Non-Technological and Non-Economic Innovations: Contributions to a Theory of Robust Innovation

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Abstract

There is a peculiar dissonance in innovation research. On the one hand, the label innovation is applied to almost everything: new products, processes, services, methods, techniques. Even the diffusion of innovations to all spheres of society is called innovation. On the other hand, we find that the main focus of innovation research is still on bringing technology to market. This dissonance provoked the central questions discussed at the 2nd International Conference on Indicators and Concepts of Innovation (ICICI 2008) on «Non-technological and non-economic innovations and their impact on economy» hosted by the Competence Centre for Management at the Berne School of Business and Administration: What forms and dimensions of non-technological and non-economic innovations can nonetheless be found both theoretically and empirically? What impact do these innovations have on the economy? Are there actually innovations without a non-technological and non-economic dimension, viz. purely technological or economic innovations? Consisting of selected answers to these questions, this volume presents international scholarly […]

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There is a peculiar dissonance in current discourses on innovation. On the one hand, the label innovation is applied to almost every kind of phenomenon. New products, processes, services, methods, techniques, and finally even the market entry or the social diffusion of these innovations are called an innovation. Moreover, it is not unusual to simply use notion as a general metaphor for change in mindsets, organizations, or entire societies.

On the other hand, we find that most research on innovation is focused on the narrow “technology goes economic market” slot of innovation. This research bias results in a lack of indicators and concepts of non-technological and non-economic form of innovations, which still exists today.

This contradiction provoked the central questions discussed at the 2nd International Conference on Indicators and Concepts of Innovation on “Non-technological and non-economic innovations” hosted by the Competence Center for Management at Berne University of Applied Sciences in July 2008:

- Why do we know so little about non-technological and non-economic innovations so far? What impact does this bias have on societies and economic performance?
- What forms and dimensions of non-technological and non-economic innovations can be found both in literature and empirically? What impact should these findings have on current concepts of innovation?
- Are there innovations without a non-technological and non-economic dimension, viz. purely technological or economic innovations?

Consisting of selected answers to this question, the present volume combines building bricks of a theoretical framework for the analysis and design of socially robust innovations. At the same time, the volume results not only from the curiosity of the contributing researchers who, regardless of their cultural background or level of experience, had both the courage and the muse to conceptualize innovation beyond the borders of the current mainstream: it owes a lot to all the speakers and guests at our conference who invaluably contributed to two days in a both surprisingly relaxed and stimulating atmosphere. In this context, it is a pleasure to mention Christoph Beer from the Swiss cluster management agency innoBE Inc. as an ice-breaking keynote speaker and as a most supportive member of the ICICI 2008 conference board.

The same applies to all the board members: Dr Jari Kaivo-oja (Turku Business School), Dr Sayed Mahdi Golestane Hashemi (Iran Research Centr
for Creatology, Innovation and TRIZ), Dr Jens Aderhold (Martin-Luther-
University Halle-Wittenberg), Dipl.-Kffr. Judith Terstriepe (IAT
Gelsenkirchen), Juha Miettinen (Ubiquitous Computing Cluster Program
Tampere), and, last not least, to Prof. Dr Ralf Wetzel (Berne University of
Applied Sciences) whom I owe an incomparable degree of trust, support, and
autonomy.
Special thanks to Astrid Friedlingsdorf (Managethics Zürich) who shared with
us her profound knowledge in management constellations.

Furthermore, the success of the conference was due to generous support of
the SCOPES program of the Swiss National Science Foundation (SNF).

The last lines are dedicated to my beloved wife, Armine Roth, who is my
dearest companion as a conference chair.

\emph{Steffen Roth}
INTRODUCTION: TOWARDS A THEORY OF ROBUST INNOVATION.

Steffen Roth

Introduction

There is no denying a certain technology bias in innovation research (cf. Rennings 2000; Aderhold and John 2005; Kaudela-Baum 2008). Furthermore, but less striking, there is an economy bias in innovation research, too. Combining both biases we get the picture of the “hardcore of innovation”\(^1\): technology goes economic market.

Beyond this hardcore, an alternative mainstream is about to establish in the meantime. This trend is indicated by the increasing popularity of the labels of non-technological innovation (NTI) and social innovation (SI). At a first glance, these two concepts seem to be the missing links to the whole picture of innovation. But, on closer inspection we still have our problems with them: Being in line with the OECD STI Scoreboard (2007, D8) most concepts of NTI focus on organizational innovations in economic entities as well as on marketing innovations. Thus, the concept of NTI is still economically biased.

Unfortunately, the notion of SI does not refer to a systematic approach to the entire social dimension of innovation either. Most economics literature uses the label for residual categories of non-economic success factors of economic innovation (cf. McElroy 2002: 37f) or even as a synonym for NTI (cf. Pot and Vaas 2008; Simms 2006). Less indirectly, SI have been defined as new forms of organization, new rules, or new lifestyles (Zapf 1994) as well as new ideas about social relations (Marcy and Mumford 2007). These definitions correspond much with the most general one of Stefan Böschen and colleagues (2005) applying the notion to all cases of intended social change. Thus, all change in economy, and, against the backgrounds of virtualization and hybridization (Miles 2006), many change in technology, can be defined as social innovation, as well.

\(^1\) Please confer to Lukas Scheiber’s contribution to this volume.
The bottom line is that nearly everything can be defined as a SI: a sect (Cornwell 2007), the eBook (Cavalli 2007), or scientific management (Mumford and Moertl 2003).

Geoff Mulgans paper on “The Process of Social Innovation” (2006) is an excellent example for the corresponding confusion within the entire discourse: He refers to both the process of tertiarization of economies and the political institution of female suffrage as examples for social innovations, while claiming that social innovations fundamentally differ from business innovation, not without admitting that there “are of course many borderline cases” (ibid: 146) between social and business innovation. Against the background of the present discourse on SI, he is not even so wrong with that.

Superfluously, the paradox of innovation (John 2005: 54) is handed down from the general discourse on innovation to the specific discourse on NTI and SI, as well: innovation can refer both to an object and a process. And, if we consider that an innovation is only an innovation when it succeeds on the market (cf. Rogers 2003; Aderhold 2005), then we find that innovations have a social dimension, as well. But, what is an innovation, then: Is a new object or idea an innovation, yet? Should we call the process of the development of an (process) innovation an innovation? Or does the notion apply to the process of its diffusion in(to) markets and societies? And, finally, if innovations do also have a social dimension, then is there a social dimension of social innovations, too?

Both these questions and the confusion caused by them is more than just an academic problem: policy makers and triple helix managers demand knowledge on “Elements of Innovative Cultures” (Dombrowski et al. 2007), advanced indicators of innovation including its social dimension (Moris, Jankowski, and Perrolle 2008), and more systemic policy views (Soete 2007). Experts in marketing discuss the broadened role of their discipline and business against the backgrounds of the increasingly perceived increasing impact of corporate social responsibility concepts (cf. Uslay, Morgan, and Sheth 2008; Maciariello 2008) or stakeholder views (Troshani and Doolin 2007) on economic performance. Some even question the existence of “the pure commodity in the age of branding” (Wilk 2006: 303). And, finally, open innovation (Chesbrough 2003) has got what it takes to become another epoch-making concept.

Hence, Mulgan (2006: 145) might be right to claim, “that the pace of social innovation will, if anything, accelerate in the coming century”. At least, this idea corresponds with the increasing NTI focus of the OECD (2007), either
in spite of or due to the fact that the both concepts do (not) refer to the same phenomena. In any case, there is some idea or certainty that the real potential of innovation is in its social dimension (cf. Pot and Vaas 2008, whose concept of SI does not differ much at all from the OECD’s concept of NTI).

One explanation for the lack of systematic approaches to most crucial aspects of innovation is an insufficient interaction between innovation research and social theory (cf. Aderhold 2005: 15). In the following, we will be stimulating interaction between innovation research and systems theory, because the work of Niklas Luhmann (1987; 1997) provides us with both selective and universal categories for the systemizing of communication. Doing this we refer to Jon-Arild Johannessen and his colleagues with a double respect, as well: we will pursue his “search for a systemic theory of organizational innovation” (cf. Johannessen 1998) by developing a systemic approach to the general phenomenon of “innovation as newness” (Johannessen, Olsen, and Lumpkin 2001: 20).

The result of the interaction between innovation research and systems theory will be a systemic concept of innovation that distinguishes between an object dimension, a time dimension, and a social dimension of innovation. This innovation triangle model will be serving as an editorial framework for the individual contributions of the present volume. In this sense, the present introduction is a practical example for an alternative structure for discourses on (social) innovation, as well.

After the introduction of the authors and their contributions, the present text focuses on the social dimension of innovation and on economic innovations as a special case of social innovation. In this context, first evidence for the existence of non-economic markets is presented, as well. Based on this evidence, the introduction concludes with the vision of a theory of robust innovation, i.e. innovations that succeed in both economic and non-economic markets of society.

**On the meaning of innovation**

We assume the concept of innovation to make sense ("Sinn" in Luhmann 1987: 44f; 2008: 12ff). Thus, just like every other form of sense, innovation is most basically characterized by the difference between actuality and potentiality. In the context of innovation this difference refers to the idea that something actually new cannot be old at the same time, but, that it may be quiet soon. Hence, the specific difference characterizing innovation is the difference
It is common sense to use the difference new/old in terms of time, i.e. in terms of the difference after/before (Luhmann 1987: 116). This makes sense, but only one among others: systems theory distinguishes between three dimensions of sense, i.e. beyond the time dimension there is also an object dimension and a social dimension of sense (ibid: 112). In other words, we cannot only ask new with regard to when? but also new compared to what? and new to whom?². It is not up to time alone to decide whether something is new, or not: innovation is not only a matter of temporal change (after, not before) but also a matter of objective uniqueness (the one, not the other) or of social exclusiveness (ego, not alter).

In this sense, we can distinguish three dimensions of innovation (cf. figure 1): if we apply the label of innovation on new artefacts³, i.e. products, ideas, or methods, then we focus the object dimension (the novelty). This is the dimension that authors like Jens Aderhold and René John (2005: 7) refer to when they are criticizing the technology bias in the present discourse on innovation.

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² Regarding these questions we are on the one hand inspired by Johannessen and colleagues (2001) who ask three questions about innovation in the context of “economic units” (ibid. 27), as well: what is new? How new? And: new to whom? On the other hand the authors themselves state that the dimensions deduced from the what- and the how-question are not very selective against the one deduced from the whom-question (ibid. 23). Additionally, it seems to us that the how-question cannot be located on the same level of analysis as the what- and the whom-question because you cannot answer the first question without knowing the answers on at least one of the latter (which does not apply for the other ways round).

³ This includes both material and immaterial artefacts (cp. Rammert 1993: 11).
This object dimension can be distinguished from the time dimension of innovation in terms of the difference between innovation and invention:

“In the word innovation, we find the Latin stem novus, whereas in the word invention, we find the stem (…) venire. It is evident that the first relates to the meaning of something new, whereas the second, as venire is a verb that implies an action of moving, brings to mind the meaning of looking for something and finding something” (Cavalli 2007: 958f).

In this sense, invention would be the temporal process leading to the object(ive), the innovation. Unfortunately, Georg Krücken (2005: 65) puts it some other way round as he defines innovation as the process of the introduction of inventions.

For this reason we will keep it simple and, at least for a while, follow the innovation sociologist René John (2005), who helps us to establish a minimal consensus by distinguishing between an object dimension and a process dimension of innovation. By focusing the time process dimension of innovation we are not longer interested in novelties but rather in temporal processes of innovation (ibid. 55ff; Kaudela-Baum et al 2008: 34f), in organizational change or changeability as the competence to permanent evolution (Moldaschl 2006;
Baitsch and Wetzel 2008), or explicitly in organizational time management strategies (Simsa 2001). Such, innovation becomes a synonym of transformation or change.

But, if we recall the definition of Georg Krücken, then we find that it corresponds much with definitions that are in line with the diffusion of innovations approach presented by Everett Rogers (2003), too. This means that we are confronted with another paradox of innovation: On the one hand, we can easily conceptualize diffusion as a temporal process of the increasing spreading or distribution of innovations. But, on the other hand, we would all agree that this meant telling a long story much too short: diffusion is about communication paths within a given social system. Thus, innovations are characterized by strong social externalities (cf. Beckert 1998: 51), which refers to their social embeddedness: “The road towards innovation leads through the jungle of social attribution” (Pohlmann 2005: 10). The knowledge of the laws of this jungle as well as the possession of both exclusive (Schumpeter 1954) and inclusive (Chesbrough 2003) means of innovation is assumed to be a competitive advantage. And, it is right this word that describes best the difference an innovation makes if we focus the social dimension of innovation: then innovation refers to a difference in a social relation, i.e. the advantage of the one or the disadvantage of the other.

By neglecting this social dimension of innovation, René John does not find out much about the entire “paradox of innovation” (2005: 54): without any doubt it is a smart idea to apply evolution theory’s triad of variation, selection, and re-stabilization on the analysis of the time dimension of innovation (after having distinguished it from the object dimension of innovation). But, as John exclusively focuses on the time dimension of innovation, he systematically fades out two out of three dimensions of innovation. By doing so, he also automatically deletes two out of three corresponding theoretical offers from the table of content of the “super-theory” systems theory (cf. Schimank 2003): the object-dimensional theory of differentiation and the social-dimensional theory of communication. In other words, he keeps looking through only one lens although his microscope would provide him with two further resolutions, i.e. levels of analysis (cf. again figure 1).

Of course, against the background of complex research objects the limitation of the plurality of perspectives is not the worst strategy. But, it is most crucial to recall that fading out a paradox does not mean to solve it: there is no logical or elective affinity between innovation research, the time dimension, and evo-
olution theory. Innovation is 3D. Hence, it is most important to know what we want to know. Given that, it is surprising that of all people innovation sociologists promote the time dimension as the key dimension of innovation. Without any doubt it is most important to analyse the time dimension of innovation, but this has got rather few to do with innovation sociology, not to speak of a solution for the innovation paradox. Only a concept taking the object dimension, the time dimension and the social dimension as well as the corresponding theoretical approaches into account will provide us if not yet with a solution, then, at least, with an adequate perspective on the paradox. In this sense, the object of the following section is a modest one: it aims at a first systematic sketch of the three dimensions of innovation and of logical inter-relations between them.

The three dimensions of non-technological and non-economic innovations

The basic distinction between the object dimension, the time dimension, and the social dimension is both selective and universal, i.e. it can be applied to any kind of social system as well as to any kind of level of the analysis of communication. Hence, in the following, our three-dimensional approach to innovation can serve as an editorial framework for the presentation of the contributions to the present book, which could hardly be more diverse concerning topics, theoretical approaches, and geographical contexts:

The first chapter of the book is devoted to the object dimension of non-technological and non-economic innovations. First, Lukas Scheiber from the University of Stuttgart, Germany, is peeling out the yet mentioned hardcore of innovation (“Economy and technology”) and its future change. Then, Veronique Favre-Bonte, Elodie Gardet, and Catherine Thevenard-Puthod from the University of Savoy, France, are presenting “A typology of innovations in retail banking”. We owe insights into “The role of non-technological innovations in the growth of the engineering industry, the economy, and the society of Rajkot” to Hardik Vachhrajani from the University of Mumbai, India. Hans-Werner Franz makes the final contribution to this chapter from the Dortmund University of Technology, Germany, on “Social science produc-
tion or social innovation by social science production”.

The headline of the second chapter is: *the time dimension of non-technological and non-economic innovations.*

Here, Nikolay Trofimov from the Russian Academy of Science Moscow, Russia, is presenting his research results on “Organizational and managerial innovations in large companies and their impact on technological innovations and innovation strategies”.

Next is Alexander Kesselring’s report on “Social innovation in private companies: an exploratory empirical study” conducted by him as a member of the Zentrum für Soziale Innovation, Austria.

Finally, Jens Aderhold from the University of Halle-Wittenberg, Germany, is focusing on the “Rationalities of Innovation”.

The final chapter is on *the social dimension of non-technological and non-economic innovations,* of course.

In this chapter, Jari Kaivo-oja from Turku Business School, Finland, is “Integrating innovation and foresight research activities: Key models and challenges in non-technical and non-economic innovation actions”.

Valentina Pomazan and Petru Lucian from Ovidius University of Constanta, Romania, are presenting “Innovation indicators for scientific and technical higher education”.

The concluding contribution from Hugues Jeannerat and Olivier Crevoisier from the University of Neuchâtel, Switzerland, is devoted to the development “From proximity to multi-location territorial knowledge dynamics: the case of the Swiss watch industry”.

This first assignment to the chapters already indicates that there is no necessary elective affinity between non-technological or social innovations on the one hand and the social dimension of innovation on the other hand: while all contributions deal with non-technological or social innovations, only a minority of them is focusing their social dimension. But, can researchers really work on social innovations without focusing the social dimension of innovation? And, generally speaking, don’t we feel like suggesting, “that innovation ranges across a single continuum that encompasses all three aspects” (Johannessen, Olsen, and Lumpkin 2001: 27)? We can only agree with this suggestion, of course. Nonetheless, everything starts somehow: every idea or con-
cept of innovation has got to enter the three dimensional continuum somewhere, i.e. either at the object dimension or the time dimension or the social dimension of innovation. For example, if we enter the continuum at the object dimension of innovation, then we have three options: staying in the object dimension (i.e. looking for its hardcore), moving to the time dimension, or moving to the social dimension of innovation (cf. figure 2).

![Figure 2: The Dimensions of Innovation and their Interrelations: the Innovation Triangle](image)

Hence, we argue that it is the object dimensional hardcore of innovation to define innovations as new products or commodities. Additionally, we find that we can treat temporal processes or social relations as if they were objects that can be owned (patents on methods) or sold on a market (services).

If we choose time as our first contact to the innovation continuum, then we are about to develop a completely different picture of innovation: the hardcore of time is change, while its object reference is transformation (and not the method as means of transformation). Based in the time dimension, a reference to the social dimension leads to the definition of innovation as the successful process of the diffusion of products, methods, or services.

Finally, our entry point could be the social dimension of innovation, as well. Then, the concept of advantage (germ.: "Vorteil") would define the hard core of
innovation, with the notions of *advance* (germ.: “Vorsprung”) and *label*\(^4\) referring to temporal and object-related aspects of the social dimension.

Keeping figure 2 in mind we can revisit the authors of this book and appreciate their contributions in a much more appropriate way: In his text on *Economy and technology: about the hard core of innovation*, Lukas Scheiber enters the discussion with the question of what non-technological and non-economic innovations are, before going on with asking how both types of innovation are (to be) handled these days as well as in future. By crossing the differences of technological/technological and economic/non-economic innovations, he finally distinguishes commodities (technological, economic) from services (e.g. open software, Wikipedia; technological, non-economic), organizational change processes (non-technological, economic), and means of organization (networks, parties; non-technological, non-economic). Such, he writes an excellent paper of high theoretical value for the discussion on social innovation with a clear focus on the object and the time dimension of innovation. Alexander Kesselring’s study on *Social innovation in private companies* even consciously fades out the social dimension of the social innovation in order to establishing a certain distinction between social innovation and social change. Such, he focuses on the time dimension by presenting a typology of sustainable change processes in private companies.

The first to perceptibly flirt with the social dimension, as well, are Veronique Favre-Bonte, Elodie Gardet, and Catherine Thevenard-Puthod: starting with the what-question regarding *A typology of innovations in retail banking*, i.e. starting with the object dimension they finally show how product innovations, process innovations, and service innovations contribute to the competitive advantage in the banking sector.

In his paper on *The role of non-technological innovations in the growth of the engineering industry, the economy, and the society of Rajkot*, Hardik Vachhrajani also focuses on the object dimension of innovation: he demonstrates how the competitive advantage of an Indian mechanical engineering cluster is assembled by raw material innovations, service innovations (micro-credits), and process innovations (family-based outsourcing strategies).

Against the background of knowledge production in the age of Mode II, Hans-Werner Franz also enters the innovation continuum at the object di-

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\(^4\) In this context, the label of label refers to brands, social addresses, or status symbols of all kind, as well.
mension by introducing a set of methods and tools called social production of science (not *Social science production*). Additionally, organizational change processes that led to the development of the very method and the methods’ advantages in the context of knowledge production in social sciences are discussed.

Nikolay Trofimov’s contribution on *Organizational and managerial innovations in large companies and their impact on technological innovations and innovation strategies* is an outstanding example of an analysis of the time dimension of innovation in the most dynamic context of transformation societies: he draws our interest to the current state of arts in organizational and management innovations (OMI) practices in Russian large companies as well as to factors influencing their diffusion to smaller companies and other parts of society.

Jens Aderhold’s *Rationalities of innovation* aim at the historical embedding of the innovation concept, i.e. the identification of long-term factors within the social process of transformation. His discussion of the term transformation supports the development of distinctive categories within the time dimension of innovation: while the notion of change refers to innovation as an internal effect within the system of reference, the notions of transformation and diffusion refer to external effects on objects and subjects. While the notion of transformation is often applied to change processes with well-expected outcomes, the concept of diffusion refers to change in more self-organizing and, thus, less predictable settings.

By *Integrating innovation and foresight research activities* and identifying *key models and challenges in non-technical and non-economic innovation actions*, Jari Kaivo-oja switches the focus between the time dimension and the social dimension of innovation: foresight effects advance, and his integration of non-economic innovations into the still economy focused concept of open innovation excellently supports the vision of more robust competitive advantage.

Valentina Pomazan and Lucien Petcu are presenting *Innovation indicators for scientific and technical higher education*. Carried out against the background of the pan-European shortage of young people in engineering and natural sciences, the aim of their study is to provide knowledge on the image of the Romanian educational system as well as on the corresponding need for innovations in education that support the development of specific competitive advantages in the European educational market.

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5 For example, Manfred Moldaschl (2005) shows that it is both quiet common and most important (not) to mix up these two dimensions.
Finally, Hugues Jeannerat and Olivier Crevoisier (*From proximity to multi-location territorial knowledge dynamics: the case of the Swiss watch industry*) emphasize the role of information flows between producers and consumers: they assume high product quality to be the necessary but not longer sufficient prerequisite for an innovations’ success in the age of emotional differentiated markets. Thus, they focus on labeling strategies and community building efforts as well as on the corresponding organizational change processes of a local production system in the context of a de-localized system of consumption.

As a result of the discussion, on the one hand we find that our three-dimensional concept of innovation actually can integrate the most divers topics and approaches. Additionally, we find that, in total, our small collection of contributions covers all dimensions and sub-dimensions of innovation, yet. Thus, we are confident regarding both the models’ relevance and integrative power in the context of the more general discourses on innovation. Nonetheless, we are looking forward to aspects of innovation that cannot be integrated in the 3D-concept. On the other hand it strikes our attention that there is no contribution exclusively focusing on only one dimension. Thus, approaches to the social dimension are still carried out in the paths of object-related and temporal metaphors. Same in the general discourse on innovation where a selective approach to the social dimension of innovation is still due. It cannot be the matter of the present introduction to fill this research gap, right now. Nonetheless, by focusing economic and non-economic innovations it can present some surprising snapshots of a specific cut-off of the social dimension of innovation, at least.

### The special case of economic innovations

If we talk about economic and non-economic innovations, then we more or less consciously base on a concept of functional differentiation: economy is not politics is not science, etc. Additionally, we automatically refer to the social dimension of innovation. Products, services, techniques, organizational change, or diffusion processes are only economical phenomena if they are related to the competitive sphere of economic advantages, i.e. the economic

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6 The three dimensions of sense are deduced from on (only) three of the six basic interrogatives: what, when, and who. Maybe, there is space for three further dimensions in innovation research?
market. But, then, again, this reference is only one among other possible references: there are non-economic products (e.g. in arts, cf. Cohen 2007), as well. An invoice accompanies not every service. The introduction of new public management in the public management is politics, not economy (Wolfgang-Renninson 2007). The diffusion of the knowledge presented in this book is an aspect of science, first of all. And there are even non-economic spheres of competition in society (cf. Baecker 2006), e.g. the yet mentioned European market of universities and scientific disciplines mentioned in this volume (cf. the contribution of Valentina Pomazan and Lucian Petcu), as well.

Thus, as far as the economic character of an innovation is concerned, it is the social dimension that makes the differences: Economic innovations are objects or processes leading to advantages on the economic market that can be interpreted as economic innovations themselves. And, if we recall the idea that there are non-economic objects and processes that are produced or performed with regard to non-economic advantages, too, then we find that economic innovations are only one type of social innovations among others. Furthermore, if we can imagine these kinds of non-economic innovations, then we need to take the existence of non-economic markets (spheres of competition for advantage) into account, too. This also makes sense against the background of differentiation theory: systems theory (Luhmann 1997) distinguishes three major forms of social differentiation: segmental, stratification, and functional differentiation. It is quite common to apply the first two forms of differentiation to markets which we use to distinguish in terms of geographical segments as well as in terms of target groups deduced from social structure focussed market research. Thus, there is no logical reason why the third form should be neglected. This applies even more against the background of the idea that functional differentiation is the primary form of differentiation of contemporary world society (cf. Luhmann 1997; Stichweh 1995, 1997). Consequently, we follow Dirk Baecker (2006: 333) who states: “markets count as economic phenomena but (that) they are common in other social spheres as well”. And, as Niklas Luhmann (1997) distinguishes ten functional systems of society, we can identify nine further markets of society: political markets, scientific markets, arts markets, religious markets, educational markets, legal markets, health markets, sports markets, and the market of mass the media system. Accordingly, evidence for the existence of non-economic markets can be found in this book as well as in economic anthropology, economic sociology, innovation sociology, and business sciences (cf.
Roth 2008). Nonetheless, there is still a research gap concerning a comparative analysis of forms and functions as well as of interrelations between all the markets of society.

**Towards a theory of robust innovation**

Even the most economic innovation can be defined as the outcome of pansocietal efforts (Barré 2001; Nowotny, Scott and Gibbons 2001) or as the result of the co-evolution of both economic and non-economic functional systems of society (Etzkowitz and Leydesdorff 2000; Leydesdorff 2005, 2006). At the end of this introduction, we can draw two consequences from this: *First*, in accordance with a developing alternative mainstream in innovation research, the contributions to the present book stress immense impact of non-technological and non-economic innovations on economic performance. Unfortunately, current discourses on non-technological innovations, non-economic, or social innovations rather lead to logical dead ends or case study based detours then consistent pathways towards competitive indicators and strategies of innovation beyond the “technology goes economic market” paradigm.

Against this background, the three-dimensional concept of innovation developed in this introduction is an invitation to invest on step back for two steps forward: By most basically distinguishing between an object dimension, a time dimension, and a social dimension of innovation, it presents continuum of both universal and distinctive categories of innovation. This so-called innovation triangle allows to analyze, to compare, and to coordinate most diverse approaches to innovation. First of all, this applies to the contribution of the present book that it serves as an editorial structure. By this means, the single contributions stand for interest-specific access points to the innovation continuum and, thus, for the development of problem-adequate concepts and indicators of innovation. Hence, we are confident that further discourses on innovation will be inspired by our systemic approach to innovation.

*Secondly*, with special regard to the social dimension of innovation, in a final step we adapt the concept of socially robust knowledge (Nowotny, Scott, and Gibbons 2004): we argue that innovations that succeed on more than one market are more robust innovations. Thus, robust innovations can be defined as objects, processes, and advantages that realize (further) advantages in more than just one market of society. To this effect, these multi-impact innovations
can be assumed to be both more profitable and more sustainable than single-market innovations. Against the background of geographical segmentation or social stratification, this idea seems quite self-evident: if a product, a method, or a service conquers new world regions or target groups, then it is likely to produce more advantage. The idea that products, methods, and services do diffuse between (non-)economic markets, as well, will take us a bit longer to get used to, even though most of us use to deal with these kinds of diffusions every day: for example, since the dawn of Mode II we know that scientific objects, processes, and advantages can diffuse to economy as well as that they usually need specific support with that. The constant efforts of business entities to deal with intangibles or to develop new sense organs for what they call stakeholder in the context of corporate social responsibility or open innovation can be interpreted as further examples for a more or less conscious orientation towards non-economic markets. Despite of all signs, there is neither a sound trans-economic market concept nor a corresponding theory of robust innovations. Accordingly, there isn’t a specific marketing concept for the promotion of robust innovations either. Nonetheless, the both is what the synopsis of the contributions to this volume suggests: a focus on the realization of robust objects, robust processes, and robust advantages, i.e. in total robust innovation, irrespective of whether the own starting point is in economy, politics, science, or any further market of society.

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7 At least, the idea seems strong enough that organizations consult specialists in market research, trend scouting, idea production, and open innovation on the both issues.


teme, 1, pp. 29-45.

ECONOMY AND TECHNOLOGY: ABOUT THE HARD CORE OF INNOVATION AND ITS FUTURE CHANGE.

Lukas Scheiber

Introduction

To develop a better understanding of non-economic and non-technological innovations, to which bigger impacts in future are ascribed, it could be first of all valuable to figure out resp. narrow down the fundamental logic of economy, technology and innovation in modern society. All three concepts and their inter-twinedness belong to an understanding of society and societal change that is highly corresponding with our understanding of modern industrial society, as we know it the last 160 years. With the invention of computers and its networks it seems to develop a new type of society which Baecker in accordance to Drucker calls next society (Baecker 2007). This ‘thought ahead’ society as a knowledge society will be characterized by the following:

- “Borderlessness, because knowledge travels even more effortlessly than money.
- Upward mobility, available to everyone through easily acquired formal education.
- The potential for failure as well as success. Anyone can acquire the ‘means of production’, i.e., the knowledge required for the job […]” (Drucker 2002)

Within this next society we have good reasons to expect a shift of the inter-lacement of economy, technology and innovation because access to means of production will differ and new social rationalities can enter the stage. First empirical examples show a new impact of business models like described by Wikinomics (Tapscott and Williams 2007) where economy plays not anymore the one-and-only role for innovation. E.g. Mozilla develops its products by volunteers that are highly motivated. They are not paid with money but maybe with reputation or inclusion in social networks. The profit of Mozilla is not privatized but refines future product development over the Mozilla foun-
dation. Furthermore technology, as the selection of the Mozilla example shows, i.e. computer, internet and software, gets more and more a medium of communication and is not determined by and important because of its materiality or hardware.

The wording of the title outlines that a central goal of the following contribution lies in the development of a heuristic framework as a core concept, in which it is on the one hand possible to extract reasons for the actual (or now better to say actual past) interlacement of and the societal preference for economic and technological innovations. On the other hand it should be possible to derive structural perspectives and problems on the basis of the outlined core concept that have to be taken into consideration when we talk about non economic and non technological innovation.

How could it be possible to handle in the case of (not only) non-economic and non-technological innovation the uncertain future from the standpoint of the present?

Frame of Reference: Social and Technological Systems

In literature it is very often unclear resp. not pointed out what is meant when researchers talk about economy, technology and innovation and a lot of premises rest unmentioned and unclear. With a strong link to social system theory developed by Niklas Luhmann (1998) it is possible to work out in the following the fundamental differences and connections between all three concepts.

For a start it is possible to differ basically in social and technological systems, whereby economy could be regarded as one functional system of society. Society as a social system is differentiated itself functionally what means there could be observed several social systems as functional systems that solve a certain and always different problem for society. In this context we can locate economy, politics, science etc. as functional systems whereby no single system can rule another or solve problems for another system. E.g. politics can’t communicate economical in literal sense because it is not possible to buy political power. If it’s the case society calls this phenomenon corruption and tries to avoid this systemic coupling by attracting the law. Every functional system observes itself and its environment along its specific code. The function of a code is to reduce contingency by operating regardless of the consequences strictly under a digital logic. For economy this logic is ‘to pay or not to pay’; for science the logic is ‘true or false’ (and nothing else).
On another level society shows a further type of a social system, which has the biggest influence on our current innovation systems: Organisations and nowadays networks are the type of social systems, where decisions for innovation are possible and different sorts of systemic rationalities could be dealt with. Enterprises as organizations for example are goal oriented and have to make profit that allocates them clearly to economics and to the economic code. But they can’t proceed without taking the law, scientific truth or societal development into consideration. Organizations are the social loci where innovations are made and all kinds of systems (technological, biological, psychological and social) and especially different codes of social systems are intertwined or translated.

In contrast technology as a system is not social at all but socially constructed or shaped (Bijker 1997, Bijker, Hughes, and Pinch 1993). Technology cannot be seen as defined by its physical objectivity and it is not without physical conditions. Somehow it depends on the media of technology in which kind of form it appears and which kind of purpose can be expected. There can be identified as forms of the medium technology for example habitualization, mechanization and algorithmization (Rammert 2007):

Habitualization as a form of technology is built up on the medium of bodies as biological ‘wet ware’. Action then is schematized as routines such as workflow, revue dancing or surgical technique. Mechanization as a form of technology mirrors the classical interpretation of technique as a machine. This ‘hard ware’ picture has been for decades linked with steam engines, railroads, rockets etc. and defines the medium of mechanization as physical objects. Algorithmization as a form of technology enters the field since computers can transfer information into binary codes and binary codes into information by using programs built up by binary codes. The medium of algorithmization is ‘soft ware’ made of symbols.

By following these differentiations it is comprehensible that research about non-economic innovation means to observe ‘only’ societal innovation, political and legal innovation and organizational innovation by excluding all economic logic. By following the defined and described media of technology they have to be excluded as well when we observe non-technological innovation.

Is this possible? The answer at that point of discussion could not be ‘yes’ or ‘no’ but should be pointed out as a question of standpoint, perspective and observation. The presented differences between the single types of social or technological systems show that a clear allocation of innovation as non-
economic and non technological and vice versa is not possible because nowadays society seems to have the form of a ‘seamless web’ (Bijker 1997) where everything depends on everything. But what could be separated and observed with logics of their own are the involved systems that shape and form innovations by operating within their codes as frames of references.

An Evolutionary Model of Innovation

How we can link social and technological systems with the problem of innovation? With the boom of the buzzword innovation and the increase of research on innovation a lot of process models enter the stage which clearly show single and linear planned steps of innovation but neglect the dependencies and determination of the process by social and technological systems. From a structural perspective they all separate into a chaotic pre-innovation area which is often called creativity, idea or invention. Then follows an area of decision making that have some stop and go rules. The last step is often called diffusion of innovation and asks the question of how innovation “is communicated through certain channels over time among the members of a social system.” (Rogers 2003).

With an evolutionary model that works with variation, selection and stabilization it is possible to avoid the often constructed linearity of innovation processes. Innovation processes can be modelled as recursive processes with feedback and feed forward loops that have to cope with the fundamental problem of innovation as a future paradox:

The future always is and remains unknown and cannot rule the present. Operating into the future means always to cope with the paradox situation that the future is not an accessible object for rational planning and controlling (Luhmann 2000: 158). Everything that occurs as new is developed under assumptions that are basically not ‘adequate’ for this future, so that the conditions for success have to be built up simultaneously (John 2005: 54). Pohlmann describes this phenomenon and one possible ‘solution’ as follows: “Organizations and other social systems prefer innovations that are ‘conform–non-conform’. They have to be understandable and usable according to old rules but rule breaking at the same time.” (Pohlmann 2005: 11) The trick in this ‘solution’ seems to be the linkage of the two contradictory terms conform and non-conform. The fundamental future paradox of innovation is reflected in
different streams of research and practice not only under the poles ‘conform and non-conform’. It appears already in Schumpeterian research as ‘creative destruction’.

In the frame of an evolutionary innovation model ‘creative destruction’ can be observed as variation as an irritation for social systems. This irritation, for example an accident, an earthquake or some action that is unknown and not fitting in given context has to be communicated in social systems. If not, it does not exist and has no influence. Variation is not made for selection, what means that variation just can’t know the future. But of course social systems like enterprises try everything to increase the probability of being selected.

If a variation is selected depends on its compatibility to given structures. E.g. climatic change gets a topic for social systems when it is possible to translate it in existing codes like ‘to pay or not to pay’ or political power. Structural filters of selection are the codes of the social systems named before.

For making a selection durable stabilization is a fundamental need. In the frame of social system theory selection itself has a stabilizing function but because what is selected has already a certain kind of stable form (Luhmann 1998: 485). But every selection has to be brought in a new relation to the concerning system. From the perspective of innovation in organization there have to be processes of system building by differentiation (Halfmann 1996: 104).

On organizational level the emergence of new production processes, new departments or new organisational forms etc. are observable.

Irrespective of how social systems built up their innovation processes in detail, the future problem of innovation remains the fundamental paradox: operating into the future without having the possibility to predict it.

To bridge over this lack of causality between the present and the future, social evolution has brought up several modes which are characterized by acting ‘as if’ the future is expectable and accessible. Risk management gives a first hint of how these kinds of modes could work. Risk is described as a certain kind of social construct that operates into the future by building up alternatives of future states and evaluating these states by connecting it to probable costs and profits. On balance risk management works with economical parameters of costs and profits and inside a certain ‘range’ of causality.

The Economy of Innovation
If a variation like a creative idea or an accident makes sense or not could be decided if social systems have the ability to translate it into their own code or have the ability to rank codes like it is the case in organizations. First of all an innovation as a (market) product has to make sense in an economical context. Then it has to keep up with the micro political structure of hierarchies etc. Nevertheless different dimensions have to be mixed and brought into order to draw a decision. Risk management was one example for such a translation into the economical system. What could be responsible for the extreme visibility of economical oriented decisions in the case of innovation?

Economy in this context is not observed as an input output systems but as a so called autopoietic, self-referential system (Luhmann 1988: 58). On the one hand economy produces itself by using elements of itself. Nothing can rule economy directly from the outside. On the other hand the economical environments like politics, law etc. have to be translated into the code of economy (what was described above as a binary difference of ‘to pay and not to pay’).

In this theoretical discourse economy is a social system that solves and, that is important, produces exactly one problem of society: scarcity, what means it’s not enough for all. Economy shows a so called double coding: Scarcity of property is translated into the scarcity of money and vice versa. Double coding is responsible for the economical dynamics by forcing equilibrium and disequilibrium as stable and simultaneously unstable states of economy. On the one side the property of someone is always the none-property of all others. The acceptance for this social state is generally low and all none-owners have to be motivated to accept the unequal allocation of property. By doubling the cycle of goods, represented by property and its exchange, with the cycle of money increases the possibility to accept this unequal allocation. Every transferred property could be assigned a certain monetary value. Owning or not owning goods is reflected after monetization in owning and not owning of money and accordingly in solvency and insolvency. “While ‘just’ property is quite uninteresting – what should I do with a backyard with 20 apple trees? – the medium money universalizes scarcity and interests.” [Luhmann 1998: 349, originally in German]

The monetized code is expressed and operated by economy as a medium of success with two possibilities of affiliation: to pay or not to pay. The wording ‘success’ should not be interpreted as economical success but as the increased probability of acceptance of communication (ibid.). First of all money as a medium of success bridges the social difference between alter and ego. Alter-
ego-constellations are marked by double-contingency. On both sides of this relation it is known that both sides can act as it is wished and the other way round. Money links in such a case a selection of somebody, e.g. to consume a product, with the motivation of somebody to accept this interests. The combination of selection and motivation was not always solved as peaceful as it happens by using money. Using force of arms has been an appropriate instrument for a long time to solve double contingency in society. But with the evolutionary achievement of money a new quality of solving double contingency enters the stage.

Compared with a more general understanding of communication as talk or discourse money is symbolic visualized. As symbolic medium money has the ability to be transferred and the ability to forget. When money is spent it’s gone and you can imagine as hard as you want it won’t come back in your wallet. But what you spent it for and what it was spent before it was in your wallet is not saved on the physical symbol. Therefore money ‘has no smell’.

The transfer transports only quantitative information what is the reason for its discharging effect. Nothing else has to be communicated or proofed when you want to buy a pretzel at the bakery, only that you have the money to afford it. The so called generalization of money guarantees that it is spendable for different reasons and unspecific in its usage.

Additionally to these characteristics on a social dimension money has the ability to be an effective medium in a temporal context. If a payment makes sense or not can be decided by price understood as the economical program that shows which side of the code should be marked. In the case of innovation future prices are unknown but with money it is possible to bed for upcoming developments in the future. Innovation in this context does not start with a good idea but with an investment what means spending money with the expectation to get back more in future. The net present value method shows clearly the mathematically expressed connection between money and time (Majer 2001: 157):
The connection of money and time allows measurable feedback (did we earn money?) and especially important for innovation feed forward communication. With every selection a bet on future development is possible. Beside of that interplay the double coding of economy enables innovation dynamics. With an innovation it is possible to produce and reduces scarcity and to transfer scarcity of products into the scarcity of money, with which it is at the same time possible to bridge over time gaps of innovation processes.

The strong downsizing and transformation of future uncertainties by using money as a medium of success could be regarded as one reason for the societal preference of economical innovation. Economy as one structural filter in innovation processes seems to play the role of a goalkeeper for mechanisms of selections. But with using and communicating in technology even more than downsizing and transformation of future uncertainties seems to be possible.

**Technological Innovations**

In all diversity of ‘wet ware’, ‘hard ware’ and ‘soft ware’ as media of habitualization, mechanization and algorithmization as forms of technology there can be observed two connecting moments that characterize technology in its cores: causality and repeatability. Technology as a medium can be defined as fixed causality (Luhmann 2000, Halfmann 1996). If we press the light switch, there is light. From this point of view technology has the function to deliver expectable effects without stressing any more connotations. That could be on that stage of discussion compared with the effect of money because money and technology cause open space for other communication. E.g. the main
thing when driving a car is not the fixed causality between turning the key and starting the motor but to choose other modalities of communication like to speed or to cruise through the city. The more contexts of communications (speeding, cruising, transporting etc.) are selectable; the ‘better’ technology seems to be. The more information (technology is based on) gets in the background and the more functions technology has, the ‘better’ technology is observed (e.g. NBIC as the converging of Nanotechnology, Biotechnology, Information technology and Cognitive science).

When fixed causality itself becomes a topic of communication, technology can then be defined as installation (Halfmann 1996: 126). Then the border between included causality (what was until then of no interest) and between the excluded environments, which were until then free for other communication, collapses. In this situation the physical, biological or chemical construction of technology enters the stage and must be brought back in causality by using other causalities like a glue, screwdrivers or codes. In this frame technology can be seen as memorized communication of intended purposes and expected effects (Schulz-Schaeffer 2000: 75).

This system-theoretical point of view neglects the perspective of doing technology as a social practice and counts it in the environment of social systems by drawing a sharp distinction between technology as a medium of the social and as an installation.

Nevertheless this sharp distinction may help to understand socio-technical phenomena like innovation. What is the internal logic of technological evolution? Technological evolution and social evolution are intertwined, co-evolving and tend to build up more variety. By orienting these technological conditions towards innovation, there could be observed one fundamental difference between society and technology. While society is a self reproducing social system, technology has the form of an allopoetic system that can’t reproduce itself. As a medium it provides the potentiality to be used in social contexts by appearing in different forms. When we observe technology as supply technology that could be mostly described by its most wide-spread form of mechanization, technology has the function of making society independent of its ecological environments. Prominent examples start with fire and hand axe and end with water and energy supply, canalization and nuclear power plants. That form of technology is corresponding with the long time very prominent proposition of Arnold Gehlen, that the human being is an entity of imperfection (Mängelwesen, Homo Inermis) and therefore has to use
technology as booster of its wet ware (Gehlen 1950). Nowadays understanding of technology has fundamentally changed towards technology of information and computer networks. Technology as a medium gets more and more a medium of dissemination of communication. Prominent examples are the printing press and computers. In that frame social systems use technology either as supply technology or as medium of dissemination of communication. “What works, that works.” (Luhmann 1998: 518). Technology has the function of saving consent and the possibility to coordinate always difficult and conflict-laden human acting. The continuous societal preference for technological arrangements or technological innovation has to be seen in the possibility to handle complex situations of double contingency by communicating over (often complicated but always causal) technological systems.

**Building Blocks of Future Innovation: Media of Success and Media of Communication**

The societal preference for everything what is marked as ‘new’ could have different reasons.

What is pointed out here is the fundamental problem of innovation as a future paradox. Paradoxes could not be solved but transferred or bridged over. In the case of innovation we found two strong mechanisms to reduce complexity and temporal gaps. Money, as medium of success and characterized as symbolic and generalized, shows the ability to bridge over time. It works by forgetting or neglecting all other social contexts like morality, power, love etc. In its economical contexts it’s related to property and scarcity what are the starting and ending points of economical dynamics and found the ‘need’ for innovation. Content-wise we observe a societal preference for technological innovation because of its causal simplification. By using technology as a medium of communication much more complexity could be build up and handled.

What other structural possibilities does society have to be innovative and to build up innovations? By picking up the expressed assumption of the beginning it seems that our modern society is evolving in a direction where the interplay of economy, technology and innovation seems to change. The implementation of the computer and its networking assigns the introduction of a new medium of dissemination. As a technical artefact its medial character is founded in its causal simplification: by algorithmization much more infor-
formation could be saved, activated and disseminated than ever before. The range of communicative accessibility increases and hypertext allows non-linear communication. Usually society builds up new cultural forms of itself, which catch the exploding excess of communication. Internet itself and corresponding new social forms of networks, e.g. in civil society, ecology movement or opens source, show first blueprints of the so called next society. Societal restlessness lacks of rationality and temporal forms of social systems could be some kinds of an ‘answer’ towards computer communication.

First of all it should be worked out for plausibilization what kinds of innovations seem to be possible or are actually empirically observable in the unmarked space of economy and technology. The following table 1 shows the result of crossing economic and technological innovation with the unmarked space of non economic and non technological innovation:

<table>
<thead>
<tr>
<th>Economic</th>
<th>Technological</th>
<th>Non Technological</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cars, Trains,</td>
<td>Organisational Innovation</td>
</tr>
<tr>
<td></td>
<td>Mobile Phones,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computers</td>
<td></td>
</tr>
<tr>
<td>Non Economic</td>
<td>Open Software (Linux),</td>
<td>Social Networks,</td>
</tr>
<tr>
<td></td>
<td>Wikipedia</td>
<td>Political Parties</td>
</tr>
</tbody>
</table>

Table 1: Crossing of Non-/Economic and Non-/Technological Innovations (own source)

In accordance to the above mentioned difficulties in finding clear empirical forms of economic and technological innovation and vice versa it should be outlined that structural problems of innovation will keep up in future: also in future the future will be uncertain and still can’t orient the present. But forms of how innovation processes are designed and what kinds of results are possible could be expected as different. One main question what is derivable at that point of the discussion is, what kind of form future media of success will have in accordance to allow selections and communicative closure of variation in a way that there will be a result that could be called innovation.

The empirical plausiblizations from above show that societal and technological evolution is intertwined by the co-evolution of social and technological segments through its reciprocal augmentation relation. The more complexity
could be handled by technology the more complexity in society is possible and vice versa. Already computer communications allows new organizational forms like networks, where enterprises, social networks, single persons and other computers are loosely coupled but where enough restrictions of double contingency could be found so that communication is processed.

The question what enters the stage here concerns basically the problem of how next innovation processes could be managed with what kind of media of success.

**Conclusion: New Media of Innovation**

When we observe non-economic and non-technological innovation we can ask for mechanisms of selection beside money. What medium has the quality of increasing the probability of acceptance of communication and what corresponding structural filter can be used in innovation processes? This filter has to have two structural qualities if we postulate structural future similarity: it has to be symbolic and generalized. By symbolization it is guaranteed that it is reusable without demanding for a new consent. Reusability contents the possibility of temporal durability and increases the likelihood of being used as a stake into the future. And the medium has to have the ability of generalization, what means that it is unspecific in its usage. When we remember the discussed medium money it is possible to spend money for (nearly) everything what occurs as a potentiality in social communication.

What kinds of candidates have been discussed yet? Morality as one often discussed candidate is as insufficient as values. Morality (what is good and what is bad) is indeed much more about conflict than on ensuring the acceptance of communication (Luhmann 1998: 317). And values are not so much discussable or fluid that there could be found a shared basis from which selections of variations get likely. The chance to run innovation processes over time because the running itself is good or valuable is often very small. When we look at a possible other ‘candidate’ we here would like to propose reputation as a medium of success in next society. Especially open innovation projects and open innovation models show that reputation seems to have the ability to connect selection and motivation on a social and temporal dimension. Nevertheless reputation underlies some restrictions which make it not as easy as communicating by money. Reputation is not as easy usable, shareable and exchangeable because it’s strongly connected to trust, what makes it asymmetric.
in its proceeding. Reputation is time intensive to build up and under ‘wrong’, what means not adequate, conditions gone in a second. Symbolization and generalization is heavily conditioned, what complicates the combination of selection and motivation and its time spanning processing. Research and practice on trustworthiness and credibility of organizations figure out the impact and the importance of reputation under terms of computer communication. Communicative affiliations in innovation processes can neither be processed by insistence on truths nor on benefit but have to take the context of reputation into consideration. But if society has the ability to build up and will build up new media of success is finally a practical and not a theoretical decision in the frame of the outlined structural terms.

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Main: Suhrkamp.

A TYPOLOGY OF INNOVATIONS IN RETAIL BANKING

Veronique Favre-Bonte, Elodie Gardet, and Catherine Thevenard-Puthod

Introduction

The French banking sector saw profound changes and increasing competition in the last twenty years (Zollinger and Lamarque, 2004). In this difficult context, banks have to find solutions through innovation to remain competitive, either by decreasing costs, or by differentiating from competitors. Innovation indeed allows putting new products on the market, which can give a pioneer bank advantage over its competitors (even if it is temporary).

However, in spite of the increasing number of innovations introduced into the banking sector (OCDE, 2000), the literature rarely focuses on this sector. In a more general way, services remain the "poor relative" of the literature in management of innovation (Gallouj and Gallouj, 1996; Dumont, 2001). The majority of researches in management of innovation are more interested in technological innovations, and in particular those developed in sectors of biotechnologies, semiconductors, and others. (Baum, Calabrese and Silverman, 2000; Gilsing and Nooteboom, 2005; Roijakkers, Hagedoorn and Van Kranenburg, 2005). However, the results of these researches appear hardly transferable to services (Sundbo, 1997). For example, the main criteria for measuring innovation in technology, such as number of patents or Research & Development budgets, do not seem to be valid measures in services. In the same way, innovation in services is often less tangible, more human and relational than technological (Warrant, 2001; De Jong and Vermeulen, 2003). Finally, within services, specific forms of innovation can be found (it is the case of “tailored” innovations that exist in numerous business to business service sectors, but not necessarily in the environment of retail banking), which encourage researchers to focus on a single sector: insurance (Gallouj and Gallouj, 1997), hospitals (Djellal and Gallouj, 2005), audit (Gallouj and Gallouj, 1996), etc. Some authors in banking innovations either focused on the development of new offers

8 « Les mécanismes de l'innovation sont complexes et une abondante littérature s'efforce d'éclairer le sujet. Le management des entreprises de services est lui aussi complexe et une littérature non moins abondante lui est consacrée. Mais l'intersection de ces deux sujets, l'innovation dans les services, forme un ensemble étroit, en France comme à l'étranger, et limité à quelques travaux pionniers », Dumont, 2001, p.14
(De Jong and Vermeulen, 2003), or considered that banks could not innovate outside new technologies (Karmarkar, 2000; Ding, Verma and Iqbal, 2007). In our opinion, a frame allowing a census of innovations in the retail banking sector is missing.

Innovation refers to the creation of value, directed mainly to the customer, but also being able to concern other parties such as the organization itself (Flipo, 2001). Innovations can also involve several dimensions (Djellal and Gallouj, 2001; Avlonitis, Papastathopoulou and Gounaris, 2001): the concept of service, process (information system or method of work), the organization (hierarchical level, structures, etc.) and the type of external relation (new types of interface, intervention of an intermediary, etc.). We consider that innovation exists when there are deliberate actions aimed at profiting by modifications (De Jong and Vermeulen, 2003). By basing ourselves on this definition, the objective of this article is to better define what banking innovations cover, to show that there are several categories of innovation in retail banking, and to propose a typology.

In the first part, a literature review of the main work on innovation in the banking sector as well as in services in general leads to the proposition of a typology. In the second part, the proposed typology is applied to the case of the main French retail bank: The Crédit Agricole. This case study also illustrates that an innovation is not an isolated phenomenon in the organization. We shall try to show how a first innovation can engender a series of others.

**Looking for innovations in banks**

After having explained why innovation is an issue that particularly affected banks for the last twenty years, we present a synthesis of the literature on innovation in the banking sector. The synthesis shows two limitations: (a) a focalization of research on new offers (visible innovations for customers) and (b) technological progress as the only source of innovation. We try then to propose a typology of innovations that allows a better explanation of the variety of banking innovations.

**A banking sector in full mutation that urges banks to innovate**

In the last twenty years, French banking sector has known profound changes which urged banks to evolve, from a structural and strategic point of view, bringing them notably to develop their practices in innovation.
The world deregulation and the French banking law of 1984 put an end to a period during which the French banks were "a little protected" (Zollinger and Lamarque, 2004). This legal evolution changed the competitive landscape profoundly by modifying the positions of traditional banks and by favoring the arrival of new entrants on the banking market. Besides the foreign banks, two new types of actors appeared: the large-scale retailers and insurance companies. So, the leaders of large retailers did not hesitate to create their own bank (e.g. Accord for Auchan, S2P for Carrefour ...) and to propose credit cards and other financial services to their customers. Insurance companies also penetrated the banking activity, by relying on their important portfolio of particular customers (e.g. Axa Bank, AGF Bank, etc.). Consequently, competition strongly became intensified, especially that the market of main banking services (e.g. accounts-checks, credit cards, etc.) reached saturation (97 % of the French population possess bank account, according to Lamarque, 2003).

At the same time, banks have to face a greater requirement of their customers, notably in the transparency of invoicing and return on investments. Better-educated customers want to optimize their financial management and they do not hesitate to appeal to consumers' associations in case of litigation. Many persons are clients at several banks and they play the competition to obtain preferential treatment (example of property loans).

Finally, at the technological level, progress in information and communication technologies revolutionized the functioning of banks. If banks had to cope with new types of competitors (the "virtual" banks, which have very limited physical infrastructures), leading them to seek solutions to reduce their operating costs, they have also benefited from the internet opportunities to communicate differently with their customers and to offer new services. The costs of integrating these new technologies are particularly heavy, they had to make trade-offs in terms of allocation of resources, both financial and human. All of these regulatory, sociological and technological changes resulted in a renewal of the banking design, and a change in management practices (Zollinger and Lamarque, 2004). The banks had to think about how to create a sustainable competitive advantage. Two generic strategies (Porter, 1982) are being used in a complementary manner: domination by the costs and differentiation. Cost reduction concerns mainly the "production" of the service or what is called the "back-office" (De Coussergues, 2007). Thanks to computers, banks seek to minimize the price of routine operations and to carry out centralized treatment. Differentiation concerns several aspects. Thus, despite many regulatory
constraints that banks have to face (including supervision by the authorities, which severely limits the scope for creating new products), they regularly try to launch new offerings (Oseo, 2005). Then, as they can not play on the price (there are few references to prices in the commercial messages, the impact of this factor is low; Ferrary, 1997), nor on offered yields (very close to other banks), they are trying to find other ways of differentiation, through a better quality of service (Zollinger and Lamarque, 2004): customization of the offer, setting up new distribution channels (for example, Internet) that allow greater proximity with the customer, better service availability and speed of transactions.

We can see the challenge of innovation emerging: whether to lower their costs or to differentiate themselves, banks need to innovate in order to remain competitive in the market (Reidenbach and Moak, 1986; Drew, 1994; Storey and Easingwood, 1993). However, despite the challenge and the reality of these practices, there are few researchers who are interested in banking innovation (Reidenbach and Moak, 1986; De Jong and Vermeulen, 2003; Athanassopoulou and Johne, 2004; Menor and Roth, 2006). In addition, they adopt a fragmented view of innovation and focus either on the development of new services, or on the impact of technological progress on the functioning of companies.

The major limits of current research

Earlier research on innovation in banking has raised the question of the existence of innovations and their strategic importance. According to Reidenbach and Moach (1986) and Reidenbach and Grubs (1987), banks do not always consider innovation as a means of development. However, those who establish and formalise development programmes for new products perform better than others, whatever their size. Näslund (1986), in its comparison between financial innovations and those from industry, shows that banks innovate, but these innovations are easier to imitate than in industry because they are easier to implement. A bank which innovates will benefit from its lead on the market only for a very short time, because its competitors will quickly imitate the new product, which can not be patented.

As we can see, previous research was only interested in what the Anglo-Saxon literature called NSD (New Services Development; Sundbo, 1997). Some additional works (e.g., De Jong and Vermeulen, 2003; Athanassopoulou and Johne, 2004; Menor and Roth, 2006) also ignore other types of innovation,
such as those affecting the process of issuing the service. However, technological progress has affected many facets of the bank functioning, especially the back office. For example, the automation of many administrative tasks has allowed officers to spend more time with customers and evolve toward more trade missions and advice. The banking business is often regarded as one of the most exposed to informatics mutations (Cooper and De Brentani, 1991).

Based on this influence of technological and computer progress, Barras (1986 and 1990) has constructed a theory of technological innovation diffusion in services. The adoption by a bank of a new computer system indeed causes a succession of innovations, which can be described in three stages:

1. the learning of new software causes at first incremental innovations of process, designed to improve the efficiency of service (such as the automation of back-office banks by the introduction of computers);
2. as a second step, we can observe an improvement in the quality of service through more radical innovation of process (banking ATM which can cut costs and improve the quality of service);
3. finally, product innovations may emerge (home banking).

For Barras, innovation does not exist outside technological possibilities. In line with his work, several authors focused on the role of technology in the practices of banking innovations (Karmarkar, 2000; Ding, Verma and Iqbal, 2007). Ding et al. (2007) focused on the development of self-service activities (hydrants rebate check, consultation with account balances, print account statements, etc.) and considered that technology is an essential resource that all banks must master. However, if the impact of technology on the practices of innovation in the banking sector is undeniable, it seems that banks can develop innovations outside technology (Eiglier and Langeard 1987; Gadrey, Gallouj and Weinstein, 1995; Sundbo, 1997; Djellal and Gallouj, 2001; Flipo, 2001; Patris, Valenduc and Warrant, 2001; Kandampully, 2002; Abi Saab and Gallouj, 2003). Technology is indeed only a component of the delivery system. Other factors may be at the root of innovations: deregulation allowing the introduction of new services previously prohibited, changing behaviours of customers showing new requirements or new needs, increasing competitive intensity that pushes banks to differentiate themselves and to develop new human resource skills (Tremblay, 1989; Gallouj and Gallouj, 1997). In addition, banking innovations are not always very visible. This is the case with social innovations (Warrant, 2001) which relate to the behaviour of individuals (new roles which are allocated to employees of the company, for example).
However, the human dimension is often forgotten. Finally, the Barras model indicates that banks have rather reactive behaviour in relation to innovation. As Gallouj (2002) suggests, this seems to be a simplistic vision of reality. In summary, neither approaches focus on NSD, nor do approaches based on the impact of technology consider the heterogeneity of banking innovations. That is why we develop a typology that fills this gap by addressing the diversity of innovations better.

**Proposition of a typology covering the variety of banking innovations**

There are few authors who have tried to compile a typology of innovations in banking. In addition, existing works are linked to the NSD already mentioned and are thus partial. Thus Karmarkar (2000) focuses only on services in connection with the new information and communication technologies (Internet, telephone, interactive terminals, etc.) and proposes a two-axes typology: the mode of access to the service (centralized: the client must move, or decentralized: the client has access to the service without moving), and the cost of access to technology (continuum from low to high). We have expanded our field of investigation to the literature on innovation in services in general. We found several typologies, the most important of which appear in Appendix 1.

Most of these typologies are constructed from a single dimension:

- Element affected by innovation (product, process or organization, criteria that draw on the work of Schumpeter, Belleflamme et al, 1986; Djellal and Gallouj, 2001; and Hamdouch and Samuelides, 2001),
- The degree of novelty of innovation, which can also be combined with the risk level of innovation (incremental, radical or total innovation based on Arnaud, 1987 and Dumont, 2001),
- And the method of production of innovation (with the participation of the client or not; Sundbo and Gallouj, 1998).

These criteria, although relevant, are used in a very isolated way and do not appear to be able to fully encompass the variety of innovations in banking. The combined use of two criteria would doubtlessly refine existing typologies. There are some classifications that are apparently built on several criteria, but these are not always clarified (Gallouj and Gallouj, 1997; de Vries, 2006). Therefore, none of the existing typologies seems operational enough to identi-
fy the different types of innovation that can exist in the banking sector. That is why, without denying the contribution of this earlier work, but on the contrary trying to make a summary, we are proposing a two-dimensional matrix (Table 1). The first dimension relates to the subject of innovation, i.e. the element that will be affected by the novelty, and the second dimension focuses on the degree of novelty of an innovation. For the first criterion (the subject of innovation), we chose to use the Eiglier and Langeard model (1987), which identifies five components in a servuction system (neologism used by the authors to describe the production of a service). The system of internal organization (also called the "back-office" or "backstage" in Lovelock and Lapert, 1999), includes all the traditional functions of the company not seen by the customer (marketing services, HRM, purchasing…) and how these services work (their working methods, equipment, information system…). In the front office, we find tellers (advisers), the physical medium, which is the equipment used by the staff or clients in the issuance of the service (bank, robots, but also more generally in the premises where the service is delivered) and the customer, who will more or less be involved in the production of the service (he may, in some cases, define the problem and / or assume a number of operational tasks). Finally, the system issues a “product”: the service itself, which corresponds to the offer which is made to the customer. The advantage of this model is that it differentiates more components of a service than the mere criterion product / process / organization model, and it makes it possible to distinguish between what is visible to the customer and what is not. This model allows us to show an essential constituent of the system in the case of banks: the back office, where fundamental skills are often located (Bancel-Charensol and Jougleux, 1997).

Table 1: Proposal of a retail banking typology

<table>
<thead>
<tr>
<th>DEGREE OF NOVELTY</th>
<th>+</th>
<th>++</th>
<th>+++</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental Innovation:</td>
<td>Already existing components, but either improved or recombined</td>
<td>Radical Innovation:</td>
<td>New for the firm</td>
</tr>
</tbody>
</table>

SERVICENew service
### Table

<table>
<thead>
<tr>
<th>(= new offer)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Front office **</td>
<td></td>
</tr>
<tr>
<td>Teller</td>
<td></td>
</tr>
<tr>
<td>Physical Medium</td>
<td></td>
</tr>
<tr>
<td>Customer participation</td>
<td></td>
</tr>
<tr>
<td>Back office*</td>
<td></td>
</tr>
<tr>
<td>Support Functions, information system …</td>
<td></td>
</tr>
</tbody>
</table>

* innovation that is invisible to the customer

** innovation that is visible to the customer

The second dimension focuses on the degree of novelty of an innovation. This criterion makes it possible to identify whether banks are able to develop innovations other than minor, as critics often contend (Gallouj, 1998). We distinguish three levels of innovation: incremental innovations that relate to items already in the bank, which were either improved or recombined (within the meaning of Gallouj and Weinstein, 1997), that is to say grouped or organized differently; radical innovations which designate the introduction of new elements to the company (but which can also exist in other banks), and finally, total innovations that result in the introduction of an entirely new element, new both to the company and to its environment (an element that does not existed before at any of the competitors). We propose now to ensure the implementation of our typology by testing it on the heterogeneity of banking innovations within the first French retail bank: The Crédit Agricole.

### Methodologies and Results

In this section, we begin with an overview of the methodology used to better understand innovations in the studied bank. Then, we explain and place each innovation in our typology. Finally, we select two examples of innovations to better detail them, and especially to highlight a phenomenon we have seen many times: the cascade effect of innovations.
Sampling
To assess the relevance of our typology, we chose to study in depth the case of a retail bank. The objective was to identify the various innovations of the company over the last decade and to classify them. The aim of the case study was therefore to describe and to illustrate (Hlady-Rispal, 2002).

The case has been selected to serve the studied phenomenon. Our choice fell on The Crédit Agricole for different reasons. The Crédit Agricole is the first French credit institution, in its own funds (69.4 billion euros in June 2007), number of employees (more than 80,080 employees) and its market share in the retail banking activity (over 25% since its acquisition of the Credit Lyonnais). As a leader of the retail market, the bank seemed to develop a large number of innovations. It was also regarded as one of the most dynamic banks in the market (Ferrary, 1997).

As the Crédit Agricole is much decentralized with autonomous 41 regional entities, we chose to focus our attention on the functioning of one of these entities. Each entity has a certain freedom; although, in most cases, it adopts innovations developed by the headquarters, it is authorised to propose its own innovations.

Data collection and analyses
In order to identify practices of innovations within the regional entity, we performed ten semi-structured interviews (see Table 2, below), with an average duration of one hour and a half. These interviews were designed to understand the key innovations developed over the past decade, their nature, their origins, their degree of novelty and their strategic impact on the entity.

Table 2: An overview of the interviews conducted within the regional bank

<table>
<thead>
<tr>
<th>Duration of the interview</th>
<th>Function of the interviewee</th>
<th>Innovations studied</th>
<th>Date of the interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1h45</td>
<td>Marketing Manager</td>
<td>Mozaic / Green Points / Products for Seniors / New agency concept</td>
<td>04/05/07</td>
</tr>
<tr>
<td>2h00</td>
<td>Vice Director of the bank</td>
<td>Insurance / Mozaic / Green Points / Products for Seniors / New</td>
<td>30/05/07</td>
</tr>
</tbody>
</table>

For confidentiality reasons, we do not mention the name of the regional entity.
<table>
<thead>
<tr>
<th>Time</th>
<th>Position</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1h30</td>
<td>Bank service manager</td>
<td>Products for cross-border workers / Intelligent Billing</td>
<td>05/07/07</td>
</tr>
<tr>
<td>1h00</td>
<td>Agency manager</td>
<td>Products for cross-border workers</td>
<td>04/07/07</td>
</tr>
<tr>
<td>1h45</td>
<td>Cheque service officer</td>
<td>Automation of cheques deposit</td>
<td>09/07/07</td>
</tr>
<tr>
<td>2h00</td>
<td>International Service Employee</td>
<td>Products for cross-border workers</td>
<td>21/08/07</td>
</tr>
<tr>
<td>1h00</td>
<td>Marketing manager assistant</td>
<td>Mozaic / Green Points / Products for Seniors / New agency concept</td>
<td>09/07/07</td>
</tr>
<tr>
<td>1h30</td>
<td>Geographical area manager</td>
<td>Products for cross-border workers</td>
<td>20/08/07</td>
</tr>
<tr>
<td>2h30</td>
<td>Marketing Manager</td>
<td>Products for cross-border workers / Mozaic / IHM / Seniors / New agency concept / Green Points / New methods of diagnosis / Square Habitat</td>
<td>04/01/08</td>
</tr>
<tr>
<td>1h30</td>
<td>Logistics Officer</td>
<td>New agency concept / IHM Ergonomics / Intelligent Billing</td>
<td>08/01/08</td>
</tr>
</tbody>
</table>

These interviews were supplemented by internal secondary data (internal memoranda written by the headquarters, presentations of innovations to employees) and external (newspapers articles). The codification has been done thanks to the recommendations made by Miles and Huberman (2003). Each interview has been encoded and gradually refined during the research. This was achieved as soon as possible after each interview and was the basis for the preparation of subsequent discussions. We have also compared, when it was possible, the information and made a triangulation between the primary and secondary data.

**The case of the Credit Agricole**

The regional entity of the Crédit Agricole has regularly innovated or adopted innovations from the headquarters over the past decade. We particularly focused on the thirteen most frequent innovations. Each innovation is presented using the same structure: (a) general description of the innovation and its context, (b) then explanation of its position within the typology.
Mozaic:
Innovation in a few words: it is a specific offer for young people aged from 10 to 25 years. The Mozaic account holders have a service package, which may include various banking products (checking account, credit card, student loan at preferential rates and no fees), as well as other benefits (discounts on the products of corporate partners like cinema tickets, CD, invitations to the event operations, driving licence ...).
Positioning in the matrix: this innovation relates to a new offer, which is incremental in nature. The various services existed, they were combined together via the establishment of a package and improved (that is to say adapted to the specific needs of the target).

Loans for seniors:
Innovation in a few words: the bank proposes to older people packages that include consumer loans, mortgages (lifetime mortgage loan…), transmission conventions (life insurance contracts…) with the heirs, and so forth.
Positioning in the matrix: this new offer is incremental since it is an assembly and an enhancement of pre-existing offerings.

New methods of diagnosis:
Innovation in a few words: Establishment of diagnostic tools in the agencies to facilitate the work of consultants: insurance, savings, credit, tax optimization, transmission... These innovations of formalization (as defined in Sundbo and Gallouj, 1998) help the staff structure interviews with issues that improve the discovery of the customer.
Positioning in the matrix: incremental innovation of front office enabling the staff to propose offers nearer to the needs and expectations of customers.

Improved ergonomics of Men Machines Interfaces (MMI):
Innovation in a few words: the general thinking on the use of banking equipment concerns different aspects. It applies to both customers and the back office (employees at headquarters or agency network). With regard to the customers, the introduction of robots requires management of the interface in order to make the use easier (colors, provision of the text, data density, placement of buttons, writing messages, and so on.). For example, in the early
robots, customers got the money and then withdrew the card. But many clients were taking money and forgetting to withdraw their card. This caused many oppositions and an additional workload for staff. Following new developments, these two actions have been reversed.

On the back office, there were strong changes with the collaboration of Google for employees’ computers (easier access to information through a more fluid navigation; search assistance by topic on the intranet since November 2007, etc.).

**Positioning in the matrix:** we have therefore both an incremental innovation of front office (visible to the customer) on the physical medium that is being constantly improved thanks to the behaviour of customers towards automations, but also an incremental innovation of back office.

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**Pacifica (property insurance):**

**Innovation in a few words:** The CA has embarked on insurance of property (vehicles, furniture…) via a subsidiary, Pacifica. It has proposed to its customers packages + credit insurance. But unlike the competition, the CA was the 1st bank to establish a direct link between the garage, the expert and the insured. The insured has a single interlocutor and also benefits from fast service (File treatment within 48h). Finally, the offer is a new one: a re-equipment without any conditions.

**Positioning in the matrix:** This is a new offer that corresponds to a radical innovation for the company (the "property insurance” service is new to the CA) who had to learn new skills outside its core-business (creation of a subsidiary called UDM: Unit for Disaster Management). Naturally, this innovation is not new to the market, because of the prior existence of insurers offering intrinsically the same type of service.

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**Square Habitat:**

**Innovation in a few words:** The C.A. opened real estate agencies which issue a global transaction, lease or property management. The CA has, for example, created the Green Mandate. The new mandate allows the seller to receive compensation if his property has not been sold after three months and one day. In addition, The CA is committed to making the seller announcement every week in newspapers and provides the publications evidence.

**Positioning in the matrix:** radical innovation for the company which is deploy-
ing to a new job, that of real estate agent. The CA had to learn new skills outside its core business. Before 2006, the CA real estate sales were limited, in addition to the credit financing, to the promotion and sale of products to new investors. However, this activity is not new to the market since the basic service was already provided by traditional real estate agents.

**The online bank:**
**Innovation in a few words:** Internet site allows easy access to accounts and provide an opportunity to be closer to the bank without moving (24/24h and 7/7 days available account to conduct online transactions and account management).
**Positioning in the matrix:** front office Innovation (teller, physical support, customer participation) since this is a new distribution channel. It is radical for the company but not for the market since the Crédit Agricole was not the first bank to launch the concept.

**Intelligent billing system:**
**Innovation in a few words:** the new intelligent billing aims to customize the pricing of services depending on the customer (age, "good" customer, and so on.). It leads to a better understanding of the customer, thanks to the recording and analysis of data. These data can then help customize the offer and retain customers.
**Positioning in the matrix:** Back office innovation (invisible to the customer) which required the deployment of an ad hoc computer system to identify the customer history: simulation and diagnostic software to adapt offers to customers. It is for the company a radical innovation which required new computer skills for the CA.

**Products for cross-border workers:**
**Innovation in a few words:** Due to the specificity of the market, there are many products for cross-borders within the studied regional entity (a great number of cross-border customers, with high purchasing power and with specific expectations). Among a wide range of new offerings, we can include the transfer of cross-border wages on their current account in France (which necessitated the establishment of a partnership with foreign banks), loans in foreign currency (for the consumption or habitat) at fixed or variable rates and
savings products that protect customers from too volatile exchange rates.

**Positioning in the matrix:** The CA has been a pioneer in setting up these specific offers for cross-borders. They are total innovations (new for competitive environment). Although competition has since sought to imitate these offers, the CA maintains "one step ahead" through its seniority.

**Green points:**

**Innovation in a few words:** The CA gives to some merchants located in rural areas the opportunity to deliver banking services to their customers (cash withdrawal, money transfer, booking a credit card, and so on.). This helps in maintaining a close relationship with customers in geographical areas where there is no agency. A new regulatory constraint is at the origin of this innovation which for security reasons prohibits advisers to carry money outside the agencies.

**Positioning in the matrix:** it is a new distribution channel, so a front office innovation, customer service remained the same. It is a total innovation for the environment: no other bank proposes such a "channel" for distribution.

**The new agency concept:**

**Innovation in a few words:** The CA has a very dense entities network which is a prerequisite for a local strategy. The network determines the frequency of contacts and requires the development of infrastructures to reduce operating costs and improve advices. To this end, the CA has developed the device ATICA, which aims to renovate agencies by integrating automatons which allow greater autonomy to customers, 24/24h availability for current operations and thus reposition staff (advisers) on operations with higher added value.

**Positioning in the matrix:** front office innovation with a redefinition of the staff mission, an investment in a wide range of automatons (physical media) and the greater involvement of customers. On this innovation, the Crédit Agricole has been a pioneer and has the broadest automated network in France: it is therefore a total innovation.

**The new cheque processing:**

**Innovation in a few words:** creation of a subsidiary, the CETOP (Centre of Processing and Payment Operations) for the cheques processing. Checks are
scanned by retailers or individuals (via an automaton in the agency) and the information is stored (amount, customer identification). This information is directly sent to the CA platform. This helps to secure transactions (no problem of loss of cheques), and to credit customers much faster (the period is reduced to one day when it was on average three days before the implementation of this process).

**Positioning in the matrix:** it is a back office innovation for which the Crédit Agricole had to acquire new technological and organizational skills and make major investments. Moreover, this innovation is a total innovation for the competitive environment since the CA was the first bank to introduce this type of organization (some competitors outsource their own cheque processing to the CA).

All these innovations have been positioned in the matrix (Table 3). It would therefore appear that our typology is not only able to encompass the variety of innovations (despite their heterogeneity), but also to distinguish between them.
Table 3: The Crédit Agricole’s Innovations

| Service’s Components on Which Innovation Is | Degree of Novelty | | |
|-------------------------------------------|------------------|---|---|---|
|                                           | Incremental Inovation | Radical Innovation | Total Innovation |
| New service (= new offer)                 | Mozaic           | Pacifica Square Habitat | Products for cross-border workers |
| Teller                                    | New methods of diagnosis | | |
| Physical Medium                           | IHM Ergonomics (automatons) | Online Bank | Green points New agency concept |
| Customer participation                    | -                | | |
| Front office                              | Support Functions, information system … | IHM Ergonomics (Employees’s computer screens) | Intelligent billing | Cheque processing |

Several observations can be made on the relevance of this matrix. First, we could not find an example of innovation that only focused on the unique evolution of the degree of participation of the customer. We thought it was quite rare in retail banking, that the participation of customer change without being due to the introduction of a new physical medium or driven by tellers. But the marketing director of the regional entity, which has effectively recognized that no innovation of this kind was developed in the bank, has confirmed the existence of such innovations among competitors. Then, if the innovations of improvement may relate to the components of the front office (teller or physical medium), the major part of most radical innovations appears at the launch of a new distribution channel (Green points, new concept of agency or online banking) which, in fact, impacts the three components of the front-office.

These examples of banking innovation also allow us to make a number of findings. If technological progress opens up many tracks of innovation (online

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10 Thus the Laydernier Bank sets up a sponsorship system for its clients: they obtained numerous advantages when they bring people to open a bank account.
banking, cheque processing…), both in front office and back office, a number of innovations remains unconnected with new technologies. This is the case with all new studied offerings (products for cross-border workers, Pacifica, Square Habitat, and so on.), some distribution channels (such as green points) or innovations of formalization regarding personnel in contact (new diagnosis methods). The easing of the regulations, new customer needs, and innovations of the competitors are potential sources of innovation at least as important as (if not more important than) the information and communication technologies.

These cases of innovation also show that retail banks are able to produce innovations with high degree of novelty (radical innovations, or even total), even though some of them are invisible to customers (that is the case of innovations that relate to the back office, as the process of cheque processing). In this case, the question is: how can a bank create value for customers and enhance its competitive advantage? The answer lies in the lower cost and therefore in the price, or in the quality improvement of the offered service. The competitive advantage this type of “hidden” innovation confers appears perhaps more defensible in the long term (its components are indeed less visible to competitors, as they are embedded in the structure of the company).

This analysis enables us to highlight a characteristic of the banking sector that some researchers have already identified in other sectors (Warrant, 2001): the "cascade effect" of innovations.

**Cascade effects of banking innovations**

Several innovations studied have lead to a series of other innovations in different places of the servuction system (see table 4) regardless of their initial goal (to propose a new offer to the customer or improve the back office). So there is a spread of innovations that progressively touch other elements, or even the entire system. This phenomenon appears as a watermark in the work of Barras (1986 and 1990), then much more in that of Warrant (2001). However, in addition to this research, our analysis shows that these effects, which can be described as "snowball" or "cascade" can be unrelated to the use of new technology. In addition, a trend seems to be emerging: the higher the degree of novelty of innovations is, the greater the impacts on the entire system are. A radical or total innovation will have more impact on other parts of the system than an incremental one. Finally, we propose that the starting point for a series of innovations may be the back office, the front office or an offering
as well.
Table 4: The cascading effect of the studied innovations

<table>
<thead>
<tr>
<th>Studied Innovations</th>
<th>New offer</th>
<th>New “servuction” process</th>
<th>Front office (innovation which is visible for the customer)</th>
<th>Back office: support functions, Information system…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mozaic</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Products for Seniors</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>New diagnosis methods</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>IHM Ergonomics:</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>- Automatons</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Employees’s</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>computer screens</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Pacifica</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>Square Habitat</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>Online bank</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Intelligent billing</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Products for cross-border workers</td>
<td>+++</td>
<td>-</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Green points</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>New agency concept</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Processing of cheques</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+++</td>
</tr>
</tbody>
</table>

Legend: - Not a innovation + Incremental Innovation ++ Radical innovation for the firm +++ Total innovation for the competitive environment

Grey cells correspond to the starting point of an innovation.

To illustrate this cascade effect, we choose to discuss in more detail two examples of innovation with different purposes (new offer for one, back office innovation for the other), but the degree of innovation remains the same (with reference to our typology, these are total innovations). Those innova-
tions are *products for cross-border workers* and *processing of cheques*. Let’s come back a minute to the presentation of these two innovations, before describing their impact on the servuction system (see Table 5).

The raison d’être of the innovation named *processing of cheques* was to cut costs, because it was difficult to bill the customer. For that purpose, a new organization was established by the Crédit Agricole. As a first step, the customer can file cheques 24 hours on 24, using a scanner. The images of cheques are then sent to a central platform that manages the flow of the different agencies and that credits customers. Two video-coding workshops correct any errors (wrong read cheques) and the Cetop (central cheque processing) compares the image files of the platform and the real cheques. The subsidiary then distributes these cheques to the various regional entities and to competing banks (checks of less than 5000 euros are archived for 60 days and DVDs are returned to agencies, each day).

This back-office innovation (starting point) has caused other innovations at various levels of the servuction system. Indeed, at the front office, it has meant:

- an increase in the degree of customer involvement by scanning their own cheques\(^\text{11}\);
- the introduction of new physical media (successive generations of scanners);
- the reduction of staff associated to the cheques collect.

In addition, the supply has been improved because the customer is now credited to D+1 instead of D+3.

With regard to *products for the cross-border workers*, the activity of offering new services to such clients with special needs (transfer of wages collateralized exchange, loans in currency at fixed rates…), was accompanied by changes in physical media (specific space created on the website and new machines to change currency) and the back office. Changes in the back office included development of new computer programs to monitor the stock markets and to offer customers a competitive exchange rate, and partnership with a foreign bank in charge of aggregating wages filed by the cross-border workers in different banks in the cross-border country before making the transfer to the CA in France.

\(^11\) The customer deposits himself cheques without support from the staff, then the receipt is automatically produced by the machines.
Table 5: The impact of the two innovations: cheque processing and products for cross-border workers

<table>
<thead>
<tr>
<th>PLACE OF INNOVATION</th>
<th>DEGREE OF NEWNESS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Incremental</td>
<td>++</td>
<td>Radical</td>
<td>+++</td>
</tr>
<tr>
<td>New service (= new offer)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front office</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teller</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back office</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support Functions, information system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Legend*: The black points indicate the starting point of innovation (back office or new service), and the white points show the impact of innovation on the other elements of servuction and therefore the changes in cascade that innovation has led.
This cascade of innovations raises two major commentaries. First, it suggests that a bank that wishes to innovate drastically needs to be able to change the various components of the service system in a coherent manner (Warrant, 2001). It must anticipate the impact of a radical innovation, which can affect different places of the servuction system.

In addition, a doubt remains on the relevance of research that is only interested in the Development of New Services. Such research can only have a fragmented view of mechanisms or outputs of innovation since the introduction of a new offer may produce other types of innovations. The performance of a NSD can be linked to another innovation, such as back office innovation.

**Conclusions**

This article has aimed at a better understanding of the forms of innovation in retail banking. The case study within the Crédit Agricole has brought four main results:

First, we can see that banks are able to innovate and not just incrementally. They are indeed able to entirely commercialize new bids or put in place original servuction processes.

Then, if literature has often focused on technology as the only source of innovation, our results highlight that banks can develop multiple innovations, without any technological advances. Thus, regulation and the changing needs of customers are also important causes of innovation.

In addition, the typology that we have proposed allows us to overcome some limits of previous works, broadening the discussion to all banking innovations, and not just to those of new services. There exists in the banking sector many back office innovations, which, if they are not visible to the customer, may be strategic, particularly by reducing operating costs. The bank must then take up the challenge of showing its creation of value to its customers.

Finally, an innovation is rarely isolated. When it is radical or total, it often leads to other innovations, located on other components of the servuction system. The typology developed makes it possible to highlight the impact of an innovation on the entire company.

Further works could usefully complement this research. Our study focuses on innovation in a part of the banking sector (retail banking), and only on one company (The Crédit Agricole). This research must be replicated in other banks (Yin, 1994), in order to obtain external validity. Moreover, future re-
search might show the importance of the process in implementing innovations in the banking sector. Finally, the cascade effect highlighted in this paper encourages future researchers wishing to work on banking innovation to adopt qualitative methods. These make it possible to focus on a more comprehensive and detailed vision of innovation, vision that is useful for understanding the many facets of innovation and to capture the complexity of these cascading effects. In line with De Jong and Vermeulen (2003), dealing with the process of emergence of innovations, we propose to further study these processes of emergence of innovations, depending on the type of developed innovation. That way, the cascade effect that we have identified could be better appreciated.

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THE ROLE OF NON-TECHNOLOGICAL INNOVATIONS IN THE GROWTH OF ENGINEERING INDUSTRY, ECONOMY AND SOCIETY OF RAJKOT (INDIA)

Hardik Vachhrajani

Introduction

In recent years India has emerged as one of the major destinations for conducting offshore corporate research and development (R&D). India has emerged as a strong outsourcing hub for innovation for industries like IT and Biotechnology. The 2007-08 edition of The Global Competitiveness Report of The World Economic Forum places India on rank 26th worldwide for ‘innovation and sophistication factor’ in the economy, ahead of countries like Spain (31), Italy (32), Portugal (38), Brazil (41), China (50) and Russian Federation (77); see (WEF, 2007). The Organization for Economic Co-Operation (OECD) ranks Indian as being the 8th largest R&D investor worldwide. European Union (EU) counts India among ‘major R&D performing countries in the world’ (INNO METRICS, 2006). Many other recent studies suggest India to be one of the most attractive locations worldwide for R&D and innovation off shoring.

These eye-washing figures flow bottom up which is hardly noticed by the world. Small and Medium Enterprises (SMEs) are the real backbone of the Indian economy. India has nearly three million SMEs, which account for almost 50 per cent of industrial output and 42 per cent of India’s total exports. It is the largest employment-generating sector and is an effective tool for the promotion of balanced regional development. These account for 50% of private sector employment and 30–40% of value-addition in manufacturing.

These SMEs are usually family-owned businesses that run on low to medium resources with limited manpower. Most of them do not have high end product innovation capabilities like laboratories or testing centers. First- or second-generation entrepreneurs run most of the SMEs and they do not let the lack of resources come on the way to the success of their organization. This lack of resources, in fact, prompt them to think differently of their organizational processes and to innovate on new things that can help them stay in the
business or help them succeed in competition. As they have little resources to innovate the product, they start innovating on other non-technological aspects that can give them competitive advantage. The saying ‘Scarcity is the mother of invention’ is rightly applicable in this case. This area of non-technological innovation is the least studied in the field of innovation research. These non-technological innovations can range from raw material innovation to networking or distribution innovation. They play a decisive role in the growth and survival of these SMEs. This innovation has become so deep rooted that they start affecting the cluster in which the organization is operating; and the economy and society at large of the region.

The research presented here is an attempt to study the role non-technological innovations have played in the growth of engineering industry, economy and society of Rajkot (India) as a whole.

The Context

Rajkot, the central city of Saurashtra region in Gujarat, is located in Western part of India around 250 km from Ahmedabad and 650 kms from Mumbai, India’s financial capital. Rajkot has seen industrial growth from early 40s, when some skilled craftsman migrated to Rajkot from Pakistan. The region initiated its manufacturing journey with making diesel engines and has moved up the value chain in last 60 years. Today, Rajkot is home to more than 7 clusters ranging from Engineering industry, casting and forging, diesel engines, electric motors, oil mill machinery, oil mills and machine tools. Major contributor to the development of Rajkot and its economy has been the growth of engineering industry. Today the clusters are thriving ones consisting of around 3000 enterprises with a turnover of about Rs. 3000 crore and are generating employment for more than 100000 people (UNIDO 2004).

The industry of Rajkot has witnessed a huge upturn in last six decades; and has its own set of strengths and weaknesses (Vachhrajani 2006).

Major Strengths of the Industry of Rajkot are:

- Easy availability of raw material (for most of the key industries like casting, forging etc.)
- Cost effective labor.
- Availability of highly skilled craftsmen.
- Easy availability of cost effective job workers.
- Cluster approach brings competition; competitiveness brings more number of buyers to Rajkot for their requirements.

Major Weaknesses of the Industry of Rajkot are:

- Low focus on structured innovation efforts. Innovation efforts in Rajkot have been sporadic and haven’t been professionally executed to get maximum leverage.
- Low awareness about quality requirements.
- Low technology orientation.
- Missing professional management approach. First/second generation entrepreneurs with the age-old traditions of manufacturing manage still most of the businesses. This does not attract the next generation to join the business and because of which the industry is suffering from acute succession issues.
- Unavailability of professionally trained manpower.
- Low retention ratio of trained manpower.

Key Innovation imperatives of the Rajkot region
The industry of Rajkot is known for its craftsmanship for years and has always remained a destination for quality buyers. Rajkot has been innovating from its early days in industry. The first innovations came when diesel engines of Kirloskar were made in Rajkot, which transformed the industrial landscape of the city and made Rajkot India’s leading diesel engine manufacturing hub. Even in the worst of the times of the diesel engine industry; Rajkot continued innovation with lightweight diesel engines (Nayak, 2006). After the decline in diesel engine business, Rajkot has successfully undertaken aggressive innovations in machine tools industry and automobile auxiliary business. Though it was a ‘push’ innovation after sharp decline in sales because of technology obsolesces of diesel engines in early 2000; Rajkot has taken most of the advantage of the opportunity and has undertaken large-scale innovation initiatives and which have helped the industry grow and establish its own unique identity.

Major innovative contributions were in technology; where Rajkot based units started innovating in their old tech products and turned them into high tech
products. Machine tools manufacturers like Jyoti CNC and Macpower CNC both led this were conventional lathe manufacturers who have totally transformed themselves into high-end machine manufacturers. Rajoo Engineers is another good example of the organization that has evolved as a quality plastic industry machine manufacturer in the last decade.

Another set of very important innovations came in the form of process innovation undertaken by hundreds of automobile auxiliary units. With strong focus on process control and quality, automobile auxiliary units of Rajkot today can produce the best of the things at the most cost effective rate by leveraging that unique ‘Rajkot advantage’. Some small but considerable innovations flourished during the same time with the success of Balaji wafers’ new innovation model of ‘successful packaging, bundled with customer friendly pricing and extraordinary reach’ which made it a case study worth analyzing; which has kept food giants like Frito-Lay also in the guessing. It is interesting to study the growth of Balaji Wafers in context with other industries of Rajkot (i.e. automobile, machine tools). Here there is no spillover, no cluster and still the company has thrived defying all established advantages of Rajkot.

This innovation in Rajkot has shaped the city, its economy and culture. Rajkot is made of these innovations and these innovations have their own unique ‘Rajkot’ in them. Rajkot serves as the ideal cluster of SMEs for study innovations as such clusters thrive across the country and contribute to the national economic development and employment. Rajkot has a strong base for non-technological innovations that are core supporters of the major innovation system of technological innovations. Non-technological innovations in fact, support the major technological innovations taking place in Rajkot. The research undertaken here is to study the role of non-technological innovations in the growth of Engineering Industry, Engineering SME Cluster and Economy of Rajkot.

**Literature Review**

Innovation, the process of bringing new products and services to market, is one of the most important issues in business research today. Innovation is responsible for raising the quality and lowering the prices of products and services that have dramatically improved consumers’ lives. By finding new solutions to the problem, innovation destroys existing markets, transforms old
ones, or creates new ones. It can bring down giant incumbents while propelling small outsiders into dominating positions. Innovation has capacity to transform a regional economy and has long-term impacts.

**Defining Innovation**

Innovation has numerous definitions; however employing ones that are universally accepted and the most suitable to the proposed research are studied. Schumpeter’s (1934, 1950) early research on innovation pointed to the following five characteristics: new goods, new processes, new markets, new source of supply of raw material, and a new organization status. Innovation is defined as an interactive process initiated by the perception of a new market and/or new service opportunity.

Galanakis (2006) proposed a much broader definition of innovation: “the creation of new products, processes, knowledge or service by using new or existing scientific or technological knowledge, which provides a degree of novelty either to the developer, the industrial sector, the nation or the world to succeed in the market place.” Important thing in innovation is to create some value, and this value should be manifested by its acceptance in an existing market of the emergence of a new market.

Rogers (1983) defined innovation as ‘an idea, practice of object that is perceived to be new by an individual or other unit of adoption’. Innovation represents an orientation fundamentally different from traditional financial or market-outcomes of a firm. Muffato (1998) suggested that in the innovation process, the creation of an innovation climate and related professional knowledge and capabilities are needed to support innovation activities. Hence, there is a need to change organizational arrangement and culture in order to foster innovation. This argument is in line with human capital theory used to explain an organization’s competitiveness in innovation outcomes (Chan 2004)

**Innovation and SMEs**

Innovation is one of the principal challenges to the management of SMEs. Innovation is critical to enable SMEs to compete in domestic and global markets. The importance of innovation for SMEs and start up firms was highlighted various researchers who argued that due to resource shortcoming, scale diseconomies and questionable reputation, innovation is the key competitive advantage for SMEs because it depends on quality and quantity of R & D
personnel and complex social relationships. All of these are difficult to mimic.

Large firms have the wherewithal (large scale of production and capacity, infrastructure in marketing, finance and R & D) to exploit new technology. On the other hand, the argument in favor of small firms is that they have flexibility in adjusting employees in innovation related projects and less complex management structure in implementing new projects. Most empirical studies test the Schumpeterian hypothesis about firm size on invention/innovation activity (input or output) at the firm or industry level.

SMEs are renowned for their creativity and new product development capabilities. This applies in particular to SMEs that have the ability to innovate effectively and develop new products more rapidly than larger firms. Indeed, there was little doubt that SMEs were capable of effective innovation. However, many SMEs still fail to see the opportunities and advantages that are open to them, such as the flexibility of customizing products to the requirements of the consumer, and advantage adopted by larger firms (O'Regan 2006). Devenport and Bibby (1999) state that SMEs increasingly need to develop their innovation capabilities beyond that of Technological innovation. This need comes from increased agility in larger organizations, which enables them to erode traditional SME niche markets. Furthermore, increased internationalization has encouraged some SMEs to operate in more competitive global markets where continual improvement is prerequisite to innovation, as distinct from solely technological development. Thus people, process and product dimensions are included (Tidd 2001). Porter and Stern (1999) stress that such innovation involves much more than just science and technology.

Bessat and Francise (1998) suggest that effective innovation must involve all areas of an SME with the potential to impact every discipline and process (McAdam 2000). Innovation can be transformational, radical or incremental depending on the effect and nature of the change. Afuah (1998) suggest that innovations do not have to be breakthroughs or paradigm shifts, thought organizations should strive for the larger innovation.

Although there are a number of studies on continual improvement in SMEs (Gunasekaran 1996, Bassant and Caffyn 1997, Bessant and Francise 1999), there is a relative paucity of in depth studies of innovation implementation (McAdam 2000) and its impact on the growth of the organization with reference to SMEs, and again there is a huge vacuum when it comes to study the role of non technological innovation in SMEs. It cannot be assumed that in-
novation implementation principles in large organizations are directly transferable to SMEs, where the SME is treated as a scaled down version of the large organizations. Thus there is a need for the studies on how innovation is implemented and what is the impact of the same on the growth and transformation of the organization, which is particularly noticeable in the areas of SMEs and longitudinal studies. They stress the need for further innovation research in these areas.

**Role of Innovation in the growth of SMEs**
The growth is considered to be an outcome of change process in the organization. So all theories, which relate to the organizational change would be reviewed, along with special references to innovation and subsequent change which it has brought in the organizational framework. There are again a series of cases which track the innovation and organizational growth like the case in India of Cadila (Manimala 1993) and the global ones of Motorola, GE etc.
The relationship between innovation and growth can be described as something of a paradox – on the one hand, a broad range of theoretical and descriptive accounts of firm growth stress the important role innovation plays for firms wishing to expand their market share. For example, Carden (2005) presents the main results of the McKinsey Global Survey of Business Executives, and writes that “executives overwhelmingly say that innovation is what their companies need most for growth.” Another survey of Accenture says that 95% of executives believe that innovation is critical to their organizational growth. Another survey focusing on SMEs reports that investment in product innovation is the single most popular strategy for expansion, a finding which holds across various industries (Hay and Kamshad 1994). Economic theorizing also recognizes the centrality of innovation in the growth of a firm. On the other hand, empirical studies have had difficulty in identifying any strong link between innovation and growth, and the results have often been modest and disappointing. Indeed, some studies fail to find any influence of innovation on growth at all. Commenting on the current state of our understanding of firm-level processes of innovation, Cefis and Orsenigo (2001) write: “Linking more explicitly the evidence on the patterns of innovation with what is known about firms growth and other aspects of corporate performance – both at the empirical and at the theoretical level – is a hard but urgent challenge for future research” (Cefis and Orsenigo, 2001).
A major difficulty in observing the effect of innovation on growth is that a firm may take a long time to convert, to increase in economically valuable knowledge (i.e. innovation) into economic performance. Even after an important discovery has been made, a firm will typically have to invest heavily in product development. In addition, converting a product idea into a set of successful manufacturing procedures and routines may also prove to be costly and difficult. Furthermore, even after an important discovery has been patented, a firm in an uncertain market environment may prefer to treat the patent as a ‘real option’ and delay associated investment and development costs (Bloom and Van Reenen 2002). There may therefore be considerable lags between the time of discovery of a valuable innovation and its conversion into commercial success. Another feature of the innovation process is that there is uncertainty at every stage, and that the overall outcome requires success at each step of the process.

Rajkot’s cluster, Industry and its growth
After undergoing the review of literature innovation and its role in the growth of SMEs; let us closely look at Rajkot’s cluster and its innovation. Rajkot’s industry more or less follows the diamond model suggested by Porter and Stern (1999). Model established by Yorkshire Forward in A Guide to Cluster Development, 2006 truly represents the Rajkot’s industry.

1) Company rivalry and collaboration: Horizontally and vertically the organizations of Rajkot are very well integrated. They compete for the utmost cost
reduction but also collaborate to procure the raw material or job work at the best of the rates.

2) **Input or Factor Conditions:** Rajkot has favourable input conditions for the cluster like easy availability of raw material and cost effective sub processors and assemblers.

3) **Supply Chain Conditions:** Supply chain can easily best established in the industry of Rajkot as there are numerous job workers available (Basant 1997)

4) **Customers:** Rajkot is the largest customer of its own products. In year 06-07, Rajkot and near by areas purchased around 300 CNC machines (70% of the total production of both the large scale CNC manufacturers. (Company data)

Favorable model like this has created conducive environment for industry of Rajkot. The seeds of the industrial cluster of Rajkot were sown in the 1940s when some entrepreneurs began manufacturing the spare parts of diesel engines. Diesel engine was the lifeline to agriculture in the water scarce Saurashtra region. In the 1930s, all diesel engines were imported from abroad. During the Second World War, there was a problem so far as availability of imported spare parts was concerned, which meant that users faced difficulties in repairing diesel engines. To overcome that problem, some pro-active entrepreneurs started manufacturing diesel engine spare parts in the 1940s, and later they started manufacturing the entire diesel engine. Entrepreneurs joined Laxmanrao Kirloskar and started assembling/manufacturing diesel engine and parts, and this gave birth to the engineering cluster at Rajkot. The industry got further impetus after Independence when industrial estates were set up in Saurashtra State, including Rajkot. Meanwhile, subsidies on the purchase of diesel engines by farmers continued to boost this industry. Gradually, Rajkot emerged as a key centre for the production of the slow speed, low horsepower diesel engines by small-scale enterprises, while the old, established and larger enterprises in the organized sector shifted to higher speed, more sophisticated high HP engines. NABARD provided funds to the state-level banks for land development and the diesel engine was included in their national level scheme. Support and allied industries like foundry and forging also started emerging and the manufacturing of machine tools also started in the cluster. There was a horizontal growth and the manufacturing of other products like agricultural implements, kitchenware, pumps, watchcases etc. in this cluster. These clusters thrived because of their "first mover advantages", despite the fact that
both, raw material and the bulk of the final consumers were located outside the region.

Post liberalization the industry had its own ups and downs, the most surprising being the death of diesel engine industry of Rajkot that served as the mother industry. Rajkot’s industry took this shock positively, and successfully diversified into various other industrial products and has been able to create its own niche in the market. Most of the products are basically industrial in nature and the customer base consists of reputed units like Bajaj Auto, TELCO, Kirloskar, Kinetic, Mahindra & Mahindra, and Gujarat Tractors etc. The allied support firms include 400 foundries, 1000 enterprises actively engaged in assembling, sub-assembling, 30 enterprises in manufacturing agricultural equipments including assembled products and spare parts, 200+ enterprises engaged in submersible pumps and 2000 units engaged in producing machine tools parts, diesel engine parts, agricultural implement parts, pumps, motors, etc. There are other units which supply cutting tools, cutting oil, pig iron, scrap, plating chemical, foundry chemical etc.

Researches on the industry of Rajkot are largely confined to the study of the development of clusters and its implications on the area (UNIDO 2002-2005). In the cluster framework; diesel engine has still dominated the research. ‘WTO and Survival of Small-scale Industry: The Five Myth Entrepreneurial Framework with the Case Study of Rajkot Diesel Engine Industry’ by Shukla (Referred by Vachhrajani Hardik B.) depicts details about the entrepreneurship and the diesel engine cluster. There have been few researches on the entrepreneurship pattern of Rajkot. Entrepreneurship Development Institute (EDI) and Indian Institute of Management at Ahmedabad lead most of the key researches. Though there are no major researches conducted on the innovation in region; Chandra (2006) compares three clusters, TAMA of Japan, Wenzhou of China and Rajkot of India. The study yields detailed comparative study of the pattern found amongst all the three clusters. After undergoing the literature it is clear that there is no literature available on the non-technological innovation in Rajkot. Though Chandra (2006) studies the role of innovation in the cluster of Rajkot, the research purely focuses on technological innovations of the cluster and their comparisons. Research here is an attempt to create literature in that area which is very critical for the industry and the society of Rajkot.
Methodology

The research methodology applied for the research was that of the qualitative grounded theory as proposed by Glaser and Straus (1967). The researcher visited 10 engineering organizations that are in the business of engineering in Rajkot for more than 10 years so they are aware of the whole life cycle of the business. The organizations are also considered as pioneering organizations in the field of engineering in Rajkot.

The methodology included interviews with the owner entrepreneurs and/or key managers, and observations during the organizational visits. All 10 organizations were visited personally by the researcher several times with notes and memos generated from the key ideas observed and key points raised during the meeting with the entrepreneur. Though there was no cap on the number of industry to be studied for the research, the researcher found that after 5 interviews the categories were overlapping and there was no new category generated after the 8th interview including the 9th and the 10th.

As suggested by the Strauss and Corbin (1998) coding by ‘microanalysis’, which consists of analyzing data word-by-word and coding the meaning found in words or groups of words, was carried out. An example of the same is given below.

<table>
<thead>
<tr>
<th>Interview Text</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>From my experience of non-technological innovations in Rajkot is</td>
<td>Personal view</td>
</tr>
<tr>
<td>The major challenge to innovation in Rajkot is</td>
<td>Assertion</td>
</tr>
<tr>
<td>From my experience innovation only works in Rajkot if</td>
<td>Personal view</td>
</tr>
<tr>
<td>Can never guarantee innovation</td>
<td>Assertion</td>
</tr>
</tbody>
</table>

Another method used during the interview was that of key point coding. The points regarded as important to the investigation were identified in the transcript and given an identifier attributed sequentially starting at the first interview and continuing through subsequent interviews to give P1, P2 and so on where ‘P’ indicates ‘key point’. To differentiate key points made longitudinally in subsequent case studies, these identifiers were distinguished with a suffix A.
B to J. For example key point 8 made by the entrepreneur in case A would be coded as PA8. Thus, it is possible to trace back through interview transcripts to the actual context of each key points. The following is one example from the actual data.

<table>
<thead>
<tr>
<th>ID</th>
<th>Key Point</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA1</td>
<td>The key non Technological innovation which drives innovation in Rajkot is strong family network of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>organizations which run the engineering industry of Rajkot</td>
<td>Networking</td>
</tr>
<tr>
<td>PA2</td>
<td>We rely totally on outsourcing for innovation</td>
<td>Outsourcing</td>
</tr>
<tr>
<td>PA3</td>
<td>Most of the customers are industries run by relatives.</td>
<td>Networking</td>
</tr>
<tr>
<td>PA4</td>
<td>Out outsourcing saves time and by doing to the industry which belongs to the same family; keeps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>money within the network.</td>
<td>Networking</td>
</tr>
</tbody>
</table>

Along with the grounded theory approach, the secondary data like reports of the engineering association, chamber of commerce, past researches, various articles published in the newspapers and magazines was extensively used. Once the web of hypothesis was generated; the researcher organized a focused group discussion between Dr. Hemixa Rao (Head, Department of Sociology, Saurashtra University, Rajkot), Mr. Mitul Shah (leading Industrialist and Director, Supack Industries Ltd. and alumni Entrepreneurship Development Institute, Ahmedabad) and Mr. Rajubhai Patel (leading Industrialist and Director, Sun Forge Pvt. Ltd.); and discussed the role of non technological innovations in the growth of the economy and society of Rajkot. Major findings of the discussion are reported below.

Findings

Findings of the research are divided in two categories. The first category (5.1) describes the findings of the grounded theory research done to investigate the research objective, ‘What is the role of non Technological innovation in the growth of engineering industry of Rajkot?’ The second category (5.2) describes the findings of the focused ground discussion which tries to answer the research objective that what is the role of non Technological innovation in
the growth of the economy of Rajkot?

**Role of Non Technological Innovations in the growth of Engineering Industry of Rajkot**

Traditionally Rajkot has remained a hub for Technological innovations, and industry of Rajkot is popularly known for its CNC machines and technologically advanced machine tools, spares etc. In relentless pursuit for Technological innovations, Rajkot has a strong pattern of non-technological innovations which largely stays Un-noticed. Following are the key findings of the study.

*Raw material innovations have significantly contributed to the growth of the engineering industry of Rajkot*

When going gets tough, the tough gets going. This thumb rule can be applied to engineering industry of Rajkot. The cluster of Rajkot is dominated by small and medium enterprises that run low on resources and have limited capabilities to innovate in terms of product and processes. So industries of Rajkot created a new stream of opportunity to innovate. They started working on innovating raw material. Rajkot first innovated with raw material when the first light weight diesel engine was developed by Rajkot. Since then, engineering industry of Rajkot closely worked with customers and vendors to engender raw material innovation. This innovation can further be divided into two aspects of process innovation and product innovation. Providing forged component instead of cast component saved lot of money and time, and is a good example of process innovation and finding cheaper alternative to the raw materials which customers have used for years for better product quality and low cost. Most of the organizations studied in the research have worked closely with customers and vendors to innovate raw material.

Though primarily input to the innovation was to cut cost and give similar or better quality to the customer, off late various large organizations have accepted and adopted the raw material innovations done by engineering industry of Rajkot.

*Intense outsourcing (referred here as ‘partnering’) has significantly contributed to the growth of engineering industry of Rajkot*

Industries in Rajkot mostly fall under the small category. They are started with limited capital investment and are developed slowly as and when the en-
entrepreneur starts getting the returns from the business. This limits the ability of the industry to conduct all processes under single roof and creates the need for outsourcing. Engineering setups of Rajkot require on and average 200 – 300 items which make the outsourcing inevitable. Hence, they would depend on other firms to supply them the components and services to complete an order. This led to the growth of “processing firms”- firms that would do rough casting and finish, machining, drawing etc. – firms performing individual operations for other firms. Basant’s survey of firms in 1997 revealed that about 77 percent of the sample firms outsourced jobs to other firms in Rajkot. Amongst others, the benefits cited were ability to meet orders from premises of limited size, ability to reduce costs (however, this led to intense price based competition between assemblers and subcontractors alike) etc. Often family, friends or former employees owned the outsourced firms.

The partnering phenomenon in the engineering industry of Rajkot can be further divided into two. Industry does partnering (or outsourcing) within the organization; where various processes are outsourced but the process has to be performed within the organizational premises that can lead to better quality control on the product. Second form of partnering is done where whole process is outsourced in order to be performed at the vendor’s location. The organization only has in-coming quality control over the product. Though this may not look like innovation, as across the globe organizations are doing outsourcing; the scale at which this is done and the impact which outsourcing has on the overall innovation representation of the organization to the customer, is truly remarkable and leaves the researcher with no choice but to incorporate the same as an innovation. From the research conducted it was found that there are various patterns of outsourcing followed by organizations and no definite pattern can be traced from the study of 10 organizations. So, further research is required to study the types or patterns used by the organizations in terms of outsourcing.

*Ability to innovate on meeting the delivery schedules of customers has significantly contributed to the growth of the engineering industry of Rajkot*

Meeting delivery schedule of the customer again and again is very successfully used by industry as a Unique Selling Proposition. All the organizations studied had small batch sizes, short change over time and efficient die and product change mechanism, which mean that they were able to produce more variety in small batches, which resulted in very quick and effective delivery of prod-
ucts. This ability gives advantage to the industry that they can immediately become vendor of any supplier. Once they get the entry they can prove themselves to be the quality supplier who can provide better service time and again. To achieve this, organizations use various types of innovations in die handling, maintenance and reworking. There were certain organizations that have even created different models of product distribution to make sure that delivery is done in time. This innovation affects the whole manufacturing chain of an industry from stock keeping, production planning to dispatch. A flip side of this innovation was also noticed. Most of the engineering industries of Rajkot have huge stock that is kept to make sure that delivery is met. This makes it very costly to keep the stocks, and in uncertain price environment often entrepreneurs make loss because of their inability to follow approaches like just in time.

**Agility to change according to the external changes has significantly contributed to the growth of engineering industry of Rajkot**

Agility is considered as a decisive virtue in the field of management today. Baldridge Standard also puts great emphasis on it. Agility is organization’s ability to pro actively accept the changes taking place externally. All the organizations studied in the research were found to be very agile in nature to the changes taking place around them. They in fact use their agility as a tool to make themselves more competitive. This has direct co relation with ability to meet customer delivery schedules; which is one of the signs of agility. The engineering industry of Rajkot goes beyond meeting schedules to making sure that changes, which are going to follow, are foreseen and organizations have been geared up to meet the challenge. Almost all entrepreneurs believed in importance of projecting the customer demand and projecting the macro level changes and all of them showed steps to make sure that they are gearing up their organizations for the same. There were certain organizations that pioneered some of the technologies that were at later stage accepted by other large organizations. This agility comes from entrepreneur’s ability to retain task-based employees and to outsource processes that are not the core competencies of the organization. There is no doubt that SMEs have capabilities to innovate faster than large organizations. This seems to be standing true in case of non-technological innovations after completing the study. All entrepreneurs were aware of the benefit which they had compared to the large organizations and were already utilizing the same to the maximum.
The lean organization structures with process owner approach made them far more agile than their large counterparts. In most of the organizations studied, top management of the organization did reviews at various stages to incorporate and cultivate changes in the processes, products or organization structures to make sure that they stay competitive in the market.

*Networking within and amongst the industry and entrepreneurs has significantly contributed to the growth of the engineering industry of Rajkot.*

Networking is discussed last in the findings as it was considered to be the vital most non-technological innovation in the engineering industry of Rajkot. Impact of this innovation was evident across the board on the economy of Rajkot and the society at large.

Networking as an innovation has its roots in the economy of Rajkot from the times of diesel engines. During mid eighties when diesel engines were considered as the lifeblood of the Rajkot’s economy; entrepreneurs started outsourcing processes to other units of Rajkot. As the volume of outsourcing rose; entrepreneurs started promoting their family members to float companies that can do the outsourcing work and started keeping a share in the outsourcing company. This phenomenon became deep rooted in the industry of Rajkot and in last 20 years Rajkot became a big network of entrepreneurs and the whole economy became networked.

This networking helped entrepreneurs to offer complete solutions to the customer with enhanced confidence of quality and delivery with low investment. Every organization studied was not complete in terms of process capabilities but was confident about the product which it could deliver to the customer as the outsourced activity was done at the captive units of some relative or maybe from the same ‘network’.

This networking has created Rajkot’s own identity across the county. The researcher talked with one vendor development manager of India’s leading automobile company to whom few of the studied organizations were supplying, and found that the customers had higher confidence in the outsourced activity of the ‘networked’ unit than that of a normal outsourcing unit as organizations were ready to take responsibility of the product quality and were ready to share the risk associated with the product rejection.

Networking in the industry of Rajkot promotes outsourcing and in turn is the core reason behind the indomitable entrepreneurial spirit of the region. Though, all has not gone well with the networking in last ten years. There
have been instances of difference of opinion between the networked partners, and there are certain units which have decided not to network off late and have created their own capacity; but still the advantages largely override the disadvantages. These differences have in fact helped the economy of Rajkot, as those who have left this network have started their own networks through which the economy has immensely benefited. Product innovations stay at the core of these networks and every new network starts with a new product innovation that is replicated by other, and the network strengthens.

**The Role of Non technological Innovations of the Engineering Industry on the economy and society of Rajkot**

On the outer surface Rajkot’s engineering industry is a great product innovator and has consistently strived and survived in volatile macro economic situations with its product innovation capabilities. But, behind those product innovations lie these core non technological innovations which not only drive
the product innovation but also create their own impact on the industry, cluster, economy and society at large. The outcomes of the research were given as a focused group discussion topic to the panel of experts which included leading educationists, sociologists and industrialists of the city and following are the key outcomes of the discussion.

Networked economy and society
As the findings of the research suggest; engineering industry of Rajkot has strong networking for sourcing, outsourcing and innovation. This has created a web of networks of industries and families that are interconnected for their business needs. This has helped the society of Rajkot to stay together in the times of rapid transition towards nuclear family in India. Because of the networked economy and society new initiatives come faster to Rajkot and also get replicated to scale faster. This makes sure that things come to Rajkot through that network and they get maximum advantage of the volume that they can offer. The researcher found a single group in more than 12 pieces that gave them the best price took that cutting machine. So, networking keeps Rajkot united and gets the best deal in purchases for all.

Such networking makes sure that Rajkot can even afford to have large set ups coming up in numbers as together collective strength of family / network can afford this. In last decade more than 10 manufacturing set up with the investments of more than Rs. 50 Crore has come up which is unusual for a town with less than 2 million populations. Networking gives diversity to the industry of Rajkot. People associated with the network keep on investing in newer business avenues to de risk their existing business risks. Few of the organizations studied had network interests ranging from industry, education to stock markets.

Nowhere is the social impact of networking more evident in Rajkot than in the banking sector of the city. Banking market of the city is neither dominated by the large nationalized banks nor by multinational private sector banks. Small but very effective co-operative banks that are largely run by the large networks that we discussed dominate the market. These banks offer all services ranging from lending at reasonable rate to ATM facilities. As networks and trust form the basis for the banks; non-performing assets (NPAs) are surprisingly lowest in the country (few of the banks have NPA as low as 0.1 %). Networking of the society is even evident in the hundreds of credit societies functioning in the city working for micro finance. Rajkot still has tradition of
significant family bonding, and large family gatherings during Hindu New Year are a very common thing.

_Agile economy and society_

As derived from the research, agility is a key decisive innovation for the engineering industry of Rajkot. This agility has its roots in the nimbleness of the society and people. Six out of ten entrepreneurs studied in the research came from different business background before coming into the engineering business. Three of them had changed two businesses before venturing into this business. This is a clear indication that the people and society of Rajkot is truly agile and is ready to accept and mould themselves according to the challenges. Seven entrepreneurs studied had their stake in other businesses.

Society of Rajkot has been termed as the most flexible society by various studied conducted by researchers. Changing business here in this society is not a thing to be ashamed of. In fact in most of the cases, your reputation or success of past business can help you get credit for the new business. ‘We understand that business dynamics change and accordingly people have to change their business. We appreciate that and make sure that good entrepreneurs are not deprived of credit.’ says Mr. M.K. Bheda, Manager – Credits, Co-Operative Bank of Rajkot Ltd. So, it’s a clear indication that agility is deep rooted in the culture and society of Rajkot. The roots of agility can be traced back to early 1900s when people of Saurashtra had to relocate every summer to place where there were enough water resources as Saurashtra was considered to be the most water scarce area of the country. This agility is fueled by huge migration of people from Rajkot to other parts of the world especially USA, UK and Australia. Patel, who usually belongs to areas near to Rajkot, is regarded as the most enterprising Indian community in the USA.

Ability of people to relocate truly represents inherited agility, points out Dr. Rao. People of Rajkot have been great migrants internally as well as externally and this creates a spirit of flexibility and of happily accepting the changes which comes along the way. Religious beliefs of Hinduism and strong religious orientation of the people of Rajkot also plays a noteworthy role in sustaining this agility factor.

_Resolute spirit of entrepreneurship_

Rajkot has more than 3000 Small and Medium Enterprises (SMEs) spread
across the area of 20 Square kilometers. They are linked with non-technological innovations as explained in the earlier section. Theses innovations make sure that entrepreneurship in Rajkot is promoted and is kept growing. Strong networking and intense outsourcing promote entrepreneurship and this has made Rajkot entrepreneurship hub of Western India. Today, because of enterprising spirit of Rajkot, across the country Rajkot is respected as a quality place for buyers. Spirit of enterprising of Rajkot keeps it ahead of other cities of the region in terms of per capita income and percentage of employment. Networking also keeps the families together as per the Hindu family values. Though Rajkot is not immune to transformation taking place in the Indian society, tradition of joint and large family is still preserved in Rajkot.

Conclusions

From the research we can derive that behind the successful technological innovation for which Rajkot is famous across the country; there is a strong non-technological innovation ecosystem that keeps the product innovations ticking and is as strong as that of the product innovation system. These non-technological innovations are not only limited to the industry of Rajkot but they have substantial impact on the overall economy and society of Rajkot. In fact, they have become an integral part of the society and impact the society at large. The study found out that non-technological innovations like networking and agility have direct co relation with the social characteristics and innovations like raw material, process and delivery make Rajkot hub for product and process innovation.

The outcome of this research strengthens the idea that non-technological innovations do have significant impact on the economy and society of Rajkot. There is a lot of room for further research in the field where we can study the role of other non-technological innovations beyond the engineering industry like trading, servicing, designing, etc where Rajkot has significant presence.

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SOCIAL SCIENCE PRODUCTION OR SOCIAL INNOVATION BY SOCIAL PRODUCTION OF SCIENCE?

Hans-Werner Franz

Introduction

In the first decade of the 21st century and the emerging knowledge society the social sciences, and particularly sociology, one of their core disciplines, seem to run into a very difficult situation. On the one hand, we can observe a growing demand for social knowledge and meaning in the different fields of society. On the other hand, social science itself is undergoing a profound crisis. The traditional academic ways of knowledge production and dissemination do no longer work in a way which offers society satisfactory answers and solutions. As a result, a process of “marginalisation” (Wiesenthal) and deep irritation about the efficiency and social importance of social science can be stated. As a response to this situation, growing interest of social scientists in the discussion on public understanding of science (e.g. Nowotny et al. 2001) can be registered. This discussion may be seen as a result of an attitude saying: Our traditional concepts and ways of knowledge production are still sufficient. We only have to change the ways we sell them.

Contrary to this position we think that the crisis of the academic ways of knowledge production goes deeper and reaches farther (Bonss; Weingart). Therefore, new modes of the production of social science and the social production of science will become the two faces of a more and more relevant type of professional scientific work of social scientists in the knowledge society. “Mode 2“ has been the label tagged to this newly emerging type of knowledge production by Gibbons, Nowotny et al. (1994, 2001) mostly referring to natural or engineerial sciences. For us “social science production” is a specific type of social knowledge production by social intervention.

The paper provides a self-reflective discussion of the new modes of knowledge production in the field of organisational development and networking. Starting from a specific case, sfs Dortmund, it describes new ways of knowledge production including the consequent changes of products and processes, methods and instruments, of the functional organisation and personal work styles. sfs (Sozialforschungsstelle Dortmund), a central research
unit of the Dortmund University of Technology, has been developing functional characteristics of effectiveness and efficiency of an enterprise, a community of performance, by working with private companies and for the research and consultancy market, eventually understanding itself as a competence network in a network of networks. It also shows the tensions arising from the splits between public and/or private use(r) orientation, on the one leg, and the (re-confirmed) necessity of the autonomy of science, on the other, leading to the question what problems arise and what criteria are necessary to define viable or socially robust knowledge.

Institutional Background

Since 2007, sfs is a central research unit of the Dortmund University of Technology. Established in 1972 by the federal state parliament, the Landtag, it has the mission of “accompanying industrial change” by empirical research. Originally it was founded in 1946, right after WW II, as an institute of the University of Münster – on the Ruhr, there was not a single university at that time – in the fifties and sixties it became a large institute with high profile reputation. With few exceptions, the whole post-war promotion of German professors in social sciences worked at some time in this centre. After the creation of a series of universities in the Ruhr Area during the sixties, in 1972, the institute became a pure research centre fully financed by the federal state budget, holding a total staff of 9 scientists and some assistance functions in secretariats and the library.

Today sfs is an institute with a EUR 4 million turnover (2007) of which only one third, EUR 1.3 million, is public institutional funding, and some 80 employees of which about 45 are scientific staff. The strategic social research and intervention focus of sfs is on modes of social innovation covering the whole range of work related research and consultancy on areas like vocational education and training (VET), organisation development, HRD, quality and ecological management, flexible working time arrangements, issues of (internal and external) labour markets and regional development, gender aspects, health and safety organisation, etc. (cf. Franz 2000).

A New Type of Knowledge Production
In our research area, over the last ten years, important impulses for the development of new ways of knowledge production had their origin in a series of projects in the field of organisational development and networking (Howaldt 1998b and 2003; Howaldt/Kopp 1998). They had a number of characteristics with obvious parallels to ordinary consulting processes. In the course of these projects we recognised that the process of what we used to call knowledge transfer is very complex. It turned out to be no longer a process of transferring knowledge produced in research institutes into the companies, trade unions etc. Instead, we were confronted with a much more complex step by step process of joint problem definition, joint problem solving or knowledge production and joint application of what had been newly developed. It was a small step from there to recognising that we ourselves were part of this step by step change process, and that, in fact, it was a common learning process, our responsibility being the co-ordination and shaping of it (Howaldt 1998b, Schmoch). The core task of social scientists in the framework of this emerging form of knowledge production is the creation of networks in which scientists and practitioners work together in solving their problems in a process of intense, project-based interaction. In this setting, social researchers frequently become managers or facilitators of complex research and implementation processes (cf. Franz 2007).

This type of knowledge production aims at the production of what Nowotny et al. (2001) call „socially robust knowledge“ that is suitable for solving practical problems. It may be focussed to, for example, implementing new forms of work organisation or total quality schemes in companies, developing new forms of networking along the value creation chain within companies or across organisational boundaries, supporting institutional change in regional networks, drafting new schemes of social security, implementing new forms of civil service organisation, etc. Basically it emerges wherever researchers admit that practitioners are experts of their own technical, professional and organisational reality and contribute to problem-solving on even grounds with scientific staff intervening in these processes. Hence, it demands new approaches, methods and tools of organising the work of scientists in such projects.

**The Main Characteristics of the Project Type**

This type of projects is characterised by the following aspects:
- orientation towards being useful by solving specific practical problems
- problem development and definition as a process of consensus building and negotiation
- problem solving/knowledge production in the framework of complex cross-disciplinary and cross-institutional networks
- new continuously changing forms of project organisation
- new approaches, methods and tools of working
- multi-dimensional criteria of evaluation considering general scientific value just as well as practical usefulness.

The development of the project design and the definition of problems becomes an interactive process between the scientists, experts and practitioners (who are experts of their practice as well). All participants deliver their special views, interests and demands on what and how it has to be done.

**Problem-Solving and Knowledge Production in Networks**

In the classical process of social science production, research takes place in research institutions society being an excursion from the ivory tower for mining data, a source of empirical data and information in the best case, but not a partner, also the address of knowledge transfer activities (dissemination) once research is concluded. Social science production as we and more and more other researchers practice it, is social production of science. Social actors from the fields of social action relevant to the research theme or project participate in the whole process of research. Social scientists are social actors among others with the special task and role of driving the process towards the production of knowledge, knowledge achieving varying scopes of relevance: from “simple” problem solving with and for individual partners to general problem solutions for whole fields of social action (economic sectors, professions, working methods or tools for certain types of action, etc.) or to varying degrees of general social science. Experts from companies and institutions, scientists, consultants, employees – all these groups work together creating new knowledge. So the different forms of knowledge created have to be combined and tested to evolve into socially robust knowledge.
New Forms and Tools of Project Organisation

Thus, projects are essentially networks of co-operation oriented towards the solution of practical and scientific problems. Research itself becomes an action learning process requiring new forms of project organisation. Given this operational and situative framework, different methods, tools and modes of operation are necessary.

Traditional research and researchers are used to work in the communication structures often still practised at universities: open (seemingly) unlimited and unrestricted process-oriented discourse. Projects with clearly defined conditions in terms of expected/promised results, time and money originate very different communication requirements. Result-oriented communication needs completely different tools of structuring time, information and outcomes, nevertheless, maintaining open discourse as a necessary source of creativity and openness.

For the researchers this often means that they are forced to change their personal work styles. First of all, they need to change their language as academic and non-academic project partners with different practical backgrounds are experts in their own rights and have completely different cultures, languages and terminologies.

Beyond these changes of the external work context, the nature of these projects conveys serious consequences for the internal work contexts of research institutes. For example, individual time and task management have changed considerably. Reliable project and network management have become a must. Depending on the specific problem, new modes of operation have to be developed and tested. Every project has to be shaped in an individual way referring to the special conditions of the corresponding fields of action (project partners, financial conditions, time schedule etc.).

Finally, this type of projects demands multi-dimensional criteria of evaluation which must refer to the practical as well as to the scientific objectives of the project.

New Function and Role of Social Scientists

There is a significant difference between an analytical research position and a situation where you must come to practical conclusions for action and imple-
mentation achieving previously established objectives. The traditional position of a researcher usually is a passive and contemplative one, at most, of participative observation. A consultant or action researcher (institute) in the role of a change agent must think in strategic terms or in terms of problem solving and feasibility under conditions of restricted time and other resources, self-evidently without losing the capacity of critical analysis and scientific generalisation. Participative observation turns into observing participation as a minimum requirement.

As a rule, researchers are in a practical co-ordinative and facilitating function, along with their analytical and synthetical role as scientists. Their performance as facilitators is an essential practical condition of project success. Help for self help would become the main approach in consultancy and action research which necessarily includes a participative way of working involving all relevant actors in a given field. It includes the recognition that the actors in a given field are and must stay the experts of their work. The central requirement becomes to organise progress as a participative learning process among all people implied, including the researchers, by building and knitting networks. These may become interrelated over time evolving into a network of networks (Howaldt 1998a; Franz 2003a).

Thus, social scientists come to offer special services for their partners that may be summarised in the following way:

- project and network management
- development of innovative concepts
- organisational development
- explicit or implicit training in project management techniques
- generating new socially robust knowledge
- transfer of experience

In fact, researchers find themselves in a sandwich position with a double-bind situation. On the one hand, they become facilitators of a network-based research process in which their usefulness is defined by practical as well as by scientific outcomes. One could say that from the point of view of the social project partners, after all, they are only really useful if the project leads and if they lead the project to socially robust, i.e. feasible knowledge. Thus, the outcome is competence. On the other hand, from the viewpoint of the scientific community to which they remain obliged in theory, methodology and person-
al career aspects, the project(or a serious of thematically focused projects) will only be useful if the co-ordinating researchers succeed in leading the project with its social network structure to meaningful scientific results. By adding and relating it to the scientific debate, the outcome is scientific knowledge, science. Thus, scientific management retains a not at all Taylor-inspired meaning for this social type of science production.

**New Structures of Research Organisation**

There are many ways of dealing with the organisational consequences. We will summarise how we have dealt with them adopting a subjective way of description. A much more detailed description can be found in Franz 2003a (English) or 2003b (German).

Along with the development and application of these social ways of knowledge production, the whole institute as a research organisation and as an economic organisation experienced a profound transformation which, at the same time, required a long-drawn record of continuing professional development and personal change from the researchers, ourselves.

- We had to change our traditional social fields of research. Traditional social labour research used to be - and still is very frequently - oriented towards large, industrial companies, trade unions and contexts, in our case very often even more restricted to coal and steel and the chemical industry. Since coal and steel dwindled away and as the most important action programmes of the European Union and national ministries adopted more and more a clear SME focus, we had to shift our attention to SMEs which is a very different world, and more and more to services. From large to small companies. From industry to services. From research orientation to action orientation. From trade union orientation to stakeholder and even customer orientation, the scientific community being one important customer. From supply to demand orientation.

- We had to change our products. The traditional products of a traditional research institute are publications. Of course, we still (must) produce publications since our researchers also need a publication record for their individual career face to the scientific community where publications in “refereed journals” are the non plus ultra. But
most of our customers do not want a book or an article in a scientific review as a project output. They want something they can use in their normal and current activity. They want results in a language they can understand and in a format they can use for their work. Often they want tools. Normally we must convince them that they cannot have recipes. So we have now two different groups of customers, the scientific community and the economic or political world, and we must strive to avoid double work by optimising the work and its products.

- We had to change our organisation. Working for the market and for SMEs requires becoming an SME yourself. The structural change of our (scientific) work organisation has been described above. But beyond this, the whole of the institute’s internal functioning and procedures had to change. The former line organisation based on seniority has become a network organisation with high degrees of autonomy of the research areas and of individual researchers working in teams. Seniority has been replaced by performance in acquiring and running projects successfully. Not even the management team is exempt of this basic rule. Any allocation of time resources paid from the basic public funding is linked to specific tasks, and nobody is paid fully. Traditional scientific organisations tend to be communities of practice, our institute is a community of performance. The whole management of resources has become much more flexible. We had to skip the old cameralistic way of budgeting which is normal for public institutes. We had to adopt cost unit accounting and calculations in daily work packages. Even the structures of our building became deficient as we needed much more communicative facilities, with the logical consequence that we moved to new facilities. Management got much more of a service role than before. The functions of the secretariats changed completely from typing pools to flexible project assistance. The institute has become a medium-sized research and consultancy company with a lot of employed (seemingly) “free lancers” working in internal and external networks.

Along with the changes in the approaches, methods and tools outlined above, all this says: this process sfs has undergone can be summarised in the following way: In the beginning we – at least many of us - thought we could be catalysts of change, change agents without changing ourselves. We have learnt
that it is impossible to be a change agent without changing and being changed ourselves. In a nutshell, we had to change everything. And it was a long and uncomfortable learning and change process which has not finished yet. It will never finish since we have to learn and change together with our customers and stakeholders. In fact, this is not enough, we must learn and change before our customers do. In other words, experience counts as much as science. Customer orientation in research, transfer activities and consultancy has profound consequences for the whole way of thinking and working. We had to change our way of thinking. We had to change ourselves.

**Facilitators of Social Innovation**

Facilitating co-operation of project partners with different and varying interests in the common project is a task which has become typical for many organisational contexts. Facilitators are agents of progress in many types of projects, be they within organisations or among organisations. Usually they are leaders without hierarchy, driven and being able to drive only by the endeavour of achieving the commonly agreed objectives. Working together on terms of equality and agreement instead of hierarchy and direction implies that all partners either do their work moved by their own motivation or moved by social obligation in the co-operation context. It is the facilitator’s task to make co-operation on such grounds viable. Seen from this viewpoint, social scientists practicing social research in the above described way are socially innovative themselves. The innovation consists in making participatory schemes of communication and co-operation work effectively and efficiently, thus, strengthening advanced democratic co-operation structures and methods in a social and societal environment – economy - where usually hierarchy and direction are on the agenda.

sfs has collected or developed a wide range of methods and tools based in action learning concepts (cf. Kopp et al.) that allow making professional use of them. Moderation and visualisation are the key methods of making common learning by doing and doing by learning a coherent process. This basic method hardly known beyond the boundaries of German speaking countries is accompanied by a special mix of tools gathered from creative thinking and problem solving techniques as well as from contexts of organisation and human resource development or from quality management. A considerable number of these tools have been developed by sfs researchers, like my tool kit
for “sustainable organisation and human resource development” (Franz 2003c). A further book dedicated to such methods and tool of facilitating networking is forthcoming (Franz/Sarcina 2009)

Such methods and techniques are powerful drivers of effective communication for planning and preparing common action. Organisation development and quality management as such are relevant levers of social innovation and can lead to major improvement in the effectiveness of organisations as well as of the professional management of human co-operation as one of the most important drivers of innovation, be it social or technological. Enhancing the systematic use of such methods and tools in research co-operation contexts can transform the process of research into a relevant driver of co-operation capacities. Thus, not only the management of co-operative social research processes is rendered more effective and efficient, all people participating actively in them learn from such experience and may transfer their learnings to their own organisational framework.

Problems and Questions

Even if we come to the conclusion that the transformation of social science production and its institutions is a necessary process of learning for “survivability” of the social sciences for and in the emerging knowledge-based learning society there are still a number of questions to be analysed and answered. Some of them are:

- If science has lost its monopoly of creating and administrating new knowledge and new suppliers enter the market, what is the specific product and value research institutes may offer? For example, is there a specific surplus use value as a result of the close connection between research and service/consultancy activities? Will we be able to compete on even grounds with commercial companies in the field of consultancy? Can social science, as a parallel to engineering sciences, draw its strength from developing, testing and may be even taking to market, new, innovative knowledge services (e.g. network management)?

- What will be the future relationship between production and application of knowledge? Both are closely connected in the project
networks we work in. Will it be possible to transfer knowledge into different contexts?

- Last not least, will we be able to master the institutional changes that are necessary in the research institutions and universities? How will the borderlines be drawn between the new and the old modes of social science production? What is the political and structural framework we need to cope with these new and strong demands?

There is a large gap between the traditional understanding of social research and science and the new mode of generating socially robust knowledge (science?) under the framework conditions as we have outlined them. The new mode will definitely require a thorough review of the classical quality criteria of what is scientific along with the development of new concepts, methods, procedures and organisational structures (Bender). The discussion about such an innovative approach to the production of social science as a process of social production could be very valuable for understanding the specific contribution of the social sciences to the emerging “knowledge society”.

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ORGANIZATIONAL AND MANAGERIAL INNOVATIONS IN LARGE COMPANIES AND THEIR IMPACT ON TECHNOLOGICAL INNOVATIONS AND INNOVATION STRATEGIES

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Introduction

Complex relations of science, society and industry, the growing attention on non-technological innovations (NTI) and rapid changes that exceed the capacities of perception are all attributes of modern societies. Collaborative and networking relations are of ever-growing importance for industry and services. A highly developed social capital with a lot of networking relations and R&D collaborations is a distinguishing trait of many successful firms.

Long time has passed since Merton justified the crucial role of ‘pure science’ but today there are probably as many reasons as before to once again reconfirm the status of academia (universities and publicly sponsored research institutions) as basic sources of scientific advances. Modern universities are located in even more demanding environments than at times of Merton and they carry even more missions than previously. In this respect, their direct and indirect contribution to industry has to be assessed from various points of view, taking in consideration the knowledge dynamics effects on secrecy and on knowledge protection and new organizational forms of knowledge production, such as techno parks, technology incubators and research networks, as well as many other aspects.

External knowledge acquisition and a more rational use of internal R&D are the relative benefits of networking and collaborations for industries and as usual industries are ready to finance research in academia and to develop new forms of collaboration with academia, if they see the chance to receive relevant scientific results. The rediscovery of ‘science-push’ is to a certain extent the consequence of an erroneous interpretation of ‘Mode 2’ implications for academia. Even if sometimes the outcomes of scientific activity of academia become less technological and more socially-oriented, factually academia continues to play the central role in knowledge production.

For example, Schmoch (2007) stresses the importance of ‘science-push’ factor
and the increasing interaction between industry and universities. He also points out the growing interest of industry in scientific advances at universities and develops a model of feedback reaction, called ‘interaction model’, that serves to describe the collateral reactions of the activities of scientific institutions, providing scientific output, with the activities of industry, performing applied research. In his model, ‘exploration’, ‘innovation’ and ‘diffusion’ are carried in parallel and scientific input plays a determinant role throughout this process.

The importance of ‘science-push’ view is easily demonstrated by the fact that weak scientific output renders almost impossible any further commercialization of scientific advances. As a result, modern universities are located in very competitive environments and are exposed to constantly growing pressure for more science production. Besides, they are very sensitive to the socio-economic outcomes of innovations as they determine the university’s capabilities to simultaneously respond to varying social demands and help them to perform their functions as institutes of socialization and nation-building entities. Furthermore, the universities are sensitive to governmental and industry financing. Industrial funds can boost the innovations at universities. But too large volumes of industrial R&D can deter innovations by making universities more oriented on short-term incremental innovations and applied R&D, rather than on excellence in research.

Intricate regulations in the field of intellectual property and knowledge transfer affect the open-minded approaches in research by modifying licensing, patenting and secrecy strategies in both private companies and universities. As a result, universities can patent fewer discoveries and firms can produce less valuable products. For example, the so-called ‘tragedy of anticommons’ in biotechnology with two many rights on valuable and scarce resources can induce firms to divert resources to less promising projects with fewer licensing obstacles. The same obstacles can lead to badly performed R&D for the reason of incomplete background knowledge (Heller and Eisenberg 1998).

Fewer patents in universities might signify that academic researches are becoming more secretive for the reason of growing restrictions limiting academic research, such as secrecy agreements with industry. In some cases even publication activity can be delayed or postponed (Caullfield et al. 2006). Another concern is that too much emphasis on commercialization and privatization in publicly sponsored academia not only could retard the progress of science but
could also cause results, which go against public interest (Bouchard and Lemmens 2008).

The non-linearity and dynamism of complex relations between modern governments, academia and industry, situated in a broader social environment, gave impetus to the development of a new paradigm of evolutionary economics, called ‘Triple Helix model’ (Leydesdorff and Meyer 2006). This model is putting into evidence non-technological aspects of innovation process and postulates the integration of public, private and academic sector along a ‘triple-helix’ spiral pattern of linkages emerging at various stages of innovation process (Etzkowitz and Leydesdorff 1995). Though this is an abstract model, its heuristic value consists in demonstrating the evidence of a nexus among the institutional environments, which previously were considered as independent or statically overlaid structures.

Such institutional environments are rapidly evolving and the ever growing volumes of information require improved capabilities for information processing and human resources to perform constant in-depth analysis. In this respect, the determination of initial conditions is crucial for the description of any single evolutionary process and for the identification of relevant indicators. Especially when it comes to different conceptual frameworks, such as ‘national systems of innovation’, ‘triple helix’ and other concepts dealing with systems that evolve more rapidly than the very changes can be evaluated ex post (Leydesdorff and van den Besselaar 1997).

The role of initial conditions is ambivalent. On the one hand, the initial conditions, given by a highly pre-structured environment, allow a selecting system to better develop its endogenous dynamics, thus enhancing system’s variation (Avinmelech and Teubal 2006). On the other hand, the process of variation influences the de-regulation of the environment. For example, emerging venture startups deploy multiple organizational strategies for the IPO initiation and for the diffusion of R&D, thus providing an input for capital market (de-)regulation and adaptation. This can be done, for example, through liberalization of law for venture capitalists or through creation of investment banks. These changes of the environment augment its overall disorder and disarray, though they may be directed towards establishment of new links between institutional structures. Leydesdorff and Meyer described in the following way the dichotomy of initial conditions as indicators of selected pathways and un-
derlying operating mechanisms of industry-government-academia selective environments:

The observable arrangements inform us about the initial (historical) conditions or, in other words, the pathways selected by the evolving systems hitherto. However, the reflexive specification of the evolutionary dynamics in terms of selection environments may enable us to propose improvements in terms of the operating mechanisms. How can three sources of variance be expected to operate as selection environments for each other, and under what conditions can the interaction terms be used for innovations? (Leydesdorff and Meyer 2006: 1444)

The value of this concept consists in the consideration of already expressed trends together with complex developing mechanisms, providing a momentum for innovation. Though the three sub-dynamics, represented by government, industry and academia, can be in some cases considered as analytically independent sources of variation, in reality they almost always rely on the existing initial conditions and act as selective environments on each other.

In this respect, one important question is: To what extent selective environments act as constructs? It can be supposed that transition from one prospective state to another is depending upon the ability to manage discourses at the interfaces of selective environments and to implement major trunk innovations, such as information and communication technologies (ICT). Presumably, the entire structure of industry-government-academia relations is much more fragile than it is expected to be a system operating on embodied social constructs, which it reproduces and reconstruct as the whole system is undergoing reconstruction. In some phases of system’s evolution, the ‘butterfly effect’ can be generated quite easily and lead to unpredictable social perturbations. In these phases actions need to be undertaken to provide multiple possible scenarios, which can be effectively sustained.

While it is not possible to use a double-helix model such as the model of DNA-molecule for the description of the Triple Helix model of innovation, such model could be adopted to illustrate the difference between statistical and dynamical aspects of a complex system. According to Leydesdorff the model of DNA-molecule provides us with the example of a ‘co-evolution between two dynamics’, that is to say the unidirectional (irreversible) change in time of the non-linear processes, defined by a set of initial conditions and regular changes (Table 1, source: author). When we talk about co-evolution we need to distinguish between initial conditions (e.g. a determinate evolutionary
stage) and basic trends (e.g. their regular outcomes).

Endogenous (inherent functions acting through variation)  Exogenous (environment acting through selection)  Subdivision of dynamical aspects

Statistical aspects

a) Qualitative and quantitative descriptors
   a) E.g. genetic alphabet, complementarities, codons, anticodons, sequences, etc.

b) Trends (given initial conditions of a DNA-system on a certain evolutionary stage)
   b) E.g. number of chromosomes  b) E.g. somatic attributes

Dynamical aspects

a) Evolution (irreversible, random\textsuperscript{12})
   a) E.g. gene expression

a) E.g. irreversible epigenetic (in).activations

Regular, linear

Adaptive change (slow, under a definite foresight horizon)

Irregular, non-linear

Mutation-specific change (radical, un-

\textsuperscript{12} It should be applied the concept of algorithmic randomness, describing the changes with \textit{the largest algorithmic information content} (RAND 1997). In this case the word “random” as a probabilistic characteristic is a synonym of “unintelligible” and an antonym of “uncertain”.

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Table 1. Statistical and dynamical aspects of a complex system, provided by the model of DNA-molecule

An interesting attribute of a DNA-system is its inherent capability to evolve through endogenous innovations which in turn react on the system itself in the quality of selective environments as the system becomes more and more expressed. Similarly, the dynamics at the interfaces of industry, government and academia are generated endogenously (Etzkowitz and Leydesdorff 2000) and they act on the reconstructing selective environments as such environments activate or deactivate the tacit (non-expressed) codes of the system. To this extent the selection mechanisms are included in the variation paths of the system. Of course, social systems cannot be directly compared to biological systems, because different constructs, such as ideal types, cannot be considered as stable and as unconscious as the elements of a biological system. Nevertheless, the metaphor can be useful for a better understanding of social environments for the very reason of the presence of a code, lying at the bases of both systems. Obviously, religions, languages and cultures are codes as well and they are similar to the genetic alphabet (with the exception of the high reflexive power of social constructs). The neo-Durkheimian concept of voluntary action is another reason for rejecting simplistic biological metaphors (OECD 2001). It has to be furthermore considered that all the deliberate (intentional) actions in social systems are oriented on values and goals (‘zweckrational’ and ‘wertrational’ individual and collective rationality) and thus they carry some elements of causality.

In social systems the dynamical aspects (non-linear relations) of non-technological innovations (NTI) include three major kinds of interactions: the impact of one type of NTI on another and their effect as a whole; the impact of the company environment on the NTI; the reflection of NTI on corporate culture and decision-making process. The principal peculiarity of social systems consists in its enormous reflexive capabilities on social and cultural level. In comparison, a DNA-system is much more ‘linear’ and ‘simple’.
If we take a look at other than ‘triple helix’ and more technology-based paradigms of evolutionary economics, we will find out that they describe the starting conditions and the heredity of technologies in a more linear way. For example, Schumpeter and Kondratiev postulate regular succession of technology cycles (and their socioeconomic effects), lasting approximately two generation’s time spans (~48 years). The curse of each single technology becomes more and more evident during its maturation in parallel with the increasing uncertainty of the overall reaction of the institutional environments to the adoption of derivate emerging technologies. When under complex circumstances foresight horizons become more and more restricted, new algorithms of organizational behavior emerge. Social implications of such transformations might include new views on quality of life and life standards, innovation culture and innovation management.

Kondratiev made an important distinction between two types of dynamical processes, namely between evolutionary processes which are non-repeatable and wave processes, evolving over a determinate period of time. He strongly criticized the assumption of a unidirectional linear relationship between production, innovation and socioeconomic processes.

Both complex processes of ‘triple helix’ and the Kondratiev ‘long cycles’ have some regular aspects. The long cycles are repeatable (every time on a new evolutionary level) and triple-helix dynamics are subject to reverse engineering. This means that complex interactions between academia, governments and industry can be reconstructed as the whole system undergoes some apparently chaotic reconstructions. In this case the actions of a single firm have to be in a certain sense chaotic too. Because a firm as an organized entity cannot permit internal disorder and cannot deal normally with the uncertainty of future outcomes of complex present, some new external organizational forms (like, for example, networks) have to appear in order to mitigate the sudden chaotic changes. To govern the change without governing is what can be called real chaos. The idea of regular outcomes of an apparently and inherently irregular structure is not new per se. A good example of a practical approach towards management of chaos and by chaos is given by Google, whose management achieved success in deploying the principal of ‘structured chaos’ (Lashinsky 2006).

A number of questions arise, when we talk about technological and not technological factors of innovations in a broader context of industry-government-academia relations. To what extent NTI can be the result of technology state-
of-the-art, or an indication of technology stagnation or market-led approaches, dictated by the firms? Are NTI only a function of technological advances and technological innovations? To what extent technological advances imply the direction of further scientific and technological progress by facilitating the introduction of NTI in governments, enterprises and society? How trade and non-trade markets coexist in modern societies and what apparent forms can they take? Are adaptive changes, performed with the aim to conform to some standards as good as truly radical innovations, determined by system’s variation? These questions will be taken into consideration in the following sections, though many aspects of them go beyond the scope of this paper.

The rest of the paper is structured in the following manner. In the next section, I describe the complex interaction of non-technological and non-market innovations with economic and technological innovations. In the ensuing sections, I explain the conceptual framework of organizational and managerial innovations and describe the results of a preliminary case study, involving many Russian large companies and providing some valuable insights on the attitudes and strategies of the Russian companies towards the implementation of organizational and managerial innovations.

Non-technological innovations and their hypothetic relation to technology innovations

I start with the assumption of complex relations between technological and economical innovations and NTI. While technological innovations are at the core of all other transactions which occur in modern knowledge-based societies and which are regulated by economic systems, the influence of NTI, be it a social innovation or a life-style acceptance, should not be underestimated. There are many evidences of the leading role of TI. Lacking evidence of NTI may be a consequence of the fact that many inquires simply don’t take into consideration the possible impact of non-technological factors on technologies (Trofimov 1999).

At least, it would be premature to think about NTI as a kind of an artificially constructed pattern of cultural assimilation. Successful models of behavior and adaptation, that can be totally emulated and tackled from the top down as well as from the bottom up, are relatively few. Voluntarism assumes that innovations can be effective as long as they are deliberately accepted by society.
at large. This doesn’t mean that constructivist approach towards social perception of innovations is in contrast with the fact that the society at large is a distinct player in innovation process.

To a certain degree tacit knowledge is embedded in social networks, and similarly NTI are interconnected with TI. It should be accepted that NTI and TI are not mutually exclusive, but they coexist in form of an intersection or a superposition along a continuum of all possible innovations.

While there is enough evidence of the power of technologies and technological innovations, presumably we still cannot talk of unidirectional influence of technology on the adoption of relative NTI. In this respect, the principal question is how the existing socioeconomic structures and major social and cultural innovations shape the technological advances and what is their ability to foster breakthrough technologies? The shaping of technology future by non-technology factors is one of the attributes of modern economical and technology foresight, intended as a deliberate action to construct the future.

Foresight activities are based on social constructs and different perceptions of society and technology, such as the heroic view of society, when social actions are considered as principally voluntary, and when both technologies and their outcomes are taken into consideration from a more general point of view of socioeconomic change (OECD 2001). For example, business models, organizational and market structures, as well as corporate culture are heavily influenced by trunk innovations in telecommunications and many of the possible social implications of new technologies in this field are generally considered since the inception of the relative policies (OECD 1999). This means that priority setting in modern societies is not entirely pre-conditioned by the technology state-of-the-art, nor the technology or economy factors are the only determinant ones.

Maybe we have to take lightly the prognostic capabilities of technology foresight in complex and undetermined environments, such as a ‘triple-helix’ one. Nevertheless two things cannot be underestimated: the influence of various constructs on minds, which are an essential part of any foresight activity and objective purposes for action, existing in complex environments and determined by many ‘givens’, that can perfectly be language or technical jargon,

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13 In contrast, tragic view on society presupposes that the influence of technologies is total and that technocracy is the only outcome.
based on tacit understanding, corporate culture or leadership qualities of top management and their ability to convince and motivate people. The example of policy priority-setting in case of the transition towards the so-called ‘hydrogen economy’ is also indicative. Basic technologies and processes which are used in fuel cells were known many decades and even centuries ago, but these technologies were not emphasized until the last two decades. Only a few years ago it was rediscovered the role and the significance of these technologies for society with the introduction of policies for ‘sustainable development’. In parallel governments have become more and more involved in research of alternative energy sources and ‘green technologies’. Recognizing the importance of NTI, the OECD has included the concepts of marketing and organizational innovations in its methodological guidelines (OECD 2005, cf. also table 2). Marketing innovation is defined as a new marketing method for the product placement and product pricing, including consumer-oriented changes in design and branding strategies. Organizational innovation is defined as a new organizational method, involving significant changes in business processes, workspace organization, organizational structure or its external relations. In this relation the broader definition of innovation is as follows:

An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.

In this definition there are no ‘good’ or ‘bad’ innovations, though in practice innovation is often synonymous of an improvement in terms of a personal judgment. The Russian official documents, for example, explicitly stress that innovations in technology, organization of labor or management should be based on some improvements and some breakthrough advances. The OECD concept of NTI includes as well the adoption of productivity-enhancing ICT (OECD 2005). The application of new ICT can have various effects on the decision-making process of a company. For example, the following phases can be observed: firstly, ICT (e.g. data bases and warehouses, client management systems, decision-supporting tools, semantic crawlers, web tools and other means) are implemented and adapted to become functional and useful for the personnel; secondly, such innovations start to function as distinct environments and retroactively modify the decision-making process
and communications they were intended to support. The positive role of ICT consists in reduction of low-profile and routine operations, while they help to put into evidence high-profile processes in organization, requiring additional efforts in order to achieve a solution.

To understand better the relation of NTI to technological innovations, we can rely on contemporary confirmation of the existence of long cycles of technology, which involve latent cycles of science and technology advances preconditioning the major scientific outbreaks, basic inventions and technology revolutions, explicit cycles of innovation development taking form of trunk innovations and finally the cycles of economic, governmental and societal reaction. One theoretical explanation of such technology cycles was proposed by Kon-dratiev and received further theoretical elaboration by Schumpeter (Hirooka 2003).

Marketing innovations
- Consistently new consumer-oriented marketing methods developed/adopted by the innovating firm with the principal objective of increasing the firm’s sales of new/existing products:
  - product placement
    - introduction of new sales methods, such as franchising system, direct selling or exclusive retailing, product licensing
    - use of new concepts for the presentation of products, such as sales-rooms for furniture
  - product design (e.g. changes in the packaging of food)
  - product pricing
    - new methods for varying the price of a good or service according to some variables, such as demand or business support schemes in telecom (with the exception of or seasonal, regular and other routine changes or methods whose sole purpose is to differentiate prices by customer segments)
    - interactive methods, for example allowing customers to choose desired product specifications on the firm’s Web site
  - branding strategies
    - the development and introduction of a fundamentally new brand symbol (as distinguished from a regular update of the brand’s appearance) which is intended to position the firm’s product on a new market or give the product a new image
product promotion
- the first use of a significantly different media or technique – such as product placement in movies or television programs, or the use of celebrity endorsements
- introduction of a personalized information system, e.g. obtained from loyalty cards

Organizational innovations
- Consistently new organizational methods (in business processes, workspace organization, organizational structure or organization’s external relations) developed/adopted by the innovating firm on the basis of strategic decisions taken by management with the principal objective of increasing the a firm’s performance by reducing administrative costs or transaction costs, improving workplace satisfaction (and thus labor productivity), gaining access to non-tradable assets (such as non-codified external knowledge) or reducing costs of supplies:

business processes
- processes, involving learning and knowledge sharing within the firm: a) the first implementation of methods for codifying knowledge, e.g. establishing databases of best practices, so that they are more easily accessible to others; b) the first implementation of practices for employee development and improving worker retention, e.g. education and training systems.
- the first introduction of management systems for general production or supply operations, such as supply chain management systems, business reengineering, quality-management systems

workspace organization
- new methods for distributing responsibilities and decision making among employees for the division of work within and between firm activities (and organizational units): a) new organizational model that gives the firm’s employees greater autonomy, e.g. through the decentralization of group activity and management control or the establishment of formal or informal work teams in which individual workers have more flexible job responsibilities; b) new organizational model involving the centralization of activity and greater accountability for decision making, e.g. the integration of sales and production or the integration of engineering with production

organization’s external relations
- new ways of organizing relations with other firms or public institutions, such as the establishment of new types of collaborations with research organizations or customers, new methods of integration with suppliers, and the outsourcing of business activities

productivity-enhancing ICT
- e.g. the use of new software for documenting and communicating information in order to encourage knowledge codification and knowledge sharing within the firm

Table 2. OECD classification of non-technological innovations (source: OECD 2005)

In principle the Kondratiev cycles exhibit unidirectional succession of evolutionary steps similar to those describing a life-cycle of a single technology. Kondratiev cycle starts with a set of initial conditions, given by the previous cycle, proceeds through the recovery of scientific advances during the upswing stage, reaches its boom stage accompanied by stagnation and followed by depression and downswing. A schematic trajectory of a single technology life-cycle in the context of the broader Kondratiev cycles is shown in Figure 1. In this schematic illustration four phases of technology life-cycle are shown: the recovery phase, the boom phase, the phase of stagnation and the phase of technology implementation. Often strong technological and market expectations are hyper inflated by scientific input, thus triggering the development of a new branch of technologies, but after some unsuccessful implementations such expectations brusquely decrease and leave space for a more pragmatic approach towards a few remaining low visibility technologies. One reason of such a scenario is a long-term character of many discoveries, requiring much more time for the achievement of technical feasibility and for the introduction of the relatively short-term innovations, than it is generally expected by industry and market-led science.

In reality the Kondratiev cycles are subject to more complex relations, as they are combined with many other dynamical wave processes. Some of them were specified already by Schumpeter, who pointed out the relation between Kondratiev long cycles and minor Juglar cycles (Hirooka 2003) and associated them to the appearance of major clusters of innovation (Freeman 1979).
The different effects of technological innovations on the economy and on the society can be understood better if we distinguish between incremental innovations, radical (breakthrough) innovations and trunk (fundamental) innovations. Trunk innovations represent a principal link between scientific advances and the economy at large, which can be expressed in geographical terms as new practices of communications, cancelling space and time limits. Radical innovation is true innovation as it was defined by Merton with the use of Durkheimian concept of anomie. They are the achievement of (socially) significant goals in (socially) unaccepted ways. Incremental innovations are much more close to passive adaptation, though they cannot be underestimated because of the great role, which life-styles and fashion are playing in modern societies. All these kinds of innovations exercise substantially different influence on the economy and on the society (Table 3).

Figure 1: Schematic illustration of a single branch of technologies life-cycle in relation to scientific input and market opportunities (source: author).
Incremental innovation
New design, new model “platforms”, small incremental changes of technical characteristics of products, etc.

Radical innovation
New markets, ranging from niche markets to global markets, new value chains. Radical innovations redefine industries and industry sectors [18].

Trunk innovation [16]
Pervasive impact on the economy. Trunk innovations induce many subsequent technological and non-technical innovations

E.g. innovations within Sony Walkman product family, introduced gradually from 1980 to 1991
Incremental innovations are dispersed and rely on customers’ expectations

E.g. Affymetrix GeneChip Systems, introduced in 1994
Radical innovations are spread along industry branches and different markets and are concentrated along a minor number of organizations and networks with superior human capital and market penetration rates

E.g. railways during the upswing occurring between 1846 and 1872
Trunk innovations are concentrated in the field of energy, transportation, and communications and they require access to internal or external basic resources

Incremental innovations sustain existing networking structures

Radical innovations produce networks on industry and market level

Trunk innovations set infrastructures and networks beyond industries

Incremental innovations are firstly related to new fashion and life-styles diffusion, assimilation and acceptance, they closely related to a broad category of marketing innovations,

Radical innovations are related to social capital development, knowledge transfer activities [18] and to marketing and branding strategies. Radical innovations influence and

Trunk innovations determine directions of subsequent scientific advances and cause revolutions in organizations and value creation systems of businesses. NTI determine the ex-
which includes economical and non-economical innovations [19] are influenced by organizational structure and corporate culture [20] tenant and the resolution of application of trunk innovations. Governments are involved in foresight and planning activities, delimiting the range of future outcomes, which are themselves undetermined. Many chaotic non-linear dynamics make part of these relations since the beginning.

Table 3. Different types of technological innovations, their effects and their relation to NTI (source: own source)

The degree to which the Kondratiev cycles are influenced by feedback reactions of societal and governmental regulation and acceptance is unclear. While this concept can be used for long-term prognostication, its heuristic value is limited to the time span of changes at meso-level and it totally underestimates the changes at micro-level. The predictability of long wave processes, such as the Kondratiev cycles, relies on the fact that in each moment and in each discontinuous fraction of time the system is in quasi-statistical equilibrium. Nevertheless the initial conditions of each cycle can vary substantially and it is impossible to exclude the possibility of ‘chaotic’ deviations, fluctuations and discontinuities, given by wars, social, ecological or economical crises and other unexpected factors. When we consider some other factors which function in modern societies, serious doubts can arise about the deterministic view on technological and economical innovations, which tries to explain economic disturbances and crashes in terms of an overheated economy induced through innovation diffusion (Hirooka 2003).

The nonlinearity of innovation diffusion, which leads to the saturation of the economy, may be an indication of the reaction produced by non-technological and non-market factors at meso-and micro-level. The consideration of these factors can give us an answer about the irregularities of macro-economical models relying on technology forecast. Probably, many apparent aspects of the causal relation between technological innovations and economic develop-
ment can be resolved by adopting a comprehensive vision on the role of society and NTI in delimiting the future of technological development. This is possible in the case of pro-active involvement and consideration of society and social mechanisms in priority setting and technology governance. If society and socioeconomic structural changes are taken into account as an underestimated source of variation and a missing link between technology development and technology application in industry, research and state regulation, than it will be possible to comprise the respective non-technological and non-market aspects of change, taking form of NTI. The feedback reaction provided by NTI is partially explained by the concepts of ‘triple-helix’ and ‘Mode-2’ science and the ever-evolving Polanyi’s concepts of ‘non-market trade’ and codified/non-codified knowledge.

It can be supposed, that the influence of non-technological innovations increased over time since the exploitation of steam engine during the first Kondratiev upswing in 1790 (Kondratiev 1926). At that time the principal preoccupation about society consisted in swaying the public opinion through the regulatory measures adopted by English authorities. This was a typical ‘top down’ approach to the management of risk perception of technological innovation. Today many other aspects of NTI appeared, involving more complex approaches to (de)regulation and new networking techniques, such as expert communities, NGOs, human rights observatories, etc.

Present technologies are based on major scientific discoveries and outbreaks of the past, which were successful in triggering waves of invention and which had led to recognition of big opportunities for investment. After technology upswing, the diversification and maturation of single technologies could be triggered by other mechanisms. In the paradigm of ‘normal’ science the mature phases of a technology life-cycle are subject to strong pressures of demand-led invention and cost reduction through process improvement (Freeman 1979). The paradigm of ‘post-normal’ science is focused on societal aspects of mature technologies and their impact on socioeconomic change. In this paradigm the technology communities, governments and societies joint their efforts to accomplish relevant non-technological innovations with the

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14 For example, the Kyoto-process involves scientists, policy-makers and enterprises in a complex process of innovation, in which the ‘Mode-2’ non-technological and non-market activities are the most evident. The function of this process consists in a socially-distributed knowledge, produced by constellations of concerned parties and only partially codified in conference proceedings and in disciplinary journals (Mueller 2003).
aim to consolidate the technology trends and to agree upon the future of technologies.

The manifestations of the so-called ‘Mode 2’ are more typical than it is generally thought (Weingart 1997). Cyclical shift from ‘Mode-1’ to ‘Mode-2’ science and vice versa happens along a continuum of possible intermediate states and is related to the relative shift of foresight horizons along a continuum of definite and indefinite states. When causal relations become less obvious and expectations of changes can be evaluated only ex-post (Etzkowitz and Leydesdorff 2000) the system might be in proximity to a new turn of evolution, that is of a new technology upswing. ‘Mode 2’ way of production of scientific knowledge is characterized by the transition towards trans-disciplinary approaches in science and a growing influence of mediating environments, such as service sector of the economy, transnational organizations, associations and technology transfer institutions.

The relation between TI and NTI is in many respects similar to the relation between natural geography and artificially established infrastructures of spatial economy (Fujita, Krugman and Venables 1999). Drawing this kind of parallel, we can say that TI are more similar to available natural resources which can be in turn concentrated and regulated by NTI, playing the role of artificially organized infrastructures.

Successful TI do not always lead to relevant changes in NTI. Often NTI in form of a more organized patent legislation or a more liberal innovation infrastructure play a role of a strong incentive for successful TI. For example many technological innovations in biotechnology were constrained in Russia in the 90s, despite its advantageous positions in many fields at the avant-garde of medicine, chemistry and biology. At the same time favorable conditions for biotechnology, which were created in other countries, for example in the United States, provided a background for the introduction of numerous significant innovations (e.g. Russian researcher Mirzabekov and his team commercialized the technology of DNA micro arrays in the USA for this reason).

In the same manner knowledge-intensive services can be located distantly from the location of principal knowledge flows, while exercising remote influence on them (Leydesdorff, Dolsma and van der Panne 2006). One important implication of spatial economy is that locations of vital concentration of knowledge-based processes, such as Silicon Valley, are unique and cannot be easily repeated in other regions. Spatial factors of innovation processes include as well non-trade markets’ interdependencies, the territorial locations of
the knowledge networks’ centers, social and cultural context of such networks’ locations (Coenen 2007).

**Organizational and managerial innovations as a category of NTI**

Organizational and managerial innovations (OMI) represent an adoption of a determinate behavior within organization and its transformation into business operations that are new to the whole organization. Core values of organizational innovations are leadership and charisma of top managers, their ability to inspire the entire work force, to appraise the value of people, and to organize knowledge management as the critical capabilities of an organization to produce, accumulate and acquire knowledge (Wong and Chin 2007).

Next, the different types of organizational and managerial innovations will be discussed. Namely, they include business model innovations, strategy or value innovations, collaborative innovations (including ‘open-market innovation’), knowledge management innovations and some minor types of managerial innovations. The aim of this section consists in distinguishing between OMI as slow and predictable adaptive changes and radical innovations as deliberate and pro-active actions. Some dynamical aspects of OMI will be discussed from the point of view of the impact of one type of OMI on another and their effect as a whole; the impact of the company environment on the OMI and the reflection of OMI on corporate culture and decision-making process.

Some OMI are more radical than others (Table 4). Intentionally performed organizational innovations seem to be different from those achieved adaptively. For example, Kristian Moller and Senja Svahn (2006) postulate the importance of deliberate (intentional) action in establishing radical or future-oriented business nets (e.g. emerging mobile services). From this point of view, we can suppose that one of the principal distinctions between slow adaptive change and radical innovation consists in a deliberate (intentional) action, lying at the bases of every radical innovation.

Another important aspect of radical innovation consists in its strategic relevance for the actors involved in the process of innovation. The results of such an innovation are regarded as strategically crucial improvements ex ante. In contrast, adaptive change consists in a relatively slow and a relatively passive adoption of transformations undertaken with the aim to correspond to the
existing state-of-the-art in a determinate field or to adjust some critical processes, which are lacking efficiency.

Other innovations take form of rather adaptive emulation of a determined organizational culture and belief. For example, the work of creative groups in public relations firms is entirely based on emulation of some general key values, such as collective tasks and responsibilities, open exchange of information and democratic ethical rules.

Innovations, related to management of business processes, are generally adaptive. They include designing of new business-processes, BSC and KPI elaboration, TQM and conformity with international standards. Such innovations are generally evoked by the necessity of clarification of the value creation chain, rather than of invention of a principally new one.

Radical organizational innovations in high-tech companies are oriented on new radical technologies and new markets entry through radical improvements in old value systems or through creation of new value systems. The linear market dynamics are focused on the understanding of organization’s leading positions and on the forecasting of future customer needs. Different organizational strategies and business models on this way include branding strategies, linking innovation process to demand, with an accent on mass-market and market-led applications. More complex marketing strategies have to be oriented on market strategies, which can significantly diversify or even change the whole company’s business.

Organizational innovations in multinational companies can be matched against different cultures and habits of personnel. To assure that the basic values of corporation will be mutually complementary with the values and habits of people, it is important to shift local values or to create symbiotic values. Redistribution of human resources competences and accountabilities, internal rotation, trainings and seminars are only a few methods to deal with this question. For example, in the Russian branch of German company VEKA, the managers of local projects are accountable directly to the board of directors, while senior management of VEKA Rus clarifies and defines operational goals. In this way the local hierarchical culture is mitigated by matrix organizational approaches of ‘mother’ company.

Strategy or value innovations are applied strategies which are driven not by competition on the existing markets, but on the contrary by pursuit of new values and markets (Chan Kim 1999). Strategy innovation can take form of reorganization, brand innovation, new pricing and new positioning or recom-
bination of services (e.g. Cirque du Soleil), and other forms of radical changes. All value innovations in production industries are almost always linked to some kind of disruptive technological innovations. For example, the major manufacturer of 5,25 inch hard discs Seagate in the late 80-s didn’t recognize the value of new 3.5 inch discs and continued to introduce new complex technologies in the already established market. At the same time newly established small companies, such as Conner and Quantum, firstly occupied a niche market and by trial and error introduced value innovations for the emerging global market of PCs and laptops and caused Seagate to fail on this new market\textsuperscript{15} (Christensen 2004).

Strategic management of disruptive innovations includes organizational independency, thorough revaluation of clients-base, orientation on relatively small customers, destructive approach towards old rules and standards and strong orientation on new and emerging markets. Value innovation and strategic decisions are a prerequisite for the successful commercialization of the majority of disruptive innovations. In addition to strategic decisions, there has to be an overall understanding that many failures will be inevitable and useful.

Many times, the outcomes of a strategic decision remain unclear for a long period of time even for the authors of this decision. For instance, when Intel decided to develop, to protect and to commercialize its first microprocessor for calculators in the 60-s, the company was fully concentrated on the market of DRAM integrated circuits and nobody could preview at that time that apparently useless microprocessors will become the core of the company business in the 90ies.

Value innovation can rely on culture and expectations of the clients. An example of successful value innovation for the clients is IKEA furniture. IKEA’s production is not based on pre-made products and on marketing of buyer’s preferences, but on a radically new value system, in which the buyer himself is a creative architecture of his own design and furniture style.

Adaptive organizational and managerial innovations               Radical organizational and managerial innovations

Organizational innovations

Business model innovations, such as Strategy or value innovations, such as

\textsuperscript{15} Conner and Quantum started the promotion of 3.5 inch hard discs technology and defined a completely new market relying on unusual customers: small companies and startups which appreciated more compact hard disks with lower technical characteristics.
shared services, outsourcing of functions, using of third party operating utility, redistribution of human resources, management of distribution channels, branding strategies, linking innovation process to demand, with an accent on market-led applications, deployment of ICT-assisted organizational innovations, etc.

changes of financial model of business, new values for the clients, new value creation models (e.g. business nets), etc.

Collaborative innovations (including ‘open-market innovation’), such as establishment of networks of collaborative alliances and alliances with academia; strategic mergers and acquisitions, bringing the partners into a single ownership structure with consistent changes in overall organizational processes and strategies; acquisition and integration of diversified assets, e.g. smaller companies with relevant knowledge-base and high flexibility, etc.

Knowledge management innovations: development of social capital of the firm and pro-active acquisition of external technological knowledge

Managerial innovations

Management of business processes, emulation of a determined organizational culture, etc.

Innovation of corporate culture through leadership and trust

Table 4: Organizational and managerial innovations along a continuum of adaptive and radical ones (source: own source).

Considering organizational and managerial innovations, it is possible to name at least five dimensions of change. The dimension of knowledge dynamics includes organizational changes in knowledge transfer procedures, secrecy policies, strategies, devoted to social and human capital of a firm and other processes, which can take form of organization of a corporate university.

The second dimension includes the changes of organization itself, related to specialization of labor functions, reforming of organizational structure and the
establishment of networks of organizations. One of the most important innovations in this field is design of new organizations on the interfaces of industry-government-academia environments, such as investment banks and foundations in the case of venture capital.

The third dimension is given by local and overall societal changes in Fukuyama’s terms of ‘high-trust’ and ‘low-trust’ societies (Trofimov 1999). Trust economies and trust societies are related to ideal types, embedded in culture, history and economic traditions of non-market trade and redistribution of basic goods, favored by highly specialized and individualistic social capital.

The fourth dimension of change can be reduced to the interaction at the interfaces of organization’s selective environments along a continuum of endogenous and exogenous changes. In this case the development of new technology can be considered as an endogenous source of change, while the adoption of a new technology from outside is an example of relatively passive adaptation.

Finally, the fifth dimension can be described by the geography of organizations, the spatial distribution of peripheries (e.g. supply-sides) and centers (e.g. headquarters) and the degree of virtualization of resources.

Pro-active acquisition of external technological knowledge (know-how, know-what and know-why) is crucial for every innovative organization. It requires a high degree of technological competence of human resources and a good interaction with marketing capability, understood first of all in terms of links between R&D, production and marketing. In turn marketing capability relies on social capital of the firm and on many organizational innovations, such as management of distribution channels (Poon and MacPherson 2005).

Social capital of the company can be measured as the number of functional contacts of its employees and it is assumed to influence the company performance. Still, it has to be considered the non-linear aspect of this relation. For example, in R&D-intensive environments, which are endowed with highly developed human and social capital, the overall economic benefits for the company can be quite different. This is the case of service industry. R&D-intensive service firms with a highly developed social capital exhibit rather low nominal labor-productivity. At the same time, the lower-profile service firms seem to benefit more in terms of their innovativeness from a highly evolved social capital. Such firms have the strongest sales growth and the highest labor-productivity and they are strongly oriented on cost-reduction and process innovation (Hollenstein 2003).

The Global CEO study performed by IBM in 2006 postulates the importance
of business model innovations, involving changes of the structure and financial model of the business (IBM 2006). This study confirmed that best-performing enterprises dedicate more attention to business model innovations. Three principal benefits business model innovations can be obtained from this study: economic benefits (e.g. cost reduction), strategic flexibility and the discovery of new markets through company’ portfolio diversification. While mentioned economic benefits cannot be principally associated to non-technological factors, the implications for strategy and decision-making are clearly non-technological. The CEOs rank improvements in strategic flexibility and strategic orientation on new markets as very important.

The study accentuated the importance of collaborative innovations for the establishment of new or reshaped partnerships, especially in the field of R&D. At the same time, almost nobody of the CEOs (less than 3%) alluded to the innovativeness of a company as a mere function of R&D management. This is an indication of shift towards a more non-technological perception of innovation process as a whole. At the same time, the importance of innovation culture and team-oriented environment of a firm is explicitly mentioned as a major internal source of innovation.

One type of collaborative innovations is the so-called ‘open-market innovation’ including tools such as licensing strategies, strategic partnerships and joint ventures. Open-market innovations help to exploit the benefits of free trade and knowledge transfer to burst internal innovativeness of a firm (Rigby and Zook 2002). The principal distinction of open-market innovations consists in their focus on collaborations that won’t last long, that will outsource non-necessary R&D work and that will generate many ideas and services for the company at low cost. Open-market innovations provide two effects: the diversification of businesses and markets, especially when company is engaged in highly volatile markets and saving of corporate R&D resources from volatility. The slogan is: Think of new partnerships and networks, if a few people working independently can produce innovations as good as or better than your corporate R&D lab. Open-market innovations are good, when a company just cannot approve a strategic plan or a budget without talking about what’s going on in the outside world. By answering the question ‘How many innovations burst on the scene from the periphery and surprised us?’ the open-market innovations keep focusing on low visibility technology innovations, rather than on the mainstream of technologies.
The most important hypotheses and variables of organizational and managerial innovations according to a case study of Russian large companies

The case study was performed by the Russian Managers Association (AMR), a nation-wide independent non-governmental organization engaged in fostering the transition of Russian business community towards international standards of business organization. The key members of AMR are the most influential top-managers of large companies, actively working in Russia and representing virtually all sectors of industry and services.

The outcomes of this case study, which was conducted in collaboration with the Institute of Sociology of Russian Academy of Sciences, have been partially published in the report of AMR, entitled ‘Organizational and Managerial Innovations: the development of knowledge-based economy’ (Russian Managers Association AMR 2008).

The report stresses that today we cannot consider organizational and managerial innovations in Russia as an independent source of variation. On the contrary, such innovations are, in general, the result of involuntary overtaking actions, following or accompanying major process, product or economical innovations.

One of the reasons of low adoption of OMI in Russia is a relative weakness of the Russian higher education system in the field of business management. Many managers don’t understand the function and the meaning of OMI in modern societies. They often underestimate the role of personal factor and the importance of deliberately-taken OMI. As a result, there is a substantial lack of knowledge and know-how required for successful implementation of OMI. Other reasons include specific historical conditions and the heredity of strong etatistic model of innovation system that existed in the former Soviet Union.

In brief, the methodology of this case-study is based on two principal activities: a semi-structured questionnaire and a semi-structured face-to-face interview with key experts. In total 120 organizations (Table 5) responded to the questionnaire previously disseminated via e-mail among all Russian and foreign organizations accessible to AMR. 24 questions were divided in four blocks: pre-requisites for OMI, implementation of OMI, managers’ role during the implementation of OMI and estimation of the results. After that, the
respondents were asked to select key experts in the field and ‘snowball’ strategy was applied to select 10 key experts, which took part in the interviews. Two group discussions with the participation of interested top-managers were conducted with the aim to formulate and approve the questionnaire and one group discussion was held with the aim to resume the results of the case-study.

<table>
<thead>
<tr>
<th></th>
<th>Small enterprises</th>
<th>Medium-sized enterprises</th>
<th>Large enterprises</th>
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<tbody>
<tr>
<td><strong>Production</strong></td>
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<tr>
<td>Chemical industry and biotechnology</td>
<td>7</td>
<td></td>
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<tr>
<td>IT</td>
<td>3</td>
<td></td>
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<tr>
<td>Metallurgy</td>
<td>5</td>
<td></td>
<td></td>
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<tr>
<td>Machinery and transport</td>
<td>12</td>
<td></td>
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<tr>
<td>Energy</td>
<td>4</td>
<td></td>
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<tr>
<td>Construction</td>
<td>6</td>
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<tr>
<td>Telecom</td>
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<tr>
<td>Food</td>
<td>4</td>
<td></td>
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</tr>
<tr>
<td>Other industries (low-tech)</td>
<td>5</td>
<td></td>
<td></td>
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<tr>
<td><strong>Services</strong></td>
<td></td>
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</tr>
<tr>
<td>IT-services</td>
<td>1</td>
<td></td>
<td>4</td>
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<tr>
<td>Banks and investment groups</td>
<td>15</td>
<td></td>
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<tr>
<td>Trade</td>
<td>4</td>
<td></td>
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<tr>
<td>Education and training</td>
<td>1</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Insurance</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>PR and media</td>
<td>3</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Consultancy, audit, leasing, HR</td>
<td>5</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Policy support</td>
<td>3</td>
<td></td>
<td>6</td>
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<tr>
<td>Other services (low-profile)</td>
<td>5</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td>14</td>
<td>20</td>
<td>86</td>
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Table 5. Distribution of questionnaire respondents according to institutional affiliation

The report adopts the following definition of innovation (Russian Managers Association AMR 2008, cf. Figure 2):

An innovation is the profitable implementation of a new technology, or new product (good or service), or a new organizational, technical or socioeconomic solution, related to produc-
tion, financing, commercialization, administration or some other field of company’s activity.

The definition of innovation in Russian legislation includes as well the notion of additional social benefit of a new product, process, service or organizational form in comparison to the previous ones. The classification of major attributes of OMI is shown on Figure 4.

The most widespread practices of motivation during the implementation of OMI in Russia include principally financial mechanisms: definition of a company’s salary grid on the bases of re-grading of the managerial personnel, revaluation of KPI and development of a bonus system on the basis of KPI accomplishment, clarification of carrier paths. Team-building activities and of personnel rotation are used more rarely. Finally, the role of moral rewards and moral stimuli is usually underestimated. This disproportion in many cases leads to misunderstanding and in some cases even to a failure of the foreseen practices of motivation. For example, clearly defined bonuses and KPIs from one side and the intolerance of diversification and new projects are a good means to cut off many profitable projects, trying to reduce costs and to optimize risks.
Only 3% of respondents believe that there is no necessity for OMI in their companies. 42% of them believe that OMI are needed but not too urgently to start them right now. The remaining 55% affirm that in their companies prevails a high sense of urgency with regard to the immediate implementation of specific OMI.

Despite such a strong interest, organizational and managerial innovations in Russia are generally performed centrally and on the basis of hierarchical governance. The specificity of innovation process in Russia is generally related to a high degree of institutional isomorphism, taking form of a widespread diffusion of regulatory measures ‘from above’. One example is given by the establishment of the so-called ‘Special Economic Zones’ which are similar to Italian innovation districts, providing some juridical and economical incentives and a better investment and infrastructural environment for the business.

The Russian firms try to escape the high degree of uncertainty by simply rejecting all innovations which involve complex networking or completely new organizational solutions, especially if these actions are not supported by the state.

The vast majority of Russian large enterprises are passively engaged in the implementation of OMI. They adopt a relatively higher share of adaptive strategies rather than pure radical innovations. This can be deducted from the overview of principal sources of OMI, mentioned by the respondents. Such sources are subdivided in two categories: innovations of ‘outer impulse’ and innovations of ‘inherent impulse’. Both innovation sources are intended as some kind of critical situation within a company or within its economic mar-

Figure 3. The shares of companies (%), which have implemented at least one OMI, by types of OMI (as proposed in the questionnaire, source: Russian Managers Association AMR 2008)
kets. Both of them are mostly focused on crisis-proof management, rather than on organization improvement. Innovations of ‘outer impulse’ are relatively few and take form of OMI, influenced by unpredictable (for the company) and thus sudden market changes, almost always negatively influencing the company’s performance. Innovations of ‘inherent impulse’ are predomi-

The case study was originally intended to formulate some general hypotheses that can be reassessed and valued empirically in the following studies. One principal question consists in the specification of system of reference for data collection. Key definitions need to be further explained and evaluated from the point of view of measurable indicators and variables.

Figure 4. Classification of major objects and attributes of OMI (source: Russian Managers Association AMR 2008).
Hypothesis 1: OMI in the system of management are positively related to the competitiveness of the company and to the achievement of predefined strategic goals.

In Russian companies OMI in the system of management are often internal radical changes, stimulated by crisis situations or other exogenously induced critical changes in organization strategy, provoked by radical changes in business environment. The dynamical aspects of such transformations include the overall resulting effect on organizational structure, organization of business divisions, business processes and marketing activities of the company and the feedback effect on corporate culture and decision-making process.

Hypothesis 2: The generally accepted belief in secondary function of OMI in relation to technological innovations restrains the diffusion and emulation of successful OMI.

This hypothesis presupposes that technological innovations and OMI mutually complement each other. One derivate sub-hypothesis postulates that OMI are more important at early stages of life-cycle of an organization, especially in venture organizations. Venture organizations and venture investors currently working in Russia underestimate the importance of OMI and rely almost entirely on technologies. The underestimation of OMI leads to lack of methods for evaluation of OMI impact, which in turn leads to the commercialization of successful OMI by a restricted number of consultancy firms that are capable to evaluate the positive changes, imposed by OMI.

Hypothesis 3: The companies of service sector are more disposed and more susceptible to OMI.

First of all, companies operating in the field of trade, insurance and telecommunications (mobile services) are more prone to adopt or to emulate OMI. In contrast, banks are considered to be less prone to OMI.

Hypothesis 4: Russian companies are oriented on emulation of OMI, which have been generated abroad.

OMI are unique and unrepeatable to the extent they represent a function of endogenous variation. It is not always possible to translate or to emulate the
experience of other organizations, especially if there are significant cultural and social differences between respective local environments. In Russian context all-purpose one-size-fits-all solutions, proposed by consultancy firms, are often a waste of money and time.

_Hypothesis 5: The intensity of innovation conflict during the adoption of OMI is proportional to the effective (and not formal) changes within company._

Russian top-management is generally oriented on short-term achievements and they prefer to pursue tactical, rather than strategic goals. One of the principal conflicts in this respect is supposed to be the conflict between top-management current goals and stakeholders’ expectations. One of the reasons of this conflict might be the consideration of OMI from the point of view of investments, rather than from the point of view of value innovation and corporate culture.

_Hypothesis 6: The principal obstacle for OMI is personnel’s resistance to change and sabotage._

Personnel’s sabotage is a direct consequence of low level of participation of functional managers, R&D specialists and other key persons in the decision-making process. The action ‘from above’ encounters personnel’s resistance in the case of unclear system of motivation and reward. Creative companies in service sector usually underestimate the role of material motivation, while the high-technology industrial companies usually underestimate the role of moral motivation and moral reward.

_Hypothesis 7: The effect of OMI is reflected on the achievement of company’s strategic goals and on organizational innovation management._

The principal effect is supposed to be an improved process of value creation and its contribution to the company’s capitalization growth, while other important direct or lateral effects (e.g. labor productivity, margin growth, or product/services diversification) are usually not considered. Russian companies normally use linear system of evaluation of the effects of OMI. They define the managerial practices and decision-making processes, which can be affected by OMI. Afterwards they define key indicators (mostly economic) of
change and the expected impact of OMI on these indicators. The evaluation ex post is performed from the point of view of company’s capitalization growth. At the same time, many respondents recognize that OMI don’t have a direct influence on economic indicators of organization’s performance and they agree that the estimations of lateral effects require special efforts and still can be approximate or imprecise.

Hypothesis 8: Globalization and global competitiveness is the most important driver of OMI

Russian companies continue to use tactics of second generation management, focused on the acquisition of new assets and on the restructuring of the existing ones. They still don’t fully recognize their capabilities for change through the use of radical OMI. In this context, they are heavily influenced by the changes coming from outside, especially by the changes on global markets. Trunk innovations, especially in the field of telecommunications, are a major source of adaptive OMI.

Many general variables influence the adoption and implementation of OMI in Russian context. Some of them are too generic (such as national innovation system, national legislation or national institutional framework) and some of them correspond to the global contexts. The most important variables directly related to organization’s internal processes and its immediate environment can be scheduled as it is shown Table 6. This structure of variables is based upon the results of case-study and takes into consideration the specific aspects of Russian reality, as they were mentioned in the answers of the respondents.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Specific factors</th>
<th>Some implications</th>
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<tbody>
<tr>
<td>Variables describing proactive (strategic) approaches OMI management:</td>
<td>Russian companies are more influenced by trunk innovations, especially in the field of telecommunications and they put low emphasis on innovation culture</td>
<td>Overall resulting effect on organizational structure, organization of business divisions, business processes and marketing activities. As a result, product man-</td>
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(changes in organizational structure, redistribution of functions and human resources, trainings and adaptation)

• Support mechanisms for decision-making (e.g. ICT implementation)

and often neglect the value of people.

Management, licensing and secrecy strategies are also affected, companies at the early stages of their life-cycle are more flexible and prone to diversify their assets and products.

*Variables describing organization’s capabilities*

**Economic performance**

Market and clients’ demand and expectations, cost reduction, loyalty of constant clients

The OMI are assessed from the point of view of economic performance

**Social capital (external relations)**

Quality of informal relations, visibility of formal relations

Organization visibility and the ability to receive governmental funds are strong motivations

*Variables describing retroactive (remedial) approaches*

**Conformity to standards**

Russian companies are usually willing to adopt international standards and best practices, though often they do it retroactively

Involvement of a large number of consultancy firms, outsourcing of unsuccessful activities, formal emulation of standards and best practices

**Crisis-proof management (in cases of communication failure, process failure or market failure)**

The failures cannot be foreseen because top-management is concentrated on short-term

Reformation of organizational structure, business processes and marketing activities
Russian private companies are thoroughly engaged in the development of special strategies and measures for training of their personnel and some of them have already organized corporate universities or corporate branches within major state universities. New methods and organizational models for the attraction of talented youngsters in natural and applied sciences are also in the phase of implementation across various industries, such as oil industries and telecom companies. For example, JSC Severstal since 2003 is performing a special education programme called ‘Talent Pool’ in its corporate university in collaboration with the University of North-Umbria, U.K. Some corporations (e.g. diversified financial corporation Sistema) have recently opened special faculties of business administration in collaboration with Lomonosov Moscow State University, the leading and the largest institution in Russian higher education.

The study demonstrates that generally the respondents are aware of the motivation mechanisms, provided by corporate innovation culture. Innovation culture is understood as dissemination system of key company values, determining a high level of innovation adoption, initiation and accomplishment. Nevertheless, the functioning of this system is in many cases misunderstood. The level of decision-making process for the adoption of an OMI is in 97% of cases the level of company’s stakeholders or the level of company’s board of directors. Innovation culture is associated to organizational innovation management, innovation policy measures and their explanation to the personnel. While it is obvious that an effective leadership and charismatic qualities of top-management can have a much bigger influence on corporate values than mere adoption and explanation of these values ‘from above’. It is important, that nobody of the respondents explicitly mentioned such aspects of innovation culture as the necessity to overcome mistrust and fear of failed projects (which failed though they were diligently orchestrated).

As practice shows, in Russia all OMI have to be initiated ‘from above’ to be functional and successful. But in some cases even innovations accepted on the level of top-management are destined to failure because innovation culture is also deployed ‘from above’ and furthermore is misaligned with innovation culture, traditionally set within company’s divisions. In this respect, it would be useful to consider a few examples of OMI implementation by Russian
companies.

**Example 1.** A typical process of an OMI implementation by Russian large companies with all the relative pros and cons can be shown by the following example. JSC Stekloholding, a large group of companies specialized in glass industry, introduced an automated system for accountancy and workflow management with parallel restructuring and reforming of the whole organization management. An IT-consultancy firm was chosen as a provider of IT solution and an internal ad hoc group was formed with the aim to improve control over financial flows, to improve organizational discipline and to facilitate operative access to financial and economic information for management of the company. On preliminary phase, financial motivation mechanisms were proposed, the current business-processes were described and analyzed and personnel grading with the definition of relative functional plans for managers was performed. On implementation phase, the company resources were inventoried and new standards of work for the personnel were introduced in course of some training. On exploitation phase, the results of system’s monitoring induced a further modification of the new business-processes, and at the same time the recruitment of personnel for automated work spaces had been implemented. After that, a long process for rendering system operational and functional had started. As a result, the new IT system had become operational and the so-called ‘human element’ was minimized in accountancy and workflow of the company at the expense of a huge HR churn rate and some operational expenses for the system’s maintenance. Considering this OMI, it is impossible to say whether the performance of Stekloholding will be improved and whether the current top-managers will be able to take more clear-sighted decisions as neither organizational culture nor company’s values or strategies haven’t been changed.

**Example 2.** In this example it is described a public-private partnership between a governmental agency, an enterprise and a state research laboratory. A company (A) initiated a project for the development of a new technology and obtained 50% financing from a state agency. On the basis of new organizational structures (project teams) and bilateral agreements a consortium of state research laboratories (C) started to develop a technology for A. The innovation culture within project teams was good and many R&D people in A felt enthusiastic about the project and it possible outcomes. Even if the project was
complex and risky, all the juridical and organizational innovations were well implemented. Little by little project teams started to recognize that despite project approval, linear managers in A didn’t understand the project and didn’t want to become project leaders. Moreover, the project results would probably mean new market entry for A and this posed new questions for A’s marketing strategies. R&D people in A couldn’t participate in decision-making process because they weren’t treated as peers and they effectively lacked for understanding of A’s marketing strategies. As a result, people from C adopted a passive approach towards project outcomes and financial motivation couldn’t stimulate them to produce valuable results and patents for A. Instead, they decided to use the results of the project to promote their scientific careers. Managers from A became unhappy too with the project uncertainties and tried to minimize project risks by cutting budgets. In this case we can see how a formal innovation culture can lead to the neglect of value of people and of organizational innovation opportunities. If there was a more functional innovation culture in A, the project would be possibly a failure the same, but a new project would possibly produce valuable results on the bases of previous cooperation. But here the very organizational innovation was a failure.

Example 3. A singular example of an OMI implementation by a Russian company is provided by JSC Sitronics. Together with Russian Academy of Sciences, JSC Sitronics has established ‘Sitronics Labs’. This newly established institution is responsible for commercialization of R&D and functions as a corporate research center. The R&D results are going to be leveraged by other company’s business divisions. Furthermore, the center has started to attract high quality human resources from academia and has deployed strategies for participating in standardization activities. Sitronics Labs possesses all the attributes of an important source of value creation for the rest of the company and respectively it can be considered as a future corporate ‘centre of excellence’ [34]. In fact Sitronics Labs is located in strong business environment with good networking links to competence sources, while internal clients of Sitronics are not regarded as principal clients of the research laboratory a priori. Sitronics Labs is also favorably positioned to receive investment of parent firm, while it is acknowledged the importance of centrally performed coordination of the activities of Sitronics Labs and the promotion of its interdependence from other business divisions. An important organizational strategy consists in the establishment of a climate of
high responsibility and high sense of urgency.

Though the juridical status is that of an autonomous non-profit organization, the factual autonomy of Sitronics Labs is not considered to be an important function, since its role at the interfaces with academia and government rather presupposes strong coordination and interactivity. The operational autonomy of this center of excellence as an organizationally separate unit will derive from its self-organizing potential, directed for the establishment of new and more functional links. In fact, the Sitronics Labs acts at two interfaces. It is not only an association at the interface with academia, nor only a high-technology institution for the management of corporate laboratories, but it principally is a laboratory, having two additional interfaces: an interface with Russian academia and an interface with institutions in the field of research governance and regulation.

The first example describes a passive adaptive change, caused by some inherent organizational problems. The second example tells us about a radical innovation with all attributes of pro-active thinking implemented in an unsuitable environment. The third example is a radical innovation, which is undertaken in the right environment and in the right place with many probable feedback reactions on various levels of company's activities: strategy, product portfolio, secrecy and licensing, standardization and intellectual property management, branding strategies and corporate image, new sources of knowledge acquisition.

Conclusions

Innovations perform the function of a nervous system of an organization and they can be more oriented on organization’s lability or stability, its induced adaptation or self-organization. It is better for an organization to avoid system’s lability and passively induced adaptations and to exploit its innovative potential for a greater stability and self-organization. At the same time an adaptation to rapidly evolving environments must include approaches for the development of a sort of external nervous system responsible for ad hoc strategies (such as networking activities, value innovation or diversification of company's assets) with the aim to mitigate the chaotic effects of these environments.

Entrepreneurial activity can be enhanced through consolidation of social capi-
tal in networks and through promotion of excellence in research. To accomplish this goal, relevant social and organizational innovations might include institution of new interfaces for the promotion of collaborative innovations as an invaluable source of knowledge, motivation and human capital. Economic stimuli and economic outcomes are not necessarily essential in fostering the development of social capital, even if economic investments are necessary for the introduction of the majority of social or organizational innovations. Organizational and managerial innovations play an important role in all the above-mentioned processes. The best non-technological innovations have multiple effects and feedback reactions, which go beyond the original scopes and which are not directly measurable in terms of economic performance. Such innovations can help companies to deploy pro-active strategies and to improve their technological leadership on the long term.

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Introduction

The concept of Social Innovation is not established in social theory and still seems to be widely unknown outside the academic context (Aderhold and John 2005). The common explanation for this neglect of SI is that the notion of innovation is dominated by technical innovation, which is seen as the driving force behind far ranging processes of economic and social change. This connection between technological innovation, economic performance and social change has been formulated by very prominent and classic sociologists and economists like Karl Marx or Josef Schumpeter. Schumpeter thought of capitalism as a system constantly revolutionising its very own foundations mainly through the introduction of new production techniques and new forms of distribution and organisation (Schumpeter 1993, Schumpeter 2005). The still influential macro-theory on long-term business cycles by Nikolai Kondratiev, which inspired Schumpeter, also proposed that basic technological innovations are responsible for social change.

Even if the notion of social innovation is present in these early works it is perceived as a secondary phenomenon, which accompanies or follows technological and economic innovations on their path – a view which is still present in modern, economy-oriented innovation theory. Theoretical and empirical work in the field of social innovations in our understanding has to look for consistent and empirically applicable definitions, which present social innovations as innovations in their own right.

Defining social innovations

Social Innovation has been discussed by only few sociologists. The German sociologist Zapf, who is most prominent for his research and theories on modernisation, developed a basic and general understanding of SI in the
1990s (Zapf 1994). His short paper on Social Innovation is commonly referred to as an important initial point for further research. His definition of SI is at first glance simple: “Social Innovations are new ways to reach aims, in particular new organisational forms, new regulations, new lifestyles, which alter the direction of social change and which solve problems better than former practices. They should be worth being imitated and institutionalised.” (ibid. 33, translation by the author). This definition is obviously formulated in a very general way and encompasses a multiplicity of different phenomena, e.g. new lifestyles, organisational change within companies, new services.

Zapf states that SI alters the direction of social change which is certainly a very demanding and complicated criterion. We propose that this criterion has to be relativized and that an additional criterion has to be introduced which may help to develop a more concise understanding of SI: Intention. We emphasise that SI is an intended activity with a clear set of actors, methods and aims in contrast to social change, which is commonly perceived as an unintended result of involved social actions. “Intention” implicates that SI consists in activities which are manageable and do not transcend the possibilities of rational planning, decision making and implementation.

Zapf doesn’t explicitly refer to intentionality when discussing the relation between SI and social change. His listing of different types of SI comprises phenomena, for which it is uncertain if they always satisfy the criterion. Lifestyles, for example, may be regarded as intended in a rather instrumental, rationalised form, but beneath the rationalised surface of a lifestyle one may suspect cultural and structural conditions which shape the actual behaviour of an individual in a rather “unintended” and unconscious way. Thus, the criterion of intention would allow differentiating between SI and other forms of social practice, which are to a larger extent based on cultural preconditions and the impact of far-reaching social change on patterns of social behaviour rather than constituting a planned, project-like undertaking.

**Aligning social innovation with technical innovation**

Even if accepting intention as an additional criterion we’re still confronted with the connection Zapf proposes between SI and social change. If SI alters the direction of social change, how can this alteration be identified and assessed or even measured? Social change may be retrospectively reconstructed
in a theoretical or historical approach but current changes and tendencies are always difficult to identify. In particular the influence on current dynamics of change won't be captured easily. When we suppose that SI is a confined and manageable activity then there's the additional problem to relate this particulate activity to these far-reaching dynamics. Furthermore, many confined activities such as smaller projects and initiatives – even if they are inspired by great new ideas – won't have an immediately recognisable impact on social change and would fall out of the classification.

Setting the alteration of the direction of social change as a criterion for SI aside, our perspective opens up for more particulate projects and activities implemented within different practical fields of society. These SI may become a factor in social change, but they don't necessarily have to. The emphasis on confined and manageable, maybe particulate, forms of SI also helps to relate SI to technical innovation. Technical innovation results in a new product or a new production process which is in some aspects superior to former products/processes, superiority being measurable in terms of speed, quality, safety, etc. The “invention” or the idea behind a new product/process becomes an innovation after the market launch of the product respectively the implementation of the process. This allows a relatively clear definition of technical innovation. Technical innovation is furthermore characterised by a set of actors (developers, managers, users) and an institutional context (company, development group, development network). The criteria of confinement and manageability we proposed for SI also apply to technical innovation. Moreover, technical innovation in most cases consists in an improvement and recombination of already known technologies or production processes and is in this sense called incremental innovation in contrast to basic innovations. Basic innovations are new ground-breaking technologies like the steam engine, the telegraph, or the computer that revolutionise the way economy is organised and therefore have a major impact on society.

It seems to be reasonable to align SI with incremental technical innovation and thus underlining its practical, implementation oriented and confined character. Then SI becomes something we can “grasp” rather than a theoretical term with diffuse generality. Besides these basic common characteristics of social and technical innovation there are of course certain specifics of SI.
Aspects of SI

In the following we will discuss several aspects of SI drawn from the sociological literature (Aderhold and John 2005, Gillwald 2004, Lindhult 2008, Moulaert 2005, Mumford 2002, Zapf 1994) and from our own empirical research. These aspects are:

- Novelty
- Institutionalisation
- Durability
- Model character
- Benefit / Utility
- Value-related
- Process-oriented
- Actor-oriented
- Cooperation
- Participation

“Novelty” is of course a central criterion for innovation of any sort: “To intentionally produce change by introducing something new is the specific feature of innovation” (Lindhult 2008). However, the novelty of a certain social practice is difficult to assess and may even be irrelevant for the responsible actors who may rather be oriented at the solution of an encountered problem than at “novelty” itself. For us “novelty” is a matter of the context in focus. In the case of private companies and for our research purpose SI should satisfy two criteria: It should be new within the context of the investigated firm and additionally the activity should not be routine practice for comparable firms in terms of size and branch.

With regard to SI there is also a tension between novelty and institutionalisation, which can be circumscribed by the question: When does a new invention or idea become an innovation? For technical innovation we proposed that the market entry is this significant distinction between invention and innovation. For SI this has to be institutionalisation. SI therefore refers to a new but already institutionalised organisational form in terms of objectives, organisational structures, defined roles and durability. Thus, a new social practice needs some time to develop institutionalised structures before achieving the status of a SI.
“Benefit/utility” is a criterion which has been developed by German sociologist Gillwald who wrote a comprehensive paper on different aspects of SI (Gillwald 2004). In her view the benefit of SI refers to a certain area of society (economy, politics, social inclusion, culture, ecology) and the rationality which dominates this area, e.g. Economic rationality is dominated by the notion of efficiency, while culture is dominated by the notion of meeting cultural needs. In producing benefits within one or more of these areas, SI can also lead to drawbacks within other areas - An emphasis on preserving natural goods might hinder the expansion of economic activity to give a very simple example. SI therefore is often controversial and not necessarily perceived as “good” by all involved parties.

This leads us to the next criteria “value-related” which says that SI is related to values in a much stronger sense than technical innovation. SI is driven by values, incorporates and expresses them. Values and more concrete aims are of course not absolute but in fact a result of social processes. Different groups in society follow different interests and their social, economic and cultural resources decide whether they are able to win recognition for their interests and perspectives or not. This “struggle for recognition” as the prominent German sociologist Honneth called it decides what is perceived as a problem and what is established as a legitimate aim (Honneth 2003).

The criteria “process-oriented” and “actor-oriented” point out a difference between technical and social innovation (Lindhult 2008). SI is essentially an ongoing social process while technical innovation results in a product or a process of production. SI is therefore more variable and may be more diffuse in its form. As an ongoing process SI depends on involved actors, their engagement, their values and their (social) competences. While technical innovation involves these elements rather in the phase of development, they are an integral part throughout the implementation of SI and have a crucial impact on the definitive “character” and “quality” of SI.

“Co-operation” with partner organisations (mostly third sector) is probably one of the most general characteristics of the investigated projects in our study. The partner organisations are not only supporters but often take the roles of initiators and advisers, who are involved in core tasks of project im-
plementation, sharing their professional know-how and experience with their traditional clientele. Companies seem to depend on this kind of input and support.

The criteria “benefit”, “value-related” and “co-operation” point to the fact that SI often involves the combination or confrontation of different rationalities of functional systems (politics, economy, law, education, etc.). The notion of SI is therefore connected to the major theoretical task to identify the ways in which functional systems influence each other and how values and orientations can be transferred from one system to another.

“Participation” is an additional criterion we consider very important. SI is based on the reflection of social processes and their potential for improvement or renewal. Sociology in its multi-perspective approach to society teaches us that social processes will only be adequately understood if all relevant perspectives are taken into consideration. In case of private companies this refers in particular to employees and their possibilities to reflect on social processes and to participate in the conceptualisation and implementation of new organisational forms. A one-sided top-down approach will presumably fail to implement sustainable and effective organisational forms which depend on the engagement of employees.

Participation of course has many aspects. Many of the representatives were conscious about the importance of integrating employees from different hierarchic levels into the conceptualisation and implementation of projects. Project coordination groups included production workers as well as heads of departments and managers. Another interesting method was internal multiplier trainings: A group of employees receives a special training with external professionals and then independently gives the knowledge on to colleagues. This approach allowed a broad dissemination of knowledge relevant to the project. Informal and flexible forms of participation occurred in particular in the small companies we investigated. Employees were able to spontaneously bring up their own ideas within a culture of open and personal communication across all hierarchic levels and flexible operational roles.

**SI in private companies**

We defined SI in private companies as an intended development of new or-
ganisational forms (projects) directed at highly valued societal aims or specific problems, which may address internal or external target groups. Following this definition, there is a wide range of internal areas of private companies in which the implementation of SI is potentially possible: the organisation of work and organisational restructuring, employee-employer-relations, structures of communication, knowledge management, internal vocational training, trainee programmes, safety and health programmes, human resources development, social support for employees, etc. These fields constitute basic and necessary structures and processes within a firm and are tightly connected to main economic interests. Besides these internal fields our definition also points to activities which reach beyond the borders of the private company and show a more loose relation to main economic interests. These types of external engagements may consist in sponsoring activities, social support activities, projects which address local stakeholders (public dialogue between management and local stakeholders), research/assessment activities (reports on the impact of business activities on local social structures), memberships in associations (CSR networks and associations, cooperation with labour unions) or foundations. Sometimes this social engagement is more pronounced in the form of so called philanthropy. Philanthropy is commonly understood as a systematic and long-term donation or “investment” which aims to support a charitable cause.

Within all these fields – internal or external – the initiation of new organisational forms of social practice respectively SI seems to be possible, some of these activities actually constituting SI themselves – e.g. a network of non-profit organisations sponsored by a philanthropist or a foundation with entrepreneurial background.

**Methodology**

The study followed a rather classic research design and included a theoretical discussion of the concept of social innovation, a presentation of companies and their projects and an additional comparative analysis based on qualitative research methods. We conducted 24 face-to-face Interviews with high level representatives of Austrian companies to investigate several aspects of already implemented internal and external projects: Context, motives/objectives, initiation, implementation, responsible actors, participation, cooperation with external partners and outcomes. The selection of eligible projects and companies
was oriented at nominations for national awards. The resulting sample consisted of 24 private companies with similar proportions for three different categories of size: large companies with more than 500 employees, middle companies with 50 to 500 employees and small companies with up to 50 employees.

We decided to focus on “projects” in private companies which had a social aspect to them in terms of supporting a specific target group (often within the workforce) and addressing issues which are of concern for society in general: Educational programmes for elderly employees, diversity management, programmes for integrating persons with disabilities, support measures for women (maternity leave programmes), projects supporting external target groups (persons without bank access), etc.

We excluded the large field of organisational restructuring and organisation of work (change management, lean management, new forms of group work). These activities may be seen as SI since they meet all of the explicated criteria. It was simply methodologically necessary to enclose our focus. Otherwise the resulting heterogeneity of investigated projects would have rendered a comparative analysis nearly impossible.

A typology of SI in private companies

A typology of SI in private companies was the main result of the comparative analysis. The typology comprises five different types which combine characteristics of private companies as well as projects. The size of the companies was the most important comparative dimension since it is connected to other characteristics like internal differentiation, positions, standardisation of processes, etc.

A qualitative comparative analysis doesn't intend to deliver “representative” results which can be generalised for a large population; it rather focuses on showing the diversity of consistent types within a given field. This methodological approach follows the intent to explore a new field of research which by now hasn't received much attention from academic or applied sciences. We think that the typology provides a good first impression of what SI might mean and what types of SI can be expected to occur in the context of private companies, although it is certainly not comprehensive in a general perspective.

Type one: Large companies implementing innovative external initia-
tives
Type one refers to large companies which are often part of international concerns. These companies are characterised by institutionalised social policies (CSR). Our interviewees emphasised the importance not only of these institutionalised policies but also their personification through charismatic leading figures (CEO level).
An example for this type is the large Austrian bank *Erste Bank* with 40,000 employees in Europe. The *Erste Foundation* is the main owner of Erste Bank and led by Erste Bank CEO Andreas Treichl. The foundation supports and implements initiatives in central and south-east Europe in the thematic fields Social Inclusion, Culture and European Integration in cooperation with local organisations. In Austria the Foundation initiated the project *Zweite Sparkasse* which is basically a bank for “unbanked” people (persons who have no access to banking services due to debt). In close cooperation with the Austrian debtor advisory and a catholic social aid organisation the Foundation managed to build a new banking infrastructure where clients of the partner organisations receive their own bank account and benefit from free additional services (assurance, building savings agreement, legal advice). The project aims at providing basic banking services to the clients to improve their social integration and occupational opportunities. Another interesting aspect is that the Zweite Sparkasse relies on the honorary work of 170 employees of Erste Bank, which indicates the high potential for internal mobilisation.
The project meets further criteria of type one. It is a long-term institution which is directed at an external target group. It involves the main competences of the private company and builds on existing structures and resources. It is furthermore promoted and advised on CEO level. An important aspect is the close cooperation with partner organisations from the third sector which were involved from the beginning in the conceptualisation and the implementation of the project and still have an important function within the scope of the project (the allocation of clients, assessment). The implementation is characterised by institutionalised forms of project management and intensive planning processes in the run-up to the project.

**Type two: Large companies implementing innovative solutions for internal problems**
The second type also consists of large companies with the main difference that the initiation of projects doesn't follow a social policy in first place but is
rather a reaction to an unsatisfying situation or unsolved problem within the firm which is approached with rather unconventional methods.

A good example is the international concern ISS facility services, one of the largest employers in Europe with 450,000 employees. The concern certainly possesses a social policy, but the local companies are relatively independent and only have to meet minimum standards defined on international level. The concern traditionally employs a high proportion of migrant workers with a wide range of different ethnic backgrounds, languages and nationalities. When these differences led to serious problems of internal communication, cooperation and coordination the Austrian company decided for a quite unique measure – a theatre project. Departments which faced the above problems are visited by a human resources manager who conducts interviews with employees on problematic situations at work. The problematic situations identified in the interview are then incorporated in a theatre piece by professional actors. Employees, heads of department and managers come together to watch the piece and afterwards sit together in small groups to reflect on the problems and develop possible solutions.

Projects of this type show a rather instrumental approach, but include a clear orientation towards the needs of employees and emphasise the importance of participation in contrast to top-down decision making and implementation. The project depends on the social competence and sensitivity of the responsible actors – in the case of ISS the head of the human resources department.

**Type three: Small companies with a highly developed organisational culture, a non-discriminatory approach to employees and social support for employees**

With type three we change the context from large international companies to small companies (up to 50 employees) with only local business activities. Also the character of what we called “projects” changes drastically. In small companies one will hardly find institutionalised structures of project management, implementation plans or social policies. Our immediate impression of these small companies points to a specific leading and working culture with the authentic appreciation of a rather small team of employees at the centre. Owner-managers and their specific educational and occupational background as well as their understanding of economic success often are the main factors behind internal activities. Sometimes these activities also emerge from close interactions between employer and employees respectively dense informal structures.
of communication and participation.
An example is the small cable production company Deakon Degen, founded by a charismatic female worker who made her own experiences with discriminatory practices against women in labour market. The support of women – in particular women with children – was a main concern since then. However, providing occupational opportunities to mothers and women with disabilities was just the beginning, the activities were extended and now include such features as a free fitness programme for workers.

From a theoretical point of view these simple measures are far away from a more demanding definition of SI. From a practical point of view they mark a significant difference between conventional small companies and small companies which actively support social inclusion led by owner-managers who develop a sharp consciousness on social problems. The activities of the small companies of this type show a tendency of consolidation and in some cases become public trademarks which help these small companies to develop an attractive public profile as employers. A further result is that these companies gain access to new networks, e.g. Companies are visited by local politicians, managers are invited to conferences, third sector organisations support the companies in finding personnel.

Type four: Small companies implementing innovative external projects
Type four again consists of small private companies but in this case the social engagement goes beyond the borders of the company. These private companies approach external social problems with their activities.
A very interesting case is the private company Waldviertler Werkstätten which is part of a network of three small companies under the same owner-manager. The company started as a social project offering work to disadvantaged groups in a region which is known for its structural economic weakness since the decline of the regional textile industry. Since several years the company is independent in terms of economic performance and output, but the original philosophy is still alive emphasising a close and active relationship with the economic and social local environment. The company for example initiated the development of a local currency system which aims at avoiding an outward flow of money, which is often a problem for peripheral regions, and stimulating the circulation of money within the region. The company helped to build up a network of local public and private partner organisations and private companies which supports the currency system. The Waldviertler
Werkstätten also show an original approach to internal organisation and employee related activities. This includes for example that positions and responsibilities are not clearly defined, that employees change from production to administration or vice versa and that the highest wages are at maximum 1,5 times the lowest.

This type certainly consists of companies which are very different in their structure apart from being small companies and show different and very original approaches to social problems. However, they have in common that their social activities are strongly linked to their economic activities and have a great impact on the internal and external company profile. This type shows the possibilities of smaller companies in initiating SI which by no means have to remain on a small scale level and can also reach out to larger target groups.

**Type five: Middle sized companies implementing systematic human resources management systems**

The last type refers to middle sized companies (from 50 to 500 employees). The middle sized companies in our sample were in some way transformational companies in terms of adapting the internal structures to a larger number of employees and expanded business activities. The internal projects of these companies relate to the introduction of a professional human resources management. The projects show what is possible on the basis of a systematic and socially engaged approach towards employees. The concepts have in common that they guide employees from their entrance into the firm until they leave, but explicitly not in an instrumental or controlling way. The concepts aim to secure fair and equal conditions and quality for all employees and include systematic surveys, in-depth and discussion oriented appraisal interviews and a transparent structure of internal educational training and internal career opportunities.

**Conclusions**

In the discussed study we set out to explore different types of SI in private companies. The study had an exploratory character and cannot deliver an in-depth analysis of SI in private companies. The identification and assessment of SI affords a closer look and will not easily be achieved. The context of the study didn’t allow us to do more than one interview for every company, which is certainly problematic. There was no chance to confront the view of HR
managers and CEOs with the actual perception of employees. Since we regard participation as an important feature of SI the possibilities of employees participating in projects should be a major focus. Another challenging issue is the elaboration of a consistent and at the same time practicable definition of SI. A definition which is too general will not support the attempt to strengthen the consciousness on the potential of SI as creative and new organisational forms and institutionalised social practices able to improve the approach to major societal problems as well as particulate problems of certain organisations and societal areas.

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Rationalities of Innovation

Jens Aderhold

Introduction

Innovations fascinate us. They work with suggestions and simplifications. The often appear to be something they are not, due to the fact that they bring us very close to the action and things going on around us. At the same time though, innovations are characterized by the fact that we cannot look inside of them. Thus, distance and space are decisive for being able to actually understand how novelty turns into innovation. The first step therefore, refrains from simplifications and looks at social systems as the “place” of innovation instead of the objects themselves. It can then be questioned how discontinuities in social systems can be continued and under what conditions innovations arise. In addition to this basic theoretical decision, it will be established that long-term, historical factors and social processes of transformation influence innovations. Consequently, their operation is dependent on macro-social conditions that should be made aware. Accordingly, the second step identifies the accompanying patterns of rationality with long-term and current processes of transformation. At the same time though, innovation is also dependent on micro-social conditions. Here a change of social support structures is observed, away from the lonely inventor toward a complex network of structures. Hence, the last part of this article deals with the consequences for innovation functions that are related to these new structures.

Suggestions and Simplifications

Innovations are in vogue. That which is already familiar, when semantically filled with special radiation and impact, is designated as progressive and trend setting. The interested public is confronted with a constant stream of semantically laden distinctions based on subject and time. We do not know what moved the marketing strategists of, for example, some automobile companies to reinforce their messages with the label innovative or to add dynamics, efficiency and innovation in parenthesis. Perhaps they were caught up in the promising trail of success left by promotional hype. Perhaps they also realized
that the strategy of trying to promote the advertising message by integrating sporty themes in an ideal world of green harmony and environmental protection is not very convincing. Therefore, it is worthwhile to refer to the connection of athleticism and driving dynamics with an environmentally friendly energy recovery. The more acceleration, the more can be braked at a left turn and the more kinetic energy returns to the automotive battery. What an extraordinary innovation: acceleration and braking as an environmentally friendly means of driving fun! A different approach would be more intelligent here – an approach that places less emphasis on the meaningfulness of a technically abstract ability. Instead, the innovation can only take hold as an innovation after distribution and when an actual, significant impact is made on braking, efficiency, air drag reduction and the balancing of vehicle distance.

As is easily discerned, modern mass communication operates quite cleverly, according to the controlled game with advertencies. With its subtly calculated metaphorical language, we are introduced very closely to a single, functional detail with unbelievable, novel characteristics. We are amazed and quickly convinced by the effectiveness of the presented innovation. In another example, the argumentative composition is calculated even more subtly. In this case it is not about the, as always obvious, individual parameter, which, under closer consideration can possibly be more distracting or misunderstood as a placebo. The interaction of individual technical factors with implied general utilization comes to the center of attention here, which then systematically evokes the desired innovative effects, here those that are resource and environmentally friendly. At this point it will be left to consideration if this form of calculation adds up in reality. Likewise unanswered will remain the question if these and other advertised cases actually deal with innovations or if they are diversionary maneuvers meant to declare their own strategic decisions, such as focusing on traditional drive systems, as innovatively fertile and efficient.

Other aspects are even more interesting: the attempt to persuade the addressees with naïve semantics of innovation suitable for everyday use is obvious. That an innovation is innovative does not need to be documented profoundly and argumentatively, but intelligently, with everyday metaphorical language. Discrepancies, oddities or even inconsistencies stand out only at second glance. Yet even more serious is arguably the fact that the messages can hardly be persuasive in the long run, and to stay with this example: is it even possible to still speak of innovation if everyone is using it? Do mass distribution and the novelty of utilization even go together; and: is every little variation or im-
provement, at the same time, an innovation, or can pass as one?
First of all, it is incredibly difficult to specify when an innovation can actually be referred to according to academic criteria, not to mention a precise terminology. Virtually every issue can appear to be an innovation as long as it has some aspect of novelty. Improvements are easily equated with innovation in a world communicated by mass media although it frequently remains undetermined where the attribute “novelty” actually comes from or which standpoint or social position is at the base of this assertion. Daily communication blurs the difference between novelty and innovation. Under these circumstances, is it even possible to establish appropriate criteria of observation that would make the differentiation of legitimate or non-legitimate measures in regards to the innovativeness of a point of view, a process or an object possible? Consequently, the question must be answered as to what an innovation can be understood as. However, not just a conceptual problem that can be disposed of with a simple definition is to be brought up here.
In connection with this there is a further problem that releases the question as to who should supply the criteria or the standardized reasons for what constitutes an innovation. Daily perception as well as the operating innovation research and the innovation management oriented on it, addresses those involved or the actual objects. These are wrongly identified as the place of origin – which would not be so problematic if innovation was able to develop from a single place of origin. This hardly durable, although yet hardly investigated perception is incorporated in most of the theoretically and conceptually based reflections and suggestions for design. It deals with technically variable components, with the creative individual meant to be motivated, with continually newer versions of creative techniques to be practiced within group and organizational work, or with the revolving introduction of management and reorganization concepts that are presented.
At this point, it is also worthwhile to recall the previously presented examples. In both cases it is not about the (often not at all) new technological variations, but rather the related effects that are evoked. Their innovative meaning is not displayed in the automobile or in the driver or his or her wallet or image, but rather in a different, systematical connection. The question of innovation is linked to the indication of system relevance. In this case, novelty must prove itself, and the effects that it triggers or avoids, as innovations in the ecosystem. However, this is only the sphere that is observed. Even more important is the indication of the usually left-out observers themselves; the socially pre-
sent structures of expectation that prefer current environmentally friendly and preservation measures. Expectations, as social structures, limit the span of possible points of access. They are built on security. In addition, they reduce the burden of insecurity and complexity. In dealing with structure formation and self-regulation, systems create (social and personal) meta-rules that determine the contact with change, with disruption or with occurring discrepancies (see ibid: 138f.). The formation of expectations allows for a certain degree of reliability or security in an otherwise uncertain world. A clever strategy takes them into account and figures with certainties, self-evident matters and preferred values.

So do society and its subsystems provide the criteria and the justifications? Are they thus social processes of attribution that are to be more closely characterized and that determine what can be considered an innovation or which forms of innovation are even possible and most likely and in which systematic regards the innovations appears as an innovation (see Aderhold 2005a)? At the same time though, this would mean that the characteristics of the innovation varies with the specific structures of the respective systems and that their logic and manners of functioning are transformed with social situations as well.

**Understanding innovations and incorporating them historically**

Innovation research is, where the popularity of conceptual or theoretical foundation of underlying research efforts is concerned, cannot likely be surpassed. Virtually every issue can appear to be an innovation as long as it so much as comes near to some improvement. Innovation is equated with improvement although it frequently remains undetermined where the attribute “novelty” actually comes from or which standpoint or social position this assertion is based on. The invention of an airbag becomes an innovation alone due to the communicatively staged establishment of a time difference: crash protection before or after the implementation of the airbag. Does the consideration that an object or an issue is new suffice? Does the fact that something

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16 The creation of expectation allows for continuity in a world of transforming events. One is not only prepared for that which can be calculated in advance, but also in the case that something other than expected will happen, that surprises or disappointment will occur. Possibilities for action or damage limitations in the case of disappointment are included with the structures of expectation (Luhmann 1994: 136).
was not there before suffice as a criterion?
Is everything ultimately a question for the observer? Can the decision to determine one (or more) criterion (criteria), with the implication that an observer is yet to be identified, even theoretically be carried out – particularly when taken into consideration that there are too many observers? Or is a conceptual change of sides necessary? Can criteria for observation be provided that allow for the differentiation between legitimate and non-legitimate measures in regards to the innovativeness of a point of view, a process or an object?
As always, a typology based on general knowledge and concreteness comes easily. A useful classification goes back to Harvey Brooks (1982), who differentiated between virtually pure technical innovation (e.g. new materials), socio-technical innovations (e.g. infrastructure for private motorization) and social innovations. Within social innovation the subtypes of market innovation (e.g. leasing), management innovation (e.g. new work schedule policies), political innovation (e.g. summit meetings) and institutional innovation (e.g. self-help groups) are possible (Zapf 1994). These classifications, as useful as they might be in some regards, reveal little about the substantial core of the innovation phenomenon, i.e. about its effectiveness, the related dynamic patterns of rationality and their social incorporation.
Therefore an argumentative alteration is necessary. Let us begin with the relation between new and innovative: if innovation is being referred to, then an inference is usually made about improvement, novelty. Improvements are discontinuities. If something that did not used to exist is characterized, then a novelty is referred to (Nowotny 1997, p. 33). Novelty is therefore not identical with innovation.
In addition, the identification of innovation with improvement overlooks the fact that the term “novelty” includes problematic aspects itself. In other words, it is “an ontological absurdity: something that is, although or precisely because, it is not anything that existed until now” (Luhmann 1995a, p. 323). The term novelty is founded in an assumed or ascertained similarity and, at the same time, distinction of the observed object or event in relation to a given predecessor. We are already right in the middle of things, given that it is a

17 Business studies, however, differentiate between product, process, and social innovation, whereupon the criterion that provokes the separation is strangely vague, since the fact that only an evaluation adjustment carried out on an interactive or communicative basis by several people is capable of generating a product innovation, which logically applies to the case of the process innovation, remains completely obscure.
matter of the processes of identification, designation, removal as well as decision-making. The activities of constructing perception or observation in general as well as of similarity can be distinguished (Weik 1997, p.11). Consequently, it can be noted that the object itself does not provide the application or attribution of a “novelty” nor does it occur without context. However, this dependency does not only include the social context in which the novelty is registered as a factor. The decision about something being new or not is influenced by collective and individual (pre)structures alike, i.e. by expectations and experiences. Therefore, the designation of novelty implies that the observer is in a social context that designates an irregularity as an improvement, based on context specific structures of expectation (Luhmann 1994, p. 216).

So who is the observer or the judging expert who decides what is innovative and how it becomes so? Both business studies and the experts operating in the channel of innovation management understand the original (first-time) use of (technical, production or process oriented) improvement by a business as a case of innovation, although the concept of “improvement” already implies originality (Luhmann 1991, p. 388). Is it hence the duplication of the novelty through which an innovation is created?

Distance from such simplifications must perhaps be taken. Instead, a suggestion made here is to pose the question how disruptions in social systems are continued, that is how “contingency is normalized”. Somewhat more generally stated, innovation can be understood as a contra-inductive decision-making process “that decides differently than would be expected, thereby changing expectations” (ibid. p. 373). Hence, it is about the indication of system structures, i.e. how arrangements are made and provided and if the results fall into the spectrum of the accompanying arrangements, that is, in the range of familiar alternatives. Therefore, innovation should only be referred to when the decision results do not lie within the range of the familiar alternatives at large, that is when the finalized arrangements do not take hold and the variation consequently transforms as a surprise of previous structures of expectation.

Under these preconditions, producing willingness for innovation means nothing other than the activation or initiation of an alternate consciousness that does not constrict itself to an incidental orientation, but rather must remain steadily and continually present (see Luhmann 1991, p. 375). An adequate understanding of innovation can consequently only be developed when relevant structures of expectation are distinguished on the one hand, and on the other, communicatively structured processes of observation in which the individual
and collective participants\textsuperscript{18} are part of.

Due to many failed attempts to define innovation according to objective criteria not related to social coherencies and the discrepancy among the social positions of the observers, a concept that is consequently asserting itself assumes that it is not so much what is on the inside, the nature or the notion of an improvement, that counts. This view moves away from the designation of factual (technical) criteria for the observation of social processes of communication that (co)decide on what is to be viewed as an innovation in society, where-upon factual aspects can arise again in the communicative designation, but under the conditions of social structures of expectation.

Hence, improvements are not innovations in general, nor are the efforts of research institutes or the R&I departments of businesses. Based on the considerations that refer to events, participants and objects as social processes of construction, an innovation can be referred to when specific criteria are met (Aderhold/Richter 2006; Baitsch and others 2000; Schulz and others 2000).

Our proposal is as follows: to conceive of innovations as surprising improvements that, due to social acceptance\textsuperscript{19} and collective attribution, are characterized as a novelty\textsuperscript{20}. This means that the attribute “innovation” is assigned in retrospect, i.e. after a product, a process, or a transformation has become established. Thus, innovation is the result of a “surprising” social decision made a posteriori. Although the attribution occurs in a system that is distinguishable from the system generating innovations, the innovation still creates structurally meaningful effects in both systems (creative and utilization). Innovations can only be meaningfully referred to when the direction of social development

\textsuperscript{18} For organizations, one problem, among others, consists of the fact that this alternate consciousness itself becomes subject matter for the decision-based program decisions and therefore gets caught up in the invincible borders of planning capacities.

\textsuperscript{19} Diffusion research (among others Attewell 1992; Rogers 1995; Schenk/Dahm/Sonje 1997) is however only one address in the scientific world that deals with this question in-depth.

\textsuperscript{20} The success of a plan (that describes itself as an innovation) consequently depends not (only) on the quality of an idea or a goal, but rather is dependent on the conditions of the creation of social acceptance (above all in other social systems) as well as on the development (that can only be limitedly influenced) of structures of expectations in the respective social areas. Consequently, this perspective, originating from those who generate innovations, does not quite take hold. A perspective that is capable of including the social reference systems and coherencies should at least supplement it. Innovation research would consequently be required to consider questions, possibilities and the incorporation of communicative processes, social acceptance as well as comprehensive diffusion requirements.
is lastingly influenced at the same time by the activated transformations (whether technically induced or as usual). The quest for an adequate criterion for a social-scientifically usable concept of innovation could turn into the claim that innovation in terms of initial innovation can only be understood as a structural transformation with a broad effect for transforming the entire society or its subsystems (economy, politics, law, etc.) in a lasting and ultimately unintentional manner. In this regard it could now be worthwhile to take a brief look at almost forgotten insights of structural functionalism.

**Innovation as part of social change**

Parsons’ philosophy (1971: 35) aims at the asset preconditions of countries or societies. He examines the problems that need to be solved so that a social system (e.g. a society) can be stable and so that it can exist (for the long run). He not only examines the functional preconditions of a society, but the processes and mechanisms that are particularly momentous for the social processes of transformation as well. Adjacent to these considerations is the question of a society’s respective capacity for adaptation. This can be intensifi ed through “invention” of specific structural components. A prerequisite for this structural adaptation is the development of evolutionary universalities.  

Parsons understands this as “every development or invention that is organized in itself and so important for further evolution that they do not only arise at one point but rather, more than likely, that several systems create this invention under very different circumstances” (Parsons 1969: 55). It is within these evolutionary universalities  that he sees the preconditions for social processes of development.

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21 Parsons (1969b) himself makes reference to six modern evolutionary universalities: social stratification, cultural legitimization, administration bureaucracy, finance and market organization, general universal norms and democratic associations.

22 Subsequent to Parsons, the classical theory of modernization views modern societies (countries) in the western layout to be characterized by four basic institutions (Zapf 1990): competitive democracy, market economy, an affluent society with mass consumption as well as a welfare state. Societies in which these institutions “appear are more successful, more capable of adapting, that is more modern than those that do not adapt” (Zapf 1990: 34).

23 Thus, in 1964 Parsons dared to make the following prognosis, based on the political system of communist societies, namely: “that the communist societal organizations will prove instable and will either adapt in the direction of electoral democracy and a pluralist
Yet undetermined is the question of which improvements can become evolutionary universalities and hence innovations. In social evolution many accomplishments are found that can claim such a status (agriculture, script, bureaucratic organization, printing press, money, steam engines, landing on the moon, etc.). An emphasis must be incredibly difficult to achieve. Luhmann (1985: 17) is of assistance here, with his suggestion of the criterion “centralized interdependence”, which indicates that one structural change makes the way for, triggers or – in beneficial or hindering regards – momentously influences other structural changes. The measuring rod is moved up noticeably and the argumentative effort grows as well. We should not let ourselves be impressed by this however; instead we shall now address this discernment and the related selection of criteria. As will be seen, different inventions and their related patterns and logics of innovation can be identified according to time relation.

A long look back
If the human history of the last 10,000 years is applied as a standard, then seven technological improvements24 (innovations) and their underlying patterns of rationality can be identified based on a co-evolution of technology and social development (see Popitz 1995). Thereby, the individual stages of innovation are characterized respectively so that technical action proceeds in an increasingly indirect manner and with increasing indirectness it paradoxically becomes ever more productive. Human development, which is based in the history of technology, can thus be interpreted as the history of productive detour action that is accompanied by the development of social complexity and is ultimately reinforced (ibid: 8). The first technically, then socially-stamped detours become more complex, longer and more laden with prerequisites. Society’s dependence on the technically feasible becomes greater.

The definition of innovation should only be endeavored in the case of a “fundamental technology.” Technology can only be referred to when two aspects

party system or will >>degrade<< into less developed and politically less effective forms of organization” (Parsons 1969: 71). Wolfgang Zapf joins in with the indication “that no society can escape developing such structures (universal principals of development; J.A.) if it wants to remain survivable and autonomous” (Zapf 1975: 217).

24 The seven technologies are: technology of the tool, technology of agriculture, technology of fire development, technology of urban development, technology of the machine, technology of chemistry and technology of electricity.
are taken into consideration at the same time: the comprehensive character of the transformation and the social incorporation of technological development. The basic idea that is of interest here is the following: technology is a form of feasibility (option) that is based on the principal of detour action. Thus, the technology of the tool that was developed during the period of the human settlement highlights the fact that it is possible to produce objects for the processing of other objects in a new manner in the next stage. In this sense, tools are capital goods. In order to produce capital goods, detour actions are necessary. Something has to be done that beings no direct, immediate use, at the most a means to serve for future purposes.

These details contribute to the thesis that within human history (social development) certain decisions (technological innovations) can be identified that have lastingly influenced the relationship between humans and nature and society as a whole fundamentally and therefore permanently as well (Popitz 1995:7). The distinctiveness of technological innovation lies within the new ideas of production, in the transformation of what is given into something useful. Not only originality is conceived of and produced. A new level of feasibility is made accessible which does not mean something technical in a materialist sense but instead results in the co-production of cognitive processes and

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25 When technology is referred to, the entire span of production is meant and includes “the basic production idea, the means and methods of production and the type of produced artifact” (Popitz 1995: 13).

26 At this point it could already be worthwhile to further consider the figure of the observer, who has to recognize the new option and communicate or implement it.

27 The social entities created with process of settlement allow for continuity in the social structure (continuities of work, lineage, and the social attachment to cultivated land that occurs through the accumulation of property.

28 With the invention of the technology of agriculture, humans themselves became the producer of their food. The land became an extensive production facility and was cultivated (breeding) just as plants are. All of nature became a potential candidate for production. The idea of this technology results in the fact that nature works for humans, in the sense of a selection and enhancement of processes of nature (Popitz 1995: 22). Nature serves as a tool for humans. Foreign processes are controlled by human use.

29 Two strategies are meaningful in the process of artification: (1) the transformation of nature for human purposes. Humans interfere with the processes of nature by controlling them. (2) The alienation of humans from the natural environment. Tools already created distance between the hand and nature; weapons increased this distance to animals through hunting. Increasingly becoming a matter of discretion in urban development is the question as to how much, and how, nature should be incorporated into the city.

30 The unity of lifetime occupation is lost. People no longer live in small groups, but instead in large associations with one another. Social structures that promise continuity and orientations are necessary in order to maintain these agglomerations (structures of power).
the creation of social structures. At the same time the position of humans in the world changes. Every technological innovation is also connected with the creation or transformation of an alternate, artificial nature (with the alteration of social order). The new feasibility or new technology means that there is a greater deviation, which means that further reaching methods of dealing with deviation are necessary in order to produce a product or to carry out a service. The technologically available “new feasibility” is not only created, but rather it transforms humans (the view of humankind), society, the relationship between nature and society just as ever improvement holds new dependencies in store.

The rationality dealing with deviations is a principal that many innovations adhere to still today. With industrialization and the incipient processes of modernization the spectrum becomes even broader though. In particular the cycle theory, the “long waves” introduced by Schumpeter and later built upon by other authors makes reference to the dependency of social development on innovations the related cycles and barriers. Technical and economic initial innovations are identified as the activators of the short-term cycles of economic and, in particular social development, in relation to the technological eras referred to by Popitz. The initial assumption of this innovation theory based on cycles postulates a causative relationship: structural transformations in the economy and in society are continually aroused by technically based innovations, namely by initial innovation.

31 The interdependencies are manifold. Technical innovations are always accompanied by other changes. For one, social innovations are necessary conditions for technical innovations. For example, the transformation of a society to division of labor is a prerequisite for the development of new forms of production (metallurgy). One further interdependency is related to the systematical invariance of technology. Ramifications that result from the combination of new products to be used outlast the innovation period of the individual technologies; for example, as long as the mechanical production has been achieved it can enforce certain social forms of organization (disciplinary action).

32 One further concept that describes the transformation or stagnation of industrial society through various innovations puts forth the thesis that the entire western process of modernization is a result of four “logistical revolutions” (Anderson 1986).

33 From an historical perspective, the cyclically occurring “long waves” portray long-term phases of economic or social development. The cycles are composed of different sub-phases: sub-phases with a tendency for growing economic development. Schumpeter (1961: 159) himself distinguished four phases: two negative – recession and depression – and two positive – recovery and prosperity.

34 Initial innovations have diverse, long-lasting impulse effects for national economies or for the global economy as a whole (see Nefiodow 1996). Empirical evidence is
A brief look at past rhythms of innovation

The most well known innovation approach for modern characterization is most likely the “Kondratieff Cycles” theory from Joseph A. Schumpeter (1961; originally 1939). Here it is assumed that social development, in particular in technology and economy is characterized by long-term cyclical periods of growth and regression.

What can be said about the Kondratieff Cycles themselves is that a concrete connection between economy, technology and society is implied. The development is always supported by an initial innovation, which in turn always affects three important levels:

The technological level: cycles are always characterized by a batch of tightly linked technologies; this network determines the direction and pace of the events of innovation;

The economical level: in the course of technical development and new market generally emerges (or new markets and business types). The volume to be gained on the markets ultimately determines the growth or stagnation of the global economy.

The social level: technical and economic developments trigger or are accompanied by social transformation.

The theory of the “long waves” attempts to join the development of technical and economic possibilities to the transformation of institutional innovation. The social development is viewed with a positive omen. Even when growing and regressing phases are taken into consideration, overall – leaving the suberas aside – a continual trend upward of technical, economical and ultimately social development can be assumed.

Although the theory of the long waves itself is in the position to adequately describe the basic structures and propelling forces as well as the patterns of structural transformation of western industrial societies, it can not be overlooked that societal development remains less complex according to the empirically acquired and plausibly proven connection of technical, economical and societal development. The reported hypotheses and discovered legalities supplied through price indexes, wage indexes, the interest level, security flotation, and the volume of investments and employment.

There are of course other prominent candidates (Clark 1957); (Fourastié 1954).

The movement of the “long waves” requires a society that structurally awards added value. The question therefore is what happens when preferences change.
depend too much on the “historical generalization” for a comprehensive theory of societal (social) transformation to be provided (Zapf 1986:167). Among other things, a stagnation of growth is not only explained on an economical basis, but also precisely due to interdependencies of socio-economic and institutional-political elements. At the same time, is overlooked that the social transformation of institutions\(^{37}\) itself can trigger or hinder an industrial impulse. What more, this innovation theory misconceives the self-dynamics and interdependence of the societal subsystems\(^{38}\) that accompany the social differentiation of society (Luhmann 1997).

Ignoring these objections, the theory favors optimistic long-term predictions that seem much too short-term and condensed in light of Popitz’ guidelines. The proposed theory can therefore be seen more as a descriptive model for the plausible generalization of partial viewpoints on societal change and its related patterns for innovation. According to this, it could be theoretically and empirically interesting to identify mechanisms that refer to modernity: “the long waves and their individual phases determine for example the depressions that until now have occurred in each of the waves” (Zapf 1986: 167). In addition, physical mechanisms can be reconstructed that show when and why certain ideas, inventions and improvements are fitting and adaptable while others are not. All too much should not be expected from this point of view though. For, conditions and mechanisms according to which innovation is possible change along with the societal relations as well.

\(^{37}\) Mancur Olson (1982) also addresses the problem of social innovation with his critique of the theory of “long waves”. His theory of stagnation points out that specific social processes of power accumulation can impact the economical cycle of innovation. If these sort of social regimentations, as well as others, are accounted for, than an automatism of the 'theory of long waves' can hardly be deduced anymore. Stagnation can be triggered through most different social processes, for example when industrial power is consolidated. This can lead to innovative development turning into stagnation, for instance when businesses are no longer required to be innovative (monopoly) or when the side effects of economic action are neglected (environmental costs) and if further costs (education, black coal) are passed on to the general public, then the externalized profits can be pocketed, but with the consequence that personal endeavors will be omitted in the future. In addition, an increasing retreat from reality has a negative effect on the manner of innovation since a condition for innovation is, on the one hand, the connection to reality and on the other hand acceptance from customers or the public.

\(^{38}\) Every capitalistic development has its characteristic “accumulation regime”. Economic processes are integrated per se in institutionalized processes of regulation. The economy regulates itself ultimately through institutionally secured laws of the market and is incorporated through state legislation, tax law, tariff provisions, etc.
A look at the fleeting present
In present society, often described as an information or knowledge society, large fundamental or initial innovations are no longer dominant. Rather, the fields and players within the sciences, research and development are elected as the innovative impulses in industry, economy and society. Information accumulation, selection, knowledge and scientific work are magnified as decisive potential for innovation (among others Bühl 1997). Codified theoretical knowledge becomes a source for innovation and therefore is a motor of societal transformation. The decisive step in becoming an information society does not take place until the society-wide implementation of computer technology.39 In an up-to-date method Manuel Castells (2000: 5f) continues the ideas of a post-industrial society in his theory of the network society. The newly dawning historical period of information age is also influenced by the micro-electronic based information and communication technologies as well as gene technology. For Castells ((2001: 425ff.) however, not only the informational basis of society is changing, but more importantly the cultural basis as well. Although technological achievements do not (should not) determine40 historical evolution and social change, they can accelerate social transformation (modernization), as they are conversely able to impede or restrict development, when expansion is inadequate (Castells 2001: 7; Webster 1995). Similar to the theory of the “long” waves, Castells views these technologies as the basis of transformation, but according to his estimation the actual adaptation occurs through contact with information and knowledge. In particular the new forms of application can be emphasized that can be characterized according to the fact that information and knowledge are drawn on for the activation of new information or knowledge complexes, which ultimately leads to the development of ever newer equipment (and programs) for data processing and communication. Castells (2001: 34) suggests that these cumulatively designed feedback spirals of innovation and application found in almost every field are the central incitement of the present information and knowledge society. Somewhat more simply put, a circularly designed process of social development is found in which the application of technology creates new

39 The third technical revolution introduced with the computer does not remain restricted to a select few fields, but rather “a series of change is implied that penetrates and revolutionizes past circumstances” (Steinbicker 2001: 66).
40 See the critical appraisal from Stehr (2003).
knowledge that turns into innovation and advances social and technological change. This (newly) created practice activates in turn a search for more innovation relevant knowledge. At this point, a perpetual motion machine within the social micro-domain is encountered. Are there – as should be asked – consequences or parallels at the macro-level?

The premises of deviation and their consequences

It is obvious that modern society has developed a fondness for novelty (Luhmann 1995a: 9) and it is striking that extremely different kinds of innovative dynamics have developed in the social subsystems. Originality is called for in art but not every suggestion based on deviation and the creation of unprecedented images finds artistic acceptance. The news in mass media is oriented on the value of novelty, which they create themselves and which then appears on the screen as information worthy to be reported. The piece of information is only broadcast as long as it can be assumed that the news is considered a piece of information, that is, something new, by the non-informed and interested public. The constant craving for actuality and attention becomes the merciless criterion of selection. In politics it is vitally important for political actors to recognize the politically relevant topics in time (before the elections) in order to transfer them to the respective decision makers. At this point it is increasingly about the use of modern, that is, new techniques of presentation, as well as communicating decision-making and the meaning behind it appropriately and with public appeal (true to the motto “reform is better than stagnation”).

Since production processes in economy face circumstances of shortage, it becomes important for enterprises that their products sufficiently distinguish themselves from products of other vendors. But it is not only in those mentioned social subsystems that the search for novelty and innovation grows important. We find a change of emphasis in social expectation structures; that is, the social subsystems preferring cognitive (referring to learning) expectations gain influence while systems primarily distinguishing themselves by normative (not willing to learn) expectations (politics, law, religion) recede, which has an impact on the whole society. However, paradox and contradictory developments can also be spotted on the level of social subsystems.
The expectation of constant change becomes the leading currency in society and the consequences of this development are not yet foreseen. This preference for novelty is directly related to the functional differentiation of modern society.

This analysis suggests that modernization amounts to separate rationalization processes of particular subsystems. The combination of variables, [that is] the schemata for absorbing changes as for example markets, organizations theories, models, concepts or art style do, provokes far-reaching learning potentials (Luhmann 1975, p. 58) which, in turn, coincide with ambivalent effects.

In order to show the changes on the one hand, as well as the accompanying uncertainties on the other, these effects are to be sketched out with the help of the examples of two social subsystems – art and science – as well as the pressure to lead an individualized life, which is all-pervading in society.

(1) Art: Before art can emerge as a special form of social communication, art itself must provide for sufficient, distinguishably relevant, indications.

Hence, the norm that all pieces of art must be new if they are to be appreciated has taken root early (Luhmann 1995b, p. 70). Consequently and functionally, artistic communication adapts to refusal of or deviation from past forms and styles (Hauser 1988, p. 436ff.). To make matters more complicated, it is required to produce for unknown vendors, that is, for an unknown market. Art does not only have to be new but also appealing. In addition to the development of art, ranging from trivial art to artistic craftwork, there is enough space for provocative themes that are meant to question existing pieces of art and art as such. The emphatic refusal of traditional displays manifests itself in the provoking choice of subject and by new stylistic devices. But if artistic communication puts increasing emphasis on deviation and provocation, the problem arises that signs of deviation must be able to show people with no artistic knowledge what the new aspect is. In addition to that, it must be en-

41 Different descriptions of art have been tried in the art system. As far as art was considered fine arts, the ideal display of spirituality in the works was in the foreground. In the display of spirituality people saw the beauty, which is to be seized as a model.

42 The particular difficulty in the questioning of the manner of this transformation, of the meaning of continuity and discontinuity at the transfer from one style to the other, results from the circumstance that the break with the past and the tie to it that development and advancement play a role in art and are supported by other factors than otherwise within cultural history, namely by science and technology. Hence, the process of history is basically continuous and progressive, but in art though it is abrupt, absurd, and in regards to the quality of service, incompatible with the concept of advancement"
sured that the observer can draw bits of information from it that are useful and relevant to him.

Artistic communication presumes that the observed works of art can be understood, too; not to mention accepted. As can be observed in the meantime, this condition, which is necessary for art, is hardly paid attention to. The (new) functional problems of the current art system become apparent especially in this respect.

Consequently, the circle of people who can comprehensively take part in artistic communication, which is permanently based on deviation and innovation, grows smaller. Most exhibitions of (post)modern works of art that are based on irritation and provocation tend to overstrain the viewer. But then the socially differentiated functional system of art runs the risk of subjecting its own functionality to negotiations due to an excessive norm of deviation.

(2) Science: While early modern science mainly dealt with the detection and preparation of existing knowledge, modern science has to adapt to a new form of processing knowledge (Stichweh 1996). With grave consequences, the normative expectation has developed that deviation should be preferred and distinguished at the same time from that which is known. The expectation of novelties becomes a scientific norm. This may look like an easy request but it is certainly difficult to put into practice when traditional wisdom is opposed but novelties are still promoted. Parallel efforts are necessary in this respect. As a consequence, science has developed (and institutionally reinforced) empirical and theoretical criteria that indicate why a new argument or a deviating concept should be accepted. Even though the idea of science still awards the quest for deviation, novelty, and innovative ideas or arguments, and even though the differentiation of science allows for new re-combinations with regard to interdisciplinary research it is obvious that science increasingly tries to preserve the truth. The differentiation of disciplines, the problem of increasing complexity, as well as the milieu-establishing and reinforcing combination of institutionalized job offers, reputation, citing circles and traditionalized knowledge has led to the establishment of existing knowledge which makes further scientific insight more difficult due to successful scientific operations. Science that has a fixation on (searching for) the truth is about to become increasingly unable to grow and be innovative (as mentioned in Kuhn 1973).

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43 For an example of rejected demands of innovation and their consequences for art organizations exemplified by the Berliner Schaubühne see John (2005).

(3) *Individualization*: Functional differentiation allows and calls for a multi-functional inclusion of individuals who eventually have to cope with the different system references and demands of the functional subsystems. By breaking away from their traditional bonds and social positions, individuals gain more room to organize and determine their lives on the one hand, but the new freedom is high in price. The break-up of traditional bonds is related to the pressure to individualize (Beck 1986). Due to change from social class affinity regulated by inclusion to freedom of individuals, who need to take charge of their (job) career by relying on their self-expression for example, new needs for action develop, some of which are quite precarious. While society needs to provide for sufficient compatible expectations, individuals are constrained to get hold of system-specific and multi-system social addresses that make the desired inclusion more likely. However, working on one’s individual address is anything but simple (Giddens 1991). On the one hand society provides a rather diffuse collage of expectations, which read little into useful strategic actions (Nassehi 2000, p. 53). On the other, imitation is of little help since only successful and publicized conditions of inclusion can hardly be transferred. In order to stand out, a person’s individuality must at least shimmer through the address meant to be communicated. Trying to establish an individual address can quickly end up in a paradox: the address has to be compatible, in other words, it must be based on recognition and thus on self-imitation. At the same time, the addressing must contain novelties, in the sense of irritation through individuality. The individual is only able to cope with that paradox by dints of oscillation, that is, by integrating time. Biographization is one way to cope with this paradox in the long run. On the social level the paradox occurs in the normalization and, from the perspective of time, in the normalization of deviations; the individual paradox of self-fabrication is socialized. Deviation becomes the norm in work and free time. It should be carried out taking individual risks into consideration. Thus, it comes as no surprise that deviant careers of socialization become more likely in today’s complex societies (Luhmann 1993, p. 202). This manifests itself in the increasing and dynamic pressure to “be different from others”.

To sum up briefly, going beyond this list of structural effects that could be extended easily, it can be shown that problems relevant in society mainly appear at places where the rapidness of cognitive structures meets the slowness
and leisureliness of normative structures.

The forced change of particular subsystems towards deviation leads to stabilizing and preserving effects on the one hand. On the other, it triggers a self-reinforcing dynamic of novelty and deviation with unforeseeable consequences.

It can be established that society has shifted its structures to novelty. But as sketched out above, this is not the only connection. In addition, we have to deal with far-reaching rhythms of time, with specific cyclical conditions and sub-systematic patterns of innovation. But it is not only the social contexts including innovation that change, but also, above all, those social structures where innovations are triggered, elaborated and injected into the social process of diffusion. Some grave changes are also found here.

**Unintended restructuring of innovative institutions**

Although nothing new, the following insight has not yet been fully processed, namely that innovation is by far not due to a single inventor or mind-boggling masterstroke as was assumed in Schumpeter’s time. The development of new products or procedures takes place in cooperation\(^{45}\), be it in organizations or in arranged social contexts that go beyond organizations (Aderhold 2004; Duschek 2002; Tuomi 1999). The new challenge is not so much about technical novelties but about “the change of (inter)organizational processes, fields of forces, and the importance of actors” (Radel 1997, p. 112). Innovation is not a linear process; innovations invariably distinguish themselves by “numerous feedback loops, iterations and overlaps during all stages of innovation” (Asdonk/Bredeweg/Kowol 1991, p. 291). Above all the concurring processes of development, construction, manufacturing and sales planning are affected by different parts of rationality\(^{46}\), which are embedded in the internal and external structures of cooperation.

Complex structures of relationships, their insufficiently developed scope, as well as the accompanying processes of information gain and information ex-

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\(^{45}\) “Innovational strategies seem to prefer collective pathways. The conviction that manifold potentials can only be tapped by cooperation with (possible) competitors manifests itself in the trend of establishing horizontal networks, which are meant to represent a frame for innovation” (Radel 1997, p. 123).

\(^{46}\) Thus, the relevance of developments on the part of the practitioners, in other words, the empirical-practical rationality, opposes the FuE-rationality of technicians and constructors, or the theoretical-scientific rationality.
change come to the fore (a.o. Roehl 2000). Innovation takes place in parallel worlds. We are facing the simultaneousness of dependence and the accrued chances of cooperation and networks (Sydow 1999; Sydow/Windeler 1998). In brief, the development of new products and procedures increasingly takes place in cooperation (Nowotny/Scott/Gibbons 2001). The border of the particular company organization is crossed and, as a consequence, changed. Thus, the scope and the dependencies that the particular companies face, change unavoidably.

The importance of cooperative forms of exchange is reflected in the cascade build-up of international locations. The combination of innovation and the chosen means of network embedding becomes a factor that can hardly be neglected anymore (in the following cf. Weyer 1997, p. 136 ff.). The step from the development stage up to the functioning stage, product and market maturity is successful if one succeeds in stabilizing and extending the advised technical innovation in a social core network at least temporarily.

Strategic actors, who build up a certain extent of commitment (ability to negotiate and to enter a commitment) among each other, are necessary (Aderhold 2005b; Duschek/Wetzel/Aderhold 2005; Wetzel/Aderhold/Baitsch 2001). Social networks build the basis for the stabilization of technical innovations (Weyer 1997, p. 138). These changes of the innovation-producing social infrastructure have an impact on innovation as such.

First, if cooperation\textsuperscript{47} takes place altogether, it is the developed network that identifies with the development project of the particular innovation. The contextually structured search space becomes heavily restricted. The network as supporter of the innovation reduces the disturbing potential by setting outward boundaries. The process of closure has a double effect. On the one hand, such a high measure of efficiency and assertiveness can only be reached in that way. On the other, the transition to implementing the innovation becomes more difficult. This is because the transition from functioning maturity to commercial use is accompanied by a change of the support networks in most cases. Either the initial network is opened for commercial interests or “completely different networks, that wish to operate with new visions of use or to supplant or replace the old networks, enter the scene” (ebd. p. 141).

\textsuperscript{47} Further consideration on the difference between network and cooperation can be found in Aderhold (2004; 2005b).
In addition to that, regional groups and networks of most manifold activities and potentials have already become accompaniments of the worldwide differentiation of the market and competition. The new role of regional groups\textsuperscript{48} expresses a trend, which redefines the participation in innovation-creating processes. It becomes more than obvious at this point that the economic exchange of goods and finances has already reached a cross-regional and transnational dimension.

In this context, the form of differentiation within companies has broken away from the primate of the functional compartmenting along the supply chain. The operating areas are subdivided into profit-centers or into separate processes that are constantly called into question. In companies, much value is placed on centers of core competences, project teams or decentralized manufacturing facilities. The interaction (of uncertainty and dynamics) of the market stands in opposition to the flexible units within the companies.

The effects of the necessary cooperation and networks go so far that in some cases the borders of the company within the company are hardly perceived as such. (cf. Wetzel/Aderhold/Rückert-John 2008). Outgoing contacts increasingly resemble the internal ones, which among other things, concerns the selection criteria of the choice of the partner or decisions concerning the location.

Networking and cooperation increasingly gain importance in this context, especially when it is about conducting research and development, gaining access to new markets or defining the frame and the standard of economic actions. What single companies cannot accomplish alone might be possible in a network (Schienstock 1997, p. 79; Sabel 1989).

Global competition is not only about the skills of the company anymore. The importance of regionally different forms of embedding is not to be underestimated (Diller 2002; Grabher 1993; Giddens 1995). To a certain extent, the success of the company is dependent on the conditions of competition in its regional surrounding (Cooke 1998; Heidenreich 1997).

The manner of using knowledge available worldwide as well as internationally organized research and sales facilities (integration into global structures) pro-

\textsuperscript{48} The creation of regional clusters is related to the following preconditions (Schienstock 1997, S. 81): trust as a basis for vertical and horizontal processes of exchange; vertical exchange: technology transfer, interdependent services are provided (organizational consultation, training and development of technology, qualified workers and technological know-how.)
duce, in connection with the concentration on the regionally available know
how of research departments, labor forces, providers, institutions of higher
and continuing education and advisors (integration in regional structures),
varying potential for competition. The competitiveness of companies is linked
up to the competitive power of their surrounding regions in many respects,
and the region is conversely dependent on the competitive power of the resi-
dent companies.

Consequently, companies and regions are confronted with an apparently par-
adox challenge in the context of global competition (Heidenreich 1997, p.
501). Worldwide competitive advantages and disadvantages “can accrue from
the way economic processes are embedded regionally.” On the national and
regional level as well, the combination of decisive factors, which can hardly be
influenced by the individual actors anymore, thus determine the competitive
power of the companies (Porter 1996, p. 146 ff.; also see Heidenreich 1997, p.
503).

The nationally or regionally established concentration on different industrial
clusters leads to a process of approach, which might in some cases result in a
bundling of interests (Porter 1996, p. 156). The “atmosphere” in the eco-
omic surrounding is of vital importance with regard to the innovative and com-
petitive performance of the company. Thus, concepts and structures of a
company as well as the direct contact to the customer and to the market are
influential determinants. Of almost equal importance is the embedding in the
“economic surrounding, which distinguishes itself by efficient providers and

49 Heidenreich (1997) mentions among others the following factors: (1) Production deter-
minants: these include the educational level of the labor force, regional markets as well as
infrastructure. (2) Conditions of demand: these include the domestic demand in the par-
ticular industries. Despite the existence of global markets, domestic demand is still im-
portant. These regional markets can function as trial markets for launching and testing new
products. (3) Related industries and supply industries: if there are domestic supply indu-
tries, this has a positive effect as cheap and high-quality services can be used. In addition,
“a constant exchange of ideas and innovations” (Porter 1996, p. 151) develops in the
course of a close collaboration. Especially the tempo of innovations perceived in the sur-
rroundings does not remain without consequences for the business-minded observer. (4)
Entrepreneurial strategies and structures: national differences particularly accrue from the
way companies are structured and run by the management. The design and implementation
of internationally effective company and management concepts is realized most differently.

50 An industrial cluster can be understood as a “place bound constellation of similar, mutu-
ally dependent or complementary companies, which collaborate closely and which inter-
communicate and exchange information intensely” (Schienstock 1997, p. 80). The cluster-
forming companies “use a specialized infrastructure together, they share opportunities and
they face the same threats (ebd.)
service companies, by innovative competitors and by qualified labor and venturesome customers” (Heidenreich 1997, p. 503). With the establishment of a global “network economy” companies are not dependent on technology, the market, and the industry alone, but also on the networks they are integrated in or excluded from (Aderhold 2004).

The success of an enterprise (that describes itself as innovation) not only depends on the quality of an idea or a goal but is also dependent on the conditions of creating social acceptance (especially in other social systems), on institutionally available structures of sponsorship, on the historical constraints as well as on the development of expectation structures (that can only be influenced to a limited extent) in the particular social systems. As a result, the innovator’s point of view is not sufficient by a long shot.

But there is more to it: within the scope of innovation projects there are a lot more, very specific problems, which can hardly be solved by classical means. It is hardly to be expected, for example, that the desired market success of a still unknown product can be caused by research and development investments or by investing in the production of high-quality products. An efficient combination of “generating knowledge and downstream activities of value creation as called for by production and marketing/distribution” is claimed (Gerybadze/Meyer-Kramer/Reger 1997, p. 153). As will become apparent, it is only at a first glance a digestible adaptation.

**Conclusions: Paradoxes and other entanglements in connection with the management of innovation**

Considering the problem of connecting the fields of the supply chain, an innovation dilemma that adjusts between basic research and commercialization is referred to (Rammert 1988). Difficulties arise unavoidably in dealing with uncertainties of research and innovation processes. Different “logics” of science, technology and product orientation, interests of capital appropriation and cultural patterns of organization encounter each other. One is unavoidably confronted with procedural and material divergences and incoherencies that demand special, organizational answers, especially as far as dealing and coping with uncertainties, imponderableness, and permanent sense shifts, are concerned.

From an organizational point of view, the question arises how the problem of connecting business demands with the scientific-technical orientation can be
dealt with.

Innovation processes distinguish themselves from other work processes, above all by the combination of particular uncertainties. The following uncertainties are to be dwelled upon: (Rammert 1988, p. 33):

- **Factual uncertainties**: tasks are less standardized. Research and development projects are characterized by open tasks.
- **Temporary unpredictability**: the process of finding ideas and solving problems can hardly be temporarily structured and formalized.
- **Personal uncontrollability**: innovation processes are distinguished by a more vast action scope. Requirements for functioning are trust and self-control.
- **Economic unpredictability**: it is hard to tell at the early stage of development what kind of economic successes will be achieved in future times. One usually draws on evidence-related and indirect strategies of economization.

Organizations and management have to cope with two problems as a result. First, there is a dilemma, as the economic reality tends to hamper innovation due to its logic while “the technical rationality” prefers the utilization-slowing diversity of technical solutions (Rammert 1988, p. 101). Second, it is unclear how to gain an understanding for the market of the product to be produced that does not even exist yet (Lynn/Morone/Paulson 1996). According to this, there are no customers who can answer questions for the company and manager representatives, whose worldview does not get by without facts and without objectifying the tangible surrounding, which is, of course, impossible. Entrepreneurial and research decisions as well as decisions on economic-political grounds face tensions between the logic of development and the logic of commercialization:

- The program designers of economic promotion have recognized this problem and emphasize that innovation projects may not only amount to research and development, but also have to provide for a combination of R&D and marketing activities. This is interesting from a political-economic perspective because efforts for and the results of basic research normally do not exceed the national or regional level (Gerybadze/Meyer-Krahmer/Reger 1997, p. 154). This
changes when the results of promoted projects are about to be transferred into fields of application and commercialization. Especially international major enterprises operating at different places make an extensive use of the (internally established) transfer of knowledge. (cf. Stichweh 1999). To put it simply, knowledge about R&D is generated locally to be commercialized in global dimensions. The tender spot of national technology politics expresses itself in the fact that it hardly succeeds in creating new markets as the prerequisite for success of the innovations (Weyer 1997, p. 145) – especially if the emphasis of promotion is only limited to the transition from the invention to the functional maturity of the technology.

- Another peculiarity that may also be called an obstacle is the generation of innovation. The launch of new products does not take place in linear or sequential single steps anymore – basic research, applied research, predevelopment, production, distribution and customer service – (Hauschildt/Schmidt-Tiedemann 1993, p. 18). The actual resource is not in perfecting particular single steps but in the ability to link up and connect the individual processes on the part of the management.

As shall become apparent, innovation does not amount to a step-by-step improvement of traditional products in a long time. What becomes decisive is “opening up new markets for products and services that have yet to be developed” (Baethge 1995, p. 35). The uncertainty of economic success, as with fields that must be plowed, tilled and mucked first, is accompanied by another

51 “Technical design takes place in social networks, in which, by negotiations and mutual coordination, actors create results that are vital for the course of technology development. Alternatives can only accrue from changes or extensions of social networks, that is, when further players with different interests join in. The success of alternative strategies, however, depends on whether alternative networks can be closed operationally and socially” (Weyer 1997, p. 147).

52 It is controversial as to what kinds of processes are involved here in particular. A suggestion from Hauschildt/Schmidt-Tiedemann (1993) is worth considering. Both authors plead for a “concomitance model”. They distinguish three relevant strings of innovation – the creative string, the productive string and the distributive string – but it is about finding a form of cooperation which ensures the functioning of the three process strings by providing for a cross-procedural attendance (promoters for example), so that the results in one field also have effects on the other processes at the same time.
uncertainty: the economic-political and entrepreneurial shift to innovation calls established structures into question. The production model characterized as fordist\textsuperscript{53}, which coined post-war Germany in particular, begins to disappear. While the social modernization of the 60’s was person-orientated in respect to the extension of “educational institutions, vocational training and manpower mobility”, “innovation-orientated modernization” is primarily based on structures, that is, it creates uncertainties and uncertain promises of new action scopes by closing and thinning familiar institutions (Baethge 1995, p. 38). However, there are hardly any organizational or instructional solutions at disposal for this.

Taking everything into account, it can be pointed out that innovations are structured paradoxically in various respects. As just indicated, innovations are dependent on (social) (pre)conditions, “which cannot be met at the time of the innovation because this is the production of something new” (Sauer 1999, p. 14). Thus, the conditions that are necessary for innovation must be discovered, developed, tried and changed in the course of the innovation, too. This is a fact which is mentioned now and then but which is paid little attention to.

We have come across other peculiarities further above, which shall be summarized very briefly. We have emphasized that novelties turn into an innovation only after the fact. At the first glance this is a rather unspectacular statement. Thinking a little further though, this also means that as soon as a novelty is labeled as an innovation (and people make extensive use of this), it actually is not an innovation anymore. Because then it is ever-present, it has asserted itself, many people know und use it, but precisely at this moment it is not new any longer or only for a very short period of time. All the hassle and all the effort just for always short-lived glory.

If the management of innovations is now focused on, another paradox comes to light (Baecker 1993, p. 14): The innovative enterprise must be constantly integrated into the organization, in fact by reintroducing the concepts of success and failure into a (yet) successful enterprise/organization. A new goal is set, providing that the success that has just been achieved will be considered a

\textsuperscript{53} “Fordism not only amounts in the dyad of mass production and mass consumption, but also represents a broad social model of organization and regulation: Its main elements were a strongly Taylorized differentiation of labor, centralized decisions in dominant enterprises und an appropriately polarized social structure” (Baethge 1995, p. 33). In the Federal Republic of Germany strong trade unions as well as extended rights of co-determination must be taken into account.
failure in the future. It is common knowledge that successful changes, which are brought in today, may not exist tomorrow. As it seems, the organizations react irrationally. They create uncertainty instead of – as could be expected according to March/Simon – absorbing it. Uncertainty becomes a permanent state caused by in-house dispositions of distinguishing success and failure.

Innovations are risky in many respects. On the one hand they are risky because entrenched routines apparently have to be abandoned and because the implicitness of things is put into question, with the outcome of this trial remaining open and with success being subject to an incalculable future. On the other hand, it may also be risky to dispense with innovations. The consequence would be that the one’s own supply would gradually drift away from those of competitors relying on innovation and risk. The demand goes down one day or other and the realization that it was wrong to dispense with innovations and stick with colorful brochures and hollow promises comes too late. The horse has bolted. The train has left the station.

Hence, we come across particular uncertainties when dealing with innovations:

- Basically, innovation is factually undetermined, dependent on time but unpredictable, uncontrollable in personal respects and incalculable in economic respects.

- Innovation cannot be processed in sequential steps (along a supposed supply chain). The ability to connect, to link up, to coordinate communicatively, to think recursively, to plan and to act is necessary.

- Innovation can only be realized together, in the context of social network structures.

- During the innovation process, contradictory and incompatible logics encounter each other (e.g. logic of development vs. logic of application).

Innovations lead to a paradigm shift: it does not necessarily have to be the newest and best invention or solution to be successful on the market. A formulated market and business strategy grows important that not only focus on obvious solutions and customer demands but that also considers the relevant but multitudinous functioning requirements of complex systems. Thus, innovation puts traditional company structures, management concepts, and in this context also traditional worldviews and experiences into question. Now the question is which advice should we take? Innovation, pretence innovation or
non-innovation? Our answer is unambiguous and clear; of course all of the three strategies are still in the running but it remains to be seen which one will be successful at the end and for whom.

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INTEGRATING INNOVATION AND FORESIGHT RESEARCH ACTIVITIES: KEY MODELS AND CHALLENGES IN NON-TECHNICAL AND NON-ECONOMIC INNOVATION ACTIONS

Jari Kaivo-oja

Introduction

Innovation, creativity and design are among the most frequently used words in business and society today. In most situation innovation studies are focusing on markets and technical road-mapping of future innovations. Less attention is paid on non-economic and non-technical innovations.

Contrary to common trends, this article is focusing on non-technical and non-economic innovations. Furthermore, in this article we discuss about key models of non-economic and non-technical innovation. This paper is not fully comprehensive survey, but just focused on 4 important models of modern innovation studies, which should be a part of research agenda in the field of innovation research of non-technical and non-economic innovations.

In this paper my aim to add to traditional innovation models non-economic element. In this way I try to build up new theory of NMI.

Integrating innovation and foresight research

According to Kaivo-oja (2006), we can connect foresight systems and innovation systems in the following seven alternative ways, which are non-linear rather than the conventional linear (Takeuchi and Nonaka, 1986, see details in Fig 1-14, sources: all own source). We present seven theoretical alternative interaction models, which all are possible in modern firms and corporations. We consider that foresight systems can play and actually often do play an important part in relation to innovation systems.

The models of interaction between the foresight system and the innovation process are presented below (see Kaivo-oja 2006).
All these innovation models are including an economic element, production
and marketing. One way to extend these models to non-economic innovation models is just to add social system instead of production and marketing. In such way we shall have 7 novel interaction models of innovation process. These models are non-economic social systems models.

Figure 8 Model VIII: Innovation-Foresight-Social systems (IFSS) model

Figure 9 Model IX: Foresight-Innovation-Social systems (FISS) model

Figure 10 Model X: Social systems-Foresight-Innovation (SSFI) model

Figure 11 Model XI: Social systems-Innovation-Foresight (SSIF)

Figure 12 Model XII: Foresight-Social systems -Innovation (FOI)

Figure 13 Model XIII: Innovation- Social systems -Foresight (ISSF)
One important research question concerning non-economic and non-technical innovations is how foresight systems handle these kinds of innovations. One thing is sure. There is increasing complexity in the innovation field. Especially there are many interesting trade-offs between non-economic innovations and economic innovations. We can also expect that the nature of trade-offs between non-economic innovations and economic innovations depends on the nature of economic innovations. This question is analyzed in the next chapter 3.2.

**Key innovation models and reflections**

In this section we discuss 4 different innovation models/theories and their relevance in relation to non-economic innovations. We also discuss some important aspects of non-technological innovations.

**Open innovation model**

Growing attention has been recently devoted to the concept of “Open Innovation,” both in academia and in practice. Chesbrough, who coined the term “Open Innovation” describes in his book *Open Innovation: The New Imperative for Creating and Profiting from Technology* (Chesbrough 2003) how organizations have shifted from so-called closed innovation processes towards a more open way of innovating (Chesbrough 2003, Sundbo and Gallouj 1998, Sundbo and Gallouj 2000, DeJong, Bruins, Dolfsma and Meijgaard 2003, De Brantani 1991). Traditionally, new business development processes and the marketing of new products have taken place within the firm boundaries (Figure 15). Open innovation
Several factors have led to the erosion of closed innovation. First of all, the mobility and availability of highly educated people has increased over the years. As a result, large amounts of knowledge exist outside the research laboratories of large organizations. In addition to that, when employees change jobs, they take their knowledge with them, resulting in increasing knowledge flows between firms. Secondly, the availability of venture capital has recently increased significantly, which makes it possible for good and promising ideas and technologies to be further developed outside the business organization. Besides, the possibilities to further develop ideas and technologies outside the organization are growing, for instance, in the form of spin-offs or through licensing agreements. Finally, other organizations in the supply chain, e.g., suppliers, play an increasingly important role in the innovation process.

As a result, organizations have started to look for other ways to increase the efficiency and effectiveness of their innovation processes. For instance, through active search for new technologies and ideas outside of the firm, but also through cooperation with suppliers and competitors, in order to create customer value. Another important aspect is the further development or out-licensing of ideas and technologies that do not fit the strategy of the organization. Some good ideas can also be distributed to non-economic purposes. Open Innovation can thus be described as: combining internal and external ideas as well as internal and external paths to market to advance the development of new technologies (Figures 4 and 5).
One interesting aspect of open innovation model of Chesbrough (2003) is that it is not taking non-economical innovations into consideration, just new markets are described as potential place where innovations are outsourced (see Figure 16). This issue is analyzed more in the context of innovation category model. Accordingly we can conclude that open innovation model could be developed towards taking also non-economic innovations into consideration.

Figure 17. Open innovation paradigm with non-economic innovations
The existence of open innovation model implies that in the first place, the shift described above means that organizations have to become aware of the increasing importance of open innovation. Not all good ideas are developed within the business organizations, and not all ideas should necessarily be further developed within the business organization’s boundaries. The Table 1 below further illustrates this fact:

Table 1. Closed and open innovation principles (Chesbrough 2003, xxvi)

<table>
<thead>
<tr>
<th>Closed innovation principles</th>
<th>Open innovation principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>The smart people in the field work for us.</td>
<td>Not all the smart people in the field work for us. We need to work with smart people inside and outside the company.</td>
</tr>
<tr>
<td>To profit from R&amp;D, we must discover it, develop it, and ship it ourselves.</td>
<td>External R&amp;D can create significant value: internal R&amp;D is needed to claim some portion of that value.</td>
</tr>
<tr>
<td>If we discover it ourselves, we will get it to the market first.</td>
<td>We don't have to originate the research to profit from it.</td>
</tr>
<tr>
<td>The company that gets an innovation to the market first will win.</td>
<td>Building a better business model is better</td>
</tr>
</tbody>
</table>
If we create the most and the best ideas in the industry, we will win.

If we make the best use of internal and external ideas, we will win.

We should control our IP, so that our competitors don’t profit from our ideas.

We should profit from others’ use of our IP, and we should buy others’ IP whenever it advances our business model.

This means that within the business organization a shift should take place in the way people look at the company and its environment. Involving other parties when developing new products and technologies can be of great added value. For instance, think about cooperation with other organizations in your sector, with suppliers, and universities and, of course, end-users. So, the essential thing is that in open innovation operations experts are found and they constitute the key operators. Open innovation strategy can also connected to the Blue Ocean strategy and actor-network theory, which are both very relevant approaches to the European companies.

**Innovation category model**

The following innovation models are inspired by the innovation category model of von Stamm (2003, 49). Her model divides innovations to incremental and radical innovations and to existing market and new market innovations. To understand the new role of non-economic innovation we can add non-economical innovations to her model. In this reshaped innovation category model there 6 innovation categories A, B, C, D, E and F).

In Figure 18 is presented conventional trends in markets and society. Accord-
ing to this approach innovation tend develop in the long run towards incremental and existing market system. These conventional trends are linked to the closed innovation model, not to the open innovation model.

Figure 18: Innovation category model: typical processes

In Figure 19 is presented non-conventional, countervailing trends in markets and society. According to this alternative approach innovations can also develop in the long run towards new markets, radical innovation model and towards non-economic systems. These non-conventional trends are linked to the open innovation model, not to the closed innovation model.

Schumpeterian tradition of innovation research
A theoretical framework for dynamic competition and firm dynamics can be found in the notion of “creative destruction” by Schumpeter. Dynamic competition is a process in which innovators with new technology enter a market and compete with incumbents with conventional technology. If the innovation is successful, the entrants will be able replace the incumbents. If not, they will fail to survive. Indeed, such dynamic competition “from the new commodity, the new technology, the new source of supply, the new type of organizations ”strikes “not at the margins of the profits and the outputs of the ex-
existing firms but at their foundations and their very lives” (Schumpeter 1934). In the Schumpeterian tradition, many empirical studies focused on the relationship between firm size and innovation. Some arguments for a positive effect of firm size on innovation are as follows (Cohen, Levin and Mowery 1987; Symeonidis 1996):

Figure 19. Innovation category model: countervailing open innovation processes

The returns from R&D are higher where the innovator has a large volume of sales over which to spread the fixed costs of innovation (economies of scale in R&D),

Large diversified firms can benefit from positive spillovers between the various research programs (economies of scope in R&D);

Large firms can undertake many projects at one time and hence diversify the risks of R&D, and

Large firms with market power have an advantage in securing finance for risky R&D, because size and market power can increase the availability and stability of external and internal funds.
But, one can also find counter-arguments in the spirit of Schumpeter (1934), namely, the bureaucratization of inventive activity (Cohen and Levin and Mowery 1997):

As firms grow large, efficiency in R&D is undermined through loss of managerial control; and

As firms grow large, the incentives of individual scientists and entrepreneurs become attenuated as their ability to capture the benefits from their efforts diminishes.

In Schumpeterian research tradition less attention is paid on large social systems, which potentially have large innovation potential. For example, educational and university systems create new innovation potential, but they are not necessarily monopolies in existing or new markets.

In many empirical studies, Schumpeter’s claim that large firms in concentrated markets have advantage in innovation was interpreted as a proposition that innovative activity increases more than proportionately than firm size (Cohen 1995). Alternatively, some other studies examined the relationship between market concentration and innovative activities measured by innovative inputs (R&D expenditures, R&D employment, etc.) or by innovative outputs (patent counts, etc.). However, it was also pointed out that Schumpeter had never claimed a continuous relationship between R&D and firm size. What Schumpeter focused on is said to be the qualitative differences between small, entrepreneurial enterprises and large, modern corporations in their innovative activities.

Innovation is a concept where there is considerable variance in individual observers’ definitions; both between common sense - or laymen thinking - understanding and analytical approaches, and between different analytical or theoretical approaches. One element common to all these approaches is that market introduction is a crucial aspect of innovation. This is what distinguishes innovation from invention, the concepts are incomparable in the sense that invention is a technical concept, innovation an economic concept. But they are not wholly unrelated; technical feasibility is a necessary, but not sufficient condition for economic feasibility. For service innovations, social or cultural feasibility is also a very necessary condition for economic feasibility.

Since the concept of innovation involves at least novelty to the firm, the change in market characteristics is related to a change in some firm characteristics. Already Joseph Schumpeter (Schumpeter 1934, 1987, 1994) pointed out
that the simplified picture of profit-maximizing price-competing firms, with price as the main information carrier between the actors on the market, was too simple a picture to explain the development of market systems. In addition to price competition there is an even more important technological competition; with firms competing on qualitative characteristics of products and processes. Schumpeter identified five classes of innovation that were important determinants of economic outcomes. The first two; *technological product and process innovation*, have almost exclusively been focused on in the innovation literature and research. In a way non-technical and non-economic innovations have been neglected because Schumpeter’s two first innovation categories have attracted so much research attention and activity. As Schumpeter’s focus was primarily on industry level and not on firm level, an innovation was something that was new to the world - it was *new to the industry, not new to the society*. Hence he regarded also his third category - *organizational innovations* - as the appearance of new general organizational modes transferable to and applicable in a wide variety of firms, as well as restructuring on the industry level. The industry perspective excludes adjustment and imitation processes of the original industry-level innovation, as well as other local, ‘new to the firm’ innovations. Local re-organizations of business firms that are highly specific to the individual firm are thus excluded from his perspective. His two last categories of innovation were the conquering of a new source of input or raw material, which we would probably not consider an innovation today, and the opening of new markets. Generally, we can note that Schumpeter did not pay so much attention to service innovations and business models.

To sum up Schumpeter introduced 5 categories of innovation: (1) The introduction of a new good (with which consumers are not yet familiar) or of a new quality of a good, (2) the introduction of a new method of production, which need not founded upon a discovery scientifically new, (3) the opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before, (4) the conquest of a new source of supply of raw materials or half-manufactured goods, and finally (5) the carrying out of the new organization of any industry, like the creation of monopoly position or breaking up of a monopoly position.

Nevertheless, the ultimate effects of innovations as economic phenomena are related to the commercial effects on the markets that the innovator is supplying. This makes it correct to state that innovation is a supply-side phenome-
non, but this is different from characterizing driving mechanisms of innovation processes, whether they are pushed by suppliers or pulled by customers. Market introduction presupposes the existence of a market. The process of introducing innovations into the economy may however in several instances be considered as the creation or opening of new markets. For services it is claimed that it is necessary to include a new class of innovations into this spectrum - delivery innovations (Miles et al 1995). Delivery innovations are described as innovations in the delivery system or medium of the service provider, such as ICT-based service provision.

Current focus on innovation processes differs somewhat from the original perspective of Joseph Schumpeter (1987, 1994). First of all, the OECD Oslo manual on innovation surveys (OECD 1992), as well as the many innovation studies based on it, focus on firm-level innovation. A firm-level approach makes innovation and diffusion complementary, rather than dichotomous, concepts. The intra-industrial diffusion process is considered an integrated part of innovation processes. The level of innovative activity differs quite considerably according to whether the analysis is restricted to ‘new to the industry’ innovations or includes ‘new to the firm’ innovations. The critical ratio between them can distinct industry-specific patterns. There are no immediate reasons to believe that this picture differs qualitatively between manufacturing and services industries. It is often claimed however that the innovator’s appropriation of benefits from the innovation is more difficult in services as service innovations are easy to copy.

Schumpeter’s focus on innovation is reflected in Neo-Schumpeterian economics, developed by researchers like Christopher Freeman (1982) and Giovanni Dosi (1982).

**Triple Helix model and non-technical and non-economic innovations**

The active role of universities in relation to the society has been gaining emphasis in conjunction to, for instance, defining the so-called third task of the universities. Besides the roles of information node, transmitter, and networker, the concrete tasks of universities would include the production of new openings based on foresight research and information as well as catalyzing various innovations that cross borders. The functional tasks of universities in relation to the society can in principle be classified into two basic categories: the classical model and the interactive model. The first one describes the universities’ traditional tasks in transmitting information and producing new ideas
and innovations. The idea that research results could be directly applicable faces many practical challenges.

Typical examples of the classical model are the training of experts for the needs of businesses, contracted research, theses, and students’ practical training periods. This is much of what is desired of higher education institutions. These operations are quite important and significant from the point of the region and the individuals. From the point of the development of different operators and operations the interactive model indicates the dynamic and intimate role of universities in the development of, for instance, a region. A successful, innovative network is often a community where the operators of academia, the cultural sector, and businesses meet one another in a fruitful way.

There are many kinds of models to describe collaboration between Universities and other actors. The Triple Helix is a result of Henry Etzkowitz’ (Etzkowitz, Dzisah, Ranga and Zhou (2007), Etzkowitz 2006, 2008) analysis of the change in scientific information production and universities in the information society. According to Etzkowitz, information production has moved from universities to university-government-industry interaction. For this area he has given the name Triple Helix, which has become a popular concept in the field of higher education research and some other fields, such as innovation research.

The Triple Helix is a model for understanding and guiding interactions in university-industry-government relations. Each actor within the Triple Helix has its own task. Universities produce research, industries manufactures, and the government secures certain stability for maintaining exchange and interaction. “The triple helix regime operates on these complex dynamics of innovation as a recursive overlay of interactions and negotiations among the three institutional spheres. The different partners engage in collaborations and competitions as they calibrate their strategic direction and niche positions. The “triple helix” denotes that this social world is more complex than the natural one.” We can figure out three alternative models (Figures 20, 21 and 22) of the Triple Helix model. These models can also be seen as future option frameworks for the European innovation policy.
Figure 20. An Etatistic Model of University-Industry-Government Relations

Figure 21. A "laissez-faire" Model of University-Industry-Government Relations

Figure 22. The Triple Helix Model of University-Industry-Government relations
The very special feature of Triple Helix model idea is that it is in a specific way emphasizing the role of non-economic factors in the innovation policy. However, on the other hand, one important logical aspect of Triple Helix model is that industry (wealth generation) and economic factors are always in some way involved in innovation processes. In this way Triple Helix model is not taking non-economic factors into consideration seriously. The Triple Helix model includes policy institutions and academia as special factors. When two selection environments operate upon each other, mutual shaping in a co-evolution along a particular trajectory is one possible outcome. When three selection environments are involved, more complex dynamics can be expected as a result of interactions involving bi-lateral and tri-lateral relations. Three selection environments are specified in the Triple Helix model: (1) wealth generation (industry), (2) novelty production (academia), and (3) public control (government). Furthermore, Triple Helix model somewhat reduces the complexity by using university-industry-government relations for the specification of the historical conditions of the non-linear dynamics.

We can add non-economic aspects to Triple Helix, when system dynamics of innovation process can be seen to be more complex. See Figure 23 (next page). We can conclude that if we take non-economic factors seriously, we must develop Triple Helix model, which actually goes beyond Triple Helix.

Figure 23. Non-economic aspects and Triple Helix
Conclusions and reflections

One way to analysis non-economic innovations is to present new versions of traditional innovation theories and models. This paper has focused on four interesting innovation models, (1) open innovation model, (2) innovation category model, (3) Schumpeter’s classical innovation theory and (4) Triple Helix model. Firstly, in this article I added non-market sector to open innovation model. In this way it is possible understand innovation in process and innovation out process can also be connected to non-economic systems and market organizations. We can conclude this additional element gives a new perspective to open innovation model and associated open innovation processes.

Secondly, in this article I also make a new extension to traditional innovation category model of von Stamm. I added to her model non-economic sectors, where incremental and radical innovations can also emerge. In also discussed about conventional trade-offs between different innovation types, but also added countervailing trade-offs.

Thirdly, I discussed about Schumpeter’s classical definitions of alternative innovations. I noted that Schumpeter’s model did not pay much attention to non-economic elements of innovation, although he paid to them some minor attention.

Fourthly, I presented 3 alternative Triple Helix models and a fourth model of new Triple Helix, which includes non-economic systems. I noted that non-economic systems probably make Triple Helix model more complex to understand and it probably changes our view about the innovation dynamics associated with the Triple Helix model.

One general conclusion is that all these models do not include the framework of non-economic innovation. They are based on the fundamental economic ideas of market organizations, industries and markets. In this paper I have added to these models non-economic element. In this way I have tried build up new theory framework of NEI. Less attention in this paper is paid to non-technical innovations (NTI, thus social and service innovations).

If we analyze the sphere of NEI and NTI innovations, we can outline 4 new innovation research field categories. This kind of innovation categorization helps us to identify 4 critical research topics of innovation studies. We can say that both NEI and NTI analyses inspire us to build up 4 innovation research
programs, which have specific background aspects. In this way NEI and NTI analyses and discussions can shift paradigm of innovation research to new interesting directions.

Table 2. Four new innovation categories inspired by NTI and NEI analyses

<table>
<thead>
<tr>
<th>Non-technical innovations</th>
<th>Technical innovations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Social innovations (NTI) in markets (EI)</td>
<td>B. Social innovations (NTI) in NEI social systems and environments</td>
</tr>
<tr>
<td>C. Technical market (TI) innovations (EI)</td>
<td>D. Technical innovations in NEI social systems and environments</td>
</tr>
</tbody>
</table>

In this paper I have outlined new more broad innovation theory for boxes B and D. Box B is explained mostly by conventional innovation theories. A new dynamic research field is service innovation studies. It is important to understand that there are many service innovations which are outside markets. We can also say that limits between different innovation types are not very clear. Often there is trade-off between economic and non-economic innovations, and social and technical innovations.

Table 3. Four new innovation categories inspired by NTI and conventional incrementa/radical innovation analyses
From Table 3 one can see that this clarification between technical and non-technical innovations is important. It is possible to have both incremental and radical social innovations, which are non-economical innovations.

References


INNOVATION INDICATORS FOR SCIENTIFIC AND TECHNICAL HIGHER EDUCATION

Valentina Pomazan and Lucian Petcu

Introduction

Innovation in education is difficult to be captured, since the educational process is an intimate one, involving primarily subjective factors. Nevertheless, it can be mirrored by indicators which can identify its presence and stimulate it. Innovation in education is sustained by technology, has strong impact on economy but its intimate resorts are non technological. Education innovation occurs often, but it is not identified as such, therefore not supported, mostly because the common perceptions that innovation is pure technical and/ or involves major changes. We report correlation analysis results build on survey containing a list of indicators to appreciate the innovation in the Scientific and Technical higher education. The proposed study was conceived to support the design and development of effective and accessible technology enabled learning environment, able to attract and retain students in Scientific and Technical profiles at Ovidius University, in Constanta, the second city of Romania.

Rationale

The need to survey the innovation in education is two folded and resulted from the recent dramatic changes in the curriculum. First, it was triggered by the Bologna process in our country. Romania aims to align itself to the European standards and education is one of the most sensitive areas, influenced by the new societal demands. The second aspect relates to the paradox of the emerging knowledge society: more knowledgeable citizens, users of advanced technology face the fact that less and less young people choose studies and careers in Science and Technology. This unbalanced situation has an important consequence for the educational sector: the need to adapt to the new ways people learn, their needs and priorities.

The present work identifies whether there are correlations between success factors and impacts of innovation and will stand as a basis for further innova-
tion efficiency analysis.

**Innovation Efficiency – A Tool for Guiding Policy Decisions**

Increasing of the innovation efficiency is related to “productivity” and means more innovation outputs with respect to the inputs. Technological Education has to pay attention to the innovative aspects due to their stimulative role in one’s scientific formation. More, innovative educational methods act as attractors for technological innovation.

The European Innovation Scoreboard 2007 (Katz 2007) defined innovation efficiency proposing the analysis of the innovation outputs with respect to the inputs.

One can easily transpose those definitions to the education innovation. In this respect, the Inputs are:

- Innovation drivers
- Structural conditions for innovation potential
- Knowledge creation
- Investment in educational RD activities
- Innovation and new initiatives
- Efforts towards innovation at organizational level,

while the outputs can be assessed as:

- Applications
- Performance expressed in terms of activities
- Certified Educational Techniques
- Achieved results in terms of successful educational practices.

There is a strong liaison between the input and the output of the innovation, in general (Katz 2005), and the best way to increase the efficiency of a phenomenon or process is to identify its presence and mechanisms. Any decision policy in academic education should take into account the efficiency of the innovative component, stimulating and rewarding it, recognizing its important role in building a real knowledge society.

**The Survey – Concept and Sampling**
This study objectives were:

- To capture qualitative and quantitative aspects of the innovation in Scientific and Technical education
- To correlate success factors with the potential innovation impact

A computer driven questionnaire was applied in laboratory conditions to the students with engineering and scientific majors. Friendly interface and competent assistance was offered in order to avoid shallow or incomplete answers. The questionnaire was built on 4 dimensions, each having several items:

- Success factors,
- Educational Process basis,
- Impact of the educational process,
- Problems and barriers for innovation in education.

The Success factors dimension had items regarding:

- Seeking and attracting prospective students
- Satisfying existing students
- Developing niche or specialized attractive profiles
- Developing student designed educational products
- Active involvement in developing new educational standards
- Ability to comply with new social context, with the necessity of knowledge oriented society and sustainable development
- Implementation of new science communication methods/technologies.

The Educational Process basis dimension took into account:

- The existence of ongoing or abandoned educational products?
- The acquisition of machinery, equipment and software, external knowledge and the personnel.
- Information sources for education innovation.

The Impact of the educational process dimension considered:
- Increasing range of educational products
- Improving quality of educational products
- Improving flexibility of the education
- Reducing costs per unit output (costs per student)
- Increasing capability of education
- Reducing materials or energy per student
- Increasing visibility of the institution
- Meeting the labour market requirements for the graduates
- Meeting the regulatory requirements at the national and European level.

Finally, the Problems and barriers for innovation in education dimension aimed to approach some of the most representative deterring factors for education innovation:

- Lack of funding
- Lack of information
- Difficulty in finding collaboration partners
- Difficulty in developing dialog with the potential employers
- Lack of qualified personnel
- Inertia of the upper level educational systems.

The sample were 257 students enrolled in engineering and science (figures 1 and 2).
The Survey – Analysis

The t-test applied for students boys/girls on the items referring to the satisfaction level regarding the overall education process revealed that there are no gender differences in the students satisfaction level (table 1).

<table>
<thead>
<tr>
<th>Table 1: Analyzed Items (ST)</th>
<th>t</th>
<th>p</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male - Male Items</td>
<td>1.447</td>
<td>0.149</td>
<td>No</td>
</tr>
<tr>
<td>Female - Female Items</td>
<td>-1.723</td>
<td>0.114</td>
<td>No</td>
</tr>
</tbody>
</table>

Correlation analysis presented in this material checked the relations between the success factors and the impact of the educational process items (tables 2, 3), also with the deterring factors for innovation in education (table 4).

<table>
<thead>
<tr>
<th>Table 2: Analyzed Items</th>
<th>r</th>
<th>p</th>
<th>Correlated</th>
</tr>
</thead>
<tbody>
<tr>
<td>students satisfaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved flexibility of</td>
<td>0.686</td>
<td>&lt;0.001</td>
<td>Yes</td>
</tr>
<tr>
<td>the education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced costs per unit</td>
<td>0.112</td>
<td>0.395</td>
<td>No</td>
</tr>
<tr>
<td>output (costs per student)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Students satisfaction level is linked with an flexible and innovative view of the curriculum but the institutional effort to minimize costs is not appreciated by the direct beneficiaries of the educational effort. The students seem very little aware of the overall/ breakdown budget involved in their formation as specialists.

**Table 3: Analyzed Items**

<table>
<thead>
<tr>
<th></th>
<th>r</th>
<th>p</th>
<th>Correlated</th>
</tr>
</thead>
<tbody>
<tr>
<td>students satisfaction level</td>
<td>0.511</td>
<td>&lt;0.001</td>
<td>Yes</td>
</tr>
<tr>
<td>ability to comply with the new social content</td>
<td>0.450</td>
<td>&lt;0.001</td>
<td>Yes</td>
</tr>
<tr>
<td>ability to access and attract prospective students</td>
<td>0.390</td>
<td>&lt;0.001</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The institutional visibility and its compliance with the social and economic requirements in terms of educational are strongly linked with the succes factors and can be defined as ones of the strongest indicators for innovative education.

**Table 4: Analyzed Items**

<table>
<thead>
<tr>
<th></th>
<th>r</th>
<th>p</th>
<th>Correlated</th>
</tr>
</thead>
<tbody>
<tr>
<td>students satisfaction level</td>
<td>0.125</td>
<td>0.276</td>
<td>No</td>
</tr>
<tr>
<td>Active involvement in developing new educational standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>students satisfaction level</td>
<td>0.601</td>
<td>&lt;0.001</td>
<td>Yes</td>
</tr>
<tr>
<td>Improved flexibility of the education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ability to access and attract prospective students</td>
<td>0.543</td>
<td>&lt;0.001</td>
<td>Yes</td>
</tr>
</tbody>
</table>
The fact that students satisfaction is not influenced by the active involvement in developing new educational standards, despite their will to be integrated in the new European socio-economic context, can be linked with a certain lack of social responsibility and information education. The students perceived the inertia of the upper level educational systems as an impediment for the institutional ability to attract potential students.

Conclusions

In the targeted context there are still cliches regarding the personal education framed within the social context. Innovation in education is mainly connected with teaching techniques and teacher’s ability to adapt the curriculum to the existing equipments, basis and trends in information apprehension. The overall costs have little impact on satisfaction and do not stimmulate the new approaches in education until the “prestige” factor will have strong influence on one’s final decision to enroll or continue specific studies. There is a faible perception about the educational standards among the beneficiaries of the educational system and the quality of the educational process is not viewed in a larger standardized context. Students appreciate a flexible and creative approach in education, despite their relative indiference to the structure of an educational offer. Students have a rather pragmatic approach and link certification of the new education products only with the legal aspects of their own effort recognition. From this point of view more efforts are to be dedicated to the importance of the european integration from the very begining of their formation. There is an obvious need for awarness arising among the potential beneficiaries of the educational process towards the quality of this process.

References
Introduction

Over the last decades, territorial approaches have played an important role in the economy of innovation. They have given rise to a vast array of literature on conceptual models such as innovative milieus, technopoles, industrial districts, or more generally clusters which have been synthesised by Moolaert and Sekia (2003) under the generic name of Territorial Innovation Models (TIMs). One the one hand, these models have been able to explain the role of technology and “diffuse focused” learning within geographical proximity as innovation drivers. On the other, they presented the evolution of local production systems as a specialization process in the global economy.

Nowadays, learning and innovation are not intermittent or occasional as in traditional industry, but ongoing processes. New theories on the knowledge economy remark that in new innovation processes, knowledge is mobilised more systematically, more permanently and at longer distance. Furthermore, works on cultural resources, cultural clusters or creative cities, for instance, have shown that numerous innovations today take place more frequently via socio-cultural dynamics than techno-scientific ones. Production-consumption systems have changed and the traditional regional networks have scattered within space.

The case of the Swiss watch industry can be related to this conceptual change. After having leaded the international watch market, new technological and structural changes drew the Swiss watchmaking companies mobilise new strategies since the late 1970s. Non-technological innovation provided new resources for differentiation and competitiveness. As well, the traditional regional know-how of watchmakers has combined with new activities dedicated to authenticity and image creation from other territories.

From that perspective, new theoretical questions have appeared. What kind of new relations have developed between watch brands and consumers? In what
way are the authenticity and the image of the watches controlled? What is the new role of technology in such processes? What kind of knowledge do firms mobilised in order to generate, legitimise and support the symbolic value of their product? What are the new territorial stakes and the new role of the local scale in such processes?

The paper tries in the first part to develop theoretical considerations on knowledge economy and territory in relation to traditional literature about innovation and territorial models. The concept of Territorial Knowledge Dynamics (TKDs) is proposed to explain new economic and territorial stakes.

The second part focuses on the case of the Swiss watch industry. The role of non-technological value added and the rise of new activities related to the traditional watch industry is analysed. As well, the new socio-economic dynamics between the watch industry and the consumer is observed in order to understand the way watch brands construct their image and authenticity through narration and emotional experiences and how integrated the system of production-consumption has become. Particularly, diffusion and legitimisation processes are central for the creation and economic valorisation of image and authenticity. Finally, the role of the local scale in the global economy is reconsidered by proposing a conceptual approach based on multi-location TKDs.

**From technology, innovation and proximity to combinatorial and multi-location territorial knowledge dynamics**

The traditional paradigm based on technological trajectories, territorial innovation models, and cumulative knowledge dynamic

In an industrial approach to economy, Nelson and Winter (1982) distinguish between radical innovations and technological trajectories. Radical innovations (for example organic chemistry) appear as exceptional phenomena. Their origin is exogenous to the system and they open up a new development constituted by the succession of innovations that mobilise the basic technological principles of radical innovation. Innovation therefore takes place along new trajectories that appear intermittently. Each phase leads to refining new techniques or products that are then implemented over a certain period. The dynamics of using and generating knowledge emerge during this trajectory, increasing the division of labour within the industry. Thus, sectors of activity and companies develop that are distinct from one another in terms of their
technologies and products. The knowledge dynamic is mostly cumulative. Geographical proximity favours the cumulative dynamics of using and generating knowledge. These theories, but also those on communication, all – in one way or another – place the emphasis on the fact that rich interaction producing creative learning requires, to a considerable extent, geographical proximity.

To do so, it is necessary to differentiate between two degrees of learning (Planque 1991; Maskell, Bathelt and Malmberg 2006). On the one hand, there are mono-functional (Planque, 1991) or strong focused learning (Maskell, Bathelt and Malmberg 2006), whose objectives are clearly identified from the outset and within which the division of labour among the various participants is clearly established. This rather fine-tuned or targeted mono-functional knowledge dynamic reduces uncertainty or restricts it to calculable risks. The cognitive division of labour is organised and stable. The external effects are in principle known, anticipated and sought after by the organisation (whether a network or via intra-company projects). Such learning can overcome the barriers represented by distance or by the absence of a common past, since the said organisation and convergence of interests makes up for those aspects.

On the other hand, there are multi-functional or diffused focused learning, which apply to several dimensions at once and in which the participants' contributions are not clearly established at the outset. Consequently, this type of knowledge dynamic is characterised by complexity and considerable uncertainty. It can only take place to the extent that assurances regarding relations between the actors exist (trust, commonly respected rules on competition/co-operation, relational capital, common language, etc.) (Grossetti and Godart 2007). Since the cognitive division of labour is not stabilised and the external effects among the partners can take many forms, such learning usually traverse a lengthy socialisation process that is in principle only possible within the framework of physical proximity or at least by means of prior sharing of rich experiences typical of a milieu.

Multi-functional learning requiring proximity, associated with a mono-functional opening to increasingly open markets and technologies that are developed elsewhere, led to widely recognised theories on regional development. Benko and Lipietz (1992) offered, at the time, a panorama of these approaches (industrial districts, science parks, etc.). We should also mention the GRE-MI research programme which, as of 1985, progressively drew up and documented the concept of the innovative milieu (Camagni and Maillat 2006). A
presentation of the history of these Territorial Innovation Models (TIMs) has recently been completed by Moolaert and Sekia (2003). All of them assume that local innovative dynamics permit a region to become part of an increasingly global economic environment.

This relation has always been perceived as a two-way phenomenon. Regions that come under pressure because of the increase in competing producers or technologies are supposed to adapt thanks to a local dynamic of appropriating the new technologies or of organisational change. Inversely, the regions that produce radical innovations locally achieve penetration of a global market and modify the market’s characteristics.

Innovative regions are those that are capable of imagining their local production system within a global environment by means of a development process that is above all endogenous. In other terms, in order to be innovative a region must be capable of matching its dynamics of the use and the generation of knowledge. However, traditional literature on TIMs rather focuses on innovation processes than on knowledge dynamics. It is only with the emergence, towards the end of the 1990s, of theories on learning regions that knowledge was considered as a resource for local innovation (Lundvall 1992; Florida 1995; Maillat and Kebir 1999).

It should be noted that these models once again strongly reflect the idea that industry is the driving activity in innovative regions. Fundamentally, production and innovation take place at the scale of a differentiated region and are sold in an undifferentiated global market (“think globally, act locally”). Moreover, it should be noted that innovation is most frequently technological, and that efforts are made to organise space around this reality (in the form of technopoles).

**Critical recent socio-economical changes**

Some important and critical recent changes have affected the traditional theoretical paradigm presented above. Three of them seem to be crucial in order to build a more complete understanding of new conceptual stakes within our current society.

The first of the changes to the conditions for innovation is that numerous recent technologies, such as information technology or the Internet, have become highly decompartmentalised since they have been brought into – and perfected within – an extremely large number of activities and have also been combined with other technologies. Antonelli (2006) speaks of *fungible*
knowledge that has become increasingly flexible and configurational, i.e. it can be adapted to the needs and ideas that develop in many sectors.

Secondly, the unprecedented increase in the mobility of goods, services, capital but above all of information and the labour force has strongly affected the flow of long-distance exchange. New multimedia technologies, the development transports and political or institutional creations such as the European Union or the World Trade Organization are all leading to a massive increase in information and knowledge exchange and are thus opening up an extraordinary potential for both innovation and competition. This increase in mobility has loosened spatial and temporal constraints, and the issues at stake are of a new kind. The distinction between rich (multi-functional) learning requiring physical proximity and more finite (mono-functional) ones that can take place at distance seems to have become more relative today.

Thirdly, numerous innovations today take place more frequently via socio-cultural dynamics than techno-scientific ones. In fact, changes to society's values and practices are currently responsible for changes to products and services. This phenomenon takes on various forms, and has been the subject of many research projects (Cooke and Lazzeretti 2008). First of all, and on a fairly trivial level, the growth of the cultural industries (media, entertainment sport, tourism and leisure, cinema, video games, etc.) requires above all socio-cultural knowledge. Secondly, the incorporation of cultural and aesthetic aspects, etc. within products is taking on increasing importance within the components thereof. Clothing, watchmaking, and the automobile industry, etc. are examples of traditional industries whose products are evolving more and more according to fashion, aesthetic trends or society's ethics. Finally, we see the significant development of "the experience economy" (Pine and Gilmore, 1999), which consists of creating a high level of added value to a classical good or service by incorporating various types of experience related to the consumer's participation or emotions (branding, events, coaching, etc.).

Thus, the incorporation of knowledge into economic processes no longer takes place in a sporadic manner but one that is systematic and permanent (Ascher, 2001, Foray, 2004). Today, innovation is thus radically different from the traditional model of the industrial society, and in many ways (Colletis-Wahl et al. 2008). Notions of industrial sectors and areas have lost their coherency. Knowledge dynamics are at present articulated in a cross-sectoral manner, around composite entities such as health, communication or tourism (Cooke 2007). Increase in mobility has loosened spatial and temporal con-
straints, and the issues at stake are of a new kind. The distinction between rich (multi-functional) learning requiring physical proximity and more finite (mono-functional) ones that can take place at distance seems to have become more relative today. As well, the renewed importance of the socio-cultural component of products and services thus highlights, to a greater extent than in the past, the value of symbolic knowledge (Cooke, 2007). This trend results in taking learning resulting from relations with consumers into account to a greater extent.

Reflection regarding the new spatial forms that rich learning are taking on clearly shows the justification for taking territory into account within the analysis of current economic phenomena. A genuine research programme on territorial economies consists of exploring these new forms and understanding how they influence economic processes. The broader territorial paradigm that we propose sees knowledge as a cognitive process that is shared among humans and that is generated and used within social interaction, in various contexts. The paradigm attempts to go beyond the traditional one of innovation and proximity with a view to developing an approach constructed around the concept of Territorial Knowledge Dynamics (TKDs).

Non technological innovations, combinatorial and multi-located knowledge Dynamics

At present, the economic actors have easier access to extremely numerous areas of knowledge that are spatially dispersed. Their problem is one of identifying and mobilising these resources within a coherent business model. Cooke et al. (EURODITE, 2006) highlight the combination of analytical (science-based) knowledge, synthetic (engineering) knowledge and symbolic (branding, design, advertising) knowledge, which all complete one another within industrial processes. Technological knowledge has thus simply become one of the types of knowledge that are combined within economic production. Nowadays, non technological innovations (NTI) are as important as traditional technical innovation. As well, by moving to more cultural resource and NTI, the role of consumer has increased a lot. Production and consumption systems are partially integrated from now on.

If we base our hypothesis on the idea that today, numerous possibilities for learning and innovation via the combination of knowledge exist at various external locations, the central question is that of the modalities by which this knowledge can be mobilised. Within composite logic, making use of
knowledge takes place by ad hoc use, strongly conditioned by knowledge that has already been generated upstream. The project becomes increasingly structuring. In other words, it is to a lesser extent the enterprise, the sector or the technology that shapes the economic processes and to a greater one the ad hoc combination thereof around a production / consumption system with a fairly short lifespan. Today, it is no longer simply a question of accumulating knowledge along a trajectory but to an increasing extent of articulating it with knowledge from the exterior.

For Doz, Santos and Williamson (2001), it is today necessary to go beyond traditional theories of the spatial division of labour resulting from low-cost production strategies and to develop new concepts based on the capacity to draw up strategies or projects in a meta-national knowledge network. It is no longer sufficient for an enterprise to establish a good global production or distribution network. The most competitive enterprises are today those that take the most rapid decisions regarding how they will act globally and that combine various types of knowledge that exist elsewhere. It is no longer a question of simply going out to find the appropriate competencies where they are the least expensive, but one of imagining new projects based on competencies that are currently accessible. The availability of competencies precedes and drives innovation. The development of new, Knowledge Intensive Business Services (KIBS) should be placed in relation to this new state of affairs (Strambach 2001; Simmie and Strambach 2006).

Furthermore, in this new conceptual paradigm, the traditional articulation between the local and the global scale has to be reconsidered. Generation and use of knowledge are now dynamics that take place at different scales and between different places, neither within a single region nor within an undifferentiated global environment. This is the case for technological dynamics either within a same sector (for e.g. rich interaction between Toulouse and Hamburg for aircraft engineering) or between different sectors (for e.g. interaction between local Japanese capabilities for miniaturisation and a Finnish firm focused on mobile telephony competencies).

But this phenomenon also appears for non technological knowledge dynamics at two levels. First, at the level of the production system, some territories for fashion or lifestyle in Paris or Milan have become non-technological knowledge producers. They combine, for instance, with the Swiss watch industry in order to innovate in the field of luxury. Second, as non technological knowledge dynamics are more often connected to consumption contexts,
multi-location dynamics develop within production-consumption system. It is for example the case of the interactions between specific people magazine conceptualised and embedded in the local consumption culture of Singapore and the Swiss watch industry. These two later examples related to watch industry are more detailed in the second part of the paper.

In this proposed paradigm based on combinatorial and multi-location TKDs the role regions is changing and it is especially the case for cities. On the one hand, work on creative cities (Landry 2000; Cooke, Lazzeretti et al. 2008) reveals that certain cities are becoming central in the process of cultural and non technological knowledge generation. Those such as Paris, London or New York have long been aware of and used this phenomenon. Today, however, traditionally industrial cities such as, Bilbao, Barcelona and Hamburg are making use of cultural dynamism in order to retain their positioning. Industrial cities that have not been capable of carrying out a conversion in the direction of more symbolic knowledge dynamics have in many cases lost some of their importance over recent years. On the other hand, cities have developed a strong capacity to combine and use long-distance knowledge. As Gaschet and Lacour (2007) have observed, cities have become “clusties” since they are no longer just a specific knowledge system (a "cluster in the city") but are also becoming a central element within wider territorial dynamics by means of activities that permit the anchoring of mobile knowledge (a "cluster by the city"). Here, for example, knowledge-intensive business services play an overriding role (Simmie and Strambach 2006).

In the second part of this article, the conceptual new paradigm described above is approached through the case of the Swiss watch industry and its recent development. Possible new stakes are observed in the field of non technological innovation, knowledge economy and territorial economy.

The case of the swiss watch industry

The case of the Swiss watch industry, principally in the Jura Arc, gives a good example of this evolution. Till the middle of the seventies, the Jura Arc was competitive on the global watch market through its technical know-how implemented by geographical proximity learning. After that time, the development of new technologies such as quartz watches changed the whole production system of the watch industry. In order to remain competitive, the Swiss manufacturers developed a new business strategy using culture as new re-
source for innovation. First with design and later with branding in general, the Swiss watch industry have developed desirable product and narrations where high-technology has become the material base. To do so, the importance of non-technological activities has increased within the traditional watchmaking firms as well as out of them. New places have also gained in importance in that complex production-consumption system.

**The traditional watch production system**

Till the 1970s the Swiss watch industry present many characteristics of the traditional paradigm described previously. Through specific and localised technical competencies, the Swiss watch manufactories in the Jura Arc and in the city of Geneva are leaders on the international watch market. This development is driven by cumulative knowledge dynamics (empirical improvement of the production system). Innovation processes mostly take place within the region which concentrates a large range of small suppliers and sub-contractors as well as high-level technical schools. This proximity of actors facilitates multi-functional learning which enables the adaptation or the development of new products (for e.g. the first mechanical wristwatch, the first quartz wristwatch) and competitive industrial processes of increase productivity and standardisation.

Over that time, the international demand for watches is higher than the global offer. The Swiss watch industry is leader on the market but loosing leadership. Watch manufacturers mainly develop strategies of industrial production and focus their advertisement on the product (Künzi, 2007). Non technological innovations are low and the production (at the local scale) and consumption (at the global scale) processes remain strongly autonomous.

With the fast drop of production costs of the quartz technology in the 1970s and with the appearance of the international competition, the traditional Swiss manufactures fall into a crisis. Between 1970 and 1984, the number of employees within the sector falls from about 90’000 to about 30’000 and the number of enterprises from about 1’600 to about 600 (Federation of the Swiss Watch Industry FH, 1997-2008). To get out of this crisis, the Swiss watch industry starts two fundamental changes (Crevoisier, 1995). On the one hand, a strong valorisation of non technological innovations such as design, jewellery decoration or fashion is developed in order to place the Swiss watches in a growing socio-economical trend to move closer to the socio-distinction of consumers. On the other, concentration of activities within larger firms,
standardisation and developments of productivity applied to electronic modules drive to a drop of production costs. The role of technology changes and Territorial Knowledge Dynamics become more complex.

**Non technological innovation, customisation and combinatorial knowledge dynamics**

Over the 1980s, in order to be competitive on the international market, the production of watch modules has been mostly standardised by the concentration of production activities within larger companies on the one hand. On the other, watchmaking firms differentiate their product through design and fashion components. Progressively, Swiss watchmaking companies focus their strategy of differentiation on the creation of emotion related to the brand and the visible part of the watch (the most famous example is the *Swatch* watch). New actors such as foreign firms specialised for luxury and fashion (Cartier, Bulgari) implement in the Jura Arc and start to produce watches. Furthermore, communication strategies and products become more oriented towards social distinction of consumers (sport, business, popular, …).

This situation stabilises till the late 1990s but meets a new development in the 2000s with the growth of the luxury sector (Figure 1).

![Figure 1: Evolution of knowledge dynamics and market strategies in the Swiss watch making sector](image)

**Source:** Jeannerat and Crevoisier 2008
According to the theory of the technological trajectories (Nelson and Winter, 1982) the traditional mechanical watches should have disappeared after having been replaced by a more competitive technology, in our case the quartz technology. However, the Swiss mechanical watch production has constantly increased since the late 1990s. The global value of their exportation has trebled over the ten last years and run over the global exportation value of electronic watches since 2001 (Federation of the Swiss Watch Industry FH, 1997-2008). Differentiation is still built through design but with the need of luxury, the emotional components of the product have increased. As well, the consumers are more and more personally integrated within this creation process. Unlike the traditional advertising strategy mainly based on the product, Swiss watchmaking firms have established a coherent production system of image, emotion, authenticity and experience related to their brands. Künzi (2007) speaks of the creation of idealised universes. Swiss watch industry is no more constituted by watch production companies but by brands in competition. This phenomenon can be regarded as a whole non-technological innovation system because technology isn’t the central driving force any longer. It is adapted following the need of the idealised universe created by the brand (for e.g. a watch made of a new material especially designed for the America’s Cup event). As well, knowledge dynamics are not only articulated in a cumulative way but rather combine with diversified knowledge. Knowledge interactions have developed out of the traditional watchmaking activities towards complementary activities such as Medias, events, tourism, film production, architecture, interior design, etc. The constitution of institutions by watch manufacturer (Rolex Institute and first of all The Fondation de la Haute Horlogerie) which are responsible for organising events, promoting watchmaking history or culture in general is a good example of this situation. Combinatorial knowledge dynamics take place within watchmaking firms as well as out of them (Figure 2).
More and more firms take on people from human sciences or art universities for event organisation, communication, museum or exhibition creation or design. As well, brand head quarters are now more and more artistic building designed by famous international architects (Le Corbusier’s Turkish Villa or the site of Plan-les-Ouates where many traditional watch Manufactures have built sophisticated and artistic buildings) and stages where clients can experience the traditional fabrication of watches (possibility to see watchmakers at work) and the history of the firm (museum of the manufacture’s history). However, the most relevant development is characterised by the creation or reinforcement of activities which were not traditionally connected to the watch industry sector. Some film production companies dedicate part of their work especially to promotion of watch brands. As well Web-TV, auction enterprises, exhibition and creation companies as well as communication and multi-media firms specialised in the field of watches have appeared. We can also observe some strategic cooperation between Media activities, events organisation and tourism which valorise each other.

In the present watchmaking system, new economic opportunities exist for non watchmaking activities. As well, interdependency of new-media, media, fashion and event in the development of emotion and experience are very
strong. A good example of this phenomenon is the creation by an important Swiss press group (Edipresse Group) of a special entity (Edipresse Luxes) specialised in watches and luxury. This enterprise brings together different knowledge and territories (Swiss watch magazines, fashion magazine from Paris, watch-lifestyle magazine from Singapore but also an international centre for watch documentation, a specialised website for actuality in the watch world and a famous award for watches implemented in Geneva).

The evolution of the World Watch and Jewellery Show Baselworld also shows the transformation towards a symbolic valorisation of watches. Exhibition halls are no longer simple show rooms but stages where clients get into emotional experiences and fantasy worlds (the name of the halls explicit this idea: hall of emotion, hall of experience, hall of dreams, etc.). As well, more than connecting producers and clients/consumers, the event brings together media (special day and special place only for journalists) and multi-media (live video-diffusion of auctions happening at the same time in Geneva).

Although sell of part of magazines or entry tickets at Baselworld provide a partial financial income for complementary activities, this complex system of socio-economic exploitation and creation of non-technological-based value added is economically dependent of the watch industry (sponsoring, advertising, sub-contracts or mandates). The global business model remains mainly centred on one monetary income: watch selling. Swiss watch manufactures in competition with each other on the international market remain the point where the cores of business strategies articulate and they strongly seek to control the whole system. However, complementary knowledge and activities have become crucial for the co-creation, stabilisation, diffusion, and legitimating of the emotional universes sold by brands. Interdependencies are strong and territorial relations have changed.

**The production-consumption system: the need of diffusion and legitimating of the brand**

In a traditional paradigm of industrial and technological product selling, distribution channels and quality certification are keys of competitiveness on the global market. It was the case of the watch industry before the 1980s. Watch-making enterprises were concentrating on controlling the technical quality of the industrial chain. Outside the firm, general trading agents or independent shops were selling watches from different brands without really distinguishing the different brands from each other. As well, from the late 19th century, au-
tonomous laboratories were established in Switzerland in order to control punctuality and technical quality of watches. Since 1973, the COSC (in French, Contrôle Officiel Suisse des Chronomètres) – a non-profit association created by public authorities (several cantons where watch industry is important) with the Federation of the Swiss Watch Industry – has encompassed these traditional institutions. As well the FH was in charge of the promotion of the Swiss watch image.

With the development of strategies of differentiation through the valorisation of emotions and authenticity, the production system of watchmaking has changed. However, while technological quality can easily be certificated through functional characteristic (punctuality, water proof, etc.), non-technological value – as it is the case here for watches – branding needs more complex processes of authentification. More generally, the new territorial relations for the watch industry are defined by a complication of the production system of authenticity and experience as well as by a deep integration of the production and consumption systems.

With commercialisation of non-technological-based value added and with customisation of personal emotions and experiences, Swiss watchmaking firms need a more complex system of distribution and certification as well as a control on the whole production-consumption system of emotion and experiences that they sell.

Firstly, watch brands don’t only need to distribute their watches anymore. They need to diffuse the emotion or authenticity which is an integrated part of their product. Internally, many of them have developed mono-brands shops in most central cities in the world or have specific local managers or subsidiaries which are responsible for a right diffusion of the brand emotions. Also, websites of enterprises have become multi-media show where diffusion of emotions is more important than real and practical information about the watchmaking company. Outside the firms complementary activities diffuse and co-produce these emotions. Remaining multi-brands shops have to developed new marketing strategies (e.g. “The highest watch shop” on the top of the Matterhorn mountain), magazines have developed special magazine diffusing fashion, lifestyle, etc in relation with watches, film producers or web-television create documentation or movies to be diffused all around the world, etc. But still, watchmaking firms have a strong power on these complementary activities because the former provides the main financial income of the latter.

It is crucial for firms that no incoherent voice distracts the emotion they have
developed. Although such activities have strengthened, watchmaking firms are staying in the centre of the system and try control it. Secondly, certification of the technical quality of watches isn’t enough, watch brands also need an external *legitimation* of the emotion they produce. In this field, as it already was the case with the COSC, independence of *legitimising third parties* is crucial. Independent journalists are supposed to provide a neutral voice about the coherence of the brand and the quality of product. Auctions enterprises are meant to select and propose worth-selling watches and award events such as the Geneva Watchmaking Grand Prix are not supposed to be sponsored by watchmaking companies (as it is the case for the watch award of Geneva). However, this independence isn’t perfect and companies can partly influence it by selecting the journalists who are allowed to take part at an event, by buying their own watches at an auction or by mandating the film producers they want to deal with. Nevertheless, independence has to be respected, at least formally because customers are disposed to pay for emotions but are hard to please. They need an external legitimation of what they buy.

Because non-technological value added in the Swiss watch industry require a more complex construction of quality, the traditional manufactures as well as the complementary activities described above innovate together by combining knowledge including more and more the consumer’s aspirations. As they combine, territorial knowledge dynamics are affected and local socio-economical stakes are changing.

**Territorial and institutional consideration**

The development of non-technological innovations in the Swiss watch industry has raised the need of combinatorial knowledge dynamics on a more differentiated market. In this context, territorial relations have also evolved through the need of production of authenticity, co-production of image and diffusion (Figure 3).
While watch fabrication competences remain strongly embedded in the traditional Swiss watchmaking region, this tradition has become a resource for the authenticity of the image production. The “Swiss Made”, COSC, or “Poinçon de Genève” labels do not only certificate technical quality of watches but also legitimise the image of the regional tradition and know-how for watchmaking. As well, other institutions such as watchmaking museums or tourism promotion institutions have been created to combine the regional industrial culture with the knowledge of tourism promotion. La Chaux-de-Fonds and Le Locle, two historical cities of watch production, are preparing an application to become World Heritage of the UNESCO. However, most of the time, the image produced is not stabilised by a common strategy or common understanding of the regional resources (no common territorial marketing strategy). It mostly emerges from the image produced by each watchmaking firm in competition the other ones.

Some TKDs related to image co-production have also developed with other areas. As regional or neighbour metropolitan areas concentrate more services in the field of media, communication, arts, events, etc. and are symbolic knowledge generators, their importance for combinatorial knowledge dynamics has grown and the traditional region tends to broaden. The Lausanne metropolitan area except its polytechnic University was traditionally not part of the watchmaking region. Now, this area becomes more and more important
for providing new services such as marketing and communication or media and multi-media production for the watch industry. More distantly, many communication and advertising campaigns are elaborated by offices situated in London.

Furthermore, cities like Paris or Milano are in the same time territories of image co-production (communication, art, design, marketing services) and territories driving complementary authenticity (historical tradition for fashion, luxury, jewellery, etc.).

It is possible to observe a third type of territorial relation. Some places are actually diffusion spaces where the Swiss watch manufactures sell their product through image adapted to the local market culture. For instance, a place like Tokyo is a platform where shows, shops or exhibitions are organised and where the emotion created around the product diffuse locally. Some other places are territories of diffusion as well as image co-producers. It has always punctually been the case of the city of Basle which is not directly involved in watch production but becomes once a year the international centre of the watch industry through its World Watch and Jewellery Show. More continuously, it the case of Singapore which diffuses the image of Swiss watches to the local culture but co-produce complementary image by producing new kinds of lifestyle Medias dedicated to watches. It also appears that places become in the same time territories of diffusion and of authenticity. For instance, the city of Valencia during the international sailing competition of the America’s Cup becomes the place where a watch brand sponsoring a boat uses the local sea culture in order to promote the authenticity of its watch especially produced for this event.

Finally, it is interesting to observe that the city of Geneva has continuously been an international promotion portal for the whole Swiss watch industry with traditional cumulative knowledge dynamics (implementation of watch manufactures) and combinatorial knowledge dynamics (events, tourism, press, etc.). But, the position of this city in the TKDs of authenticity production, image co-production and diffusion is strengthening. Punctually (through events) or continuously (through services, museums or marketing schools for luxury) Geneva can be seen as the place where knowledge dynamics combine, circulate and anchor within the region very strongly.

The traditional articulation between the regional production system and the global market seems to lose pertinence. On the one hand, multi-location knowledge dynamics are increasingly complex on the value chain of image
production (need of co-production of image).

On the other, authenticity and image produced have to implement within differentiated spaces of consumption and be diffused in a standardised as well as in a differentiated way. The new stake for the early Swiss watchmaking region is to remain within these multi-location TKDs by developing continuously new combinatorial knowledge dynamics.

A synthesis of the considerations which where developed all over the points made above are presented in Figure 4:

**Figure 4: From innovation and proximity to Territorial Knowledge Dynamics**

<table>
<thead>
<tr>
<th>Unit of analysis</th>
<th>Innovation and proximity</th>
<th>Territorial Knowledge Dynamics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilisation</td>
<td>Punctual / Discontinuous</td>
<td>Generalised / Continuous</td>
</tr>
<tr>
<td>Knowledge articulation</td>
<td>Cumulative and technological trajectories (mono-sectoral)</td>
<td>Combinatorial dynamics of technology and non-technology (multi-sectoral)</td>
</tr>
<tr>
<td>Market interdependences</td>
<td>Specialised production systems in the global market</td>
<td>Complex production-consumption systems</td>
</tr>
<tr>
<td>Territorial dimension</td>
<td>Spatial division of activities/labour</td>
<td>Multi-location knowledge dynamics</td>
</tr>
</tbody>
</table>

*Source: Jeannerat and Crevoisier 2008*

**Conclusions**

The case of the Swiss watch industry shows new socio-economical stakes in relation with the development of non-technological innovation and with the growth of mobility and accessibility of knowledge.

For Swiss watchmaking enterprises - but also for all the subsidiary or complementary activities in the traditional region of watch production - non-technological innovations have become crucial in order to remain competitive in the global economy. Capacity to produce emotions or authenticity directly connected to the product permits to the traditional watch industry to different-
iate and to create an important value added on the extra-regional markets. Furthermore, such kind of innovations in non-technological fields depend strongly on the ability to combine other activities in the Media, events organisation, auctions, tourism, museology, show production and even architecture. Thus, traditional technological and cumulative knowledge dynamics anchor with combinatorial knowledge dynamics. The role of Technology development (technical/functionality improvement of watches) has changed. In the Swiss watch industry, technology is no longer the driving force of innovation but it is the adaptation or the consequence of non-technological changes. Its adequate matching with non-technological innovations is crucial in order to sell a coherent symbolic and synthetic product.

However, the sell of products whose a great value added is not based on technology provides a need of complex diffusion and legitimation on the market. Control of technical quality by watchmaking companies is no longer enough. Brands have developed control strategies all along the authenticity and image production chain. Because watches represent the largest monetary income into the system, all complementary activities in non-technological fields coordinate in the same business model. The autonomy of legitimising third parties is very important because watch is no longer a functional object anymore and its symbolic value added needs to be authenticated.

New territorial consideration can also be formulated. On the one hand, even though the technical nature of watches is produced through mostly regional and cumulative knowledge dynamics, their non-technological component based on symbolic knowledge dynamics are highly combinatorial and multi-located. Image, authenticity and emotional value added are generated and co-produced between the traditional watchmaking territory and creative cities (Paris, Milano, Singapore, etc.). The cultural role of cities is also important to bridge both production and consumption systems and to diffuse (anchor locally) the image and authenticity created elsewhere. Moreover the role of Geneva in the production of watches and authenticity, legitimation and diffusion is strong. This could be seen as a “clusty” function for the whole traditional watchmaking region by making knowledge circulate from and to different territories and anchor locally.

New economical stakes in a knowledge-based economy and non-technological knowledge dynamics have to be studied if one wants to understand the success of such a sector as the Swiss watch industry. The region is not only the place where technical competences cumulate but also the place where an im-
age can be created and multi-location knowledge dynamics combine, circulate and anchor. In that perspective, policy on multi-sectoral project development and institutional promotion of regional images are bound to play an increasing role. Also, non-technological transfers from more art or socio-cultural training to industry can be considered as important as traditional technological transfers’ policies. It seems that it is by interacting multi-locally, by matching technological and non-technological innovations, by projecting and anchoring combinatorial knowledge dynamics that territories will be able to perform globally.

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Editors, Authors, and Abstracts

Preface

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Introduction: Towards a Theory of Robust Innovation

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Keywords: Non-economic innovations, robust innovation, innovation theory, non-economic markets, economic sociology, systems theory.

Abstract: In accordance with a developing alternative mainstream in innovation research, the contributions to the present book stress immense impact of non-technological and non-economic innovations on economic performance. Unfortunately, current discourses on non-technological innovations, non-economic, or social innovations effect rather logical dead ends or case study based detours, than consistent pathways towards competitive indicators and strategies of innovation beyond the “technology goes economic market” paradigm.

Against this background, this introduction develops a three-dimensional model of innovation distinguishing between an object dimension, a time dimension, and a social dimension of innovation. This “innovation triangle” of both universal and distinctive categories helps to analyze, to compare, and to coordinate most diverse approaches to innovation.

The model will be applied to the contributions of the present book that it serves as an editorial structure. Accordingly, the individual contributions represent interest-specific access points to the innovation continuum and, thus, for the development of problem-adequate concepts and indicators of non-technological and non-economic innovation.

Then, with special regard to the social dimension of innovation, we refer to evidence for the existence of non-economic markets. Based on that, we adapt the concept of socially robust knowledge: we argue that innovations that succeed on more than one market are more robust innovations. Thus, robust innovations can be defined as objects, processes, and advantages that realize (further) advantages in more than just one
market of society. To this effect, these multi-impact innovations can be assumed to be both more profitable and more sustainable than single-market innovations.

Economy and Technology: About the Hard Core of Innovation and Its Future Change

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Keywords: next society, theory of social systems, innovation, economy, technology

Abstract: The term ‘innovation’ shows both a long commonsensical and a scientifically stamped history. The result of this history is the tight linkage of innovation with technological and economic advance. If we switch from innovation as a cause for prosperity and welfare to factors, that have an impact on innovation, we can identify two ‘well-known’ main frameworks: technology and economy. This focus on only two rationalities seems to be questionable at least; especially when a modern society shows much more variety on the level of its social systems (Luhmann 1998: 185). In addition to that theoretical standpoint the described hard core of innovation seems to evolve in accordance to the shift of modern society to a so called next society (Drucker 2002) in which non technological and non economic communications could have a more visible impact on variation, selection and stabilization of innovation.

A typology of innovations in retail-banking

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Keywords: innovation, service, banking sector

Abstract: Since the beginning of the 1990’s, the topic of innovation management is more and more present in the strategic speeches of companies. However, researchers focus their attention mainly on technological innovations in the industrial sector and abandon the service sector, which is, nevertheless, the first in terms of capacity to innovate (OCDE, 2000). However, services are very heterogeneous, so we suggest focusing on one case: retail banking, which is little studied (Jansen, 2005). We aim to propose a typology of innovations in retail banking and to clarify the concept and its implications for banks. We propose, through the study of the main French banking group (The Crédit Agricole), to investigate the various facets of innovation in this sector. So we aim to: a) Capture the specificities of innovation in the retail banking sector, b) Propose a typology of the various forms of innovation developed in this sector, and c) discuss future ways of research. The analysis of the innovation practices within The Crédit Agricole highlights three main contributions. First, banks do not only innovate in an incremental way. Second, while the literature often focused on technology as the only source of innovation (Ding, Verma and Iqbal, on 2007), sources are in fact multiple: regulatory relief, new customers’ needs, and competitors’ innovations. Third, innovation in the retail-banking sector often takes the shape of process innovation, which is hardly patentable and can be easily copied, contrary to innovation in products. This characteristic makes the innovation hardly visible to customers and competitors, but allows banks to obtain a durable competitive advantage. The analysis of the innovation practices within The Crédit Agricole puts notably in evidence three main contributions. First, banks do not only innovate in an incremental way. Secondly, while literature often focused on technology as the only source of innovation (Ding, Verma and Iqbal 2007), sources are in fact multiple: regulatory relief, new customers’ needs, competitors’ innovations. Thirdly, innovation in banking sector often takes the shape of process innovation which, contrary to numerous products innovations (hardly patentable in banking sector and so easily copiable), are certainly hardly (even not) visible by the customers (and the competitors), but on the other hand allow banks to obtain a durable competitive advantage.

The Role of Non Technological Innovations in the growth of Engineering Industry, Economy and Society of Rajkot (India)

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Keywords: non technological innovations, small and medium enterprises, engineering industry of Rajkot

Abstract: The engineering industry of Rajkot truly represents towering ambition of India’s economic might. The industry is spread across 20 miles’ industrial belt, home to more than 3000 Small and Medium Enterprises (SMEs); employing 100,000 people and generating annual turnover of Indian Rupees 3000 Crore. (Source: UNIDO 2004) The engineering industry of Rajkot is divided in sub process clusters like forging, casting, machining, machine manufacturing and turning. The industry has survived and strived with strong focus on product, process and technology innovation (Vachhrajani Hardik, 2007). There have been various researches on the product and technology innovation capabilities of the engineering industry of Rajkot. If we really go beyond the apparent loudening of the product and technology innovation; the engineering industry of Rajkot has very successfully used non technical innovations to move up the value chain. These
innovations have fostered organization’s technical as well as product capabilities and have gone beyond the organizational boundaries to impact the cluster and economy of the city at large. These innovations are less researched but have significant impact on the growth trajectory of the organization and beyond. The qualitative research tries to identify the role of non technical innovations on the growth of engineering industry of Rajkot using grounded theory approach. The researcher studies top ten innovative organizations from the engineering industry and attempts to probe into unexplored aspects of non technical innovations and the role which they have played in the growth of the organization. In the later part of the research; the researcher uses focused group discussion among key industrialists, economists and social scientists of the city to find out the impact of the non technical innovations on the economy and society of the city.

Social Science Production or Social Innovation by Social Production of Science?

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Keywords: social research, social innovation, innovative research design, research and consultancy

Abstract: At the beginning of the 21st century and the emerging knowledge society social science seems to run into a very difficult situation. On the one hand, there is a growing demand for social knowledge in the different spheres of society. On the other hand, social science itself is undergoing a deep crisis. The traditional academic ways of knowledge production and dissemination do no longer work in a satisfactory way. As a result a deep irritation about the efficiency and social importance of social science can be stated. Therefore, new modes of producing social science characterised by a more social process of science production are becoming the two faces of an increasingly relevant type of professional scientific work of social scientists. “Mode 2” has been a label tagged to this newly emerging type of knowledge production by Gibbons, Nowotny et al. mostly referring to natural or engineering sciences. The author shows that “social science production” is a specific type of social knowledge production by social intervention based on a growing set of methods and tools. Their common denominator is the propelling of the self-reflection capacities of social actors, thus, enhancing the democratic potential of civil society. The paper provides a self-reflective discussion of new modes of innovation in the field of organisational development and networking. It includes a brief case study showing how sfs (Sozialforschungsstelle Dortmund), a German public research institute now forming part of the Dortmund University of Technology, has been developing functional characteristics of effectiveness and efficiency of a company by working with private companies and numerous public institutions, eventually understanding itself as a competence network in a network of networks.

Organizational and Managerial Innovations in Large Companies and Their Impact on Technological Innovations and Innovation Strategies

Nikolay Trofimov, M.A.
**Abstract:** Today researchers stand in front of the growing evidence that innovation process is determined by complex interactions between science, society and industry. While a lot has been done to shed light on such interactions, still many dynamical aspects of such interactions remain obscure. For example, it is not clear whether the non-technological innovations (NTI) are only a function of technological advances and technological innovations (TI) and to what extent technological advances imply the direction of further scientific and technological progress by facilitating the introduction of NTI in governments, enterprises and society. It is supposed that the relation and the interdependency of NTI and TI have to be one of the starting points in the discussion on NTI, if we want to have a clear vision on the role of NTI phenomena as a whole. The focuses of our analysis of NTI are organizational and managerial innovations (OMI), which can take form either of rather slow and predictable adaptive changes, either of radical innovations. A methodological distinction between adaptive and radical aspects of OMI is proposed. Radical innovations are described in terms of a deliberate and pro-active action having influence upon enterprise value creation, networking and knowledge acquisition strategies on the long term. The reflection of OMI on corporate strategy and decision-making process is considered on the basis of the results of a preliminary case study, involving 120 Russian companies.

**Keywords:** Innovation, Management, Triple Helix, Organizational Innovations, Marketing Innovations.

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**Social Innovation in Private Companies: an Exploratory Empirical Study**

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**Keywords:** social innovation, private companies

**Abstract:** A recent study at the Centre of Social Innovation in Vienna allowed me to investigate forms of Social Innovation (SI) in private companies. The study followed a rather classic research design and included a theoretical discussion of the concept of social innovation, a presentation of companies and their projects and an additional comparative analysis based on qualitative research methods. After discussing the general definition of SI as well as its application to private companies this paper will present the typology of company and project characteristics, which resulted from the comparative analysis as well as examples of investigated projects. The theoretical considerations are guided by the proposition that the concept of SI has to be linked closely to fields of practical application to gain a specific meaning. This also means that SI has to be distinguished from more general forms of “social change”. Our theoretical strategy was to point out several characteristics shared by social and technical innovations: Intention, institutional
context, responsible actors, etc. This helped us to go beyond formal definitions and to apply the term Social Innovation to projects in private companies, which usually don't have large effects on social change and are better understood when compared to incremental technological innovations. Rather than establishing a clear distinction between non-economic (non-technical) and economic innovations our research explored projects in which both aspects are combined.

Rationalities of Innovation

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Keywords: Social Systems Theory, Innovation Functions, Social Transformation

Innovations fascinate us. They work with suggestions and simplifications. They often appear to be something they are not, due to the fact that they bring us very close to the action and things going on around us. At the same time though, innovations are characterized by the fact that we cannot look inside of them. Thus, distance and space are decisive for being able to actually understand how novelty turns into innovation. The first step therefore, refrains from simplifications and looks at social systems as the “place” of innovation instead of the objects themselves. It can then be questioned how discontinuities in social systems can be continued and under what conditions innovations arise. In addition to this basic theoretical decision, it will be established that innovations are influenced by long-term, historical factors and social processes of transformation. Consequently, their operation is dependent on macro-social conditions that should be made aware. Accordingly, the second step identifies the accompanying patterns of rationality with long-term and current processes of transformation. At the same time though, innovation is also dependent on micro-social conditions. Here a change of social support structures is observed, away from the lonely inventor toward a complex network of structures. Hence, the last part of this article deals with the consequences for innovation functions that are related to these new structures.

Integrating innovation and foresight research activities: Key models and challenges in non-technical and non-economic innovation actions

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Keywords: Innovation Foresight, Open Innovation, Social Innovation, Radical Innovation.

Abstract: Innovation, creativity and design are among the most frequently used words in business and society today. In most situation innovation studies are focusing on markets and technical road-mapping of future innovations. Less attention is paid on non-economic and non-technical innovations. Contrary to common trends, this article is focusing on non-technical and non-economic innovations. Furthermore, in this article we discuss about key models of non-economic and non-technical innovation. This paper is not fully comprehensive survey, but just focused on 4 important models of modern innovation studies, which should be a part of research agenda in the field of innovation research of non-technical and non-economic innovations. In this paper my aim to add to traditional innovation models non-economic element. In this way I try to build up new theory of NMI.

Innovation Indicators for Scientific and Technical Higher Education

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Keywords: education, innovation indicators, correlation analysis

Abstract: Innovation in education is difficult to be captured, since the educational process is an intimate one, involving primarily subjective factors. We report correlation analysis results build on survey containing a list of indicators to appreciate the innovation in the Scientific and Technical higher education. The proposed study was conceived to support the design and development of effective and accessible technology enabled learning environment, able to attract and retain students in Scientific and Technical profiles at Ovidius University. The indicators panelled can be regarded as means to capture qualitative and quantitative aspects of the innovation in Scientific and Technical education. We were able to identify whether the are correlations between success factors as the level of satisfaction of enrolled students, the ability to comply with the new social content, the ability to access and attract prospective students and impacts of innovation (increasing visibility of the institution, met the labour market requirements for the graduates, met the regulatory requirements at
From proximity to multi-location Territorial Knowledge Dynamics: The case of the Swiss watch industry

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Keywords: Dynamics of innovation, Territorial Innovation Models, Territorial Knowledge Dynamics, Watch Industry

Abstract: Over the last decades, territorial approaches have played an important role in the economy of innovation. They have given rise to a vast array of literature on conceptual models such as innovative milieus, technopoles, industrial districts, or more generally clusters. On the one hand, these models have been able to explain the role of technology and “diffuse focused” learning within geographical proximity as innovation drivers. On the other, they presented the evolution of local production systems as a specialization process in the global economy.

New theories on the knowledge economy remark that in new innovation processes, knowledge is mobilised more systematically, more permanently and at longer distance. Furthermore, works on cultural resources, cultural clusters or creative cities, for instance, have shown that numerous innovations today take place more frequently via socio-cultural dynamics than techno-scientific ones. Production-consumption systems have changed and the traditional regional networks have scattered within space.

The case of the Swiss watch industry, principally in the Jura Arc, gives a good example of this evolution. In order to remain competitive, the Swiss manufacturers have developed a new business strategy using the culture as new resource for innovation. From that time on, watch brands sell authenticity where the high-technical watch has become the material base.

Trough the case of the Swiss watch industry, the article proposes a new conceptual framework giving importance to knowledge dynamics between production and consumption systems, between technological and non-technical as well as their territorial consequences.