FP1 to FP7, shows clearly that participants from non-university research institutions are relatively more experienced with the FP than participants from the university sector.

Projects within the European Framework Programme rarely were starting points for a bilateral WTZ-cooperation. Only in 11.5% of all cases a WTZ-project was based on a previous FP-project. The inverse constellation, namely that previous bilateral WTZ-cooperation eventually leads to FP-participation can be found much more frequently: Almost 60% of all Austrian WTZ-coordinators have discussed or considered a mutual FP-submission with their foreign project partner before, independent from their organisational affiliation. Amongst these, nearly 40% actually did submit an FP-application of which 46% got funded by the European Commission for the respectively submitted projects. This success rate is surprisingly high as compared to the average rate of approval in the FPs of around 20% to 25% (differentiated by the three Framework Programmes applicable for this study: FP5, FP6 and FP7).

We may draw on several assumptions for explaining that: The first is metrological in nature caused by a probably disproportionate response rate of projects that might have had rather positive experiences with the transfer of their WTZ-project into the FP. In this case it can be assumed, that this group in general was more "talkative" than the group of Austrian WTZ-coordinators who have not attempted to carry their projects over or failed to do so. Because the research question of the present study was known by the addressed Austrian coordinators of bilateral projects, this explanatory assumption is not unrealistic. An alternative explanatory assumption for this high success rate is, that a first testing of the substance of research work in a bilateral project as well as the testing of the bilateral[19] cooperation itself, might lead to a sounder basis for a future successful project submission in the European Framework Programme. What speaks in favour of this assumption is the fact that amongst all 165 cases examined, "only" 22.2% transferred (and transformed) their initial bilateral project into an FP-submission. This indicates a selective filtering process towards the more complex FP ("stairway of excellence"). This filtering process actually does not show statistically remarkable differences between participants from the university versus the non-university sector.

Those 22.2% of the cases investigated that did submit a follow-up project to the FP are contrasted by 39.4% of bilateral project cases that submitted with their foreign cooperation partners one or more consecutive projects to funding schemes outside the FP (for example national funding programmes). This allows the conclusion that in quantitative terms follow-up possibilities other than FP were preferred (or possible).

Furthermore nearly half of the Austrian coordinators of bilateral WTZ-projects from the university-sector who neither have follow-up projects within the FP nor outside continued their work with the help of own (university) finances. This type of financially and structurally internalised follow-up differs significantly from the participants with non-university research background, of which only 19% of those who neither followed-up their collaborative work within the FP nor within other programmes financed (or – more precisely – were able to finance) follow-up projects with own resources. The reason for these dynamics seems to be a clearly worse financial situation of the non-university institutions, whose research endeavours depend mostly on competitively acquired project funding. Conversely participants from non-university setting tend to be more active in terms of inevitable follow-up project acquisition.

This is also reflected in the generally higher willingness of researchers from

[19] In fact most of the WTZ-projects are of bilateral nature, but very often peripherally include additional research colleagues from other teams and sometimes other countries, e.g.: in closing conferences, visits in laboratories, etc. (Buzeczki, Ch., *Bericht über die Evaluation der Mobilitätsförderung wissenschaftlicher Kooperationsprojekte im Rahmen der bilateralen Abkommen für wissenschaftlich-technische Zusammenarbeit*, op. cit.).

the non-university sector to attempt actual submission within the FP. In this respect there are significant differences between the university and the non-university sector in Austria. Whereas over one third of the researchers from the university sector aspire at *no* or *rather no* future project submission within the FP, 62% of the non-university related participants clearly consider applying for FP-funds and more than another third at least tends towards submission efforts (*"rather yes"*) within the next two years. None of the responding coordinators from the non-university sector replied with *no* or *rather no*.

Was there a dedicated science policy demand in enforcing WTZ-agreements' power of initialising Austrian FP-involvement, then one must argue, based on the findings presented in this paper, that these bilateral intergovernmental agreements should be made more attractive and inclusive for non-university research institutions, as they clearly show higher affinity for continuing FP-submissions and therefore a higher likelihood of transfers from bilateral projects into the FP can be expected.

All in all it can be stated that nearly 16% of all investigated projects are not continued in neither one nor the other way. Whereas many previous bilateral WTZ-projects are followed-up in the university sector at least by using own institutional funding (50% of incidents), 42.1% of all bilateral projects coordinated by an Austrian researcher from the non-university sector did not experience a follow-up, whereat the lack of own resources seems to be the most important reason for that. However, these detected tendencies are based only on a small number of cases. Regarding their structural orientation WTZ-agreements can clearly be described as university biased.

Influence of the partner countries

The following chapter is dedicated to describe in more detail the influence of the countries of origin of the project partners with respect to the transferability of bilateral projects to the European Framework Programme. These findings are based on the recorded perceptions of the Austrian coordinators of bilateral WTZ-projects. Foreign partners have not been included in the survey.

For the purpose of the analysis, the cooperation countries were divided into three groups. The first group contains the so-called "old" Western European EU Member States France, Italy and Spain, which have medium or advanced positions in European S&T scoreboards and much participation in the European Framework Programme.[20] The second group consists of Central European

[20] According to recent FP7-participation data, France ranks third, Italy forth and Spain fifth in terms of successful FP7-participations (*7. EU-Rahmenprogramm für Forschung, technologische Entwicklung und Demonstration (2007–2013)*, op.cit.).

Countries: Croatia,[21] Czech Republic, Hungary, Slovakia, Slovenia and Poland. These countries are at medium or lower levels in terms of FP-participation.[22] The third group consists of so called "Third Countries"[23] and in our case was built of China, Russia and Ukraine. This classification leads our research in several ways: First we comply with the current science-policy discourse of to what extent it actually would still make sense in the emerging European Research Area to operationalise bilateral WTZ-agreements with "old" or "new" EU Member States. Secondly the question of the potential of transferability of bilateral WTZ-projects into the European Framework Programme has to be put into the context of the cooperation countries, because the European Framework Programme, although in principle open for partners from outside the EU, is still driven by European objectives, agendas and interests (and not global ones). And thirdly and finally we roughly approximate structural similarities in research systems by clustering Austria's bilateral partner countries into these three groups.

In that way the Western European "old" EU Member State group can be characterised by considerable competitive research capability, while the Central European group of former post-communist or post real-socialist transformation countries inherited a roughly comparable research structure, mostly still fighting with similar problems of modernisation in the area of S&T and insufficient FP-participation (regarding the later aspect, however, Slovenia and Hungary are positive exceptions here).[24] The "Third Countries" group consists of emerging economies with extensive science potential, although this can be deducted from different trajectory paths. China in this respect is regarded as "rising star", whereas Russia and Ukraine rather try to maintain their traditionally high research capacities on an acceptably high level. Because of their bilateral, little regulative and flexible character (in comparison to complex multilateral R&D programmes), bilateral intergovernmental S&T agreements seem from a science diplomacy perspective to be a particularly appropriate instrument to foster

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[21] Croatia is the only country in this group which is not (yet) EU Member State, but in terms of S&T structurally comparable to the other countries in this group. Croatia is also fully associated to FP7 and has also been associated to FP6 starting from January 1, 2006.

[22] In terms of FP7-participation Poland ranks 13th (after much smaller countries such as the Netherlands, Belgium, Sweden, Greece, Austria, Finland and Denmark), Hungary ranks 16th, Czech Republic 17th, Slovenia 19th and Slovakia 22nd).

[23] Due to a humble return rate and number of cases, no WTZ-projects with Israel or Korea as partner countries could be analysed. The Group of "Third Countries" consists of China, Russia and Ukraine – countries that anyway have a more homogeneous organisational S&T structure, if not pooled together with Israel and Korea.

[24] These are the only two countries in the Central European group with a higher relative share of successful FP-participations (measured against al EU27 FP-participations) than their relative share of researchers expressed in full-time-equivalents (measured against the number of all EU27 researchers in terms of full-time-equivalents) (*7. EU-Rahmenprogramm für Forschung, technologische Entwicklung und Demonstration (2007–2013)*, op.cit.).

foreign science relations with geographic or structurally *more remote* countries. Interestingly, however, Austria does not make use of this flexibility potential, but rather employs one basic programmatic design for all her intergovernmental bilateral S&T agreements ("one-size-fits-all approach").[25]

The polled Austrian bilateral WTZ-project coordinators indicated that one third of their foreign project partners have already been engaged before in FP-projects. The differences between the three country groups are statistically significant. Not surprisingly bilateral research partners from Western European countries are more FP experienced (54.9%), followed by partners from the Central European countries, of which 28.6% already participated within the European Framework Programme. Partners from Third Countries have comparably less FP-project experience (10%). This is not at all surprising, because the FPs are designed for intensification of European cooperation rather than global collaboration. However, this information, as well as the one presented in the next paragraph, shall be interpreted with caution, because 27.3% of the Austrian project coordinators did not know for sure whether their foreign partners have already participated within one of the FPs or not.

There are also statistically significant differences that correlate closely with the results above on the question of how experienced the foreign project partner was assessed by the Austrian coordinators in terms of FP-participation at the point in time when the bilateral WTZ-project started. In 47.1% of the cases partners of the Western European group were assessed as *"very experienced",* while only 22.6% of the CEE partners and only 3.3% of the Third Country partners enjoyed the same high assignment. This result is little surprising and triggers the conclusion that mainly bilateral projects with experienced foreign project partners should be funded (and therefore by trend rather from Western European countries), if an hegemonial research policy would foster an instrumentalisation of the bilateral intergovernmental S&T agreement with regards to high transfer numbers into the European Framework Programme.

Figure 1 shows that the perception of the capability of the foreign project partner to coordinate an FP-project depends significantly on the different country groups. Austrian coordinators of bilateral projects assigned highest trust to partners form "old" Western European EU Member States, a bit less for Central European countries and least to partners from Third Countries. Scepticism seems to be higher here because of the obvious greater lack of experience with the daily processes and "rules of game" for coordinating an FP-project in the sense of lacking adequate "behavioural additionality".[26]

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[25] Schuch, K., 'Embedded Innovation Cultures? MODE 1 / MODE 2 in International RTD Programmes', op. cit.

[26] Falk, R., *Behavioural Additionality Effects of R&D-Subsidies*, Österreichisches Institut für Wirtschaftsforschung, Vienna 2004.

Fig. 1: Assessed capability of the foreign project partner to coordinate an FP-project by country groups from the Austrian WTZ-project coordinators' perspective

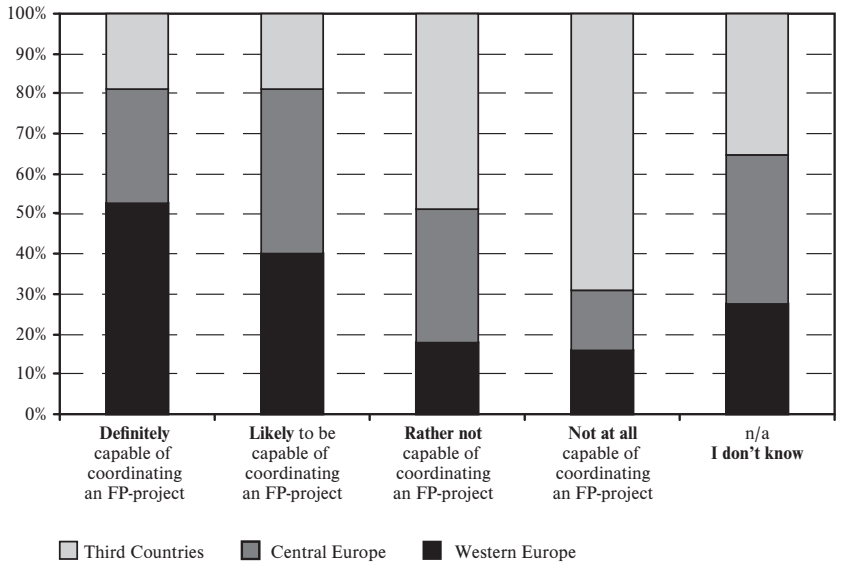


Fig. 1 shall be read in the way that for each answer category (e.g.: *"definitely capable of coordinating an FP-project"*) the percentage values are compared with the respective ones in each country group and are standardised in a scale of 100% for each answer category. Therefore no conclusions about the absolute values can be made, but the results clearly mirror the perceived differences in context of the countries of origin of the project partners.

Comparing the assessed *capability* to coordinate an FP-project with the assessed *willingness* of the foreign project partners to coordinate an FP7-project, we see that Austrian WTZ-project coordinators tend to rate the willingness of their partners from the Western European group lower than these partners' capabilities. On contrary, the willingness of the project partners from Central European countries was estimated higher than their capabilities of coordinating an FP-project. There are no perceivable differences between capability and willingness assessed for the countries subsumed under the Third Country group.

One should not over-rate these results, because they are statistically ambiguous. Nevertheless, based on the perception of the Austrian WTZ-project coordinators a feeling arises that those partners that *can* coordinate an FP-project possibly to a lesser extent *want* to do so whereas those partners who *want* probably *cannot* coordinate an FP-project.

The partnering institutions' capability of participation within an FP7-project in turn was clearly rated as positively (90%) by the Austrian coordinators of bilateral WTZ-projects. Statistically noticeable differences between the country groups in this case are not measurable. There is only a tendency towards slightly higher scepticism with respect to the project partners from Third Countries. This in sum quite high estimation shows that the transfer of bilateral projects into the FP mostly does not fail because of the lack of capacity of the foreign project partner. In this respect the question rather arises of who actually is *willing* to take the burden of the coordination work and *entrusted* to do so by its partners. Indeed two thirds of the bilateral projects with partners from the Western European country group did already discuss or consider a joint project application for the European Framework Programme. For the bilateral projects with partners from Central European countries this value reaches 60%. Both differ significantly from the bilateral projects with Third Country partners, where an FP-submission was only considered in 40% of the cases. 50% of those who discussed a mutual FP-submission actually did also submit an application together with their partners from the Western European countries, but only 30% submitted an FP-application with their partners from the Central European group. This share is even lower than with partners from the Third Country group (40%).

Why the FP-submission propensity of the Third Country group exceeds the one of the CEE group remains unclear. This might be the question of a lack of funding alternatives that more or less forces the dedicated bilateral projects with partners from Third Countries to "*fall back on*" the European Framework Programme when they want to continue their research work with their partners. This is speculation but is corroborated by the observation that continuation of collaboration with partners from Third Countries – in comparison to other country groups – is least followed-up by own funding means. The comparably low FP-follow-up-rate with partners from the Central European country group vice versa could eventually be explained by the existence of other alternative funding options or priorities towards collaboration. This country group shows also the highest percentage of follow-ups based on own funding. In case a project submission within the FP is actually made, than there is no statistically significant difference in terms of success rates between the three country groups anymore.

Knowledge transfer within bilateral projects

Asked for the knowledge transfer dynamics within the bilateral WTZ-projects two thirds of all Austrian project coordinators stated, that knowledge gains were bi-directional and balanced. 17%, however, stated that knowledge transfer might

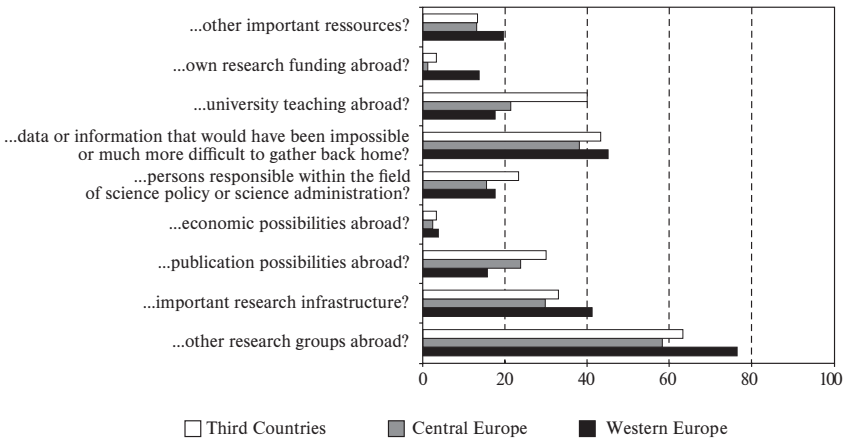
have happened a bit more intensively from themselves to the foreign partner and another 10% stated a clear tilt towards the partnering institutions. In contrast, only 3.6% assessed the overall knowledge transfer tendencies more towards the Austrian partners themselves. Another 3.6% (i.e. 6 cases) reported that no knowledge transfer had taken place at all. In these few cases one perhaps can speak of a complete failure of the bilateral collaboration. These cases accumulate in projects with Third Countries where 10% of the bilateral WTZ-projects did not generate satisfying knowledge transfers. The highest share of balanced knowledge transfer was detected in projects with Western European countries (in 78.4% of the cases), followed by the Central Europe group (64.3%). For the CEE countries 27.4% of the Austrian coordinators of bilateral WTZ-projects reported a directional knowledge transfer towards their partners. In the cases of the Third Country group this tilt is even more distinct (36.6%). There are, however, also scattered cases of knowledge transfers towards the Austrian partner traceable in both country groups.

It is interesting that Austrian coordinators of bilateral WTZ-projects from the non-university sector tend to be more sceptical as regards the knowledge transfer within the bilateral projects than their colleagues from public universities.

Personal learning effects from bilateral collaborations are rated as *very high* or at least *adequately high* by 92.7% of all responding Austrian coordinators of bilateral projects. This is an indicator for a successful exploitation of the intergovernmental bilateral S&T agreements from an Austrian perspective. The differences between the Austrian participants from the university or non-university research sector are not significant. With regards to the learning effects for the whole research institution of the Austrian WTZ-project coordinator the results are comparatively lower: Almost a fifth noticed *little* or *no* learning effects on the institute's level. In this context we find no significant differences between university and non-university research. The strategic value of the bilateral project within the home institution was rated as *very high* by 30.9% of the Austrian WTZ-project coordinators and 43.6% at least stated an *adequately high* value. 21.2% *rather* tend to see *no* strategic value in their endeavours and 4.2% answered the question on the strategic value with *not at all*. The last category has a significantly high share within the group of non-university research institutions (14.3%).

Regarding the achieved quality of the delivered results within the bilateral project (e.g. quality of publications, test results, applications, etc.) assessed by the Austrian WTZ-project coordinators, we find a very high appreciation. 95.7% cases reported a *high* or *adequate* satisfaction with their output with a significantly more critical stance on the side of the non-university sector. 21% of the Austrian coordinators of bilateral WTZ-projects from non-university research rated the overall quality of results as doubtful whereas only 2.1% of universi-

Fig. 2: Additional benefits differentiated by country groups of the foreign project partners



ty based coordinators did so. Due to the humble number of cases, the more sceptical view of the non-university institutions does not profoundly shape the absolute overall result, which is mainly formed by the answering behaviour of researchers from the university sector.

Reasons why the bilateral WTZ-cooperation of the Austrian coordinators with non-university background is rated more sceptical can only be guessed. We assume that the funding regime of the WTZ-collaboration has a threefold impact on this scepticism[27] which should not to be underestimated: (1) the annual average WTZ-project funding of about € 2.000,00 to € 3.000,00 does hardly suffice for covering additional project costs (those costs that emerge purely because of the fact that the project exists) and therefore bilateral projects have to find complementary funding sources to compensate that. Most easily obtainable and flexibly deployable financial resources are own funds, which, however, are actually hardly or not at all available for non-university research institutions. (2) Due to the small WTZ-project funding personnel costs can not be covered, which is often a central motive for project acquisition in the non-university sector, because of the lack of publicly funded planned staff positions. (3) The WTZ-project funding does not allow coverage of overhead costs, what leads to a sinking institutional motivation and benefit for non-university research institutions. While overhead costs are covered to a high extent by institutional block funding at the side of university research, the non-university research sector clearly is more dependent on overhead cost mark-ups on direct project costs.

[27] Schuch, K., 'Embedded Innovation Cultures? MODE 1 / MODE 2 in International RTD Programmes', op. cit.

Fig. 2 shows additional beneficial effects of the examined bilateral WTZ-projects differentiated by groups of countries. Benefits are measurable in all three country groups (and there is no statistically significant variation in this respect), but the lowest additional benefits in almost all categories are observable in bilateral WTZ-collaborations with partners from the Central European group under scrutiny.

In average 64.8% of the Austrian WTZ-coordinators stated that their foreign project partners provided them access to other research groups. This is applicable mostly for partners from the group of Western European countries which was the relatively most successful enabler. Here, 41.2% of the respondents stated that they got access to important research infrastructure, whereas the average over all three country groups was only 33.9% in this respect.

In terms of (a) creation of access to foreign publication possibilities, (b) enabling of access to responsible persons ("key-accounts") in the field of science policy or administration and (c) enabling of teaching in the foreign country, partners from the Third Country group were comparatively most beneficial for the Austrian coordinators of bilateral WTZ-projects.

We consider these as early-mover based entrance effects into quasi new markets. Whereas we assume that in regular bilateral collaborations with partners from Western European countries the prevalent scientific publication possibilities are more or less known or "tested" (in the sense that it is "normally" wanted from both sides to publish in international professional journals), Third Countries enable "special", not yet exploited publication additionalities (like for example in the nationally renowned professional journals of the national academies of sciences). There could also be thematically differentiated additional benefits that play a role in this respect, e.g. trough a stronger contextuality or localisation of published knowledge in the social sciences or humanities.[28]

It shall also be stated that additional economic benefits from bilateral collaboration appear only in very few cases and that the enabled access of Austrian researchers to foreign funding budgets is only statistically significantly measurable with regards to the Western European countries group under scrutiny. An above-average *very high* individual learning effect was stated by those Austrian coordinators of bilateral WTZ-projects who collaborated with partners from the group of Western European countries (72.5%). The comparative value from the Third Country group or the Central European countries group lies clearly below this benchmark with 50% of *very high* approval or 42.9% respectively.[29]

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[28] Perhaps the "impact" of a publication in Russian language dealing with one aspect of the political system in Russia is higher for the Russian editors and readers than if the same article would be published in an (eventually less referenced) international professional journal in English language.

[29] In this respect it is very interesting, that projects with partners from the Third Country group show a comparably *very high* rate of stated learning effects on the organisational level (36.7%), whereas the average over all WTZ project country groups was slightly below 30%.

Tab. 8: WTZ-projects as expedient bridge into the European Framework Programme distinguished by country groups (in %; as assessed by the Austrian project coordinators)

Country of origin of the project partner	Not at all or little expedient (in %)	Rather expedient (in %)	Very expedient (in %)
Western Europe	13.7	37.3	49.0
Central Europe	21.5	51.2	27.4
Third Countries	33.3	30.0	36.7

Accordingly the highest quality of results was rated within projects partnering up with Western European states: 78.4% of the Austrian WTZ-project coordinators with partners from this group state a *very high* quality whereas comparative values for the CEE group and the Third Country group are below this percentage (59.5% and 46.7% respectively).

Incompatibilities in transferring bilateral projects towards European schemes

Almost 80% of the responding Austrian WTZ-project coordinators regard the bilateral WTZ-projects as expedient bridge for project submissions within the European Framework Programme. Reversely more that one fifth takes a sceptical stance on the WTZ's function as a bridge. This kind of approval and denial strongly correlates with the partners' origin (see Table 8) which in turn correlates with the basic willingness to submit an FP-project within the next two years. To simplify these interrelations one can state that the highest probability for a submission of a follow-up proposal in the FP is given when the project partner is based in one of the "old" Western European EU Member States and submissions are least probable with project partners from Third Countries.

Regarding barriers of transferring bilateral projects into FP-proposal submissions almost one half of the respondents negate the argument that the ample scope of financial tolerance of the WTZ-projects is a good preparation for an FP-project submission. Nearly two thirds think that the complexity of the two kinds of project applications (application for a bilateral WTZ-project *or* for an FP-project) is so different that a transfer from a WTZ-application to an FP-application would not be easily possible. A bit over half of the respondents agreed that due to the mainly bilateral orientation of the intergovernmental bilateral S&T agreements no broad consortial base for a follow-up FP-submission can be created. Not even a quarter of the project coordinators believe that the project management skills necessary to master a bilateral WTZ-project would be sufficient for participating in a multilateral FP-project.

The thematic differences between the European Framework Programme and the bilateral intergovernmental S&T agreements, however, were considered less restrictive with respect to the potential bridging function. Concerning this matter merely one quarter of the respondents took a negative position. Likewise the lack of project partners from the business-enterprise sector in bilateral projects was regarded as a less grave problem for building a bridge to the FP.

From the listed barriers in terms of the transferability of bilateral projects into the European Framework Programme one might reason that a broadening of the bilateral to a multi-lateral perspective with a parallel increasing of financial support would be a logical action of adaptation to emphasise the bridging function of the bilateral intergovernmental S&T agreements towards FP-submission. This consequently would lead to an increase of the complexity of the application process and – in case of approval – an increase in the complexity of the project management. The instrument of the ERA-NETs might provide a proven and tested framework in this regard, which could more easily bridge between the below-critical-mass bilateral WTZ-projects and the complexity of European R&D projects.

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Re-learning from Japan: Managing Innovative Research and Technology Institutes

Balázs Borsi

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Innovation Performance in the EU and the Czech Republic: Results, Problems and Measures

Karel Mráček

Introduction

Growing and increasing competitive pressures are becoming an accompanying phenomenon of the globalised economy. The attention to assessing and achieving competitiveness, aimed initially at individual enterprises, is being expanded in this context on the level of national economies, national states, world regions and integration groupings. Questions are raised, to what extent the individual entrepreneurial subjects, countries, regions and integration groupings will be able to withstand the ever-increasing competitive pressures and remain competitive. In the contemporary world, advanced European countries and the U.S. are threatened by loss of dynamics, associated with a number of other factors (such as the consumer lifestyle associated with living on growing debts, increasing of government debts, population development, the growing potential of the BRIC countries, etc). There are specific challenges and opportunities how to master the situation of the new environment in the twenty-first century. In this context, literature and policy documents (issued by EU, OECD and/or by individual countries), increasingly hail the transition to the knowledge-based economy. Even in the past we can trace back real effects of successful exploitation of knowledge and in some theoretical works, we can find views on the significant importance of knowledge accumulation for long-term economic growth as well as views on the gradual growth of the role of intangible investments in economy. This new, however, now lies in the speed and scale of production and dissemination of knowledge and, on the whole, in recognition of knowledge as a strategic asset. Since the 70's there has been accelerating structural change in advanced economies involving transition from an industrialised economy (mainly based on work, tangible capital and material resources) to the economy increasingly based on the creation, diffusion and use of new knowledge. Characteristic features of this shift include intensification of research activities, increasing pressure on the innovative dimension of research as well as increasingly rapid implementation of innovations and rising demand for education and growth of people's skills. At the same time, human capital is accepted as a key factor for creation of new knowledge, its dissemination and effective use. Transition

to the knowledge economy is associated with new key technologies (especially with the information and communication technology), with their effects on production of knowledge, its accumulation and diffusion; with intensification of production, implementation and dissemination of technical, organizational and social innovations; with an impact on almost all aspects of social life (knowledge society).

The developed countries currently consider as a fundamental source of competitiveness not only strong research and development, but the powerful innovation system as a whole, i.e. production of knowledge in relation to its application, particularly in the commercial sphere. Competition is the main driving force behind innovation. At the same time, by the process of creation and application of knowledge, cooperative ties are being developed, there is also increasing cooperation activity among various components of the innovation process, activities of industry, academic institutions and state authorities are being interconnected. Virtually all forms of cooperation, such as cooperative research, partnership of the public and private sector, international and domestic strategic alliances, direct foreign investments, etc. show signs of growth. This is supported by the fact that in recent years, the ongoing rapid expansion of information and communication technologies (ICT) has created preconditions for more interconnected (networked) economy.

The ICT innovations are not only important in themselves, but they represent, by their universal character, an important tool for development of innovations in various fields and disciplines; they technologically enable and support the efficient creation of different institutionalised networks and clusters in favour of emergence and spread of innovations.

European strategies and innovation performance assessment

In the EU, research, development, innovation and education are taken as a key to the growth of European competitiveness. The original Lisbon strategy, adopted in 2000, defined the transition to the knowledge economy as an important prerequisite to meet the set goals. High attention to knowledge, research and innovation was also included in the revised Lisbon Strategy in 2005. Numerous statements and actions following this strategy have been adopted. However, the expected results in many cases failed to appear. With the growth of political initiatives promoting research, development and innovation after the year 2000, a question arises, to what extent are the ways and means used in the European research and innovation policies the real news emerged from the European environment and whether they are adequate for this environment. Europe has absorbed many tools from the USA – such as clusters, innovation networks,

technology companies of a new type e.g. start-up and/or spin-off firms, science and technology parks, etc. Thus a particular challenge for the future becomes the achievement of greater innovativeness in the process of creating our own European research and innovation policies.

Though the results achieved by the Lisbon strategy in the field of research, innovation and education (and not just in it) were not yet analysed deeply enough, new strings of political activities and initiatives are being developed in this direction in the framework of the "Europe 2020" strategy.[1] The driving forces for the further growth of the economy, according to the strategy "Europe 2020", are represented by Knowledge and Innovation (so-called smart growth strategy). Similarly, the now formed national competitiveness strategies (see e.g. CR) emphasise research, development, innovation and education. Attention of the strategy "Europe 2020" is to be focused mainly on strengthening of research efforts, on transformation of inventions into products and processes innovation, on transfer of technologies and knowledge throughout the EU territory, on making full use of ICT, and on the overall quality improvement of educational processes. The wording of this strategy indicates that there should be a new growth; although there are not so many significant changes in comparison with the former Lisbon strategy; the role of R&D, innovation and education in the growth of competitiveness of the Union and its Member States is again stressed. Nevertheless, in the context of explicitly formulated smart, sustainable and inclusive growth, the possibility of new targeting and reorientation of spending of means is given.

For example, R&D expenditure is re-established as a target of 3% of GDP, i.e. in the amount determined on the 2002 spring session of the European Council in Barcelona, in connection with the Lisbon strategy. But the expenditure is no longer strictly divided into 1% of GDP from public resources and 2% of GDP from private resources, and capacities of individual member countries are more taken into account. The need to increase private sector investments into R&D in the EU is continuously required, as the level of investment is still lower compared with the U.S. As a matter of fact, competing in investment into R&D on a world scale has its long-term tradition and corresponds to the current situation of globalised economy. Since the second half of the 20th century, we can encounter in the world economy the fact that the success in an international competition has been always associated with the promotion and development in the fields of science and technology. Science and technology have been repeatedly considered to be means enabling to reach goals of Great Powers; they represent conception of the assumed way leading to realisation of economy growth, to the

[1] *Europe 2020. A Strategy for Smart, Sustainable and Inclusive Growth*, COM (2010) 2020 final, European Commission, Brussels, March 3, 2010, available at http://europa.eu/legislation_summaries/employment_and_social_policy/eu2020/em0028_en.htm, accessed on December 4, 2010.

attainment of affluent society and/or to the rising living standard. Various documents from the past issued by the U.S., OECD, Japan, as well as by the former Soviet Union and other former socialist countries, testify about it. So we can find increasing requirements for support of research and development in one or another form already throughout the second half of the 20th century.

The specific requirement of 3% share of expenditure on R&D from GDP has also its certain tradition in a global scale. Already in early 60's among economists and politicians prevailed opinion about necessity of increased investment into research and development both from public and private resources and thereby ensure the further growth of GDP. This was based on relatively simple linear concept, when the support devoted to the development of science and technology was to be followed by economic growth, which should has been positively reflected in the growth of living standards. The model of the U.S. 3% of GDP share of expenditures on R&D then became the inspiration. It was necessary to make comparisons with this model, and so in that spirit – "radically increase spending on science and research" – as the OECD report then mobilized advanced economies.[2] This approach also corresponded with the prevailing science-push model of innovation behaviour. In addition, the global political environment in the period of 60's was characterised by large investments in so-called big science (see, e.g. space research, nuclear research), but also in various areas of military research. In the early 70's, however, a completely different, distinct tone started to be heard. The OECD report which was prepared under the guidance of prof. H. Brooks of Harvard University talked about wrecked hopes, about the need for a complete rebuilding of research policies, and in particular about "social failure" of science and technology.[3] The actual economic growth increasingly came into confrontation with social and environmental problems; science and technology were then criticized that they did not contribute to their solution. Since the early 70's, we have witnessed gradual creation of new institutions in this area, namely those founding assumptions of broad consensus in society (technology assessment etc.). Attention started to be more and more distinctly shifted to the issues of effective transfer of research results into practice, and the demand-pull model asserted itself as a dominant explanatory model of the innovation process. With the growing process of globalisation in the 80's and especially 90's there was growing orientation aimed to secure needs of competitiveness; non-linear models of the innovation process and the changing relations in academic and business spheres came to the fore and new generations of innovative policies have being formed.

Currently, according to the latest available and comparable data, the total investment in research and development in the European Union doesn't reach

[2] *Science and Policies of Governments*, OECD, Paris 1963.

[3] *Science, Growth and Society. A New Perspective*, OECD, Paris 1971.

even 2% of GDP, while in the U.S. it is 2.7% of GDP and in Japan 3.4% of GDP.[4] As the cause of this ongoing EU investment lagging behind the U.S. and Japan is considered the significant difference between individual EU Member States in R&D intensity (especially between the northern countries of the Union on the one hand and the southern EU countries and new member states on the other hand), and especially the fact that EU failed to achieve a more significant reversal in the level of funds expended from private sources for research and development. In addition, for the time being, there are not yet available comprehensive statistical data from which would be evident what was the overall impact of the financial and economic crisis on the field of research and development. Nevertheless, according to some partial surveys and estimates there was not a more significant downturn in corporate research and development; especially large (but again mainly American) companies invested steadily in research even in the times of crisis.

But it will be necessary to focus more of our attention on outcomes and consequences of required investments, where Europe also lags behind the U.S. and Japan in a number of indicators. In particular, it is the area of innovations, to which is also aimed one of the flagship initiatives (called Innovation Union) in the framework of the "Europe 2020" strategy implementation.[5] We can state that also here, as a matter of fact, will be continued in implementation of requirements already demanded by the Lisbon strategy that failed to be realised for various reasons in the past decade.

In recent years, increasing attention is being paid in a given firm or country to the issue of innovation performance and to its growth, in close connection with the required increase in competitiveness and its factors. The competitive environment is in its essence indispensable and irreplaceable for innovation activities, and its absence or weakening causes negative effects on the offer of inventions and innovations. At the same time, however, it seems that entrepreneurial subjects often start to solve their problem of competitiveness by innovative activity then and only then when all other ways, often less demanding from the financial and other resources points of view, are completely closed to them. However, any concept of innovation to be realistic, must come primarily from the fact that there is always a close link between the innovation as a primarily business phenomenon and maintaining firm's competitiveness. In this context, equal conditions for economic competition have to be required. The innovation environment must therefore be regarded as an organic part of the business environment, containing the overall regulatory framework and institutional arrange-

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[4] *Science, Technology and Innovation in Europe*, European Union (Eurostat – Pocketbooks), Luxembourg 2010, available at http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-32-10-225/EN/KS-32-10-225-EN.PDF, accessed on December 4, 2010.

[5] *Europe 2020. A Strategy for Smart, Sustainable and Inclusive Growth*, op. cit.

ments created by the government. Specific measures taken by state authorities to promote research, development and innovation should then be guided primarily by an effort to provide remedy or prevent some market failure in this area.

In globalised economy, attention has grown to generation of various ranking lists, allowing international comparison of competitiveness and innovation performance. These ranking lists are using not only individual indicators, but also summary indices, based on various selected factors of economic and social development. We can find the most respected annual evaluation of competitiveness of individual countries in the world in particular in the Global Competitiveness Index (published by the World Economic Forum) and in the IMD index (featured in The World Competitiveness Yearbook). These assessments include, based on a multi-criteria approach, also positions of the compared countries in the field of research, development and innovation. A special assessment, oriented to growth of innovation performance of Member States has been launched within the EU in the context of the Lisbon strategy.

Assessment of innovation performance, currently used in the EU, is essentially based on a set of selected indicators of a wide range of inputs and outputs of innovation activities and on use of a composite indicator for international assessment of innovation performance – so called Summary Innovation Index (SII), which represents an unweighted mean of the standardised values of all indicators used for comparison of individual countries. The dynamics of growth of innovative performance is also taken into account and measured to show changes among individual indicators and SII. The result assessments were in the last decade published annually in The European Innovation Scoreboard (EIS), subsidized by the European Commission. This Scoreboard, together with an assessment methodology was prepared based on the request resulting from the meeting of the European Council held in Lisbon in the spring 2000. Its task was to contribute to the so-called open method of coordination of national policies within the EU. The aim was not only determine ranking of countries, but also to look for the causes of success or lagging and to apply the best practices while respecting the specificities of each country. Therefore the EIS with its indicators began to be also considered as an effective tool for benchmarking of innovation policies of individual countries.

During its use, however, the assessment methodology had been gradually adjusted and changed. The most significant changes occurred in 2005 when the EIS was completely revised and then in 2008, when the structure of its indicators was substantially changed and many new indicators were introduced. From this year on, indicators were also sorted into blocks and dimensions. Assessments were made both according to individual indicators including their trends as well as based on the Summary Innovation Index and its trends. The EIS assessment gradually included, except the EU member states, also some other

European countries. Attention also has been devoted to comparing the EU and its member countries with the U.S. and Japan and more recently with the BRIC countries, namely with China. In the last issue of EIS 2009, structure of three blocks (enablers, firm activities and outputs) and seven innovation dimensions with a total of 29 individual assessment indicators has been used.[6]

As mentioned above, the increased rate of attention is devoted to improving innovation performance in the "Europe 2020" strategy, especially in the flagship initiative of the Innovation Union. The results achieved in the implementation of this flagship initiative are to be continuously monitored and evaluated annually. For this purpose, inter alia, a newly developed ranking system called Innovation Union Scoreboard (IUS) will be used which basically comes from the above mentioned EIS.[7] Data from this assessment will be published annually and broken down by individual EU Member States, by the EU27 as a whole, by other European countries that are not EU members, and by the main competitors of the EU, using the latest available statistics. As for EU Member States, possibility is to be gradually sought, how to enable access to the regional data levels. There are also considerations that some indicators should be broken down by gender (e.g. in the field of human resources). This innovative performance assessment should be conducted throughout the implementation of the Europe 2020 strategy, assuming that it will be periodically reviewed depending on the availability of new data, resources or on new policy orientation. The Commission also indicated that it would probably look for other performance indicators in the field of knowledge and innovation, particularly in more aggregated form.

The original list of 29 indicators in the EIS has been replaced with a new list of 25 indicators, which should reportedly better capture the performance of national research and innovation systems considered as a whole. Nineteen indicators of the new IUS have been taken over from the original EIS; 12 of them without any change, 2 indicators have been merged and 5 indicators have been partly changed by using broader or narrower definitions or different denominators. As a matter of fact, 18 indicators of the IUS 2010 are equivalent to those of the EIS 2009 and in addition 7 new indicators have been introduced into this system of innovation performance assessment. These new indicators include: International scientific co-publications; Scientific publications ranged among

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[6] *European Innovation Scoreboard 2009. Comparative Analysis of Innovation Performance*, PRO INNO Europe, European Commission, DG Enterprise and Industry, Brussels 2010, available at http://www.proinno-europe.eu/page/european-innovation-scoreboard-2009, accessed on December 4, 2010.

[7] *Innovation Union Scoreboard 2010. The Innovation Union's Performance Scoreboard for Research and Innovation*, PRO INNO Europe, European Commission, DG Enterprise and Industry, Brussels 2011, available at http://www.proinno-europe.eu/inno-metrics/page/innovation-union-scoreboard-2010, accessed on December 4, 2010.

the top 10% most cited publications worldwide; Non-EU doctorate students; PCT patent applications; PCT patent applications in societal challenges; High-growth innovative firms; Employment in knowledge-intensive activities (manufacturing and services).

As for the data sources, Eurostat and other internationally recognized sources (OECD, OHIM, EVCA, Thomson / Scopus) are used, taking in account the necessary comparability between countries. However, the problem is the timeliness of data that differs in individual indicators (in the case of IUS 2010 there are 10 indicators available from the year 2009, other 10 indicators date back to the year 2008 and 4 indicators are even from the year 2007). Data indication for the High-growth innovative firms (as a percentage of the total number of enterprises) are not yet secured in a satisfactory form, their availability is verified and therefore, for the time being, to calculate the Summary Innovation Index, 24 indicators have been used. In connection with the availability and timeliness of data for different individual indicators, authors of IUS 2010 also pointed out that they could not yet fully reflect the impact of the financial and economic crisis on the innovation performance of the EU and individual member countries. As for BRIC countries, they are developing very dynamically, especially China, but comparable data are often available with a several years of delay, which reduces their predicative value and limits possibility to use the assessments and react by adopting updated policy within the EU and its Member Countries.

According to IUS 2010 the innovation performance of the U.S. and Japan is still higher than that of the EU27.[8] It is true that the gap in innovation performance between the U.S. and the EU27 in the period until 2007 had been diminished (according to existing EIS measurements), but in the last three years the relative increase of the EU27 was slowed down and the gap (according to the results of the IUS 2010) has been very slowly, but once again increased. In total, the average of the indicators of innovation performance in the U.S. shows value by 49% higher than the EU27 (according to IUS 2010). As for the innovation performance gap between the EU27 and Japan, it remained roughly stable since 2005. This gap is slightly narrower; nevertheless, the Japanese innovation performance exceeds the EU27 by 40%. Only 12 indicators were used to comparable assessment of the EU27 with the U.S. and Japan: New doctorate graduates; Tertiary education; International scientific co-publications; Most cited publications; Public R&D expenditures; Business R&D expenditure; Public-private co-publications; PCT patents applications; PCT patent applications in societal challenges; Medium and high-tech product exports; Knowledge-intensive services exports and Licence and patent revenues from abroad.

[8] Ibid.

The U.S. show better results in 10 of these indicators used for comparison with the EU27, i.e. in overwhelming majority of the indicators. In particular, they have superiority in Licence and patent revenues from abroad,

in Public-private co-publications, in Tertiary education and in Business R&D expenditures. EU27 achieves better results only in 2 indicators used for comparison, namely in Public R&D expenditures and in Knowledge-intensive services exports. A positive feature is that the EU27 has already in some of indicators slightly higher dynamics than the U.S. (except for licence and patent revenues, New doctorate graduates, International scientific co-publications and Business R&D expenditures).

Japan shows better results than the EU27 in 7 indicators. It has a much better position in Licenses and patents revenues from abroad, in Business R&D expenditures and in Patent applications. The EU27 compared with Japan is then more active and effective in the number of New doctorate graduates, in Most cited publications, in Knowledge-intensive services exports, in International scientific co-publications and in Public R&D expenditures.

In summary, the gap between the EU27 and the U.S. and Japan in innovation performance can be explained by lower competitiveness in the field of international patent activities, by less effective links between public research and private sector, by tertiary education levels, by lower business R&D expenditures and by less successful commercialisation of research results.

In our opinion the diversity of the EU27 Member States, their different levels in science, technology and economics participate on the above-mentioned gap in innovation performance in relation to the U.S. and Japan. This is confirmed both by the EIS 2009 and by the first publication of IUS 2010 where the EU Member States have been divided into four groups according to their order in total innovation performance, determined as an average based on the set of selected indicators. Innovation leaders are represented by Sweden, Denmark, Finland and Germany, and they achieve a considerably higher innovation performance than the EU27 average. At the other end of the ranking lists are Romania, Lithuania, Bulgaria and Latvia with innovation performance considerably lower than the EU27 average (the so-called Modest Innovators).

Due to the fact that the IUS is to be the monitoring tool for the whole period of the flagship initiative Innovation Union within Europe 2020 strategy implementation, we can assume that it will continue to operate within the context of its objective of convergence with groups of the EU Member States and with their ranking which is based on different levels of achieved innovation performance and on its growth. The IUS 2010 brings a change in marking of the last group, originally called catching-up countries. Now they are called "Modest Innovators". There were also some shifts in the inclusion of some countries into groups and change of their rank on the scale of innovation performance

(probably also due to the changed set of followed indicators). Nevertheless, the overall concept of improving policy of innovation performance within the EU, based on catching up and convergence has not been changed.

When assessing development of innovation performance in the IUS 2010, the data reflecting impact of the economic crisis were not available and therefore could not be properly evaluated. Nevertheless, partial surveys and investigations have confirmed fears of a certain slowdown or disruption of convergence processes in innovation performance among EU27 countries. The relatively rapid rise of innovation performance running in the comparably weaker economies will not be obviously retained, at least in a short term, because of different depth of the course and impact of the crisis on individual countries.[9] Some countries in euro areas are likely to be affected by the impact of the growing national debts.

Position of the Czech Republic in innovation performance

As concerns position of the Czech Republic within the EU27, it is ranked, according to EIS 2009, to the group of countries known as "Moderate Innovators". According to Summary Innovation Index (SII value = 0.415) in the EIS 2009 assessment, it took even first place in this group of countries, relatively close to the EU27 average (0.478). The Czech Republic thus took 15th place in this database among the EU27 Member States (from the new member countries behind Estonia and Slovenia). But according to IUS database, it recorded decrease by two spots to 17th place, as it was overtaken by Portugal and Italy. The value of its innovation performance remained basically unchanged (0.414). However, the spacing between the CR compared with the EU27 average (0.516), has been increased.

As for the dynamics of innovation performance, which is calculated based on the development of individual indicators making up SII, is the Czech Republic by IUS 2010 rating (with average annual growth of 2.57% in the five-year period) among slightly growing countries in the group of Moderate Innovators. In the EU27 countries reached this average annual growth value of 0.85%. The group of Moderate Innovators (into which was CR transferred from the " catching-up countries"already in EIS 2007) shows so far lesser innovation performance than the average performance of the EU27 countries, but they have a higher growth trends. The Czech Republic is expected to reach the EU average, according to the Summary Innovation Index, in the course of next 10 years.

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[9] Kanerva, M., Hollanders, H., 'The Impact of the Economic Crisis on Innovation. Analysis Based on the Innobarometer 2009 Survey', *INNO Metrics Thematic Paper*, European Commission, DG Enterprise and Industry, Brussels 2009, available at http://www.proinno-europe.eu/page/thematic-papers-2, accessed on December 4, 2010.

There are some promising growth trends in the CR innovation performance in recent years, which can be described as a positive fact. However, the situation in many areas is not satisfactory, and the innovation gap between CR and the developed countries is still significant. Relatively weak points of the Czech Republic (lagging behind the EU27 average) can be identified in the following areas:

- in the area of intellectual property rights as a certain intermediate output of the innovation process, where only 5 EU countries had worse results than CR. CR patent applications amounted only about 25% of the EU27 average, and the very patent activity represented in the long-run the worst CR results even in the framework of the former EIS comparisons. But lagging is still evident in the field of community industrial designs (only 48% of the EU27 average) and trademarks (only 45% of the EU27 average);
- in the group of indicators Finance and support: lagging is caused mainly due to very low investments of venture capital reaching only 10% of the EU27 average;
- in the group of indicators characterising Open, excellent and attractive research systems, where on the one hand the CR moves well above the EU27 average in participation in International scientific co-publications, but on the other hand it is far behind the Most cited publications (45% of the EU27 average), and especially in the number of Non-EU doctorate students (16% of the EU27 average);
- in Public – private co-publications (68% of the EU27 average), which gives evidence on unsatisfactory cooperation between the public and private sector research;
- and there is relatively low share of population aged 30-34 with completed tertiary education in the total population (54% of the EU27 average). On the other hand, in the group of indicators Human resources is the CR above the U27 average in the case of youth with completed secondary education. The Czech Republic together with Slovakia occupies in a long-term leading position in the EU. As for the number of New doctorate graduates is the CR on the EU27 average level.

CR is slightly above the EU27 average in the group of indicators characterizing business investment in R&D and innovation[2] (in this case, however, entirely due to innovation expenses, excluding intramural and extramural spending on research and development), and further in the group of indicators Innovators (first of all due to increased activity in the case of organisational and marketing innovations) and in the group of indicators Economic effects characterizing the effects of innovation (namely due to exports of medium-high and high-tech products of processing industry, sales of new to market products and new products in terms of the company, while at the same time, there is very significant lagging behind EU27 average in revenues from licenses and patents from abroad).

Conceptual, methodological and data problems of the current assessment of innovation performance

Despite the relative expansion and use of innovation Scoreboards for benchmarking in current innovation policies, it can be stated that based on their analysis, the current monitoring of innovation performance has some conceptual, methodological and data problems. As concerns *conceptual problems* we are still missing due and relevant consideration of various specifics of individual national innovation systems. Therefore, we should be more cautious when interpreting results of the Summary innovation index (SII) and possibly any other newly generated composite indices of this type. They should be used as a starting point for further and deeper analyses in individual countries, regions and areas. We have to keep in mind that assessment indicators used as a base for SII, represent mostly economic views and approaches. The question in this context is whether mastering of traditional economic factors can be considered to be sufficient for the path to higher innovation performance. It turns out that knowledge in the field of innovation performance of firms and countries cannot get by with just monitoring and comparing the current selected indicators of inputs and outputs of the innovation process and their possible interpretation in the spirit and principles of catching up and imitation, but that it requires a deeper analysis of the causes and consequences of a lack of innovation activities in European countries. The results of this analysis could also contribute to solving of the current European problem, associated with inadequate transfer of knowledge and its conversion into innovation.

Efforts to introduce in EU convergence process and the current conditions of the globalised economy have a strong influence on contemporary European national research and innovation policies. In this context, the policies contain responses to signals about a particular position or spacing on selected and/or monitored parameters aimed to support and make use of research, development and innovation. The policies respond to assessments used within EU (EIS now IUS), to OECD reports and statistics and/or to internationally recognized evaluation reports on competitiveness of individual countries (Global Competitiveness Report, World Competitiveness Yearbook). Assessment procedures using various innovation performance ranking lists offer a seemingly viable way of catching-up and levelling as an approach to the formation of national policies in the field of research and innovation. E.g. in the case of the new EU Member States, specifically there was an effort to reach gradually the average level of EU countries and at the same time to achieve higher value in some monitored indicators, and first of all, to come as close as possible to the values reached by the original countries of EU 15. Besides catching-up on the national level is increasing attention paid to catching-up at the regional level in conjunction with the implementation of the principles of cohesion policy. However, some

methodical and methodological shortcomings and restrictions used in the assessment ranking lists should be discussed.

Approach towards formulation of national research and innovation policies based on catching-up and convergence is then usually and logically accompanied by imitation approach as another seemingly viable way to determine the national policies. It is, as matter of fact, a transfer of objectives and measures to promote research, development and innovation, that were designed and implemented in other European or non-European countries, mainly based on the successful impact of these measures in the country of origin on its innovative performance. But less attention is devoted to different conditions and environment of the individual countries. However, both approaches have already found their place in the formulation of the Czech national research and innovation policy. On the other hand, it cannot be denied that for a small economy living in the world of globalisation is very difficult to find its own and original way and avoid all approaches in terms of catching-up and imitation.

Difficulties in catching-up and imitation lie first of all in limited means of the state budget, often also in insufficient resources (thin capitalisation) of the corporate sector. Series of possible suitable tools and measures are affordable only to big and rich economies. The path towards catching-up and convergence of innovation performance requires, among others, to increase expenses on research and development, to ensure growth of the number of science and engineering courses and graduates at universities, to achieve a higher number of patents, etc. And the fact alone that values of factors are growing doesn't give any guarantee for growth of the innovation activities, increasing of innovation performance, or generation of desired higher-order innovations. Likewise, growth in the number of applications and granted patents does not automatically increase their overall economic values. In addition, various factors combine and complement one another. E.g. existence of available funds for research and development is insufficient condition to achieve the required effect if there is not sufficiently high quality of human potential in this area, without efficient allocation of these funds, without adequate absorption capacity of the industry and without fulfilment of other factors. When we transfer relevant instruments and measures of a research and innovation policies from another country, we should take into account socio-economic environment and problems of this country as well as possible different cultural and historical tradition. At first glance viable and attractive way, enabling formulation of a research and innovation policy on the basis of mere catching-up, imitation or by using transfer of appropriate tools and measures, may be won't ultimately lead to a success.

When we prepare assessment of innovation activities in the context of catching-up and imitation, we usually pay more attention to weak points. It became already quite traditional perspective, which is used also by different institutions and companies, strengthened by effort to gain some support from public sourc-

es. But success in the growing competitive environment requires often and first of all purposeful and intense evaluation and use of strengths to achieve higher innovation performance. It requires also identification and deeper understanding of frequently neglected factors, which can play an important role in given economic and social conditions. The problem with them, however, may be that they are difficult to be quantified, measured and described by a suitable indicator.

Methodological and data problems of monitoring and assessment of innovation performance are mainly linked with the fact that during the use of EIS, and now with the transition to IUS the methodology has been changed and also indicators were changed and amended. These various changes and introduction of new indicators limit possibility to carry out comparisons of a longer period of time. Moreover, all indicators have the same weight and thus they act by the comparison of innovation performance all as equally important. Difficulties are also with collecting data for some indicators from individual member states to ensure the comparison for the same year. In addition, the data available at the time of processing EIS and IUS reports on the situation in the given area have one-to two-year delay, sometimes greater. Last but not least – there is also need to enhance overall data quality.

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Evaluating the Contribution of EU-funded Projects to Prague Innovation Environment

Jakub Pechlát

Introduction

Providing financial support to countries and regions from the level of the European Union requires thorough and regular evaluation of the effects this support generates. As with all subsidies there is an inherent level of inefficiency that has to be minimised. It is the regular evaluation that can help to prevent such inefficiency and to further improve the focus, scope and conditions of the support.

Throughout the process of programme preparation, countries and regions have to put the proposed measures into the framework of European, national and regional development strategies. This was the case of Prague operational programmes that we will focus on in this article: Single Programming Document for Objective 2 (2004–2006, SPD 2), Single Programming Document for Objective 3 (2004–2006, SPD 3) and Operational Programme Prague Competitiveness (2007–2013, OPPC). Those three programmes were to some extent focused on improving the innovation environment in Prague and thus were subject to our analysis.

Introduction of the programmes

With the accession of the Czech Republic into the EU, the country – and its regions – gained access to financial support from European Structural Funds. Operational programmes were elaborated to provide a framework for access to this support. In the first programming period 2004–2006, Prague's good economic performance together with EU rules led to an obligation to choose only a part of the city to become eligible for the support under the investment oriented programme SPD 2. After a complicated process a selection of 24 city districts was made which form the so called "selected area". This restriction did not apply to the human resources oriented SPD 3 programme and was completely removed for the period 2007–2013.

The structure of the **SPD 2** programme was the following:

Priority 1 – Revitalization and development of city environment (75.2%)

Priority 2 – Building up the future prosperity of selected area (22.3%)

Priority 3 – Technical Assistance (2.5%)

The structure of the **SPD 3** programme was the following:

Priority 1 – Active Employment Policy (16%)

Priority 2 – Social Integration and Equal Opportunities (24%)

Priority 3 – Lifelong Learning (29%)

Priority 4 – Adaptability and Entrepreneurship (26%)

Priority 5 – Technical Assistance (5%)

The structure of the **OPPC** programme was the following:

Priority Axis 1 – Transport Accessibility and ICT Development (37.2%)

Priority Axis 2 – Environment (25%)

Priority Axis 3 – Innovations and Enterprise (25%)

Priority Axis 4 – Technical Assistance (2.8%)

Each programme has a priority with an emphasis on innovation-related measures. Numbers in brackets show the share on each programme's budget of the respective priorities. To provide a complete picture of Prague's operational programmes we have to mention the Operational Programme Prague – Adaptability as well. It is a successor of SPD 3, yet the scope of its innovation-related features is lower than that of the SPD 3 to such extent that we decided to exclude it from the focus of this article.

Presenting the projects

During the 2004 to 2006 period, 11 projects from SPD 2 and 38 projects from SPD 3 were implemented which to some extent contributed to improving the innovation environment in Prague. The cost of the projects attained 460.2 million CZK and 424.7 million CZK respectively. Since 2007 till autumn 2010, another 34 projects were approved for implementation from OPPC with a total cost of 1,363 million CZK.

The SPD 2 projects varied significantly in their scope and focus, ranging from information centres to business incubators. The SPD 3 projects were most often focused on specific R&D and innovation related education or co-operation. The OPPC projects focus mostly on purchase of research and laboratory equipment, significantly enhancing the quality of regional R&D infrastructure.

Regarding SPD 2, the most valued project is probably the Innovation centre and business incubator (cost: €5.4 million). It turned a former factory building

into a modern infrastructure for company incubation. Furthermore, through its founders, it is linked to the ČKD Group engineering companies and thus provides a potential customers or investors for start-ups developed in the incubator. Innovation business centre of the Institute of experimental medicine of the Academy of Sciences (cost: €1.7 million) is another valued project. This centre provides link to academic research institute with all benefits this represents. The rest of the projects aimed at supporting activities (information and advisory centres) and intermediation activities (technology transfer, R&D supply-demand match-making).

SPD 3 programme supported a larger number of small projects, none of which bears a significantly higher value than the others. About a third of the projects were implemented at Prague universities, another third in private companies and the rest in research institutes and non-profit organizations.

As regards OPPC, most of the projects are in their early stage of implementation and it is too early to assess the response of their future users. However, worth noting is the CZ-OPENSCREEN project, which is the national infrastructure for ESFRI Roadmap project EU-OPENSCREEN. Several projects represent new medical research centres (at both hospitals and research institutions), others are focused on physics, energy, new materials or biosciences. Almost all of the projects are implemented by public or private research organizations, universities or medical facilities.

Basis for evaluation

In 2008, the Technology Centre of Academy of Sciences elaborated a complex analysis called "Innovation potential of the Czech regions".[1] It was an ambitious effort to form a methodology to describe various aspect of innovation potential of Czech regions.

The rather comprehensive analysis was based on factor analysis combining a set of 37 variables which were chosen to best describe the innovation features of a region. The variables were grouped to five groups of related factors as shown in Table 1.

[1] Pokorný, O. et al., *Innovation potential of the Czech regions* [online], Technology Centre AS CR, SLON, Prague 2008, available at http://www.tc.cz/dokums_raw/ripeng_1233748945.zip, accessed on December 9, 2010.

Table 1: Factors used for evaluation

Group of indicators	Factors	Number of variables
Innovation drivers	Students	3
	Job attractiveness	2
	Agglomeration benefits	2
Knowledge creation	Concentration of R&D	6
	Potential of technology centres	2
Innovation and entrepreneurship	Investment	3
	Industrial zones	2
	Project activities	3
	Innovation infrastructure institutions	1
Application	Macroeconomic indicators	2
	High-tech branches	4
	Medium-tech branches	2
Intellectual property	Expenditure on intellectual property	1
	Outputs of intellectual property	4

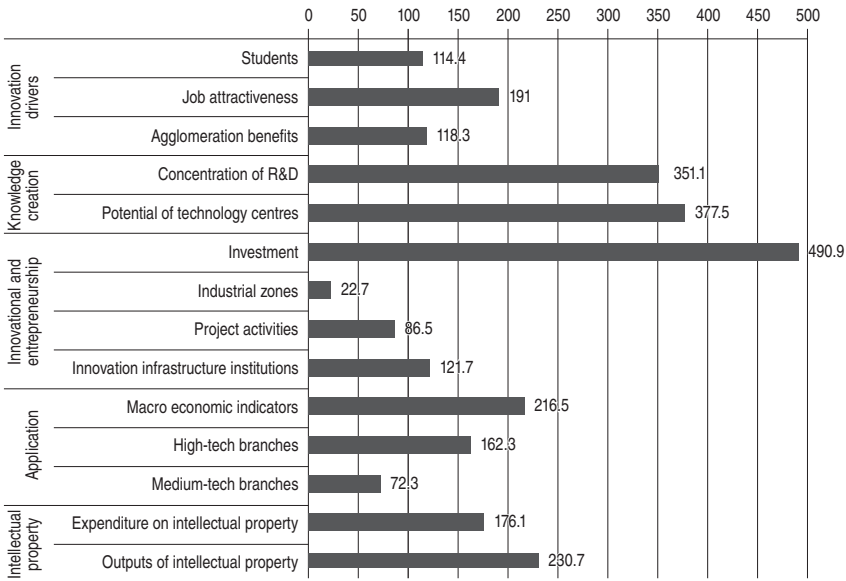
Source: Technology centre AS CR

Prague's innovation potential

Using the aforementioned factors the Czech regions were grouped by the level of their innovation potential. Prague is the only region falling to the category "highly above average" because it scored best in 10 out of the 14 factors evaluated. In its conclusion on Prague the analysis states that: "A high level of urbanization and proximity of key players in the development of an innovation environment... have a strong agglomeration effect making Prague a distinct centre of development on a national level." Only two regions fell to the category "above average", South Moravia and Hradec Kralove region. All remaining regions' innovation potential is "average" (6), "below average" (3) or "highly below average" (2). This reflects the specific characteristics of Prague among the Czech regions.

Let us take a closer look at what are the advantages of Prague, what results Prague attained compared to the country's average. The values of Prague are presented in graph 1. Prague's high value in investments is caused by a very significant concentration of foreign direct investment in Prague. Potential of technology centres is given by the concentration of highly skilled workforce

Figure 1: Factor scores of Prague compared to country's average (Czech Republic=100)



Source: Technology centre AS CR

combined with technology intensive companies such as Honeywell or Sun Microsystems. High score in concentration of R&D is given by high number of R&D institutions and human resources in Prague. High score in outputs of intellectual property has to do with the fact that share of patents of Prague origin on the total of national patents is nearly 40%. Macroeconomic indicators are regional GDP per capita and share of the region on the total gross fixed capital. In both indicators Prague scores high hence the value that is twice as high as the national average. Job attractiveness was calculated using migration balance and unemployment rate. Again, such indicators give Prague a score that is highly above the national average.

On the other hand, there are three factors in which Prague scores below the national average. Prague is a city and its economy is focused on services sector, thus there are no significant industrial zones. For the same reason, medium-tech branches are less present here than is the national average. The subaverage value in project activities reflects the fact that Prague is not eligible for Structural Funds assistance under Objective 1, where the scope of assistance is much higher and the number of projects is therefore also significantly higher. However, this situation only reflects good regional economic performance.

Table 2: Types of projects by programme

	SPD 2	SPD 3	OPPC
Science park / business incubator	2	0	0
Research / laboratory equipment	1	0	32
Technology transfer	2	9	0
Education	2	18	0
Information and/or advisory centres	4	3	1
Other	0	8	1
Total	11	38	34

Source: own evaluation

Evaluation of the programmes

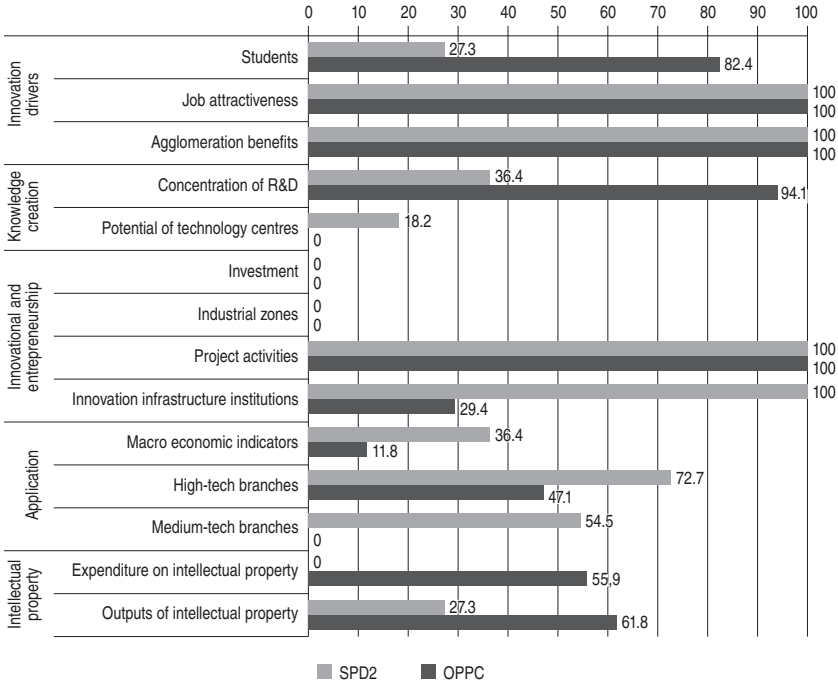
In looking for a way to evaluate European projects this methodology was used as an inspiration. More precisely, the idea was to examine to what extent these projects contribute to improvement of the factors used in the analysis of regional innovation potential.

Table 2 shows the projects of the three programmes grouped into types. It is apparent that under the SPD 2 programme projects were of several different types while the other two programmes show one dominant type of projects. Under OPPC, there is an originally unexpected one dominant type of project – research and/or laboratory equipment. This is to some extent caused by the existence and purpose of the Operational Programme R&D for Innovations available in the rest of the country which supports existing and new research facilities. The OPPC thus acts as a substitution of that programme in Prague. Given the high concentration of R&D institutions in Prague, the high demand – exceeding the available funds by a great deal – is understandable.

The spatial distribution of projects in the city mostly follows that of the research institutes and universities which represent majority of those who implement the projects. Majority of the projects is thus located in the city centre and districts Prague 6, Prague 8 and Prague 4. In the centre, there are universities and research institutions of various types. In Prague 6, two technical universities are located. In Prague 4 and 8, there are Academy of Science grounds with multiple institutes. This situation suggests that the financial assistance flows to existing centres of research which is considered a favourable effect as compared to completely new facilities built on green fields.

SPD 3 projects focused mostly on innovation-related education. Also, the spatial distribution of the projects does not really matter as their effects are

Figure 2: Contribution of SPD 2 and OPPC projects to innovation potential factors (share of projects contributing to each factor in %)



Note: Number of projects: SPD 2 = 11, OPPC = 34
Source: Technology centre AS CR, City Development Authority Prague

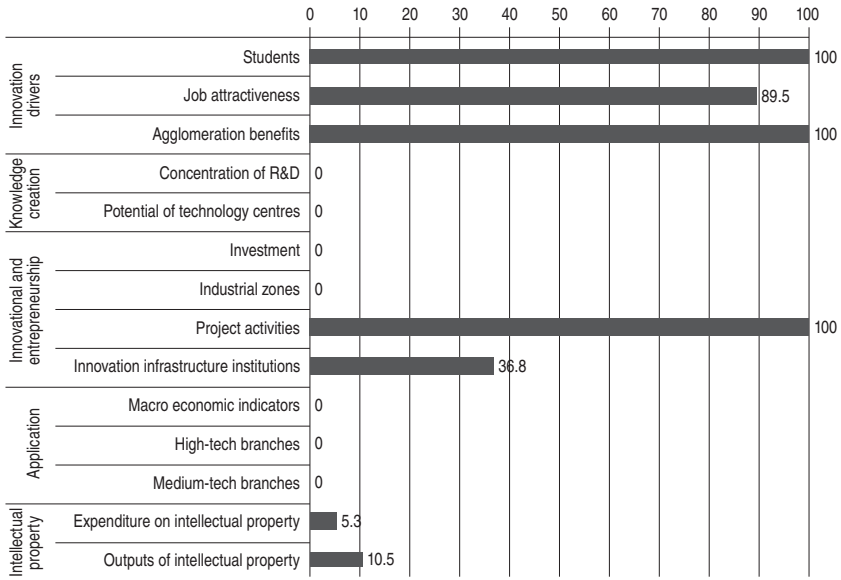
distributed among attendees (i.e. regional workforce) of courses or clients of information and other centres.

Evaluation of contribution of projects to regional innovation potential factors described earlier was based on expert opinion and produced the following results presented in figures 2 and 3. The opinion was based on project description in submitted applications.

All of SPD 2 projects contributed to job attractiveness and agglomeration benefits of the city. They are all project activities and were new facilities of innovation infrastructure. Almost three quarters of the projects were of high-tech branches, half of medium-tech branches. Of course, a project can fall in both branches.

In case of OPPC, we can clearly see the differences, the shift in the project types. As in majority of the projects universities participates either as project applicant or project partner, students will have access to modern research equip-

Figure 3: Contribution of SPD 3 projects to innovation potential factors (share of projects contributing to each factor %)



Note: Number of projects: SPD 3 = 38
Source: Technology centre AS CR, City Development Authority Prague

ment in the course of their advanced studies strengthening relationships between universities and research institutions. New workplaces for highly skilled workforce represent a contribution to job attractiveness. The projects focus on increasing the quality and quantity of research capacities, thus contributing to concentration of R&D in Prague. Since the projects are mostly new capacities of existing R&D institutions, contribution to the factor innovation infrastructure institution is lower than in case of SPD 2. As high-tech branches score was given only to projects with strong link to business sector and practical application of R&D results, the score is a bit lower in this factor. The nature of the projects strongly shifted from the research-practice interface to basic and applied research. This is also a reason behind higher share of projects with expenditure and outputs of intellectual property.

In case of SPD 3, given its non-investment nature, the effects are different and are limited to a small number of factors. As they mostly focus on education and human resources in general, effects on students and job attractiveness are the factors to which the projects contributed the most. The projects aimed at increasing the adaptability of workers on the market, at mastering new skills for use of advanced technologies or studying modern techniques of management.

Conclusions

Evaluation of projects supported from public funds is a legitimate and necessary effort aimed at decreasing inefficiency as much as possible. While devising a method for assessing and comparing what is often a heterogeneous group of projects is usually challenging, the results are valuable for both improving the present programmes (if rules allow for amendments) and for preparation of future programmes.

The method for project evaluation using the regional innovation potential assessment methodology represents one possible approach. It does not aspire to evaluate individual projects in detail. It rather offers a bit more perspective and shows to what features of the regional innovation environment and their improvement or quality the projects did or may contribute. However, one has to bear in mind a drawback of this method – that it is to a significant extent a subjective one, based on the expert opinion of the evaluator. Though, this drawback can be easily suppressed by involvement of a larger group of evaluators.

After applying the method we can make a few conclusions. The contribution of the projects is undeniable and they succeeded in fulfilling the objectives of the programmes. The investment-oriented projects have broader effects as they contribute to a larger share of the factors examined than human resources-oriented projects. It is given by the long-term nature of their outputs. We also observed a shift between SPD 2 and OPPC. In the latter programme, the contribution of projects is higher in case of innovation drivers and knowledge creation. This reflects the change in the nature of the projects from intermediary and support to research and cooperation among research institutes and universities. As a result the distribution of the projects throughout Prague reflects the distribution of research facilities where the projects are implemented.

This study has clearly shown one possible approach to evaluation of long-term effects of the support provided by European structural funds to regional innovation environment.

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Zusammenfassung

Soziale und kulturelle Dimensionen der Innovation in Wissensgesellschaften
Jiří Loudín – Josef Hochgerner (eds.)

Die Autorinnen und Autoren des Buches analysieren mehrere Aspekte von Innovationsaktivitäten – insbesondere soziale und kulturelle Aspekte – in der gegenwärtigen Gesellschaft. Aktuell werden sowohl Innovationsaktivitäten, als auch ganze Gesellschaften transformiert. Die hier präsentierten Texte referenzieren auf dieses Basisparadigma der Transformation: Innovationsprozesse werden differenzierter, kommunikativer, und insbesondere durch Quellen und Faktoren sozialer und kultureller Art erweitert, die dazu führen, dass sich Gesellschaften zu globalisierten Wissensgesellschaften entwickeln.

Der Fakt, dass die Innovationsforschung mit mancher Unklarheit konfrontiert wird, ist auch als Indiz für die Dynamik und die schöpferische Art der Innovationsprozesse zu sehen, bei denen stets neue Probleme und neue Bedeutungen auftauchen, untereinander Faktoren interagieren, die sich bis zuletzt eher voneinander getrennt entwickelten. Neue Formen dieser Dynamik findet man vor allem in der Transformation sozialer und kultureller Praktiken – man spricht daher von nicht-technischen sowie von nicht-ökonomischen Innovationen und man versteht soziale Innovation nicht mehr in erster Linie als Generieren sozialer Voraussetzungen und als Moderieren des technologischen Fortschritts, sondern soziale Innovation erhält ihren eigenen, autonomen Status. Wissensgesellschaften, die ihrem Wesen nach mit ständigen Neuerungen konfrontiert sind, haben einen stärkeren Bedarf an sozialer Intervention und an bestimmten Kulturpraktiken – in ihnen öffnen sich neue Wege für individuelle und soziale Entwicklungen, wobei hier auch neue Risiken, neue Ungleichgewichte und neue Paradoxe entstehen.

Die Beiträge im Teil 1, *Soziale und kulturelle Quellen für Innovationen (Social and cultural sources of innovation)*, befassen sich damit, wie Gesellschaften ihre Innovationsprozesse steuern. Gesellschaft und ihre Innovationen voneinander zu trennen ist freilich eine theoretische Abstraktion, die jedoch für manche Problemklärungen nützlich und begründet erscheint. Bereits die Entwicklung neuer Ideen an sich geschieht unter bestimmten biologischen und sozialen Bedingungen, und auch Technologie erhält ihren Sinn nur als Teil sozialer Handlungen.

Josef Hochgerner setzt sich in seinem Beitrag theoretisch mit der Kategorie der sozialen Innovation auseinander. Die Basisdefinition der sozialen Innova-

tion – Veränderung sozialer Praktiken – ist für alle Sektoren und Funktionssysteme der Gesellschaft geeignet. Vier Typen sozialer Innovationen (Rollen, Beziehungen, Normen, Werte) werden vorgestellt, und zwar als Grundlage zur Entwicklung empirisch bestimmbarer Indikatoren. Im Kontext der entstehenden Weltgesellschaft wird untersucht, welche Typen sozialer Innovationen in den Funktionssystemen Wirtschaft, Kultur, Politik und Recht zur Bewältigung von großen Herausforderungen besonders notwendig erscheinen. Weitgehend offen bleibt dabei noch die Frage, wie in global verbundenen Wissensgesellschaften Wissen und Einstellungen am besten in Verhaltensänderungen – also neue soziale Praktiken – umgesetzt werden können. *Jiří Loudín* untersucht die Beziehungen zwischen Wissen und Kultur in den Wissensgesellschaften. Er sucht nach Erläuterungen für Quellen der Kultur und für Widersprüche, die mit der Entfaltung und mit dem Funktionieren des Wissens in Gesellschaften, die auf Wissensprozessen basieren, verknüpft sind. Dabei verfolgt er besonders aufmerksam die kulturelle Dimension im Innovationstransfer. Die Beziehung zwischen Innovation und Sicherheit untersuchen *Lucia Belyová* und *Gerhard Banse*. Sie stellen fest, dass Sicherheitsaspekte von Innovationsaktivitäten regelmäßig dann in den Mittelpunkt der Aufmerksamkeit geraten, wenn innovative Produkte Sicherheitsrisiken enthalten. Belyová sowie Banse empfehlen ein Verfahren zur Analyse der Sicherheitskultur innovativer Produkte und deren Innovationsprozesse. *Adolf Filáček* befasst sich in seinem Beitrag mit der Beziehung zwischen Öffentlichkeit und Forschung. Er beschreibt die Szene in Europa und charakterisiert die Beziehung zwischen Öffentlichkeit und Forschung in der Tschechischen Republik, indem er die öffentliche Debatte zur Wissenschaftspolitik, wie sie neuerdings in Tschechiens Gesellschaft abläuft, analysiert.

Die Texte im Teil 2 unter dem Titel *Reflexionen über Innovationen in der gesellschaftlichen Dynamik (Reflections on innovation in societal dynamics)* folgen – im Unterschied zum Teil 1 – einem eher umgekehrten Verfahren: sie untersuchen insbesondere die Logik der inneren Entwicklung der Innovationen und auch, was Innovationen in der Gesamtdynamik der Gesellschaft bewirken. Der thematische Referenzpunkt ist dabei die Wirkung von Innovationen auf gesellschaftliche Dynamik und Stabilität. Das gemeinsame Paradigma dieser Studien zur Innovation heißt: eine langfristig nachhaltende Stabilität kann nur auf konsequenter Innovationsdynamik beruhen.

Alexander Degelsegger und *Alexander Kesselring* positionieren ihre Analyse von Innovationsprozessen am Schnittpunkt zwischen der Actor-Network-Theorie von Bruno Latour und der Lebenswelt-Theorie von Alfred Schütz. Das Ziel der Analyse ist nicht soziale Innovation von anderen Innovationstypen abzugrenzen, sondern vielmehr den allgemeinen theoretischen Bezug auf Innovation zu erweitern. Im Brennpunkt der Innovationstheorie liegt die Beziehung zwischen Beständigkeit und Wandlung und von diesem Blickpunkt aus sind es

die actor-networks, die bestehende Produkte, Dienstleistungen, Praktiken und Strukturen stabilisieren und transformieren. *Jan Maršálek* wendet sich in seinem Beitrag gegen den Hauptstrom der Innovationstheorie. Er zweifelt die These an, dass Innovationen die für die Dynamik der Gesellschaft ausschlaggebende Triebkraft sind. Er stützt sich dabei auf das Konzept der heißen und kalten Gesellschaften von Lévi-Strauss. Auch sogenannte „primitive" Gesellschaften haben Innovationen, die aber nicht zu sozialem Wandel führen. Schuld daran ist das Mythendenken, welches die soziale Wirkung der Innovationen neutralisiert. Ob und wie Innovationen verinnerlicht werden, hängt also vom Denken und von den Praktiken ab. *Petr Machleidt* beschäftigt sich mit der Beziehung zwischen Technik und Kultur, wobei er die Technik als ein Kulturphänomen betrachtet. Er stützt sich auf geschichtliche Analysen des Denkens und der Kultur in Tschechien, wo sich eine ganz spezifische Philosophie der Technik (der sog. humanistische Technokratismus) entwickelt hat und wo das Thema Technik zum Fundament bedeutendster Kulturtaten wurde (beispielsweise bei Karel Čapek).

Teil 3 sammelt unter dem Titel *Transnational und transkulturell: Transfers und Interaktionen (Transnational and Transcultural: Transfers and Interactions)* Beiträge, die sich auf internationale Interaktionen von Innovationen beziehen. Sich global entwickelnde Wissensgesellschaften sind typischerweise durch ein hohes Maß an Kommunikation, Kooperationen und anderen Transfers in den Bereichen Wissen und Innovationen charakterisiert. Diese Interaktionen finden zwischen Individuen, Regionen, Institutionen, Staaten, sowie zwischen staatenübergreifenden Strukturen und zwischen Kulturen statt. Sie sind Teil des gesamten Lernprozesses, der institutionelle, technische und kulturelle Dimensionen hat, die alle gemeistert werden müssen, wenn er effektiv sein soll. Mit der Globalisierung steigert sich die Bedeutung der Regionen – man spricht daher von Glokalisierung. Diese Entwicklung spiegelt jedoch keine Tendenz zur Autarkie wider, sondern der regionale Vorteil wird auf der Globalebene ausgespielt.

Klaus Schuch, Isabella Wagner und *Elke Dall* beschäftigen sich in ihrem Aufsatz mit Fragen der internationalen Zusammenarbeit in Forschung und Entwicklung. Sie prüfen, unter welchen Bedingungen man bilaterale Kooperationen zu multilateralen Kooperationen in europäischen Projekten weiter entwickeln kann. Ihre Analyse basiert auf Daten aus einer Erhebung, an der österreichische Institutionen teilgenommen haben, die sich an internationalen, bilateralen Forschungskooperationen beteiligten. *Balázs Borsi* untersucht Praktiken von Managern japanischer Forschungs- und Technologieinstitute anhand von Benchmarking-Kennwerten, die man ursprünglich für ein Projekt in Europa entwickelte. Daten von fünf führenden Instituten wurden gesammelt um zu beurteilen, ob die Institute die besten Praktiken liefern, die man auch unter anderen sozioökonomischen und kulturellen Bedingungen anwenden kann. Eine verstärkte Einglie-

derung unterschiedlicher Subjekte in internationale Kooperationen erlaubt und erfordert einen Vergleich und eine Evaluierung ihrer Innovationsleistungen mit dem Ziel des gemeinsamen Lernens. Dieser Frage widmet sich *Karel Mráček*, indem er die Innovationsleistungen der Tschechischen Republik nach europäischen Standards analysiert. Schließlich verknüpft *Jakub Pechlát* in seinem Text thematisch die Integration Europas mit der Evaluierung der Innovationspolitik. Seine Studie bietet am Beispiel der Region Prag ein spezifisches Verfahren zur Evaluierung der Effektivität der Förderungsprojekte der EU.

Dieser Sammelband entstand als Teil des Programms zur Förderung der internationalen Zusammenarbeit der Akademie der Wissenschaften der Tschechischen Republik; er ist das Ergebnis des Projektes „Übergang von Imitationen zu Innovationen als sozialer und kultureller Prozess“, in dem das Zentrum für Forschung in Wissenschaft, Technik und Gesellschaft beim Philosophischen Institut der Akademie der Wissenschaften der Tschechischen Republik und das Zentrum für Soziale Innovation in Wien zusammenarbeiteten.

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Name index

Social and Cultural Dimensions of Innovation in Knowledge Societies

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