# Non-technological and non-economic innovations: contributions to a theory of robust innovation

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## Contributions to a theory of robust innovation

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*Steffen Roth*

# PREFACE

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 even the market entry or the social diffusion of these *innovations*, are called "innovations." Moreover, it is common simply to use the notion as a general metaphor for a 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 gave rise to the central questions discussed at the Second International Conference on Indicators and Concepts of Innovation on "Non-Technological and Non-Economic Innovations" hosted by the Competence Center for Management at Berne School of Business and Administration 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?

This volume consists of selected answers to these questions, which are now presented without the technical flaws that apparently could not have been avoided by the Peter Lang Publishing Group, Bern, which had been responsible for the copy-editing and the release of the first edition. Five years after, the volume still testifies the curiosity of the contributing

researchers who, regardless of their cultural background or level of experience, had both the courage and the inspiration to conceptualize innovation beyond the borders of the current mainstream. It also owes a lot to all the speakers and guests at our conference, who made invaluable contributions to these two days in an atmosphere that was both surprisingly relaxed and stimulating. 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 supportive member of the ICICI 2008 conference board.

The same applies to all the board members: to Dr. Jari Kaivo-oja (Turku School of Economics), Dr. Sayed Mahdi Golestan Hashemi (Iran Research Centre for Creatology, Innovation and TRIZ), Dr. Jens Aderhold (Martin-Luther-University Halle-Wittenberg), Dipl.-Kffr. Judith Terstriep (IAT Gelsenkirchen), Juha Miettinen (Ubiquitous Computing Cluster Program Tampere), and to Prof. Dr. Ralf Wetzel (Berne School of Business and Administration), to whom I owed an incomparable degree of trust, support, and autonomy.

*The success of the conference was also due to the generous support of the SCOPES program of the Swiss National Science Foundation (SNF)*

*Steffen Roth*

# INTRODUCTION: TOWARDS A THEORY OF ROBUST INNOVATION

## Introduction

There is no denying a certain technological bias in innovation research (cf. Rennings 2000; Kaudela-Baum *et al.* 2008). Furthermore, but less strikingly, there is a bias towards economics in innovation research as well. Combining both biases gives a picture of the "hard core of innovation"[1]: *bringing technology to the economic market*.

Beyond this hard core, an alternative mainstream is about to establish itself. This trend is indicated by the increasing popularity of the labels of non-technological innovation (NTI) and social innovation (SI). At first glance, these two concepts seem to be the missing links to the whole picture of innovation yet, on closer inspection, we still have problems with them. In line with the OECD STI Scoreboard (OECD 2007: Chapter D8), most concepts of NTI focus on organizational innovations in economic entities as well as on marketing innovations. *The concept of NTI is thus still biased towards economics*.

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. Simms 2006; Pot and Vaas 2008). More directly, SI has 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 in many ways with the most general one of Stefan Böschen *et al.* (2005), applying the notion to all cases of intended social change. All change in the economy and—against the backgrounds of virtualization and hybridization (Miles 2006)—many changes in technology can thus be defined as being social innovation as well.

The bottom line is that nearly everything can be defined as a SI, including a sect (Cornwell 2007), the eBook (Cavalli 2007), or scientific management (Mumford and Moertl 2003).

Geoff Mulgan (2006) provides an excellent example of the corresponding confusion within the discourse. He refers to the process of tertiarization of economies and the political institution of female suffrage as examples of social innovations, while claiming that social innovations differ fundamentally from business innovations, admitting that there "are of course many borderline cases" (Mulgan 2006: 146) between social and business innovation. Against the background of the present discourse on SI, he is not even so wrong with that.

What is more, 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. 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 also have a social dimension. But what is an innovation, then? Is a new object or idea an innovation? Should we call the process of the development of a (process) innovation an innovation? Or does the notion apply to the process of its diffusion in(to) markets and societies? Finally, if innovations also have a social dimension, then *is there a social dimension of social innovations*, too?

These questions and the confusion caused by them are more than just academic problems: policy makers and triple-helix managers demand knowledge about "elements of innovative cultures" (Dombrowski *et al.* 2007), advanced indicators of innovation, including its social dimension (Moris *et al.* 2008), and more systemic views of policy (Soete 2007). Experts in marketing discuss the broadened role of their discipline and business against the background of the perceived increasing impact of corporate social responsibility concepts (cf. Maciariello 2008; Uslay *et al.* 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). Finally, open innovation (Chesbrough 2003) has 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 despite of or due to the fact that both concepts do (not) refer to the same phenomena. In any case, there is some idea or certainty that the real potential of innovation lies in its social dimension (cf. Pot and Vaas 2008, whose concept of SI does not differ much from the OECD's concept of NTI).

One explanation for the lack of systematic approaches to most crucial aspects of innovation is 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 will refer to Jon-Arild Johannessen, and his colleagues, on two levels: 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 *et al.* 2001: 20; Roth 2009; Roth 2010).

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 serve as an editorial framework for the individual contributions of the present volume. In this sense, the present introduction is a practical example of 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, the first evidence for the existence of non-economic markets is also presented. 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 characterized most basically 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 become old quite soon. Hence, the specific difference characterizing innovation is that between new and old (cf. Johannessen *et al.* 2001: 20; John 2005: 54).

It is common sense to use the new/old difference in terms of time—i.e. in terms of the difference before and after (Luhmann 1987: 116). This makes sense, but only one sense 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 (Luhmann 1987: 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 to new artefacts[3], i.e. products, ideas, or methods, then we focus on 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 current discourse on innovation.

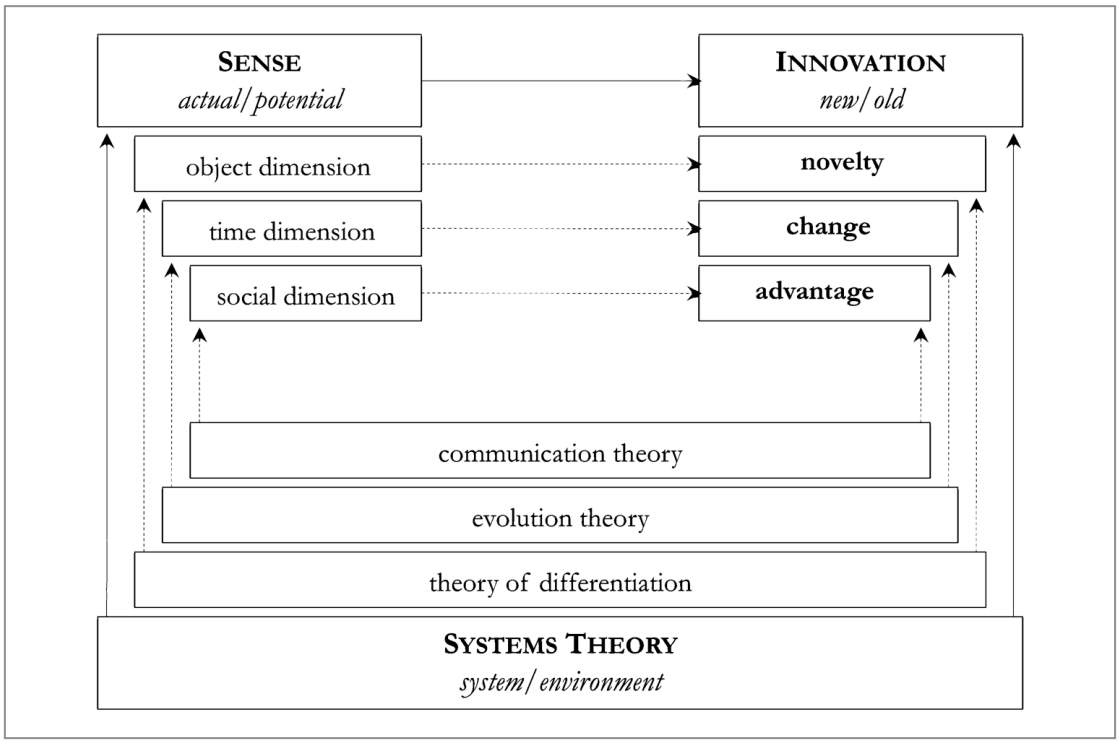


Figure 1: The three dimensions of innovation (Roth 2009)

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 the 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 on the time process dimension of innovation we are no longer interested in novelties but rather in the temporal processes of innovation (John 2005: 55ff; Kaudela-Baum *et al.* 2008: 34f), in organizational change or changeability as the competence to permanently evolve (Moldaschl 2006; Baitsch and Wetzel 2008), or explicitly in organizational time-management strategies (Simsa 2001). As such, innovation becomes a synonym for transformation or *change*.
But if we recall the definition of Georg Krücken, then we find that, to a large degree, it also corresponds to definitions that are in line with the diffusion of innovations approach presented by Everett Rogers (2003). 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 spread or distribution of innovations. However, on the other hand, this means making a long story much too short: diffusion is about communication paths within a given social system. Innovations are thus 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*. It is precisely this word that describes best the difference an innovation

makes if we focus on 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 discover 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 to 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 ignores two of the three dimensions of innovation. By doing so, he also automatically deletes two of three corresponding theoretical offers from the table of content of the "supertheory" 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 crucial to recall that fading out a paradox does not mean solving it: there is no logical or elective affinity between innovation research, the time dimension, and evolution theory. Innovation is three dimensional. Hence, it is most important to know what we want to know. Given that, it is surprising that, of all people, it is innovation sociologists who promote the time dimension as the key dimension of innovation. Without any doubt, it is most important to analyze the time dimension of innovation, but this has little to do with innovation sociology, and even less with a solution for the innovation paradox. Only a concept that takes into account the object dimension, the time dimension, and the social dimension as well as the corresponding theoretical approaches will provide us, if not yet with a solution, then at least with an adequate perspective of the paradox.

In this sense, the objective of the following section is modest: it aims at a first systematic sketch of the three dimensions of innovation and of logical interrelations 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 in terms of topics, theoretical approaches, and geographical contexts.

The first part 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, describes the hard core of innovation mentioned above and its possible future changes in "Economy and Technology."
Veronique Favre-Bonte, Elodie Gardet, and Catherine Thevenard-Puthod from the University of Savoy, France, then present "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 from Dortmund University of Technology, Germany, makes the final contribution to this part with "Social Science Production or Social Innovation by Social Science Production".

The title of the second part is *The Time Dimension of Non-technological and Non-economic innovations.*

Here, Nikolay Trofimov from the Russian Academy of Science in Moscow, Russia, presents the results of his research 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 Center for Social Innovation (ZSI), Austria.

Finally, Jens Aderhold from the University of Halle-Wittenberg, Germany, focuses on the "Rationalities of Innovation."

The final part deals with the *Social Dimension of Non-Technological and Non-Economic Innovations*.

In this part, Jari Kaivo-oja from Turku Business School, Finland, reports about "Integrating Innovation and Foresight Research Activities: Key Models and Challenges in Non-Technical and Non-Economic Innovation Actions."
The concluding contribution by Hugues Jeannerat and Olivier Crevoisier from the University of Neuchâtel, Switzerland, is "From Proximity to Multi-Location Territorial Knowledge Dynamics: The Case of the Swiss Watch Industry."

This mapping of the articles 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 focus on their social dimension. However, can researchers really work on social innovations without focusing on the social dimension of innovation? Do we not feel like suggesting, "that innovation ranges across a single continuum that encompasses all three aspects" (Johannessen et al. 2001: 27)? We can only agree with this suggestion. Nonetheless, everything starts in some fashion: every idea or concept of innovation has to enter the three-dimensional continuum at some point, 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 hard core), moving to the time dimension, or moving to the social dimension of innovation (cf. Figure 2). Hence, we argue that it is the object dimensional hard core of innovation to define innovations as new *products* or commodities. We also 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 point of contact with the innovation continuum, then we may develop a completely different picture of innova-

tion: the hard core of time is *change*, while its object reference is *transformation* (and not the method as means of transformation). Based on 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.

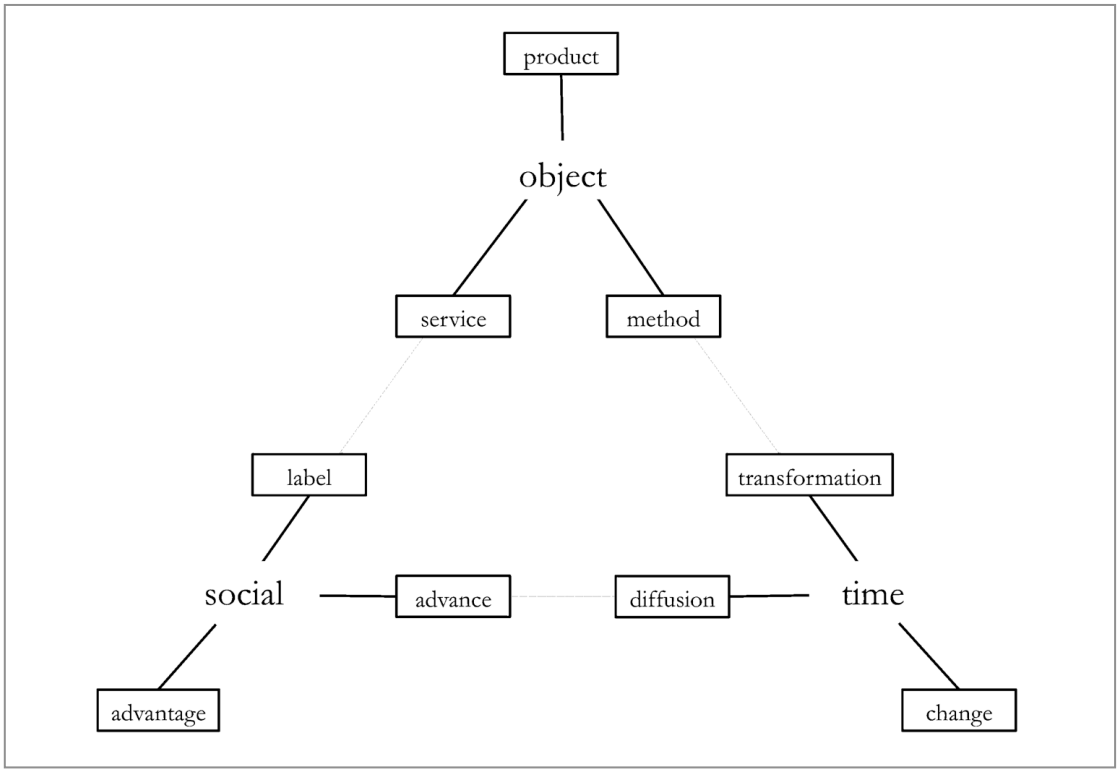


Figure 2: The dimensions of innovation and their interrelations: the innovation triangle (Roth 2009)

Finally, our entry point could be the social dimension of innovation as well. Then, the concept of *advantage* (German: "Vorteil") would define the hard core of innovation, with the notions of *advance* (German: "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 "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 asking how both types of innovation are to be handled now as well as in the future. By crossing the differences of technological/technological and econom-

ic/non-economic innovations, he ultimately 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). He thus writes an excellent chapter of high theoretical value for the discussion on social innovation, with a clear focus on the object and the time dimensions of innovation. Alexander Kesselring's study "Social Innovation in Private Companies" consciously fades out the social dimension of the social innovation in order to establish a distinction between social innovation and social change. He therefore 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 are Veronique Favre-Bonte, Elodie Gardet, and Catherine Thevenard-Puthod: starting with question for "A Typology of Innovations in Retail Banking"—i.e. starting with the object dimension, they conclude by showing how product innovations, process innovations, and service innovations contribute to competitive advantage in the banking sector.

In his chapter on "The Role of Non-Technological Innovations in the Growth of the Engineering Industry, the Economy, and 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 on the object dimension by introducing a set of methods and tools called the social production of science (not *social science production*). Organizational change processes that lead to the development of the very method and the methods' advantages in the context of knowledge production in social sciences are also 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 attention to the current state of the art 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" aims to embed the innovation concept historically, i.e. to identify 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 easily predictable outcomes, the concept of diffusion refers to change in more self-organizing and, thus, less predictable settings[5].

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 strongly supports the vision of a more robust competitive advantage.

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 no longer sufficient prerequisite for an innovation's success in the age of emotionally differentiated markets. They thus 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.

Because of these discussions, on the one hand we find that our three-dimensional concept of innovation can integrate the most diverse topics and approaches; on the other, we find that, in total, our small collection of contributions covers all dimensions and sub-dimensions of innovation so far. We are thus confident regarding the models' relevance and integrative power in the context of the more general discourses on innovation. Nonetheless, we look forward to aspects of innovation that cannot be integrated in the three-dimensional concept[6].

It is noticeable that there is no contribution that focuses on only one dimension. The social dimension is thus still approached with object-

related and temporal metaphors, and this is also the case in the general discourse on innovation where a selective approach to the social dimension of innovation is still due.
It cannot be the purpose of the present introduction to fill this research gap at the present time. Nonetheless, by focusing on economic and non-economic innovations it can present some surprising snapshots of a particular 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 our views on a concept of functional differentiation: the economy is not politics, is not science, and so forth. We also automatically refer to the social dimension of innovation. Products, services, techniques, organizational change, or diffusion processes are only economic phenomena if they are related to the competitive sphere of economic advantage, i.e. the economic market. However, this interpretation is only one among other possible interpretations: there are non-economic products (e.g. in the arts, cf. Cohen 2007), as well. An invoice does not accompany every service. The introduction of a new management style into a public service is politics, not economics (Wolfgang-Renninson 2007). The diffusion of the knowledge presented in this book is an aspect of science, first of all. There are even non-economic spheres of competition in society (cf. Baecker 2006).
As far as the economic character of an innovation is concerned, it is thus the social dimension that makes the difference. Economic innovations are objects or processes leading to advantages on the economic market that can be interpreted as economic innovations themselves. 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 of a number of types of social innovation.
Furthermore, if we can imagine these kinds of non-economic innovations, then we also need to take into account the existence of non-economic markets (Roth 2012). 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 geographically segmented markets as well as in terms of target groups deduced from social structure-focused market research. There is thus 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 in contemporary world society (cf. Stichweh 1995, 1997; Luhmann 1997). Consequently, we follow Dirk Baecker (2006: 333) who states "markets count as economic phenomena but they are common in other social spheres as well." As Niklas Luhmann (1997) distinguishes ten functional systems of society, we can identify nine further markets in society: political markets, scientific markets, arts markets, religious markets, educational markets, legal markets, health markets, sports markets, and the mass 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; Roth 2012). Nonetheless, there is still a research gap concerning the comparative analysis of forms and functions as well as of interrelations between all the markets in society.

## Towards a Theory of Robust Innovation

Even the most economic innovation can be defined as the outcome of pan-societal efforts (Barré 2001; Nowotny *et al.* 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 the immense impact of non-technological and non-economic innovations on economic performance. Unfortunately, current discourses on innovations that are non-technological, non-economic, or social tend to lead to logical dead ends or case-study based detours rather than consistent pathways towards competitive indicators and strategies of innovation beyond the "*bringing technology to the economic market*" paradigm.

Against this background, the three-dimensional concept of innovation developed in this introduction is an invitation to take one step back in order to take two steps forward. By making the most basic distinction

between an object dimension, a time dimension, and a social dimension of innovation, it presents a continuum of both universal and distinctive categories of innovation. This so-called innovation triangle makes it possible to analyze, to compare, and to coordinate the most diverse approaches to innovation. First, this applies to the present book; it contributes by serving as an editorial structure. In this sense, 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. We are confident that further discourses on innovation will be inspired by our systemic approach to innovation.

*Second*, with special regard to the social dimension of innovation, in a final step we adapt the concept of socially robust knowledge (Nowotny *et al.* 2004): we argue that innovations that succeed in more than one market are innovations that are more robust. Robust innovations can thus be defined as objects, processes, and advantages that realize (further) advantages in more than just one market in society. To this effect, these multi-impact innovations can be assumed to be both more profitable and more sustainable than single-market innovations (Roth 2014). 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 advantages[7]. The idea that products, methods, and services diffuse between (non-) economic markets as well, will take us slightly longer to get used to, even though most of us are used to dealing 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 the economy, and that they usually need specific support to do so. The constant efforts of business entities to deal with intangibles, or to develop new sense organs for what they call stakeholders in the context of corporate social responsibility or open innovation, can be interpreted as further examples of a more-or-less conscious orientation towards non-economic markets. Despite all the signs, there is neither a sound trans-economic market concept nor a corresponding theory of robust innovations. Accordingly, there is no specific marketing concept for the promotion of robust innovations either.

Nonetheless, the aim is what the synopsis of the contributions to this volume suggests: a focus on the realization of robust objects, robust pro-cesses, and robust advantages, i.e. in total robust innovation, irre-

spective of whether one's own starting point is in economy, politics, science, or any other market of society (Roth 2012).

## Notes

1 Please refer to Lukas Scheiber's contribution to this volume.
2 Regarding these questions we are on the one hand inspired by Johannessen *et al.* (2001) who ask three questions about innovation in the context of "economic units" (Johannessen *et al.* 2001: 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 (Johannessen *et al.* 2001: 23). It also 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 to at least one of the latter (which does not apply the other way round).
3 This includes both material and immaterial artifacts (cf. Rammert 1993: 11).
4 In this context, the term "label" refers to brands, social addresses, or status symbols of all kind, as well.
5 For example, Manfred Moldaschl (2005) shows that it is both quite common and most important (not) to mix up these two dimensions.
6 The three dimensions of sense are deduced from (only) three of the six basic interrogatives: what, when, and who. Maybe there is space for three further dimensions in innovation research.
7 For a discussion of the challenges involved in such transfer cf. Roth, Kaivo-oja and Hirschmann (2013).

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# PART I

# THE OBJECT DIMENSION OF NON-TECHNOLOGICAL AND NON-ECONOMIC INNOVATIONS

*Lukas Scheiber*

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

## Introduction

To develop a better understanding of non-economic and non-technological innovations, which are expected to have a bigger impact in future, it is valuable to understand or at least narrow down, the fundamental logic of economics, technology, and innovation in modern society. The three concepts and how they are intertwined belong to an understanding of society and societal change that strongly corresponds with our understanding of modern industrial society, as we have known it during the last 160 years. With the invention of computers and their networks, a new type of society seems to be developing; Baecker, in accordance with Drucker, calls it the "next society" (Baecker 2007). This society, being a knowledge society, would 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 reason to expect a shift in the interlacement of economics, technology, and innovation because access to the means of production will differ and new social rationalities can enter the stage. Empirical examples show the new impact of business models such as those described by Wikinomics (Tapscott and Williams 2007), where the economy no longer plays the one and only role for innovation. For example, Mozilla develops its products using volunteers who are highly motivated. They are not paid with money but perhaps by

reputation or inclusion in social networks. The profit for Mozilla is not privatized but refinances future product development over the Mozilla foundation. Furthermore, technology, as the selection of the Mozilla example shows (i.e. computer, Internet and software), increasingly becomes a medium of communication and is not determined by, or 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 the 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 that have to be taken into consideration when we talk about non-economic and non-technological innovation.

How might it be possible to handle non-economic and non-technological innovation in an uncertain future?

## The Frame of Reference: Social and Technological Systems

In the literature, when researchers write about economics, technology, and innovation, they are often unclear and do not explain what they mean; a lot of premises are not mentioned explicitly and remain unclear. With the social system theory developed by Niklas Luhmann (1998), it is possible to work out the differences and connections between all three concepts. For a start, it is possible to differentiate between social and technological systems, and the economy can be regarded as one functional system in society.

Society as a social system is itself differentiated functionally: social systems can be observed as being functional systems that solve different particular problems for society. In this context we can isolate the economy, politics, science, and so forth, as being functional systems where no single system can dominate another or solve problems for it. For example, politics cannot communicate economically in a literal sense because it is not possible to buy political power. (Society calls this phenomenon corruption and tries to avoid this systemic coupling by regulating it with the legal system.) Every functional system interacts with itself and its environment using its own specific code. The function of a code is to use a

binary logic to reduce contingency by operating regardless of the consequences, For the 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 social system—one that has the biggest influence on our current innovation systems: organizations and nowadays networks are the type of social system where decisions for innovation are possible and different sorts of systemic rationalities can be dealt with. Enterprises as organizations, for example, are goal oriented and have to make a profit. This allocates them clearly to economics and to the economic code. But they cannot proceed without taking the law, scientific truth, or societal development into consideration (Roth, Scheiber, and Wetzel 2010; . Organizations are the social loci where innovations are made and all kinds of systems (technological, biological, psychological and social), and especially the different codes of social systems, are intertwined or translated.

In contrast, technology as a system is not social at all but is socially constructed or shaped (Bijker *et al.* 1993; Bijker 1997). Technology cannot be seen as being defined by its physical objectivity and it has physical conditions. The media of technology determine the kind of form in which it appears and which kind of purpose can be expected of it. The forms of technology media can be identified; for example, habitualization, mechanization, and algorithmization (Rammert 2007).

Habitualization, as a form of technology, is built on the medium of bodies as biological "wet ware." Action, then, is schematized as consisting of 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 for decades been linked with steam engines, railroads, rockets, and so forth, and defines the medium of mechanization as physical objects. Algorithmization, as a form of technology, enters the field because 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.

Research about non-economic innovation, following these distinctions, involves observing "only" societal innovation, political and legal innovation and organizational innovation, by excluding all economic logic, which also has to be excluded when we observe non-technological innovation.

Is this possible? The answer at this point in the discussion cannot be "yes" or "no." The question is one of standpoint, perspective, and observation. The differences between the 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 society today seems to have the form of a "seamless web" (Bijker 1997) where everything depends on everything. What can be separated and observed, however, are the systems that shape and form innovations by operating within their codes as frames of reference.

## An Evolutionary Model of Innovation

How can we link social and technological systems with the problem of innovation? With current interest in "innovation" and increased research on innovation, a lot of process models have appeared that clearly show single and linear planned steps of innovation but neglect the role of social and technological systems in the process. From a structural perspective they all separate into a chaotic pre-innovation area that is often called "creativity," "idea," or "invention." A process of decision making then follows, which has some "stop-and-go" rules. The last step is often called the diffusion of innovation and addresses the issue 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 modeled 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 is always, and remains, unknown. Operating into the future always means coping with the paradoxical situation that the future is not accessible for rational planning and control (Luhmann 2000: 158). Everything new that occurs 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 two contradictory terms: "conform" and "non-conform." The future paradox of innovation is reflected in different streams of research and practice that are not only under the poles "conform" and "non-conform." It appears in Schumpeterian research as "creative destruction."

In an evolutionary innovation model, "creative destruction" can be observed as variation in social systems. This variation, for example an accident, an earthquake, or some action that is unknown and does not fit in a given context, has to be communicated in social systems; otherwise, it does not exist and has no influence. Variation is not made for selection, however, social systems like enterprises try everything to increase the probability of being selected.

Whether a variation is selected depends on its compatibility with given structures. Climate change, for example, becomes a topic for social systems when it is possible to translate it into existing codes like "to pay or not to pay" or political power. The structural filters of selection are the codes of the social systems mentioned above.

In order to make a selection durable, stabilization is a fundamental need. In social system theory, selection itself has a stabilizing function because what is selected already has a certain kind of stable form (Luhmann 1998: 485). But every selection has to be brought into a new relationship with the system concerned. From the perspective of innovation in organization, there have to be processes of system building by differentiation (Halfmann 1996: 104). At the organizational level, the emergence of new production processes, new departments, new organizational forms, and so forth, are observable.

Irrespective of how social systems have built up their innovation processes, the future problem of innovation remains the fundamental paradox: operating into the future without being able to predict it.

To address this difficulty, social evolution has produced several techniques that act as if the future were predictable and accessible. Risk management gives a first hint of how this could work. Risk is described as a certain kind of social theory that operates into the future by building up alternative future scenarios and evaluating them by connecting them to probable costs and profits. On balance, risk management works with economic parameters of costs and profits and inside a certain "range" of causality.

## The Economy of Innovation

Whether a variation, such as a creative idea or an accident, makes sense or not can be decided if social systems have the ability to translate it into their own code or have the ability to rank codes, as in the case of organizations. First of all an innovation as a (market) product has to make sense in an economic context. Then it has to keep up with the micro-political structure of hierarchies, and so forth. Nevertheless different dimensions have to be mixed and brought in order to reach a decision. Risk management was one example of such a translation into the economic system. What could be responsible for the dominance of economic-oriented decisions in the case of innovation?

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

In this theoretical discourse the economy is a social system that solves and, significantly, produces one problem of society: scarcity, which means there is not enough for all. The 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 economic dynamics by forcing equilibrium and disequilibrium as stable and simultaneously unstable states of economy. The property of someone is always the non-property of all others. Acceptance of this social state is generally low and all non-owners have to be motivated to accept the unequal allocation of property. Doubling the cycle of goods, represented by property and its exchange, with the cycle of money, increases the possibility of people accepting this unequal allocation. Every transferred property is assigned a certain monetary value. The owning or not owning of goods is transferred after monetization into the owning and not owning of money, and accordingly into 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 the economy as a medium of success with two options: to pay or not to pay. The word "success" should not be interpreted as economic success but as the increased probability of an acceptance of communication (Luhmann 1998: 349). 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. In such a case money links someone's choice, for example to consume a product, with the motivation of somebody to accept this choice. The combination of selection and motivation has not always been solved as peacefully as it is when money is used. 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 way of solving double contingency entered the stage.

Compared with a more general understanding of communication as talk or discourse, money is symbolic. As a symbolic medium, money has the ability to be transferred and the ability to forget. When money is spent, it is gone and you can imagine as hard as you want but it will not come back in your wallet. But what you spent it for and what it was spent on before it was in your wallet is not saved on the physical symbol. The transfer transports only the quantitative information that is the reason for its discharging effect. Nothing else has to be communicated or proved 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.

In addition to these characteristics on the social dimension, money has the ability to be an effective medium in a temporal context. Whether a payment makes sense or not can be decided by the price, which is understood as the economic 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 bet on future developments. Innovation in this context does not start with a good idea but with an investment, which means spending money with the expectation of getting more back in future. The net present value method shows clearly the mathematically expressed connection between money and time (Majer 2001: 157):

$$ACI_{0\geq} \leq \sum_{t=0}^{n} \frac{EP_t}{(1+i)^t}$$

$ACI_0$ = Asset Cost of Investment at t = 0

$EP_t$ = Expected Profit in Year t

$i$ = Interest

$t$ = Time

The connection between 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. Besides, the double coding of economics enables innovation dynamics. With an innovation it is possible to produce and reduce scarcity and to transfer scarcity of products into the scarcity of money, with which it is possible to bridge, over time, gaps in innovation processes (cf. Scheiber 2010).
Money as a medium of success has the ability to reduce and transform future uncertainties like no other medium. Because of this character it may be regarded as the main reason for the social preference for economic-oriented innovation. Economy as one structural filter in innovation processes seems to play the role of a goalkeeper for the selection process of inventions. But the ability to reduce future uncertainties cannot only be observed in the case of money but also in the case of technology as is shown in the following passage.

## Technological Innovations

In all the diversity of "wet ware," "hard ware," and "soft ware" as media of habitualization, mechanization and algorithmization as forms of technology, two connecting moments can be observed that characterize technology in its core: causality and repeatability. Technology as a medium can be defined as fixed causality (Halfmann 1996; Luhmann 2000). If we press the light switch, there is light. From this point of view, technology has the function of delivering predictable effects. This could be a similar discussion to the one about the effect of money because both money and technology create an open space for other communication.

For instance, the main thing when driving a car is not the fixed causality between turning the key and starting the motor but the choice of other modalities of communication like whether to speed or to cruise through the city. The more contexts of communications are selectable (speeding, cruising, transporting, and so forth), the "better" technology seems to be. The more the information that technology is based on remains in the background, and the more functions technology has, the "better" technology is observed to be (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 (which was of no interest until then) and excluded environments, which were until then free for other communication, disappears. 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 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 that technology is 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 us to understand sociotechnical 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, one fundamental difference between society and technology can be observed. While society is a self-reproducing social system, technology has the form of an allopoetic system that cannot reproduce itself. As a medium it provides the potential to be used in social contexts by appearing in different forms. When we observe technology as supply technology, which can mostly be described by its most widespread 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 proposition of Arnold

Gehlen, that the human being is an entity of imperfection (Mängelwesen, *Homo inermis*) and therefore has to use technology to boost its wet ware (Gehlen 1950). Nowadays, our understanding of technology has fundamentally changed since the rise of information technology and computer networks. Technology as a medium is increasingly becoming a medium of dissemination of communication. Prominent examples are the printing press and computers. 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 establishing consent and the possibility of coordinating always difficult and conflict-laden human action. The ongoing societal preference for technological arrangements or technological innovation has to be seen in the context of the possibility of handling 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 social preference for everything that is marked as "new" could have different reasons. What is pointed out here is the fundamental problem of innovation as a future paradox. Paradoxes cannot be solved but they can be transferred or bridged over. In the case of innovation we found two strong mechanisms to reduce complexity and temporal gaps. Money, as a medium of success, and characterized as symbolic and generalized, has the ability to bridge over time. It works by neglecting all other social contexts like morality, power, love, and so forth. In its economic contexts it is related to property and scarcity, which are the starting and end points of economic dynamics, and it facilitates the "need" for innovation. In terms of content, we observe a social preference for technological innovation because of its causal simplification. By using technology as a medium of communication, much more complexity could be built up and handled.
What other structural possibilities does society have to be innovative and to build up innovations? It seems that our modern society is evolving in a direction where the interplay of economics, technology, and innovation seems to be changing. Since the invention of the Internet, the computer has introduced a new medium of dissemination: by algorithmization

much more information can be saved, activated, and disseminated than ever before. The range of communicative accessibility has increased and hypertext allows non-linear communication. The Internet itself, and corresponding new social forms of networks, for example in civil society, the ecology movement, or open source, show the first blueprints of the so-called next society.

First, the kinds of innovations that seem to be possible, or are actually empirically observable in the unmarked space of economy and technology, should be established. Table 1 shows the result of crossing economic and technological innovation with the *unmarked space* of non-economic and non-technological innovation:

| | **Technological** | **Non-technological** |
|---|---|---|
| **Economic** | Cars, trains, mobile phones, computers | Organizational innovation |
| **Non-economic** | Open software (Linux), Wikipedia | Social networks, political parties |

Table 1: Crossing of non-/economic and non-/technological innovations

Structural problems associated with innovation will continue; the future will be uncertain, but the ways in which innovation processes are designed and the kinds of results that are possible can be expected to be different. One main question at this point in the discussion concerns the kind of form future media of success will have to allow selection and communicative closure of variation in a way that there will be a result that could be called innovation.

Social and technological evolution is accompanied by the evolution of social and technological segments in a reciprocal relationship. The more complexity can be handled by technology, the more complexity is possible in society and vice versa. Computer communications already allow new organizational forms like networks, where enterprises, social networks, single persons, and other computers are loosely coupled, but where enough double contingency restrictions can be found so that communication can be processed.

The question here concerns the problem of how future innovation processes can be managed and with what kind of media.

## Conclusion: New Media of Innovation

When we observe non-economic and non-technological innovation we can ask for selection mechanisms beside money. Which medium has the quality of increasing the probability of acceptance of communication and which corresponding structural filter can be used in innovation processes? This filter has to have two structural qualities: it has to be symbolic and generalized. Symbolization guarantees that it is reusable without demanding new consent. Reusability implies the possibility of temporal durability and increases the likelihood of being used in the future. The medium has to be generalizable, which means that its use is unspecific. Returning to the medium of money, discussed earlier, it is possible to spend money for (nearly) everything that occurs as a potentiality in social communication.

Which kinds of candidates have been discussed so far? Morality is one often-discussed candidate. Morality (what is good and what is bad) is much more about conflict than ensuring the acceptance of communication (Luhmann 1998: 317; Roth 2012b; Roth 2013). Values are not so discussable or fluid that a shared basis can be found from which selections of variations are likely. The chance to run innovation processes over time because the running itself is good or valuable is often very small. Here we would like to propose reputation as a possible "candidate" as a medium of success in the next society (Scheiber 2011). 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 has some restrictions in comparison with communicating by money. Reputation is not as easily usable, shareable or exchangeable because it is strongly connected to trust, which makes it asymmetric in its proceeding. Reputation takes a lot of time to build up and can disappear in a second under "wrong" conditions. Symbolization and generalization are heavily conditioned, which complicates the combination of selection and motivation and its processing over time. Research and practice on the trustworthiness and credibility of organizations can reveal the impact and importance of reputation in computer communication. Communicative affiliations in innovation processes have to take the context of reputation into consideration. But whether society has the ability to build up, and will build up,

new media of success is a practical and not a theoretical decision in the frame of the outlined structural terms.

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# A TYPOLOGY OF INNOVATIONS IN RETAIL BANKING

## Introduction

The French banking sector has experienced profound changes and increasing competition since the mid-1980s (Zollinger and Lamarque 2004). In this difficult context, banks have had to find solutions through innovation to remain competitive, either by reducing costs, or by differentiating themselves from competitors. Innovation allows new products to come on the market, which can give a pioneer bank an advantage over its competitors (even if it is temporary).

Despite the increasing number of innovations introduced into the banking sector (OCDE 2000), the literature rarely focuses on this. In a more general way, services remain the "poor relative" of the literature about the management of innovation (Gallouj and Gallouj 1996; Dumont 2001[1]). Most studies in the management of innovation are more interested in technological innovations, and in particular those developed in the biotechnology, semiconductor, and other sectors (Baum *et al.* 2000; Gilsing and Nooteboom 2005; Roijakkers *et al.* 2005). However, the results of these studies hardly appear transferable to services (Sundbo 1997). For example, the main criteria for measuring innovation in technology, such as number of patents or research and development budgets, do not seem to be valid measures of 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 (for example, "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), and so forth. Some authors writing on banking innovations either focused on the development of new products (De Jong and Vermeulen 2003), or considered that banks could not innovate outside new technologies (Karmarkar 2000; Ding *et al.* 2007). In our opinion, a

framework for the assessment of innovations in the retail-banking sector is missing.

Innovation refers to the creation of value, directed mainly at the customer, but also being able to concern other parties such as the organization itself (Flipo 2001). Innovations can also involve several dimensions (Avlonitis *et al.* 2001; Djellal and Gallouj 2001): the concept of service, process (information system or method of work), the organization (hierarchical level, structures, and so forth) and the type of external relation (such as new types of interface or intervention of an intermediary). We consider that innovation exists when there are deliberate actions aimed at profiting by modification (De Jong and Vermeulen 2003). By using this definition, the objective of this chapter is to better define what banking innovations cover, to show that there are several categories of innovation in retail banking, and to suggest 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: Crédit Agricole (CA). 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

Having explained why innovation is an issue that particularly affected banks since the mid-1980s, we present a synthesis of the literature on innovation in the banking sector. The synthesis has two limitations: (a) a focalization of research on new offers (visible innovations for customers) and (b) technological progress as the major source of innovation. We will 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*

Since the mid-1980s, the French banking sector has experienced profound changes, which stimulated banks to evolve from a structural and strategic point of view, notably forcing them to develop their innovation practices.

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 foreign banks, two new types of actors appeared: large-scale retailers and insurance companies. The leaders of large retailers did not hesitate to create their own banks (for example, Accord for Auchan, and S2P for Carrefour) and to offer credit cards and other financial services to their customers. Insurance companies also penetrated the banking sector by relying on important portfolios of particular customers (for example, Axa Bank and AGF Bank). Consequently, competition intensified strongly, and the market for the main banking services (accounts, checks, credit cards, and so forth) reached saturation (97% of the French population possesses a bank account, according to Lamarque 2003).

At the same time, banks have to face greater demands from 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 consumer associations in case of litigation. Many people are clients at several banks and they play the competition to obtain preferential treatment (for example, with regard to property loans).

Finally, at the technological level, progress in information and communication technology revolutionized the functioning of banks. If banks have 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 Internet opportunities to communicate with their customers in different ways, and to offer new services. The costs of integrating these new technologies are particularly heavy; thus, banks have had to make trade-offs in terms of the allocation of resources, both financial and human. All of these regulatory, sociological and technological changes have resulted in a renewal of the way in which banking is designed, and a change in management practices (Zollinger and Lamarque 2004). The banks have had to think about how to create a sustainable competitive advantage. Two generic strategies (Porter 1982) are being used in a complementary manner: reducing 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 them out in a cen-

tralized fashion. Differentiation has 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 cannot 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, they are trying to find other ways of differentiation, through a better quality of service (Zollinger and Lamarque 2004): product customization, setting up new distribution channels (for example, the Internet) that allow greater proximity to the customer, better service availability, and greater speed of transactions.

We can see the challenge of innovation emerging: whether to lower costs or to differentiate themselves, banks need to innovate in order to remain competitive in the market (Reidenbach and Moak 1986; Storey and Easingwood 1993; Drew 1994). 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). 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 Limitations 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 that establish and formalize development programs for new products perform better than others, whatever their size. Näslund (1986), in his comparison between financial and industrial innovations, shows that banks innovate, but these innovations are easier to imitate than in industry because they are easier to implement. A bank that innovates will benefit from its lead in the market only for a very short time, because its competitors will quickly imitate the new product, which cannot 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 (for example, 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 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 being 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 installation of a new computer system by a bank causes a succession of innovations, which can be described in three stages:

1. The learning of new software at first causes incremental process innovations, 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 process innovation (such as the 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 banking innovations (Karmarkar 2000; Ding *et al.* 2007). Ding *et al.* (2007) focused on the development of self-service activities (hydrants rebate check, print account statements, and so forth), and considered that technology is an essential resource that all banks must master. However, if the impact of technology on innovation in the banking sector is undeniable, it seems that banks can develop innovations outside technology (Eiglier and Langeard 1987; Gadrey *et al.* 1995; Sundbo 1997; Djellal and Gallouj 2001; Flipo 2001; Kandampully 2002; Abi Saab and Gallouj 2003). Technology is only a component of the delivery system. Other factors may be at the root of innovations: deregulation allowing the introduction of new services that were previously prohibited, changing behavior of customers who show 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 behavior of individuals (new roles that 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 behavior in relation to innovation. As Gallouj (2002) suggests, this seems to be a simplistic vision of reality.
In summary, neither approach focuses 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.

## Proposal for a Typology Covering the Variety of Banking Innovations

There are few authors who have tried to compile a typology of innovations in banking. Existing works are linked to the NSD and are thus partial. Karmarkar (2000) focuses only on services in connection with the new information and communication technologies (Internet, telephone, interactive terminals, and so forth) and proposes a two-axis 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 the technology (a 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.
Most of these typologies are constructed from a single dimension:

- The element affected by innovation (product, process or organization, criteria that draw on the work of Djellal and Gallouj 2001 as well as 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 Dumont 2001).
- 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 doubtless 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). None of the existing typologies therefore seems operational enough to identify 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 summarize it, we are proposing a two-dimensional matrix (Table 1). The first dimension relates to the subject of innovation—the element that will be affected by the novelty. 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 (1987) model, which identifies five components in a servuction system (a 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 so forth) 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 be more-or-less 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 that 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.

| | | | DEGREE OF NOVELTY | | |
|---|---|---|---|---|---|
| | | | + Incremental innovation: *existing components, but either improved or recombined* | ++ Radical innovation: *new for the firm* | +++ Total innovation: *new for the competitive environment* |
| Service's components | New service (= new offer) | | | | |
| | Front office ** | Teller | | | |
| | | Physical medium | | | |
| | | Customer participation | | | |
| | Back office* | Support functions, information system … | | | |

** Innovation that is invisible to the customer.*
*** Innovation that is visible to the customer.*

Table 1: Proposal for a retail banking typology

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 ones, as critics often contend. We distinguish three levels of innovation: incremental innovations, which 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 that 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 has not existed before at any of the competitors). We propose now to test our typology it on the heterogeneity of banking innovations within the first French retail bank, Crédit Agricole.

## Methodologies and Results

In this section, we begin with an overview of the methodology used to better understand innovations in the bank that was studied. Then we will 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 the case of a retail bank in depth. 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 illustrate the phenomenon studied. We chose Crédit Agricole for different reasons. Crédit Agricole is the first French credit institution. Its own funds came to 69.4 billion euros in June 2007, it has more than 80,080 employee, and its market share in retail banking has been over 25% since its acquisition of Credit Lyonnais. As a leader in 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 very decentralized, with 41 autonomous regional entities, we chose to focus our attention on the functioning of one of these entities[2]. Each entity has a certain freedom; although, in most cases, it adopts innovations developed by the headquarters, it is authorized to propose its own innovations.

*Data Collection and Analyses*

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

| Duration | Function of interviewee | Innovations studied | Date |
|---|---|---|---|
| 1h45 | Marketing manager | Mozaic / green points / products for seniors / new agency concept | 04/05/07 |
| 2h00 | Vice director of the bank | Insurance / mozaic / green points / products for seniors / new agency concept | 30/05/07 |
| 1h30 | Bank service manager | Products for cross-border workers / intelligent billing | 05/07/07 |
| 1h00 | Agency manager | Products for cross-border workers | 04/07/07 |
| 1h45 | Check service officer | Automation of check deposit | 09/07/07 |
| 2h00 | International service employee | Products for cross-border workers | 21/08/07 |
| 1h00 | Marketing manager assistant | Mozaic / green points / products for seniors / new agency concept | 09/07/07 |
| 1h30 | Geographical area manager | Products for cross-border workers | 20/08/07 |
| 2h30 | Marketing manager | Products for cross-border workers / Mozaic / IHM / seniors / new agency concept / green points / new methods of diagnosis / square habitat | 04/01/08 |
| 1h30 | Logistics officer | New agency concept/, IHM ergonomics / intelligent billing | 08/01/08 |

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

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 according to the recommendations made by Miles and Huberman (2003). Each interview was 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 also compared the information, when possible, and made a triangulation between the primary and secondary data.

*The Case of Crédit Agricole*

The regional entity of Crédit Agricole has regularly innovated or adopted innovations from the headquarters over the past decade. We particularly focused on the 13 most frequent innovations. Each innovation is presented using the same structure: first (a) a general description of the innovation and its context, then (b) an explanation of its position within the typology.

*Mozaic*
INNOVATION IN A FEW WORDS: this is a specific product for 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 and so forth).
POSITIONING IN THE MATRIX: this innovation is a new offer, which is incremental in nature. The various services existed, they were combined through 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 offers older people packages that include consumer loans, mortgages (such as a lifetime mortgage loan), transmission conventions (such as life insurance contracts) with the heirs, and so forth.
POSITIONING IN THE MATRIX: this new offer is incremental as it is an assembly and an enhancement of pre-existing offerings.

*New Methods of Diagnosis*

INNOVATION IN A FEW WORDS: the establishment of diagnostic tools in the agencies to facilitate the work of consultants: insurance, savings, credit, tax optimization, transmission and so forth. These formalization innovations (as defined in Sundbo and Gallouj 1998) help the staff structure interviews with issues that help them to understand 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 Man-Machine 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 machines requires management of the interface in order to facilitate their use (colors, provision of the text, data density, placement of buttons, writing messages, and so on.). For example, in the early robots, customers first received the money and then withdrew the card. But many clients were taking the money and forgetting to withdraw their card. This caused many to oppose the technology and an additional workload for staff. Following new developments, the two actions have been reversed.

In the back office, there were large 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, and so forth).

POSITIONING IN THE MATRIX: we therefore have both an incremental innovation in the front office (visible to the customer) on the physical medium, which is being constantly improved thanks to the behavior of customers towards automated machines, but also an incremental innovation in the back office.

*Pacifica (Property Insurance)*

INNOVATION IN A FEW WORDS: CA has embarked on insurance of property (such as vehicles and furniture) via a subsidiary, Pacifica. It has offered its customers packages and credit insurance. But unlike the competition, the CA was the first 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 48 hours). Finally, the product is new: re-equipment without any conditions.
POSITIONING IN THE MATRIX: this is a new product that corresponds to a radical innovation for the company (the "property insurance" service is new to the CA), which had to learn new skills outside its core business (the 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 essentially the same type of service.

*Square Habitat*
INNOVATION IN A FEW WORDS: CA 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 deploying to a new function—that of real estate agent. Crédit Agricole had to learn new skills outside its core business. Before 2006, the CA real estate sales were limited to credit financing and the promotion and sale of products to new investors. However, this activity is not new to the market because the basic service was already provided by traditional real estate agents.

*The Online Bank*
INNOVATION IN A FEW WORDS: an Internet site allows easy access to accounts and provides an opportunity to be closer to the bank without moving (accounts are available 24 hours per day, seven days per week for conducting online transactions and account management).
POSITIONING IN THE MATRIX: this is a front-office innovation (teller, physical support, customer participation) as it is a new distribution channel. It is radical for the company but not for the market as CA 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, status as a "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 a radical innovation for the company, which required new computer skills.

*Products for Cross-Border Workers*

INNOVATION IN A FEW WORDS: due to the specificity of the market, there are many products for cross-border workers within the regional entity (there are 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 to their current accounts in France (which necessitated the establishment of a partnership with foreign banks), loans in foreign currencies (for consumption or real estate) at fixed or variable rates, and savings products that protect customers from volatile exchange rates.

POSITIONING IN THE MATRIX: CA has been a pioneer in setting up these specific offers for cross-borders. They are total innovations (new for the competitive environment). Although competition has since sought to imitate these offers, CA remains "one step ahead" through its longer experience.

*Green Points*

INNOVATION IN A FEW WORDS: CA gives 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 them maintain 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 from carrying money outside the agencies.

POSITIONING IN THE MATRIX: this is a new distribution channel. This is a total innovation for the environment: no other bank had proposed 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 ATICA device, which aims to renovate agencies by integrating automatic machines, which allow greater autonomy to customers and 24-hour 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 automatic machines (physical media), and the greater involvement of customers. On this innovation, CA has been a pioneer and has the broadest automated network in France: it is therefore a total innovation.

*New Check Processing*

INNOVATION IN A FEW WORDS: the creation of a subsidiary, the Centre of Processing and Payment Operations (CETOP) for check processing. Checks are scanned by retailers or individuals (via a machine in the agency) and the information (amount, customer identification) is stored. This information is directly sent to the CA platform. This helps to secure transactions (there is no problem of the loss of checks), and to credit customers much faster (the period is reduced to one day whereas it was on average three days before the implementation of this process).

POSITIONING IN THE MATRIX: this is a back-office innovation for which CA had to acquire new technological and organizational skills and make major investments. Moreover, this innovation is a total innovation for the competitive environment since CA was the first bank to introduce this type of organization (some competitors outsource their own check processing to CA).

| | | | DEGREE OF NOVELTY | | |
|---|---|---|---|---|---|
| | | | + Incremental innovation | ++ Radical innovation | +++ Total innovation |
| Service's components | New service (= new offer) | | Mozaic products for | Pacifica square habitat | Products for cross-border |
| | Front office | Teller | New methods of diagnosis | Online bank | Green points New agency concept |
| | | Physical medium | IHM ergonomics (automatons) | | |
| | | Customer participation | – | | |
| | Back office | Support functions, information system … | IHM ergonomics (employees' computer screens) | Intelligent billing | Check processing |

Table 3: Crédit Agricole's innovations

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 can also distinguish between them.

Several observations can be made on the relevance of this matrix. First, we could not find an example of innovation that focused only on the evolution of the degree of participation of the customer. We thought it was quite rare in retail banking that for the participation of customers to change without either the introduction of a new physical medium or a proposal by tellers. But the marketing director of the regional entity, who effectively recognized that no innovation of this kind had been developed in the bank, confirmed the existence of such innovations among competitors[3]. Where innovations for improvements 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, a new concept of agency, or online banking), which, in fact, affects the three components of the front office.
These examples of banking innovation also allow us to draw a number of conclusions. If technological progress opens up many tracks of innovation (online banking, check processing . . .), both in the front office and back office, a number of innovations remains unconnected with new technologies. This is the case with all the new offerings studied (products for cross-border workers, Pacifica, Square Habitat, and so on), some distribution channels (such as green points) or innovative forms of formalization (new diagnosis methods). The easing of regulations, new customer needs, and competitors' innovations as potential sources of innovation are 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 a high degree of novelty (radical innovations, or even total innovations), even though some of them are invisible to customers (that is the case of innovations that relate to the back office, as in check 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 that 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 "cascading ffect" of innovations.

*Cascade Effects of Banking Innovations*

Several of the innovations studied have led to a series of other innovations in different places in the servuction system (see Table 4) regardless of their initial goal (to propose a new service for the customer or improve the back office). So a spread of innovations progressively touches other elements, or even the entire system. This phenomenon appears as a thin red line in the works of Barras (1986 and 1990), and later much more in that of Warrant (2001). However, in addition to this research,

our analysis shows that these effects, which can be described as "snow-ball" or "cascade" effects, can be unrelated to the use of new technology.

| Studied innovations | New offer | New "servuction" process | | | |
|---|---|---|---|---|---|
| | | Front office* | | | Back office** |
| | | Teller | Physical medium | Customer participation | |
| Mozaic | + | + | + | – | ++ |
| Products for seniors | + | – | – | – | – |
| New diagnosis methods | – | + | – | – | + |
| IHM ergonomics: | | | | | |
| – Automatic machines | – | – | + | – | – |
| – Employees' computer screens | – | + | + | – | + |
| Pacifica | ++ | ++ | ++ | – | ++ |
| Square Habitat | ++ | ++ | ++ | – | ++ |
| Online bank | + | ++ | ++ | ++ | ++ |
| Intelligent billing | – | + | – | – | ++ |
| Products for cross-border workers | +++ | – | + | + | ++ |
| Green points | + | +++ | +++ | +++ | – |
| New agency concept | + | +++ | +++ | +++ | + |
| Processing of checks | + | + | + | + | +++ |

*Legend:*
– *Not an innovation.*
\+ *Incremental innovation.*
++ *Radical innovation for the firm.*
+++ *Total innovation for the competitive environment.*
* *Innovation which is visible for the customer*
** *Support functions, information system …*
*Grey cells correspond to the starting point of an innovation.*

Table 4: The cascading effect of the innovations studied

A trend also seems to be emerging where the higher the degree of novelty of innovations is, the greater the effects 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 and the front office as well as a product.

To illustrate this cascade effect, we will discuss two examples of innovation with different purposes in more detail (a new product and a back office innovation for the other), but the degree of innovation remains the same (with reference to our typology, these are total innovations). Those innovations are *products for cross-border workers* and *processing of checks*. Let us return for a minute to the presentation of these two innovations before describing their impact on the servuction system.

The *raison d'être* of the *processing of checks* innovation was to cut costs because it was difficult to bill the customer. For that purpose, CA established a new organization. As a first step, the customer can file checks 24 hours daily using a scanner. The images of checks 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 (incorrectly read checks) and the Cetop (central check processing) compare the image files of the platform and the real checks. The subsidiary then distributes these checks to the various regional entities and to competing banks (checks of less than 5,000 euros are archived for 60 days and DVDs are returned to agencies each day).

This back-office innovation 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 checks[4];
- the introduction of new physical media (successive generations of scanners);
- the reduction of staff associated with check administration.

The supply has also been improved because the customer is now credited to D+1 instead of D+3.

With regard to *products for 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 web site and new machines to change currency), and the back office. Changes in the back office included the 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.

This cascade of innovations 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 parts of the servuction system.

Doubt also remains regarding 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 chapter has attempted to provide a better understanding of the forms of innovation in retail banking. The case study within the CA has brought four main results:

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

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

Thirdly, the typology that we have proposed allows us to overcome some limits to previous works, broadening the discussion to all banking innovations, and not just to those of new services. In the banking sector many back-office innovations exist; these, 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 work could usefully complement this research. Our study focuses on innovation in a part of the banking sector (retail banking), and only on one company (Crédit Agricole). This research must be replicated in other banks (Yin 1994), in order to obtain external validity. Moreover, future research might show the importance of the process in implementing innovations in the banking sector. Finally, the cascade effect highlighted in this chapter should serve to encourage 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—a vision that is useful in order to understand 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 study these processes of the emergence of innovation further, depending on the type of innovation developed (Roth 2009; Roth 2010). That way, the cascade effect that we have identified could be better appreciated.

## Notes

1 "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: 14).
2 For reasons of confidentiality, we do not mention the name of the regional entity.
3 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.
4 The customer deposits checks without support from the staff, then the receipt is automatically produced by the machines.

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

## 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 2007–8 edition of *The Global Competitiveness Report of The World Economic Forum* ranks India as 26th worldwide for "innovation and sophistication" in the economy, ahead of countries such as Spain (31), Italy (32), Portugal (38), Brazil (41), China (50), and the Russian Federation (77) (WEF 2007). The Organization for Economic Co-Operation (OECD) ranks Indian as being the eighth largest R&D investor worldwide. The 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 offshoring.

These astonishing figures bring to light a fact that has thus far hardly been 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% of industrial output and 42% of India's total exports. They constitute the largest employment-generating sector and are an effective tool for the promotion of balanced regional development. They account for 50% of private sector employment and 30–40% of value addition in manufacturing.

Indian 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 such as laboratories or testing centers. First- or second-generation entrepreneurs run most of the SMEs and they do not let the lack of resources stop them on the way to the success of their organization. This lack of resources, in fact, prompts them to think differently about their organizational processes and to

make new innovations that can help them stay in business or help them succeed in competition. As they have few 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" can truly be applied in this case. This area of non-technological innovation is the least studied in the field of innovation research. 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 it has started to affect not only the cluster in which the organizations are operating but also the economy and society of the region at large.

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 the western part of India, approximately 250 km from Ahmedabad and 650 km from Mumbai, India's financial capital. Rajkot has seen industrial growth from the early 1940s, when skilled craftsmen migrated to Rajkot from Pakistan. The region initiated its manufacturing journey by producing diesel engines and has moved up the value chain in the last 60 years. Today, Rajkot is home to more than seven clusters ranging from the engineering industry, casting and forging to the production of diesel engines, electric motors, oil mill machinery, oil mills, and machine tools. A major contributor to the development of Rajkot and its economy has been the growth of engineering industry. Today the clusters are thriving; they consist of around 3,000 enterprises with a turnover of about Rs. 3,000 crore and generate employment for more than 100,000 people (UNIDO 2004).

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

The major strengths of industry in 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 workers.
- Cluster approach brings competition; competitiveness brings a greater number of buyers to Rajkot for their requirements.

The major weaknesses of the industry of Rajkot are:

- Low focus on structured innovation efforts. Innovation efforts in Rajkot have been sporadic and have not 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 still manage most of the businesses. This does not attract the next generation to join the business; because of this, the industry suffers from acute succession issues.
- Unavailability of professionally trained manpower.
- Low retention ratio of trained manpower.

## Key Innovation Imperatives of the Rajkot Region

Industry in Rajkot has been 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 times for the diesel engine industry, Rajkot continued innovation with lightweight diesel engines (Nayak 2006). After the decline in the diesel engine business, Rajkot has successfully undertaken aggressive innovations in the machine tools industry and automobile auxiliary business.

Although it was a "push" innovation after a sharp decline in sales because of technology obsolescence of diesel engines in early 2000, Rajkot has taken advantage of the opportunity and has undertaken large-scale innovation initiatives, 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 technology products and turned them into high-tech products. Machine tools manufacturers such as Jyoti CNC and Macpower CNC, who both led this, were conventional lathe manufacturers that totally transformed themselves into high-end machine manufacturers. Rajoo Engineers is another good example of an organization that has evolved: it has become 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 a strong focus on process control and quality, automobile auxiliary units in Rajkot today can produce the best products 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 and which has kept food giants such as Frito-Lay guessing as well. 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 to 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 studied the role of non-technological innovations in the growth of the engineering industry, the engineering SME cluster and the 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, which 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 the capacity to transform a regional economy and has long-term impacts.

*Defining Innovation*

Innovation has numerous definitions; however, only those that are universally accepted and most suitable to the proposed research are examined here.
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."

In innovation the important thing 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 the traditional financial or market outcomes for 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 ar-

rangement 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 as well with multidimensional approaches to innovation (Roth 2009; Müller, Roth, and Zak 2010; Roth, Wetzel, and Müller 2011; Scheiber, Roth, and Reichel 2011).

*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 by various researchers who argued that, due to lack of resources, 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 copy.

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

Small and medium enterprises 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 *et al.* 2006). Devenport and Bibby (1993) 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 a prerequisite to innova-

tion, as distinct from solely technological development. Thus people, process, and product dimensions are included (Tidd *et al.* 2001). Porter and Stern (1999) stress that such innovation involves much more than just science and technology.

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

Although there are a number of studies on continual improvement in SMEs (Gunasekaran 1996; Bessant and Caffyn 1997; Bessant and Francis 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 there is a huge vacuum when it comes to study the role of non-technological innovation in SMEs. It cannot be assumed that innovation implementation principles in large organizations are directly transferable to SMEs, and that the SME can be treated as a scaled-down version of the large organizations. Thus there is a need for studies on how innovation is implemented and what the impact of this is 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.

*The Role of Innovation in the Growth of SMEs*

Growth is considered to be an outcome of the change process in the organization. So all theories that relate to the organizational change would be reviewed, along with special references to innovation and subsequent change that it has brought in the organizational framework. There are a series of cases that track innovation and organizational growth like the case of Cadila in India (Manimala 1993) and the global ones of Motorola, GE, and so forth.

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 inno-

vation 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."

A major difficulty in observing the effect of innovation on growth is that a firm may take a long time to convert 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 the associated investment and development costs (Bloom and Van Reenen 2002). There may therefore be a considerable lag 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 reviewing innovation literature and its role in the growth of SMEs, let us examine innovation in Rajkot. Rajkot's industry more-or-less follows the diamond model suggested by Porter and Stern (1999). The model, established by Yorkshire Forward in *A Guide to Cluster Development* (2006), truly represents the Rajkot's industry.

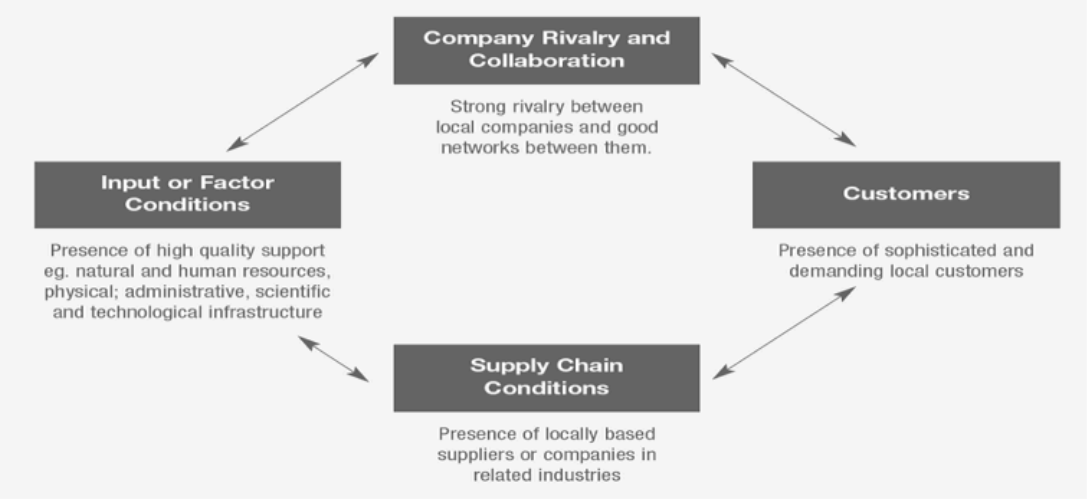


Figure 1: Yorkshire model for cluster growth (Source: Porter and Stern 1999).

- *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 raw material or work at the best rates.
- *Input or factor conditions:* Rajkot has favorable input conditions such as easy availability of raw material and cost-effective sub-processors and assemblers.
- *Supply chain conditions:* a supply chain can easily be established in the industry of Rajkot as there are numerous workers available
- *Customers:* Rajkot is the largest customer for its own products. In the year 2006–2007, Rajkot and nearby areas purchased around 300 CNC machines (70% of the total production of both the large-scale CNC manufacturers) (company data).]

A model like this has created an environment conducive for industry in Rajkot. The seeds of the industrial cluster of Rajkot were sown in the 1940s when entrepreneurs began manufacturing the spare parts of diesel

engines. Diesel engines were the lifeline for 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 arising from the lack of availability of imported spare parts, 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 received 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 center for the production of slow-speed, low-horsepower diesel engines by small-scale enterprises, while the old, established, and larger enterprises in the organized sector shifted to more sophisticated, higher speed, and high-power 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 emerged and machine tools were also manufactured in the cluster. There was horizontal growth and other products like agricultural implements, kitchenware, pumps, watchcases, and so forth, were manufactured 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.

After liberalization the industry had its own ups and downs, the most surprising being the death of the diesel engine industry, which had served as the mother industry for Rajkot. Rajkot's industry adjusted positively to this shock, 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, Gujarat Tractors, and so forth. The allied support firms include 400 foundries, 1,000 enterprises engaged in assembling and sub-assembling, 30 enterprises that manufacture agricultural equipment including assembled products and spare parts, 200+ enterprises engaged in submersible pumps and 2,000 units engaged in produc-

ing machine-tools parts, diesel engine parts, agricultural implement parts, pumps, motors, and so on. There are other units that supply cutting tools, cutting oil, pig iron, scrap, plating chemicals, foundry chemicals, and so forth.

Research on industry in Rajkot is largely confined to the study of the development of clusters and its implications on the area (UNIDO 2002–2005). In the cluster framework, the 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 to Vachhrajani Hardik B.) depicts details about the entrepreneurship and the diesel engine cluster. There have been few studies on the entrepreneurship pattern of Rajkot. The Entrepreneurship Development Institute (EDI) and the Indian Institute of Management at Ahmedabad lead most of the key research. There are no major studies conducted on the innovation in region but Chandra (2006) compares three clusters, TAMA of Japan, Wenzhou of China, and Rajkot of India. The study yields a detailed comparative study of the pattern found amongst all three clusters. An extended search has made it clear that there is no literature available on non-technological innovation in Rajkot. Chandra (2006) studies the role of innovation in the cluster of Rajkot, but the research focuses only on technological innovations of the cluster and those to which it is compared. This research into non-technological innovation is thus an attempt to create literature an area that is critical for industry and society in Rajkot.

## Methodology

The methodology used for the research is that of qualitative grounded theory as proposed by Glaser and Strauss (1967). The researchers visited ten engineering organizations that have been in the engineering business in Rajkot for more than ten year; the researchers are thus aware of the whole life cycle of the business. The organizations are also considered to be 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 ten 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. Although there was no

cap on the number of industry to be studied for the research, the researcher found that after five interviews the categories were overlapping and no new category was generated after the eighth interview. As suggested by 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.

| **Interview Text** | **Codes** |
|---|---|
| From my experience of non-technological innovations in Rajkot is | Personal view |
| The major challenge to innovation in Rajkot is | Assertion |
| From my experience innovation only works in Rajkot if | Personal view |
| Can never guarantee innovation | Assertion |

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".

| **ID** | **Key point** | **Code** |
|---|---|---|
| PA1 | The key non-technological innovation which drives innovation in Rajkot is strong family network of organizations which run the engineering industry of Rajkot | Networking |
| PA2 | We rely totally on outsourcing for innovation | Outsourcing |
| PA3 | Most of the customers are industries run by relatives. | Networking |
| PA4 | Our outsourcing saves time and we assign work to an industry which belongs to the same family; this keeps money within the network. | Networking |

To differentiate key points made longitudinally in subsequent case studies, these identifiers were distinguished with a suffix A 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.

Along with the grounded theory approach, secondary data—reports of the engineering association, chamber of commerce, past studies, various articles published in the newspapers and magazines—were 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 alumnus of the Entrepreneurship Development Institute, Ahmedabad) and Mr. Rajubhai Patel (leading industrialist and director, Sun Forge Pvt. Ltd.). The role of non-technological innovations in the growth of the economy and society of Rajkot was discussed. The major findings of the discussion are reported below.

## Findings

The findings of the research are divided in two categories. The first category describes the findings of the grounded theory research carried out to investigate the research objective "What is the role of non-technological innovation in the growth of engineering industry of Rajkot?" The second category describes the findings of the focused ground discussion, which tries to answer the research question "What is the role of non-technological innovation in the growth of the economy of Rajkot?"

### *The Role of Non-Technological Innovations in the Growth of the Engineering Industry of Rajkot*

Traditionally, Rajkot has been a hub for technological innovations, and industry in Rajkot is popularly known for its CNC machines and technologically advanced machine tools, spares, and so forth. In relentless pursuit of technological innovations, Rajkot has a strong pattern of non-

technological innovations that has remained largely unnoticed. The following are the key findings of the study.

*Raw Material Innovations have Significantly Contributed to the Growth of the Engineering Industry of Rajkot.*

When the going gets tough, the tough get going. This rule of thumb can be applied to the engineering industry of Rajkot. The cluster of Rajkot is dominated by small and medium enterprises that run on low resources and have limited capabilities to innovate in terms of product and processes. So the industries created a new stream of opportunity to innovate. They began working on innovative raw material. Rajkot first innovated with raw material when the first lightweight diesel engine was developed there. Since then, the engineering industry of Rajkot worked closely with customers and vendors to engender raw material innovation. This innovation can further be divided into two aspects: process innovation and product innovation. Providing forged components instead of cast components saved a lot of money and time; it is a good example of process innovation and finding a cheaper alternative to the raw materials that customers have used for years in order to achieve 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.
Although the primary reason for the innovation was to cut costs and give similar or better quality to the customer, of late various large organizations have accepted and adopted the raw material innovations done by the engineering industry in Rajkot.

*Intense Outsourcing ("Partnering") has Significantly Contributed to the Growth of the Engineering Industry*

Industries in Rajkot mostly fall into the "small" category. They are started with limited capital investment and are developed slowly, as and when the entrepreneur starts getting returns from the business. This limits the ability of the industry to conduct all processes under a single roof and creates the need for outsourcing. Engineering setups of Rajkot require 200–300 items on average, which makes outsourcing inevitable. Hence, they depend on other firms to supply them the components and services

to complete an order. This has led to the growth of "processing firms"—firms that do rough casting and finish, machining, drawing, and so forth—firms performing individual operations for other firms. Bessant's survey of firms in 1997 revealed that about 77% of the sample firms outsourced jobs to other firms in Rajkot. Amongst the benefits cited were the ability to meet orders from premises of limited size, and ability to reduce costs (however, this led to intense price based competition between assemblers and subcontractors alike). 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. The industry does partnering (or outsourcing) within the organization where various processes are outsourced but the process has to be performed within the organizational premises, which can lead to better quality control on the product. A second form of partnering is done where a whole process is outsourced in order to be performed at the vendor's location. The organization only has incoming quality control over the product. This may not look like innovation, as across the globe organizations are doing outsourcing, but the scale at which this is done and the impact that 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 ten organizations. Further research is thus required to study the types or patterns used by the organizations in terms of outsourcing.

*The Ability to Innovate on Meeting the Delivery Schedules of Customers has Significantly Contributed to the Growth of the Engineering Industry of Rajkot*

Meeting the 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 changeover time and efficient die and product change mechanisms, which mean that they were able to produce more variety in small batches, which resulted in very quick and effective delivery of products. This ability gives an advantage to the industries in 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 on 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, which is kept to make sure that delivery is met. This makes it very costly to keep the stocks, and, in an uncertain price environment, entrepreneurs often make losses because of their inability to follow approaches in time.

*The Agility to Change According to the External Changes has Significantly Contributed to the Growth of the 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 an organization's ability to proactively accept external changes. All the organizations in this study were found to be very agile in response to the changes taking place around them. They use their agility as a tool to make themselves more competitive. This has a direct correlation with the ability to meet customer delivery schedules—one of the signs of agility. The engineering industry of Rajkot goes beyond meeting schedules to make sure that changes that are going to follow are foreseen and that organizations have been geared up to meet the challenge. Almost all entrepreneurs believed in the importance of projecting customer demand and projecting the macro-level changes, and all of them took steps to make sure that they are gearing up their organizations for the same. Certain organizations pioneered some of the technologies that were accepted at a later stage by other large organizations. This agility comes from entrepreneurs' 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 capability to innovate faster than large organizations. This also seems to be true in the case of non-technological innovations after completing the study. All entrepreneurs were aware of the benefit that they had compared to the large organizations, and were already using this to the maximum.

Lean organization structures with the process owner approach made them far more agile than their large counterparts. In most of the organizations studied, the top management of the organization carried out reviews at various stages to incorporate and cultivate changes in the processes, products. or organization structures to ensure 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 most vital non-technological innovation in the engineering industry of Rajkot. The 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 the mid-1980s, 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 could 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 the last 20 years the whole economy of Rajkot became a big network of entrepreneurs.

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

This networking created Rajkot's identity across the country. The researcher talked with one vendor development manager of India's leading automobile company whom a few of the studied organizations were supplying and found that the customers had higher confidence in the outsourced activity of the networked unit than in that of a normal outsourcing unit as organizations were ready to take responsibility for product quality and were ready to share the risk associated with product rejection. Networking in industry in Rajkot promotes outsourcing and in turn is the core reason behind the indomitable entrepreneurial spirit of the

region. However, all has not gone well with networking in last ten years. There have been instances of difference of opinion between the networked partners, and there are certain units that have decided not to network of 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, which have immensely benefited the economy. 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

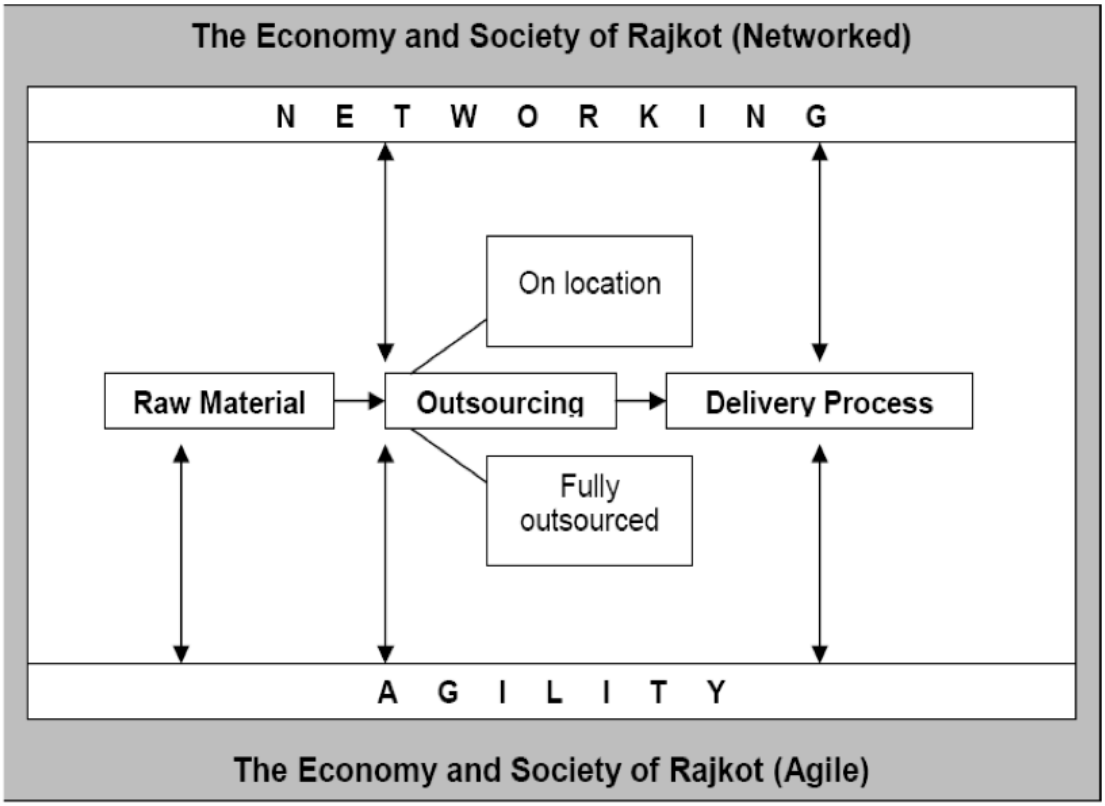


Figure 2: Non-Technological Innovation Eco-System of the Rajkot Engineering Industry (Vachhrajani 2008).

On the surface, Rajkot's engineering industry is a great product innovator and has consistently striven and survived in volatile macro-economic

situations with its product innovation capabilities. But behind those product innovations lie 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 from the city. The key outcomes of the discussion are given in Figure 2.

*Networked Economy and Society*

As the findings of the research suggest, the engineering industry in 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 Rajkot to retain traditional nuclear families in times of rapid transition in India. The networked economy and society enable new initiatives to come faster to Rajkot and to replicate 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 ensures that Rajkot can even afford to create large setups in numbers; the collective strength of family and network can afford this. In last decade more than ten manufacturing setups with investments of more than Rs. 50 crore have been created. This is unusual for a town with a population of less than 2 million. Networking gives diversity to industry in Rajkot. People associated with the network keep on investing in newer business avenues in order to decrease their existing business risks. Few of the organizations studied had network interests ranging from industry and education to stock markets.
Nowhere is the social impact of networking more evident in Rajkot than in the banking sector of the city. The banking market in 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 (some of the banks have NPAs as low as 0.1%). Networking is even more evident in the hundreds of credit societies functioning in the city working for microfinance. 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 the research shows, agility is a key decisive innovation for the engineering industry in 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 a 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 in Rajkot are truly agile and are ready to accept and mould themselves according to the challenges. Seven entrepreneurs studied had their stake in other businesses.

Rajkot is very flexible. Changing business is not something to be ashamed of. In fact, in most of the cases, your reputation or the 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 of Credits, Co-Operative Bank of Rajkot Ltd. So, it is a clear indication that agility is deeply rooted in the culture and society of Rajkot. The roots of agility can be traced back to the early 1900s when people of Saurashtra had to relocate every summer to places where there was enough water, as Saurashtra was considered to be the area of the country with greatest water scarcity. This agility is fueled by huge migration of people from Rajkot to other parts of the world, especially the United States, the United Kingdom and Australia. Patel, who usually belongs to areas near Rajkot, is regarded as the most enterprising Indian community in the United States.

Dr. Rao points out that the ability of people to relocate represents inherited agility. The people of Rajkot have been great migrants internally as well as externally and this creates a spirit of flexibility and of accepting

changes. Hinduism and the strong religious orientation of the people of Rajkot also play a noteworthy role in sustaining this agility.

*Resolute Spirit of Entrepreneurship*

Rajkot has more than 3,000 small and medium enterprises (SMEs) spread across an area of 20 km$^2$. They are linked with non-technological innovations as explained above. These innovations ensure that entrepreneurship in Rajkot is promoted and keeps growing. Strong networking and intense outsourcing promote entrepreneurship and this has made Rajkot's entrepreneurship a hub of western India. Today, because of the enterprising spirit of Rajkot, throughout the country Rajkot is respected as a quality place for buyers. The spirit of enterprise of Rajkot keeps it ahead of other cities of the region in terms of per capita income and percentage of employment. Networking also keeps families together in accordance with Hindu family values. Rajkot is not immune to transformation taking place in Indian society but the tradition of large families is still preserved in Rajkot.

## Conclusions

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

The outcome of this study strengthens the idea that non-technological innovations do have a 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, and so forth, where Rajkot has a significant presence.

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

## 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 be running 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 methods of knowledge production and dissemination no longer work in a way that offers society satisfactory answers and solutions. As a result, a process of "marginalization" (Wiesenthal 2008) and deep irritation about the efficiency and social importance of social science can be stated (Roth 2009; Müller, Roth, and Zak 2010; Roth, Reichel, and Müller 2011; Scheiber, Roth, and Reichel 2011; Roth 2011).

As a response to this situation, there has been growing interest from social scientists in the discussion on the public understanding of science (e.g. Nowotny *et al.* 2001). This discussion may be seen as a result of an attitude saying "Our traditional concepts and methods 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 in academic methods of knowledge production goes deeper and reaches further (Bonss 1999; Weingart 2001). New modes of production of social science and the social production of science will become therefore 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 et al 1994; Nowotny *et al.* 2001), mostly referring to natural or engineering sciences. For us "social science production" is a specific type of social knowledge production by social intervention.

This chapter provides a self-reflective discussion of new modes of knowledge production in the field of organizational development and networking. Starting from a specific case, the Sozialforschungsstelle Dortmund (sfs), it describes new ways of knowledge production including the consequent changes of products and processes, methods and instruments, of the functional organization and personal work styles. Sfs, a central research unit of the Dortmund University of Technology, has been developing a catalog of the 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 hand, and the (reconfirmed) necessity of the autonomy of science on the other, leading to the question of what problems arise and which criteria are necessary to define viable or socially robust knowledge.

## Institutional Background

Since 2007, sfs has been 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 founded in 1946, right after the Second World War, as an institute of the University of Münster—there was not a single university on the Ruhr at that time. In the 1950s and 1960s it became a large institute with a high profile reputation. With few exceptions, the whole post-war promotion of German professors in the social sciences worked at some time in this centre. After the creation of a series of universities in the Ruhr Area during the 1960s, in 1972 the institute became a pure research center fully financed by the federal state budget, holding a total staff of nine scientists plus support functions.
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 such as vocational education and training (VET), organization development, HRD, quality and ecological management, flexible working

time arrangements, issues of (internal and external) labor markets and regional development, gender aspects, health and safety organization, and so forth (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 organizational development and networking (Howaldt 1998b and 2003; Howaldt and Kopp 1998). They had a number of characteristics with obvious parallels to ordinary consulting processes. In the course of these projects we recognized 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 by research institutes into the companies, trade unions, and so forth. 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 recognizing 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). 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," which is suitable for solving practical problems. It may be focused on, for example, implementing new forms of work organization or total quality schemes in companies, developing new forms of networking along the value creation chain within companies or across organizational boundaries, supporting institutional change in regional networks, drafting new schemes of social security, implementing new forms of civil service organization, and so forth. Basically it emerges wherever researchers admit that practitioners are experts of their own technical, professional, and organizational reality and contribute to problem solving on even grounds with

scientific staff intervening in these processes. Hence, it demands new approaches, methods, and tools for organizing the work of scientists in such projects.

### The Main Characteristics of the Project Type

This type of projects is characterized by the following:

- 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 organization.
- New approaches, methods and tools of working.
- Multi-dimensional criteria of evaluation considering general scientific value 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 in their practice as well). All participants deliver their special views, interests and demands on what has to be done and how.

## 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. It also addresses knowledge-transfer activities (dissemination) once research is concluded. Social science production as we and increasingly other researchers practice it, is the 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. Experts from companies and institutions, scientists, consultants, employ-

ees—all these groups work together to create 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 Organization

Projects are thus essentially networks of cooperation oriented towards the solution of practical and scientific problems. Research itself becomes an action learning process requiring new forms of project organization. Given this operational and situational framework, different methods, tools, and modes of operation are necessary.

Traditional research and researchers are used to working in the communication structures often still practiced 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 for 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: 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 in 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, and so forth).

Finally, this type of project demands multi-dimensional evaluation criteria, 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 one must come to practical conclusions for action and implementation in order to achieve previously established objectives. The traditional position of a researcher is usually 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 generalization. Participative observation turns into observing participation as a minimum requirement.
As a rule, researchers are in a practical, coordinative and facilitating function, along with their analytic and synthetic role as scientists. Their performance as facilitators is an essential practical condition for the project's 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, experts in their work. The central requirement becomes to organize progress as a participative learning process among all people involved, 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 summarized as follows:

- Project and network management.
- Development of innovative concepts.
- Organizational development.
- Explicit or implicit training in project management techniques.
- Generating new socially robust knowledge.
- Transfer of experience.

In fact, researchers find themselves in a difficult position. 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 out-

comes. 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 personal career aspects, the project (or a series of thematically focused projects) will only be useful if the coordinating 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 Organization

There are many ways of dealing with the organizational consequences. We will summarize 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 organization and as an economic organization experienced a profound transformation, which, at the same time, required a long-drawn record of continuing professional development and personal change from the researchers, we.

– We had to change our traditional social fields of research. Traditional social labor 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 programs of the European Union and national ministries increasingly adopted a clear SME focus, we had to shift our attention to SMEs, which are a very different world, and increasingly 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 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 optimizing the work and its products.
– We had to change our organization. Working for the market and for SMEs requires becoming an SME yourself. The structural change of our (scientific) work organization has been described above. But beyond this, the whole of the institute's internal functioning and procedures had to change. The former line organization based on seniority has become a network organization with a high degree 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 from 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 organizations 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 acquired much more of a service role than before. The functions of the secretarial staff changed completely from typing pools to flexible project assistance. The institute has become a medium-sized research and consultancy

company with many (seemingly) "freelancers" working in internal and external networks.

Along with the changes in the approaches, methods and tools outlined above, the process that sfs has undergone can be summarized 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. Briefly, 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 cooperation among project partners with different and varying interests in the common project is a task that has become typical for many organizational contexts. Facilitators are agents of progress in many types of project, be they within organizations or among organizations. Usually they are leaders without hierarchy, driven and being able to drive only by the endeavor of achieving the commonly agreed objectives. Working together under conditions 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 cooperation context. It is the facilitator's task to make cooperation 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 cooperation work effectively and efficiently, thus strengthening advanced democratic cooperation structures and methods in a social and societal environment—economy—where hierarchy and direction are usually on the agenda.

A wide range of methods and tools have been collected or developed by sfs, based on action learning concepts (cf. Kopp *et al.* 2003) that allow making professional use of them. Moderation and visualization 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 organization and human resource development or from quality management. A considerable number of these tools have been developed by sfs researchers, such as my tool kit for "sustainable organization and human resource development" (Franz 2003c). A further book dedicated to such methods and tool of facilitating networking is Franz and Sarcina (2009).

Such methods and techniques are powerful drivers of effective communication for planning and preparing common action. Organization development and quality management, as such, are relevant levers of social innovation and can lead to major improvements in the effectiveness of organizations as well as of the professional management of human cooperation 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 cooperation contexts can transform the process of research into a relevant driver of cooperation capacities. Thus, not only is the management of cooperative social research processes rendered more effective and efficient—all people participating actively in them learn from such experience and may transfer their learning to their own organizational 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 and in the emerging knowledge-based learning society, there are still a number of questions to be analyzed 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 ground with commercial companies in the field of consultancy? Can social science, as a parallel to engineering sciences, draw its strength from developing, testing, and maybe even taking to market, new, innovative knowledge services (for example, 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?
– Will we be able to master the institutional changes that are necessary in the research institutions and universities? How will the borders 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 criteria of what is scientific along with the development of new concepts, methods, procedures, and organizational structures (Bender 2001). 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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# PART II

# THE TIME DIMENSION OF NON-TECHNOLOGICAL AND NON-ECONOMIC INNOVATIONS

*Nikolay Trofimov*

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

## Introduction

Complex relations between science, society and industry, growing attention to non-technological innovations (NTI), and rapid changes, are all attributes of modern societies (Roth 2009; Müller, Roth, and Zak 2010; Roth, Wetzel, and Müller 2011; Scheiber, Roth, and Reichel 2011). Collaboration and networking are of ever growing importance for industry and services. Highly developed social capital with a lot of networking relations and R&D collaborations is a distinguishing trait of many successful firms.

A long time has passed since Robert K. Merton justified the crucial role of "pure science" but today there are probably as many reasons as before to confirm 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 was the case during the time of Merton and they have even more functions than previously. In this respect, their direct and indirect contribution to industry has to be assessed from various points of view, taking into consideration the effects of knowledge dynamics 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 collaboration 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 obtain relevant scientific results. The rediscovery of the "science-push" is, to a certain extent, the consequence of an erroneous interpretation of "Mode 2" implications for academia. Even if the outcome of scientific activity of academia sometimes becomes 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 the "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 the "interaction model," which 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 the "science-push" view is easily demonstrated by the fact that weak scientific output renders any further commercialization of scientific advances almost impossible. 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: these determine the universities' capabilities to respond to varying social demands simultaneously and help them to perform their functions as institutes of socialization and nation-building entities. Furthermore, 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 also hinder innovations by making universities more oriented to short-term incremental innovations and applied R&D, rather than excellence in research.

Intricate regulations in the field of intellectual property and knowledge transfer affect 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 too 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 due to incomplete background knowledge (Heller and Eisenberg 1998).

Fewer patents in universities might signify that academic research is becoming more secretive because of growing restrictions limiting academic research, such as secrecy agreements with industry. In some cases even

publication activity can be delayed or postponed (Caulfield *et al.* 2006). Another concern is that too much emphasis on commercialization and privatization in publicly sponsored academia could not only retard the progress of science but could also cause results that are against the 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 the 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 the innovation process (Etzkowitz and Leydesdorff 1995). Although this is an abstract model, its heuristic value consists in demonstrating the evidence of a nexus among the institutional environments that were previously considered as being 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 analyses. 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.

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 the creation of investment banks. These changes of the environment augment its overall disorder and disarray, although they may be directed towards the establishment of new links between institutional structures. Leydesdorff and Meyer described the dichotomy of initial conditions as indicators of selected pathways and underlying operat-

ing 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 do selective environments act as constructs?* It can be supposed that transition from one prospective state to another depends 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). In some phases of the 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 a model could be adopted to illustrate the difference between statistical and dynamical aspects of a complex system. According to Leydesdorff, the model of the DNA molecule provides us with an example of "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). 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. | a) E.g. cell environment | |
| b) Trends (given initial conditions of a DNA-system at a certain evolutionary stage) | b) E.g. number of chromosomes | b) E.g. somatic attributes | |
| Dynamical aspects | | | |
| a) Evolution (irreversible, random[1]) | a) E.g. gene expression | a) E.g. irreversible epigenetic (in)activations | Regular, linear |
| | Adaptive change (slow, under a definite foresight horizon)<br><br>Mutation-specific change (radical, under an indefinite foresight horizon) | | Irregular, non-linear |
| b) Cycles (reversible, complex) | b) E.g. DNA or RNA replication | b) E.g. reversible epigenetic alterations | Regular, linear<br>Irregular, non-linear |

Table 1: Statistical and Dynamical Aspects of a Complex System, Provided by the Model of a DNA Molecule

An interesting attribute of a DNA system is its inherent capability to evolve through endogenous innovations. These, in turn, react to the system itself in the quality of selective environments as the system is increasingly expressed. Similarly, the dynamics at the interfaces of industry, government and academia are generated endogenously (Etzkowitz and Leydesdorff 2000). 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 dynamic 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 on the 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 a 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 for a time span of approximately two generations (~48 years). The curse of each single technology becomes increasingly evident during its maturation in parallel with the increasing uncertainty of the overall reaction of

institutional environments to the adoption of derivate emerging technologies. When foresight horizons become increasingly restricted due to complex circumstances, new algorithms of organizational behavior emerge. Social implications of such transformations might include new views about 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 that 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 (Hirooka 2003).

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 as well. Because a firm as an organized entity cannot permit internal disorder and cannot deal normally with the uncertainty of future outcomes of a complex present, some new external organizational forms (like, for example, networks) have to appear in order to mitigate the sudden chaotic changes. To observe the change without governing it 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 principle of "structured chaos" (Lashinsky 2006).

A number of questions arise when we talk about technological and non technological factors of innovation in a broader context of industry-government-academia relations. To what extent can NTI be the result of technological state-of-the-art, or an indication of technological stagnation, or market-led approaches dictated by the firms? Are NTI only a function of technological advances and technological innovations? To what extent do technological advances imply the direction of further scientific and technological progress by facilitating the introduction of NTI in governments, enterprises, and society? How do trade and non-trade

markets coexist in modern societies and what apparent forms can they take? Are adaptive changes, performed with the aim of conforming to standards, as good as truly radical innovations, determined by system's variation? These questions will be taken into consideration in the following sections, although many aspects of them go beyond the scope of this chapter.

The rest of the chapter is structured in the following manner: The next sections describe the complex interaction of non-technological and non-market innovations with economic and technologic innovations. The ensuing sections explain the conceptual framework for organizational and managerial innovations and describe the results of a preliminary case study involving many large Russian companies. The study provides 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 lifestyle acceptance, should not be underestimated. There is much evidence for the leading role of TI. The lack of evidence for NTI may be a consequence of the fact that many inquiries simply do not take into consideration the possible impact of non-technological factors on technologies (Trofimov 1999).

It is at least 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. This does not mean that a constructivist approach towards social perception of innovations is in contrast with the fact that the society at large is a distinct player in the 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 that 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, we presumably 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 future technology through non-technology factors is one of the attributes of modern economic and technological 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 technologies and their outcomes are both taken into consideration from a more general point of view of socioeconomic change[2] (OECD 2001). For example, business models, organizational and market structures, as well as corporate culture, are heavily influenced by trunk innovations in telecommunications; many of the possible social implications of new technologies in this field have been generally considered since the inception of the relative policies (OECD 1999). This means that setting of priorities in modern societies is not entirely preconditioned by the technological state of the art, nor are the technological or economical factors the only determinant ones.

Perhaps 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 be language or technical jargon, 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 the case of the transition towards the so-called "hydrogen economy" is also indicative. Basic tech-

nologies and processes that 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 the role and the significance of these technologies for society was rediscovered with the introduction of policies for "sustainable development." In parallel, governments have become increasingly 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 innovation in its methodological guidelines (OECD 2005, cf. also the below list). Marketing innovation is defined as a new marketing method for 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, although in practice innovation is often synonymous with an improvement in terms of a personal judgment. 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 (Source: adapted from OECD 2005):

*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 a franchising system, direct selling or exclusive retailing, product licensing
- Use of new concepts for the presentation of products, such as salesrooms 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 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) 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) a

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*

For example, the use of new software for documenting and communicating information in order to encourage knowledge codification and knowledge sharing within the firm

The OECD concept of NTI includes 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 of the reduction of low-profile and routine operations, while they help to put into evidence high-profile processes in organizations, requiring additional efforts in order to achieve a solution.

To better understand 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 the form of trunk innovations and finally cycles of economic, governmental and societal reaction. One theoretical explanation for such technology cycles was proposed by Kondratiev and received further theoretical elaboration by Schumpeter (Hirooka 2003).

In principle, the Kondratiev cycles exhibit a unidirectional succession of evolutionary steps similar to those describing the life-cycle of a single technology. A 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, and reaches its boom stage accompa-

nied 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 the 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 inflated by scientific input, thus triggering the development of a new branch of technology, but after unsuccessful implementations such expectations quickly decrease and leave space for a more pragmatic approach towards a few remaining low visibility technologies. One reason for such a scenario is the 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.

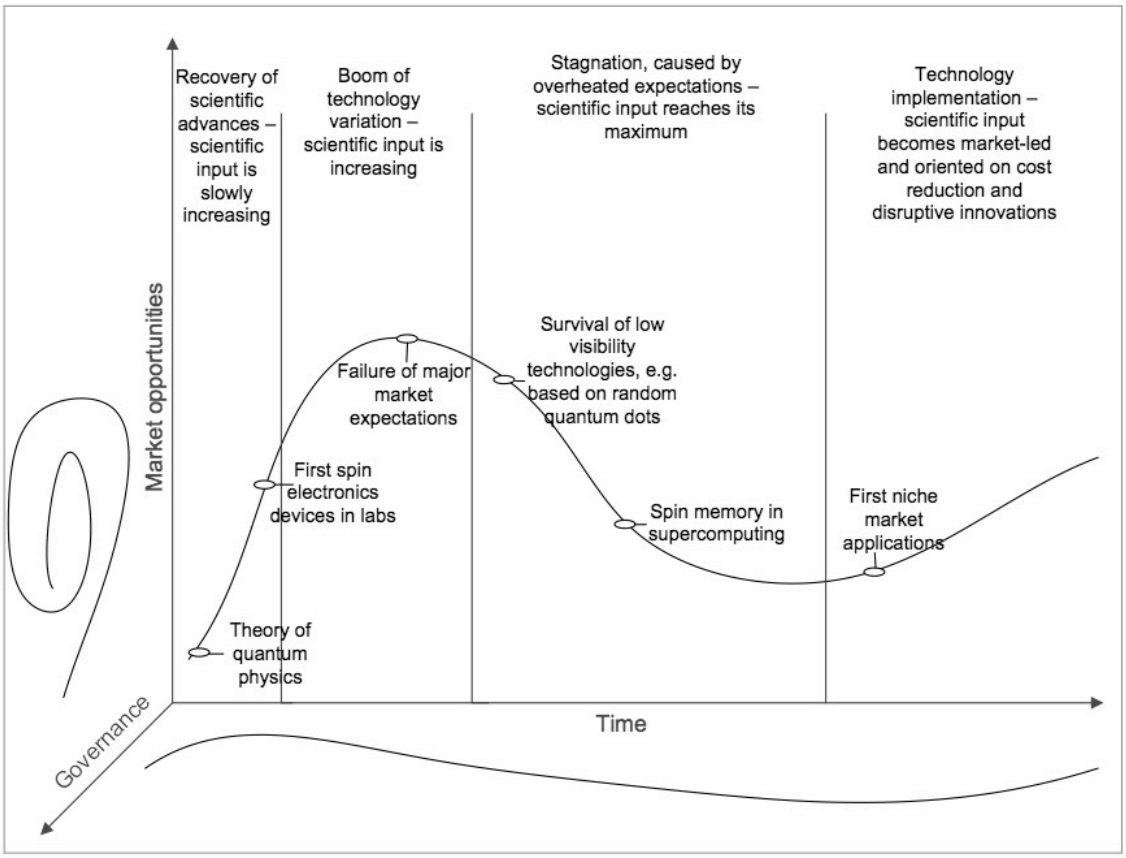


Figure 1: Schematic illustration of a single branch of a technology life-cycle in relation to scientific input and market opportunities

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 by Schumpeter, who pointed out the relation between Kondratiev long cycles and minor Juglar cycles (Hirooka 2003) and associated them with 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 the Durkheimian concept of anomie. They are the achievement of (socially) significant goals in (socially) unaccepted ways. Incremental innovations are much closer to passive adaptation, although they cannot be underestimated because of the great role that life-styles and fashion play in modern societies. All these kinds of innovations exercise a substantially different influence upon the economy and society (Table 2).

| **Incremental innovation** | **Radical innovation** | **Trunk innovation** |
|---|---|---|
| New design, new model "platforms," small incremental changes of technical characteristics of products, etc.<br><br>*For example, innovations within Sony Walkman product family, introduced gradually from 1980 to 1991* | New markets, ranging from niche markets to global markets, new value chains. Radical innovations redefine industries and industry sectors.<br>*For example, Affymetrix GeneChip Systems, introduced in 1994* | Pervasive impact on the economy. Trunk innovations induce many subsequent technological and non-technological innovations<br>*For example, railways during the upswing occurring between 1846 and 1872* |
| Incremental innovations are dispersed and rely on customers' expectations | 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 | Trunk innovations are concentrated in the field of energy, transportation, and communications and they require access to internal or external basic resources |

| Incremental innovation | Radical innovation | Trunk innovation |
|---|---|---|
| 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, which includes economical and non-economical innovations [19] | Radical innovations are related to social capital development, knowledge transfer activities [18] and to marketing and branding strategies. Radical innovations influence and are influenced by organizational structure and corporate culture [20] | Trunk innovations determine directions of subsequent scientific advances and cause revolutions in organizations and value creation systems of businesses. NTI determine the extent and the resolution of the 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 are part of these relations from the beginning. |

Table 2: Different types of technological innovations, their effects, and their relation to NTI

The degree to which the Kondratiev cycles are influenced by feedback reactions of social and governmental regulation and acceptance is unclear. While this concept can be used for long-term predictions, its heuristic value is limited to the time span of changes at the meso-level and totally underestimates the changes at the 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 economic crises and other unexpected factors. When we consider some other factors that function in modern societies, serious doubts can arise about the deterministic view of technological and economical innovations, which attempts to explain eco-

nomic disturbances and crashes in terms of an overheated economy induced through innovation diffusion (Hirooka 2003).
The non-linearity of innovation diffusion may be an indication of the reaction produced by non-technological and non-market factors at meso- and micro-levels. Consideration of these factors can give us information about the irregularities of macro-economic models relying on technology forecasts. Many apparent aspects of the causal relation between technological innovations and economic development can probably 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 proactive 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, it will be possible to define the respective non-technological and non-market aspects of change as taking the 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 the steam engine during the first Kondratiev upswing in 1790 (Kondratiev 1926). At that time the principal preoccupation about society consisted in swaying 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 have emerged, involving more complex approaches to (de)regulation and new networking techniques, such as expert communities, NGOs, human rights observatories, etc.
Current technologies are based on those major scientific discoveries and outbreaks of the past that were successful in triggering waves of invention and led to the recognition of big investment opportunities. After a technology upswing, the diversification and maturation of single technologies could be triggered by other mechanisms[3]. 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 joined their efforts to accomplish relevant non-technological innovations with the aim of consolidating technological trends and agreeing upon the future of technologies.

The manifestations of the so-called 'Mode 2' are more typical than 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, a new technology upswing. The 'Mode 2' method of production of scientific knowledge is characterized by a transition towards trans-disciplinary approaches in science and a growing influence of *mediating environments*, such as the 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 *et al.* 1999). Drawing this kind of parallel, we can say that TI are more similar to available natural resources. These can in turn be concentrated and regulated by NTI, playing the role of artificially organized infrastructures.

Successful TI does not always lead to relevant changes in NTI. Often NTI in form of a more organized patent legislation or a more liberal innovation infrastructure can be a strong incentive for successful TI. For example, many technological innovations in biotechnology were constrained in Russia in the 1990s despite its advantageous positions in many fields at the forefront of medicine, chemistry, and biology. At the same time, the favorable conditions for biotechnology that existed 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 far from the site of principal knowledge flows while exercising remote influ-

ence on them (Leydesdorff, Dolfsma 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 duplicated easily in other regions. Spatial factors of innovation processes also include 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 organizational behaviors and their transformationd into business operations that are new to the whole organization. Core values of organizational innovations are the 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. 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 the decision-making process.

Some OMI are more radical than others (Table 3). 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 basis of every radical innovation.

| **Adaptive organizational and managerial innovations** | **Radical organizational and managerial innovations** |
|---|---|
| *Organizational innovations* | |
| Business model innovations, such as shared services, outsourcing of functions, using of a 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. | Strategy or value innovations, such as changes in the financial model of business, new values for the clients, new value creation models (e.g. business nets), etc.<br><br>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 a relevant knowledge base, high flexibility, etc.<br><br>Knowledge management innovations: development of social capital of the firm and proactive 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 3: Organizational and managerial innovations along a continuum of adaptive and radical innovations

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 improve-

ments *ex ante*. In contrast, adaptive change consists of a relatively slow and a relatively passive adoption of transformations undertaken with the aim of corresponding to the existing state-of-the-art in a determinate field or to adjust some critical processes that 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 the emulation of some general key values, such as collective tasks and responsibilities, open exchange of information, and democratic ethical rules.

Innovations, related to the management of business processes are generally adaptive. They include designing new business processes, BSC and KPI elaboration, TQM, and conformity with international standards. Such innovations generally occur as a result of the need to clarify the value creation chain, rather than to invention a new one.

Radical organizational innovations in high-tech companies are oriented to 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 an 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 ensure that the basic values of corporations will be complement the values and habits of people, and vice versa, it is important to shift local values or to create symbiotic values. Redistribution of human resources competences and accountabilities, internal rotation, training, and seminars are only a few methods to deal with this question. For example, in the Russian branch of the 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 the "mother" company.

Strategy or value innovations are applied strategies that are driven not by competition on the existing markets, but, on the contrary, by the pursuit of new values and markets (Chan Kim 1999). Strategy innovation can take the form of reorganization, brand innovation, new pricing and new positioning, or the recombination of services (e.g. Cirque du Soleil), and other forms of radical changes.

Value innovations in production industries are almost always linked to some kind of disruptive technological innovation. For example, Seagate, the major manufacturer of 5.25 inch hard discs in the late 1980s, did not recognize the value of new 3.5 inch discs and continued to introduce new complex technologies to the already established market. At the same time newly established small companies, such as Conner and Quantum first occupied a niche market and, by trial and error, introduced value innovations for the emerging global market of PCs and laptops, which caused Seagate to fail on this new market[4] (Christensen 2004).

Strategic management of disruptive innovations includes organizational independence, thorough revaluation of the client base, orientation on relatively small customers, a destructive approach towards old rules and standards, and a strong orientation to 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 will remain unclear for a long period 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 1960s, the company was fully concentrated on the market of DRAM integrated circuits and nobody could predict at that time that apparently useless microprocessors would become the core of the company business in the 1990s.

Value innovation can rely on the 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.

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 changes in the organization itself, related to the specialization of labor functions, reform of organizational structure and the establishment of networks of organizations. One of the most important innovations in this field is the 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 an 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.

Proactive 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).

The social capital of a company can be measured as the number of functional contacts of its employees and it is assumed that it influences company performance. The non-linear aspect of this relation must be considered. For example, in R&D-intensive environments, which are endowed with highly developed human and social capital, the overall eco-

nomic benefits for the company can be quite different. This is the case in the service industry. R&D-intensive service firms with a highly developed social capital exhibit rather low nominal labor productivity. At the same time, lower profile service firms seem to benefit more in terms of their innovativeness from highly evolved social capital. Such firms have the strongest sales growth and the highest labor productivity and they are strongly oriented to 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 in the structure and financial model of the business (IBM 2006). This study confirmed that best performing enterprises dedicate more attention to business model innovations. According to the study, business model innovations can benefit enterprises principally in three ways: they can provide economic benefits (e.g. cost reduction), strategic flexibility, and the discovery of new markets through a company's portfolio diversification. While the economic benefits cannot be principally associated with 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 accented 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 none 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 a 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 innovation is the so-called "open-market innovation," which includes 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 will not 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 a company is engaged in highly volatile markets, and the 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 is 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 Large Russian Companies

The case study was performed by the Russian Managers Association (AMR), a nationwide 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 results 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, titled "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 for the low rate of adoption of OMI in Russia is a relative weakness of the Russian higher education system in the field of business management. Many managers do not understand the function and the meaning of OMI in modern societies. They often underestimate the role of personal factors 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 legacy of strong etatistic model of innovation 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 4) responded to a questionnaire previously disseminated via e-mail among all Russian and foreign organizations accessible to AMR. Twenty-four questions were divided into four blocks: prerequisites for OMI, implementation of OMI, the 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 a "snowball" strategy was applied to select ten key experts, which took part in the interviews. Two group discussions with the participation of interested top-managers were conducted with the aim of formulating and approving the questionnaire and one group discussion was held with the aim of resuming the results of the case study.

| | **Size of enterprise** | | |
|---|---|---|---|
| | **Small** | **Medium** | **Large** |
| *Production* | | | |
| Chemical industry and biotechnology | | | 7 |
| IT | | | 3 |
| Metallurgy | | | 5 |
| Machinery and transport | | | 12 |
| Energy | | | 4 |
| Construction | | | 6 |
| Telecom | | | 7 |
| Food | | | 4 |
| Other industries (low-tech) | | | 5 |

| | Size of enterprise | | |
|---|---|---|---|
| | **Small** | **Medium** | **Large** |
| *Production* | | | |
| *Services* | | | |
| IT-services | | 1 | 4 |
| Banks and investment groups | | | 15 |
| Trade | | | 4 |
| Education and training | 1 | 5 | |
| Insurance | | 1 | 2 |
| PR and media | 3 | 2 | 2 |
| Consultancy, audit, leasing, HR | 5 | 7 | 6 |
| Policy support | | 3 | |
| Other services (low-profile) | 5 | 1 | |
| TOTAL | 14 | 20 | 86 |

Table 4: Distribution of questionnaire respondents according to institutional affiliation

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

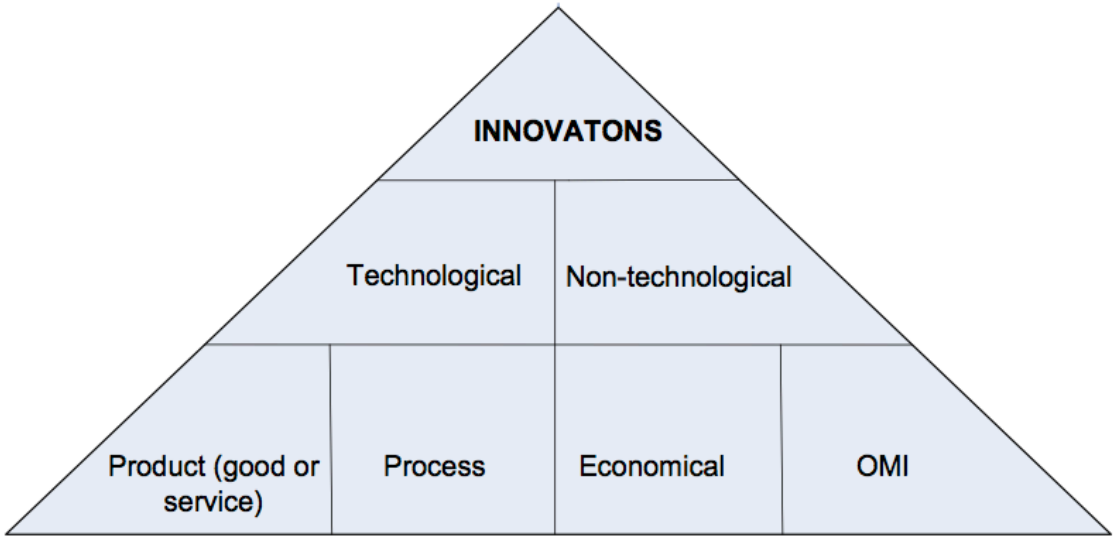


Figure 2: OMI in the framework of general classification of innovations (Source: Russian Managers Association 2008)

> 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 production, financing, commercialization, administration, or some other field of company's activity.

The definition of innovation in Russian legislation also includes 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 in 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 regrading 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.

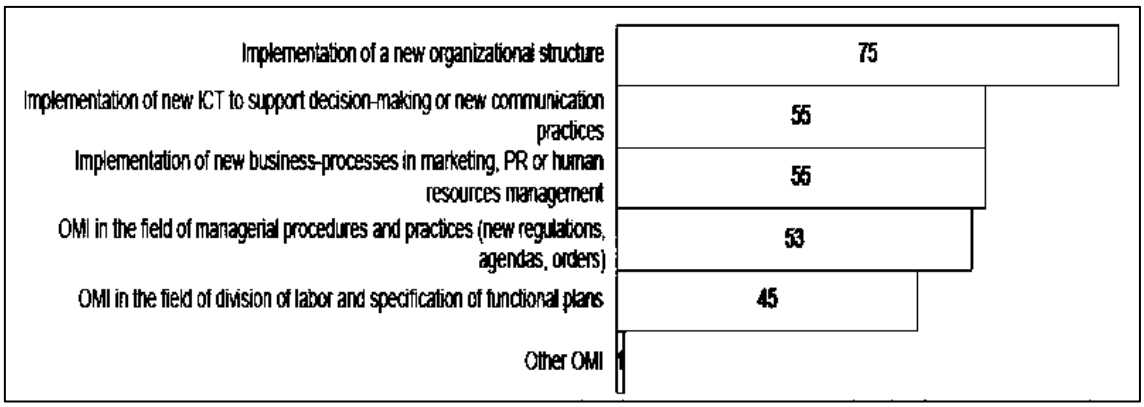


Figure 3: The shares of companies (%) which have implemented at least one OMI, by types of OMI (as proposed in own questionnaire). Note: The estimation is based on the overall number of responses by the respondents (Source: Russian Managers Association AMR 2008).

Only 3% of respondents believe that there is no necessity for OMI in their companies; 42% believe that OMI are needed but not urgently enough to start them right now. The remaining 55% affirm that a high sense of urgency prevails in their companies regarding the immediate implementation of specific OMI.

Despite such a strong interest, organizational and managerial innovations in Russia are generally performed centrally and based on hierarchical governance. The individuality of the innovation process in Russia is generally related to a high degree of institutional isomorphism, taking the 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 that 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 deduced from the overview of the 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 markets. 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 predominant ones and are generally the result of top-management discontent with the present internal situation.

The case study was originally intended to formulate some general hypotheses that can be reassessed and valuated 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.

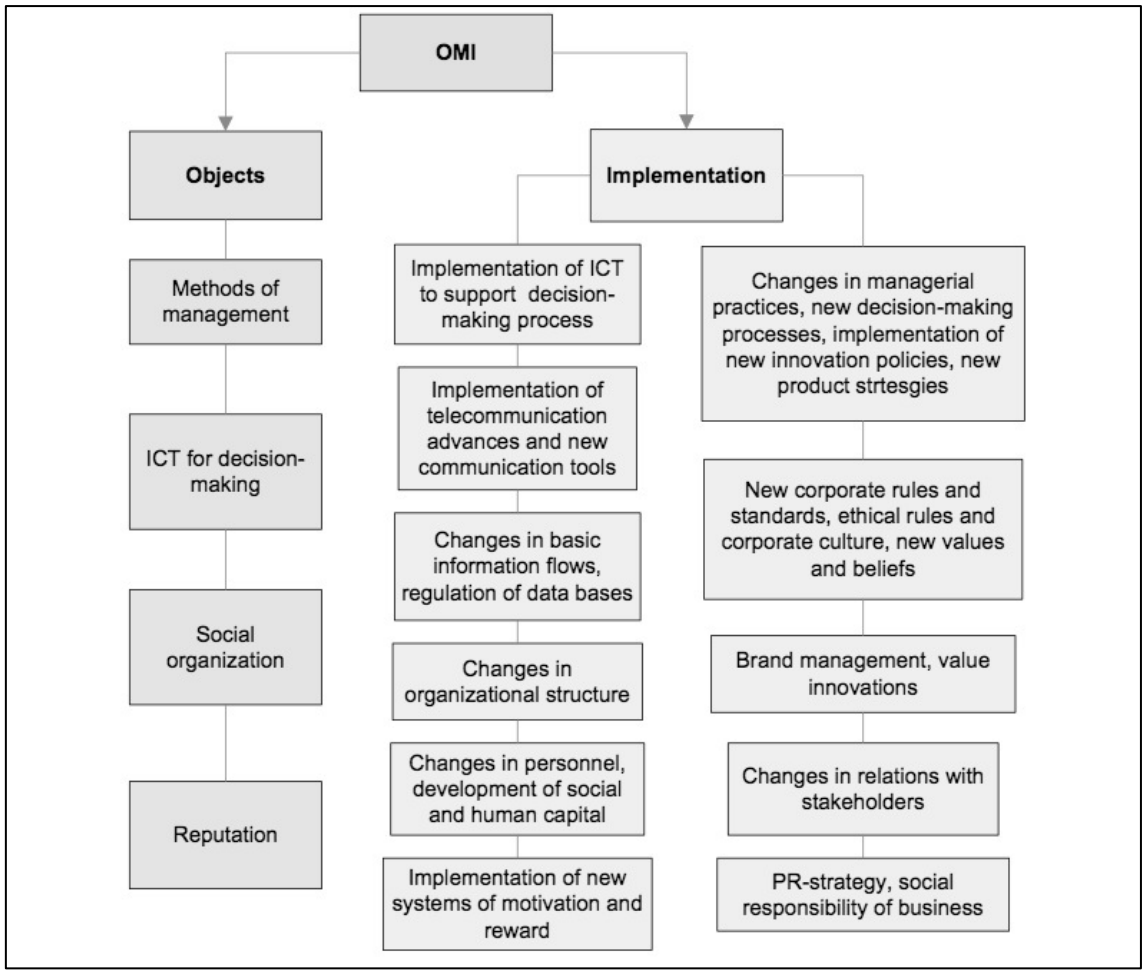


Figure 4: Classification of major objects and attributes of OMI (Source: Russian Managers Association AMR 2008).

*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 the business environment. The dynamic aspects of such transformations include the overall 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 the 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 complement each other. One derivate sub-hypothesis postulates that OMI are more important at early stages of the 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 of evaluating the positive changes resulting from OMI.

*Hypothesis 3: Companies in the service sector are more disposed and more susceptible to OMI.*
First of all, companies operating in the fields 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 towards emulation of OMI, which have been generated abroad.*
Organizational and management innovations are unique and unrepeatable to the extent that they represent a function of endogenous variation. It is not always possible to translate or to emulate the experience of oth-

er 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 the innovation conflict during the adoption of OMI is proportional to the effective (and not formal) changes within company.*
Russian top management is generally oriented towards short-term achievements and prefers 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.*
Sabotage by personnel is a direct consequence of the low level of participation of functional managers, R&D specialists, and other key persons in the decision-making process. The action "from above" encounters resistance from personnel where there is an unclear system of motivation and reward. Creative companies in the 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 by the achievement of a 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 a 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 *ex post* evaluation is performed form the point of view of the company's capitalization growth. At the same time, many

respondents recognize that OMI do not 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 changes coming from outside, especially by 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 the 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 an organization's internal processes and its immediate environment can be represented as shown in Table 5. This structure of variables is based upon the results of the case-study and takes into consideration the specific aspects of Russian reality, as they were mentioned in the answers of the respondents.

| Variables | Specific factors | Some implications |
|---|---|---|
| *Variables describing pro-active (strategic) approaches* | | |
| OMI management:<br>–Restructuring of business (mergers and acquisitions, IPO strategies, assets re-valuation)<br>–Business-processes (changes in organizational structure, redistribution of functions | Russian companies are more influenced by trunk innovations, especially in the field of telecommunications and they put low emphasis on innovation culture and often neglect the value of peo- | Overall effect on organizational structure, organization of business divisions, business processes and marketing activities. As a result, product management, licensing and secrecy strategies are also |

| | | |
|---|---|---|
| and human resources, trainings and adaptation)<br>–Support mechanisms for decision making (e.g. ICT implementation) | ple. | affected. Companies at the early stages of their life-cycle are more flexible and prone to diversify their assets and products. |
| *Variables describing the 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 objectives | Reform of organizational structure, business processes, and marketing activities |

Table 5: Variables that influence the adoption and implementation of OMI in Russia

Russian private companies are thoroughly engaged in the development of special strategies and measures for training their personnel. Some companies have already organized corporate universities or corporate branches within major state universities. New methods and organizational models for the attraction of talented youngsters in the natural and applied sciences are also in the phase of implementation across various industries, such as oil and telecommunications. For example, in 2003, JSC Severstal initiated a special education program called "Talent Pool" in its corporate university in collaboration with the University of Northumbria, in the United Kingdom. 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 the respondents were generally aware of the motivation mechanisms provided by corporate innovation culture. Innovation culture is understood as a 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. In 97% of cases the decisions on the adoption of an OMI were made by the company's stakeholders or board of directors. Innovation culture is associated with organizational innovation management, innovation policy measures, and their explanation to personnel. On the one hand, it is obvious that an effective leadership and charismatic qualities of top management can have a much bigger influence on corporate values than the mere adoption and explanation of these values "from above." On the other, it is important to note that none of the respondents explicitly mentioned such aspects of innovation culture as the necessity to overcome mistrust and fear of failed projects (which failed despite being 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 fail because the innovation culture is also deployed "from above. 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 advantages and disadvantages can be shown by the following example. JSC Stakeholding, a large group of companies in the glass industry, introduced an automated system for accountancy and workflow management with parallel restructuring and reforming of the whole organization's management. An IT consultancy firm was chosen as a provider of IT solution and an internal *ad hoc* group was formed with the aim of improving control over financial flows, to improve organizational discipline, and to facilitate operative access to financial and economic information for management of the company. In a 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. During the implementation phase, the company resources were inventoried and new standards of work for the personnel were introduced in course of some training. In the exploitation phase, the results of system monitoring induced a further modification of the new business processes; at the same time the recruitment of personnel for automated work spaces was implemented. After that, a long process for rendering the system operational and functional began. 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 the company will be improved and whether the current top managers will be able to take more clear-sighted decisions, as neither the organizational culture nor the company's values or strategies have been changed.

*Example 2.* This example describes 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 its 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 did not understand the project and did not want to become project leaders. Moreover, the project results would probably mean a new market entry for A and this posed new problems for A's marketing strategies. R&D people in A could not participate in the decision-making process because they were not 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 the project results 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. Mangers from A became unhappy with the project uncertainties as well, 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 could possibly be a failure all the same, but a new project could possibly produce valuable results on the basis of the 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 the 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." In fact Sitronics Labs is located in a 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 an investment of the parent firm, while the importance of the centrally performed coordination of the activities of Sitronics Labs and the promotion of its interdependence from other business divisions are acknowledged. An important organizational

strategy consists in the establishment of a climate of high responsibility and high sense of urgency.
Although 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 is principally 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 oriented more to an organization's lability or stability, its induced adaptation or self-organization. It is better for an organization to avoid system 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 a company's assets) with the aim of mitigating the chaotic effects of these environments.

Entrepreneurial activity can be enhanced through consolidation of social capital in networks and through promotion of excellence in research. To accomplish this goal, relevant social and organizational innovations might include the 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 processes mentioned above. The best non-technological innovations have multiple effects and feedback reactions, which go beyond the original scope and that are not directly measurable in terms of economic performance. Such innovations can help companies to deploy proactive strategies and to improve their technological leadership in the long term.

## Notes

1 The concept of algorithmic randomness, which describes the changes with *the largest algorithmic information content* (RAND 1997), should be applied. In this case the word "random" as a probabilistic characteristic is a synonym for "unintelligible" and an antonym of "uncertain."

2 In contrast, a tragic view on society presupposes that the influence of technologies is total and that technocracy is the only outcome.

3 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 of a socially distributed knowledge, produced by constellations of concerned parties and only partially codified in conference proceedings and in disciplinary journals (Mueller 2003).

4 Conner and Quantum started the promotion of 3.5 inch hard-disc 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.

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# SOCIAL INNOVATION IN PRIVATE COMPANIES: AN EXPLORATORY EMPIRICAL STUDY

## Introduction

The concept of social innovation (SI) is not established in social theory and still seems to be widely unknown outside the academic context (Aderhold and John 2005; Roth 2009; Müller, Roth, and Zak 2010). A 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 such as Karl Marx and Josef Schumpeter. Schumpeter thought of capitalism as a system constantly revolutionizing its very own foundations mainly through the introduction of new production techniques and new forms of distribution and organization (Schumpeter 1993, 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 that accompanies or follows technological and economic innovations on their path—a view that 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

Only a few sociologists have discussed social innovation. The German sociologist Zapf, who is most prominent for his research and theories on modernization, 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 organizational 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 institutionalized" (Zapf 1994: 33, translation by the author). This definition is obviously formulated in a very general way and encompasses a multiplicity of different phenomena, such as new lifestyles, organizational change within companies, and 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 emphasize 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" means that SI consists in activities that are manageable and do not transcend the possibilities of rational planning, decision making, and implementation.

Zapf does not 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 whether they *always* satisfy the criterion. Lifestyles, for example, may be regarded as intended in a rather instrumental, rationalized form, but beneath the rationalized surface of a lifestyle one may suspect cultural and structural conditions that shape the actual behavior of an individual in a rather "unintended" and unconscious way. Thus, the criterion of intention would allow differentiation between SI and those other forms of social practice that are to a larger extent based on cultural preconditions and the impact of far-reaching social change on patterns of social behavior, rather than constituting a planned, project-like undertaking.

## Aligning Social Innovation with Technical Innovation

Even when accepting intention as an additional criterion, we are 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 will not be captured easily. When we suppose that SI is a confined and manageable activity then the additional problem remains of relating 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—will not have an immediately recognizable impact on social change and would fall out of the classification.

SI may become a factor in social change, but they do not necessarily have to do this. 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 or the implementation of the process. This allows a relatively clear definition of technical innovation. Technical innovation is further characterized by a set of actors (developers, managers, users) and an institutional context (company, development group, development network). The criteria of confinement and manageability that we proposed for SI also apply to technical innovation. Moreover, technical innovation, in most cases, consists of 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 such as the steam engine, the telegraph, or the computer, which revolutionize the way the economy is organized and therefore have a major impact on society.

It seems to be reasonable to align SI with incremental technical innovation, 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 (Zapf 1994; Mumford 2002; Gillwald 2004; Aderhold and John 2005; Moulaert 2005; Lindhult 2008) and from our own empirical research. These aspects are:

- novelty
- institutionalization
- 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 social practice is difficult to assess and may even be irrelevant for the actors who may be oriented towards finding the solution to an existing problem rather than producing "novelty." For us, "novelty" is a matter of the context in focus. In the case of private companies, and for our research purposes, SI should satisfy two criteria: it should be new within the context of the investigated firm and the activity should not be routine practice for comparable firms in terms of size and industry.
With regard to SI there is also a tension between novelty and institutionalization, 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 institutionalization. Social innovation therefore refers to a *new but already institutionalized* organizational form in terms of objectives, organizational structures, defined roles, and durability. Thus, a new social practice needs some time to develop institutionalized structures before achieving the status of a SI.

"Benefit/utility" is a criterion that has been developed by the 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 that dominates this area, for example 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. Social innovation is therefore often controversial and not necessarily perceived as "good" by all involved parties.

This leads us to the next criterion, "value related," which says that SI is related to values in a much stronger sense than technical innovation. Social innovation is driven by values, and it incorporates and expresses them. Values and more concrete aims are, of course, not absolute but are 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 "process-oriented" and "actor-oriented" criteria point out a difference between technical and social innovation (Lindhult 2008). Social innovation is essentially an ongoing social process whereas technical innovation results in a product or a process of production. Social innovation 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 organizations (mostly third sector) is probably one of the most general characteristics of the projects investigated in our study. The partner organizations are not only supporters but often take the roles of initiators and advisers, which are involved in core tasks of project implementation, sharing their professional know-how and ex-

perience with their traditional clientele. Companies seem to depend on this kind of input and support.

The "benefit", "value-related" and "co-operation" criteria point to the fact that SI often involves the combination or confrontation of different rationalities of functional systems (politics, economy, law, education, and so forth). The notion of SI is therefore connected to the major theoretical task of identifying 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 that we consider to be very important. Social innovation 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 the case of private companies this refers in particular to employees and their possibilities for reflection on social processes and for participation in the conceptualization and implementation of new organizational forms. A one-sided, top–down approach will presumably fail to implement sustainable and effective organizational 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 conceptualization 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 special training with external professionals and then independently passes 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 that we investigated. Employees were able to bring up their own ideas spontaneously within a culture of open and personal communication across all hierarchic levels and flexible operational roles.

Social Innovation in Private Companies

We defined SI in private companies as an intended development of new organizational forms (projects) directed at highly valued social 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 possible: the organization of work and organizational restructuring, employee-employer relations, structures of communication, knowledge management, internal vocational training, trainee programs, safety and health programs, human resources development, social support for employees, and so forth. 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 that reach beyond the borders of the private company and show a looser relation to main economic interests. These types of external engagements may consist in sponsoring activities, social support activities, projects that 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 labor 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 organizational forms of social practice seems to be possible, some of these activities actually constituting SI themselves—for example, a network of non-profit organizations 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 SI, 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 internal and external projects that had already been implemented: 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 that had a social aspect to them in terms of supporting a specific target group (often within the workforce) and addressing issues that are of concern for society in general: educational programs for elderly employees, diversity management, programs for integrating persons with disabilities, support measures for women (maternity leave programs), projects supporting external target groups (persons without bank access), etc.
We excluded the large field of organizational restructuring and organization 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 narrow 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 because it is connected to other characteristics like internal differentiation, positions, and standardization of processes.
A qualitative comparative analysis does not intend to deliver "representative" results, which can be generalized to a large population; rather, it 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 until now has not received much attention from academic or the 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 Initiatives*

Type one refers to large companies, which are often the subject of international concerns. These companies are characterized by institutionalized

social policies (CSR). Our interviewees emphasized the importance not only of these institutionalized policies but also their personification through a 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 southeast Europe in the fields of social inclusion, culture and European integration, in cooperation with local organizations. In Austria, the Foundation initiated the project Zweite Sparkasse, which is 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 organization, the Foundation managed to build a new banking infrastructure where clients of the partner organizations receive their own bank accounts 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 voluntary work of 170 employees of Erste Bank, which indicates the high potential for internal mobilization.
The project meets further type one criteria. 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 at the CEO level. An important aspect is the close cooperation with partner organizations from the third sector, which were involved from the beginning in the conceptualization and the implementation of the project and still have an important function within the scope of the project (the allocation of clients, assessment). Implementation is characterized by institutionalized 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 does not 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 at an 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 upon a unique measure—a theater project. Departments that face 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 into a staged play by professional actors. Employees, heads of department, and managers come together to watch the performance 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 emphasize 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 Organizational 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. The character of what we called "projects" also changes drastically. In small companies one will hardly find institutionalized 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 center. Owner-managers and their specific educational and occupational background as well as their understanding of economic success are often the main factors behind internal activities.

Sometimes these activities also emerge from close interactions between employer and employees through dense informal structures of communication and participation.
An example is the small cable production company Deakon Degen, founded by a charismatic female worker who had experienced discriminatory practices against women in the labor market. The support of women, in particular women with children, was a main concern. 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 program for workers.
From a theoretical point of view these simple measures are far 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 of 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 develop an attractive public profile as employers. A further result is that these companies gain access to new networks—for example, companies are visited by local politicians, managers are invited to conferences, and third-sector organizations 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 that is known for its structural economic weakness since the decline of the regional textile industry. For several years the company has been independent in terms of economic performance and output, but the original philosophy is still alive, emphasizing a close and active relationship with the local economic and social environment. The company, for example, initiated the development of a local currency system that aims to avoid 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 organizations and private companies, which supports the currency system. The Waldviertler Werkstätten also shows an original approach to internal organization and employee-related activities. For example, positions and responsibilities are not clearly defined, employees change from production to administration or vice versa, and the highest wages are at maximum 1.5 times the lowest.
This type certainly consists of companies that 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 the fact 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 has to remain on a small scale 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 their 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 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 study discussed, 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 calls for a closer look and will not easily be achieved. The context of the study did not allow us to do more than one interview for every company, which is certainly problematic. There was no chance to confront the views of HR managers and CEOs with the actual perceptions of employees.

We regard participation as an important feature of SI, so the possibilities of employees participating in projects should be a major focus (Roth, Kaivo-oja, and Hirschmann 2013). Another challenging issue is the elaboration of a consistent and at the same time practicable definition of SI. A definition that is too general will not support the attempt to strengthen awareness of the potential of SI as creative and new organizational forms and institutionalized social practices that are able to improve the way in which major social problems are addressed, as well as particular problems of certain organizations and social areas.

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# RATIONALITIES OF INNOVATION

## Introduction

Innovations fascinate us. 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. Distance and space are decisive for being able to understand how novelty turns into innovation and under what conditions innovations arise. In this article, it will therefore be analyzed which long-term historical factors and social processes of transformation influence innovations. The way in which innovations operate depends on macro-social conditions that should be made evident. This text will therefore try to identify the patterns of rationality that accompany long-term and current processes of transformation. At the same time, though, innovation also depends 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 chapter 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, through the use of semantics, can be designated as progressive and trend setting. The 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 parentheses. 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 enhance the advertising message by presenting sporty themes in an ideal world of green harmony and environmental protection is not very convincing. Instead they considered it worthwhile to connect athleticism, driving dynamics and environmentally friendly energy recovery: more acceleration, better braking

for turning corners, and more kinetic energy returning to the car 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, for example, braking, efficiency, air-drag reduction, and the balancing of vehicle distance.

As may be easily discerned, modern mass communication operates quite cleverly. With its subtly calculated metaphorical language, we are introduced to a single, functional detail with unbelievable, novel characteristics. We are amazed and quickly convinced by the effectiveness of the innovation presented to us. In another example, the argument is composed even more subtly. In this case it is not about the obvious, individual parameter, which, under closer consideration, can possibly be distracting. The interaction between individual technical factors and general utilization becomes the center of attention here, which then systematically evokes the desired innovative effects—here those that are resource- and environmentally friendly. Whether this form of calculation adds up in reality remains an open question. The question of whether these and other advertisements actually deal with innovations or whether they are diversionary maneuvers meant to present their own strategic decisions, such as focusing on traditional drive systems as innovatively fertile and efficient, will likewise remain unanswered.

Other aspects are even more interesting: the attempt to persuade the audience with naïve semantics about innovation suitable for everyday use is obvious. Discrepancies, oddities or even inconsistencies stand out only at second glance. Yet arguably even more serious is 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 improvement, at the same time, an innovation, or can it pass as one?

It is incredibly difficult to specify when an innovation can actually be referred to as such according to academic criteria, or using 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 is frequently

unclear where the attribute "novelty" actually comes from or which standpoint or social position is at the base of the claim that something is novel. Daily communication blurs the difference between novelty and innovation. Under these circumstances, is it even possible to establish appropriate criteria with regard to the innovativeness of a point of view, a process, or an object? It is necessary to ask what innovation is. However, this is not just a conceptual problem that can be disposed of with a simple definition.

There is a further related problem: who should supply the criteria regarding what constitutes an innovation? Those involved or the actual objects are often wrongly identified as the place of origin of an innovation—which would not be so problematic if innovation was able to develop from a single place of origin. This unsatisfactory but largely uninvestigated perception is incorporated into most of the theoretically and conceptually based reflections and suggestions for design. It deals with technically variable components, with the creative individual who is meant to be motivated, with continually newer versions of creative techniques to be practiced within group and organizational work, or with the introduction of management and reorganization concepts.

At this point, it is also worthwhile recalling the examples presented previously. It is often not the new technological variations that are evoked, but rather the related effects. 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, systematic connection. The question of innovation is linked to system relevance. In this case, novelty must prove itself, and the effects that it triggers or avoids, as innovations in the ecosystem. Even more important are the observers themselves (who are usually left out). Expectations, as social structures, limit the span of possible points of access. They are built on security. They also reduce the burden of insecurity and complexity.[1] 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 discrepancies that occur (see Luhmann 1994: 138f.). The formation of expectations allows for a certain degree of reliability or security in an otherwise uncertain world. Do society and its subsystems thus provide the criteria and the justifications? Are there social processes of attribution that determine what can be considered an innovation, which forms of innovation are likely or even possible, and in which respects the innovations appears as innova-

tions (see Aderhold 2005a)? This would mean that the characteristics of the innovation vary with the 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

Virtually every issue can appear to be an innovation as long as it involves some element of improvement. Innovation is equated with improvement although it is frequently unclear where the "novelty" actually comes from or which standpoint or social position this assertion is based on. Does the consideration that an object or an issue is new suffice? Does the fact that something was not there before suffice as a criterion?

Is everything ultimately a question for the observer? Can the decision to determine one or more criteria, with the implication that an observer is yet to be identified, be carried out, even theoretically—particularly considering that there are many observers? Or is a conceptual change necessary? Can criteria be provided to differentiate between legitimate and non-legitimate claims about 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[2] 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 auto-mobility) 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—about its effectiveness, the related dynamic patterns of rationality and their social incorporation.

Let us begin with the relation between newness 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: 33). Novelty is therefore not identical to innovation.

In addition, equating 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: 323). The term "novelty" is founded in an assumed or ascertained similarity with and, at the same time, distinction of the observed object or event in relation to a given predecessor. 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 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— 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: 216).

So who is the observer or the 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: 388). Is it hence the duplication of the novelty through which an innovation is created?

Such simplifications must perhaps be avoided. Instead, the suggestion is made here to ask 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" (Luhmann 1991: 373). Hence, it is about system structures—how arrangements are made and provided and whether the results fall into the spectrum of the accompanying arrangements—that is, in the range of familiar alternatives. Innovation should therefore only be referred to when the results do not lie within the range of familiar alternatives at large; that is, when the finalized arrangements do not take hold and the variation consequently transforms previous structures of expectation in a surprising way.

An adequate understanding of innovation can only be developed when relevant structures of expectation are distinguished on the one hand, and on the other communicatively structured processes of observation of

which the individual and collective participants[3] are part. Due to many failed attempts to define innovation according to objective criteria not related to social factors and differences among observers, a concept that is consequently asserting itself is that it is not so much 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 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&D departments of businesses. Based on the considerations that refer to events, participants, and objects as social processes of construction, something can be referred to as an innovation when specific criteria are met (Baitsch *et al.* 2000; Schulz *et al.* 2000; Aderhold and Richter 2006). Our proposal is the following: to conceive of innovations as surprising improvements that, due to social acceptance[4] and collective attribution, are characterized as a novelty[5]. This means that the attribute "innovation" is assigned in retrospect—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 is lastingly influenced at the same time by the activated transformations.

The quest for an adequate criterion for a concept of innovation that is usable by social science 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 this regard it is now worthwhile to take a brief look at some almost forgotten insights from structural functionalism.

## Innovation as Part of Social Change

Parsons' (1971: 35) 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 (in 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. Alongside these considerations is the question of a society's capacity for adaptation. This can be intensified through the "invention" of specific structural components. A prerequisite for this structural adaptation is the development of evolutionary universalities.[6] 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 evolutional universalities[7] that he sees the preconditions for social processes of development.[8]
The question of which improvements can become evolutionary universalities and hence innovations remains unanswered. In social evolution, many accomplishments may be found that can claim such a status (agriculture, script, bureaucratic organization, the printing press, money, steam engines, landing on the moon, etc). 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 influences other structural changes. We should not let ourselves be impressed by this, however. 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

Within the last 10,000 years seven major technological improvements[9] (innovations) and their underlying patterns of rationality can be identified based on a co-evolution of technology and social development (see Popitz 1995). These improvements seem to become more complex, longer and more laden with prerequisites. Society's dependence on the technically feasible becomes greater.
Innovation should only be claimed in the case of a "fundamental technology." Technology can only be referred to when two aspects are taken

into consideration at the same time: the comprehensive character[10] of the transformation, and the social incorporation of technological development. Thus, the design of the tool that was developed during the period of the human settlement[12] highlights the fact that it is possible to produce objects for the processing of other objects in a new manner. In this sense, tools are capital goods.

These ideas 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[14] and society[15] as a whole (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 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 alternative, 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.[16]

The idea that innovation is about deviations is still cultivated 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 refers to the dependency of social development and innovations on related cycles and barriers. Initial technical and economic innovations[17] are identified as the activators of the short-term cycles[18] 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 causal relationship: structural transformations in the economy and in society are continually created by technically based innovations, namely by initial innovation.[19]

## A Brief Look at Past Rhythms of Innovation

The most well known innovation approach[20] for modern characterization is most likely the "Kondratieff cycles" theory of Joseph A. Schumpeter (1961; originally 1939). Here it is assumed that social development, especially in technology and the 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[21] 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 economic level:* in the course of technical development a new market generally emerges (or new markets and business types emerge). 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 "long waves" attempts to join the development of technical and economic possibilities to the transformation of institutional innovation. Social development is viewed positively. Even when phases of growth and regression are taken into consideration, overall a continual upward trend of technical, economical, and ultimately social development can be assumed.

The reported hypotheses depend too much on "historical generalization" for a comprehensive theory of social transformation to be provided (Zapf 1986: 167). Among other things, stagnation of growth cannot only be explained in economic terms, but also in terms of the interdependence of socio-economic and institutional-political elements. It is possible to overlook the fact that the social transformation of institutions[22] itself can trigger or hinder an industrial impulse. Moreover, this innovation theory misconceives the interdependence of the societal subsystems[23] 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 the light of Popitz's guidelines. According to this, it could be theoretically and em-

pirically 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. Not too much should be expected from this point of view, however: the conditions and mechanisms that determine whether innovation is possible change with social relations.

## 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 considered innovative impulses in industry, economy and society. Codified theoretical knowledge becomes a source for innovation and is therefore a motor for social transformation. The decisive step in becoming an information society does not take place until the society-wide implementation of computer technology.[24] Manuel Castells (2000: 5f) continues the ideas of a post-industrial society in his theory of the network society. The dawning 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 is changing as well. Although technological achievements do not (or should not) determine[25] historical evolution and social change, they can accelerate social transformation (modernization), as they are able to impede or restrict development when expansion is inadequate (Castells 2001: 7). Like the theory of the "long waves," Castells views these technologies as the basis of transformation, but in his view the actual adaptation occurs through contact with information and knowledge. Castells (2001: 34) also suggests that these cumulatively designed feedback spirals of innovation and application, found in almost every field, are key to 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 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 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 the mass media is oriented on the value of novelty, which the media 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. This increasingly involves the use of new techniques of presentation, as well as communicating decisions and the meaning behind them appropriately and in a way that appeals to the public.

Since production processes in the economy face shortages, it is increasingly important for enterprises that their products distinguish themselves sufficiently from products of other vendors. But it is not only in the social subsystems mentioned above that the search for novelty and innovation grows important.

The expectation of constant change is becoming very important 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 are the schemata for absorbing changes, for example markets, organization theories, models, concepts, or art styles, are leading to far-

reaching learning potentials (Luhmann 1975: 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 will be sketched out with the help of the examples of two social subsystems—art and science.

*(1) Art:* Before art can emerge as a special form of social communication, art itself must provide for sufficient, distinguishably relevant, indications[26]. Hence, the norm that all pieces of art must be new if they are to be appreciated took root early (Luhmann 1995b: 70). Consequently, and functionally, artistic communication adapts to the refusal of or deviation from past forms and styles[27] (Hauser 1988: 436ff.). To make matters more complicated, art is produced for unknown consumers—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 tradition displays manifests itself in the provocative choice of subject and by new stylistic devices. But if artistic communication puts increasing emphasis on deviation and provocation, a problem arises in that these signs of deviation must be able to show people with no artistic knowledge the new aspect. In addition to that, it must ensure 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, and that they can be accepted.[28] Hardly any attention is given to this condition, which is necessary for art. The new functional problems of the current art system are especially apparent 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[29] 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 novelty becomes a scientific norm. It is certainly difficult to put into practice when traditional wisdom is opposed while novelties are promoted. 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 differentiation of science allows for new recombinations 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).

(3) *Individualization*: Functional differentiation allows and calls for the 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). Individuals are constrained to obtain system-specific and multi-system social addresses that make the desired inclusion more likely. However, working on one's own individual address is anything but simple (Giddens 1991).

In order to stand out, a person's individuality must at least show 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 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: 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. In addition, we have to deal with 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 serious changes are also found here.

## Unintended Restructuring of Innovative Institutions

Innovation is 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[30], be it in organizations or in arranged social contexts that go beyond organizations (Tuomi 1999; Duschek 2002; Aderhold 2004). 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: 112). Innovation is not a linear process; innovations invariably distinguish themselves by "numerous feedback loops, iterations and overlaps during all stages of innovation" (Asdonk *et al.* 1991: 291). Above all the concurring processes of development, construction, manufacturing, and sales planning are affected by different parts of rationality[31], 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 exchange come to the fore (Roehl 2000). Innovation takes place

in parallel worlds. We are facing the simultaneousness of dependence and the accrued chances of cooperation and networks (Sydow and Windeler 1998; Sydow 1999).
In brief, the development of new products and procedures increasingly takes place in cooperation (Nowotny *et al.* 2001). The border of the particular company organization is crossed and, thus, changed. Thus, the scope and the dependencies that the particular companies face, change unavoidably.
The combination of innovation and the chosen means of network embedding become factors that can hardly be neglected any more (cf. Weyer 1997: 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 technical innovation in a social core network at least temporarily.
Strategic actors who build up the ability to negotiate and to enter a commitment among each other are necessary (Wetzel *et al.* 2001; Aderhold 2005b; Duschek *et al.* 2005). Social networks build the basis for the stabilization of technical innovations (Weyer 1997: 138). These changes of the innovation-producing social infrastructure have an impact on innovation as such.
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. 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" (Weyer 1997: 141).
In addition to that, regional groups and networks already accompany the worldwide differentiation of markets and competition. The new role of regional groups[33] expresses a trend that redefines participation in innovation-creating processes (Roth, Kaivo-oja, and Hirschmann 2013). It is more than obvious at this point that the economic exchange of goods and finances has already reached a cross-regional and trans-national dimension.
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 decen-

tralized 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 *et al.* 2008). Outgoing contacts increasingly resemble the internal ones, which, among other things, concern the selection criteria of the choice of partners or decisions concerning locations.

Networking and cooperation are increasingly important in this context, especially when 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 (Sabel 1989; Schienstock 1997: 79).

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

The manner of using knowledge that is available worldwide, as well as internationally organized research and sales facilities (integration into global structures), produce varying potential for competition. This also depends on the concentration of the regionally available know-how in research departments, labor forces, institutions of higher and continuing education and advisors. The competitiveness of companies is linked with the competitive power of their surrounding regions in many respects, and the region is conversely dependent on the competitive power of the resident companies.

Consequently, companies and regions are confronted with an apparently paradox in the context of global competition (Heidenreich 1997: 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 determines the competitive power of the companies (Porter 1996: 146ff.; see also Heidenreich 1997: 503).[34]

The nationally or regionally established concentration of different industrial clusters[35] leads to a process that might in some cases result in a bun-

dling of interests (Porter 1996: 156). The "atmosphere" in the economic surroundings is of vital importance with regard to the innovative and competitive performance of the company. Thus, the structures of a company as well as direct contact with the customer and with the market are influential determinants. Of almost equal importance is the embedding in the "economic surrounding, which distinguishes itself by efficient providers and service companies, by innovative competitors and by qualified labor and venturesome customers" (Heidenreich 1997: 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 not only depends on the quality of an idea or a goal but is also dependent on the conditions for creating social acceptance on institutionally available structures of sponsorship, on historical constraints as well as on the development of expectation structures (which 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 that 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 *et al.* 1997: 153). (Keine Angaben in der Literaur, schade für de Georgier)

## 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 basic research and commercialization should be preferred to (Rammert 1988). Difficulties unavoidably arise 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 of 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 may be considered (Rammert 1988: 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 broader 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 managers have to cope with two problems as a result. First, there is a dilemma as the economic reality tends to hamper innovation while "technical rationality" prefers the utilization-slowing diversity of technical solutions (Rammert 1988: 101). Second, it is unclear how to gain an understanding of the market of a product that does not yet exist (Lynn *et al.* 1996). There are no customers who can answer questions for the company and manager representatives, whose worldview requires 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:

– Marketing managers have recognized this problem and emphasize that innovative projects may not only amount to research and development, but also have to provide for a combination of R&D and marketing ac-

tivities. This changes when the results of promoted projects are about to be transferred into fields of application and commercialization. In particular, major international enterprises operating in different places make 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[36] expresses itself in the fact that it hardly succeeds in creating new markets as the prerequisite for success of the innovations (Weyer 1997: 145)—especially if the emphasis on 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, any more—basic research, applied research, predevelopment, production, distribution and customer service (Hauschildt *et al.* 1993: 18). The actual resource does not consist of the process of perfecting particular single steps but is rather the ability to link up and connect the individual processes[37] on the part of the management.

As shall become apparent, innovation does not amount to a step-by-step improvement of traditional products over a long period. What is decisive is "opening up new markets for products and services that have yet to be developed" (Baethge 1995: 35). The uncertainty of economic success is accompanied by another uncertainty: the economic-political and entrepreneurial shift to innovation calls established structures into question. The production model characterized as fordist[38], which affected post-war Germany in particular, is beginning to disappear. While the social modernization of the 1960s 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 by closing and reducing familiar institutions (Baethge 1995: 38). However, there are hardly any organizational or instructional solutions for this.

Innovations are structured paradoxically in various respects. As indicated above, 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: 14). Thus, the conditions that are necessary for innova-

tion must be discovered, developed, tried and changed in the course of the innovation as well. This is a fact that is mentioned now and then but to which little attention is paid.

We have come across other peculiarities above, which will be summarized very briefly. We have emphasized that novelties turn into an innovation only after the fact. At 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 is not an innovation any more because then it is ever present. It has asserted itself; many people know and use it but precisely at that point it is not new any longer, or it is only new for a very short period.

Another paradox concerns the management of innovations (Baecker 1993: 14). The innovative enterprise must be constantly integrated into the organization, by reintroducing the concepts of success and failure into a successful enterprise/organization. A new goal is set whenever the success that has just been achieved will be considered a failure in the future. It is common knowledge that successful changes that are brought in today may not exist tomorrow. It seems that organizations react irrationally. They create uncertainty instead of—as would be expected according to March and Simon—absorbing it.

Innovations are risky in many respects (Roth 2014a; Roth 2014b). It may be risky to dispense with innovations. 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.
- It takes at least two to play the innovation game..
- During the innovation process, contradictory and incompatible logics encounter each other (e.g. the logic of development versus the logic of application).

An innovations leads 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 market and business strategy grows important if it not only focuses on obvious solutions and customer demands but 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 in the end and for whom.

## Notes

1 The creation of expectation allows for continuity in a world of changing events. One is not only prepared for that which can be calculated in advance but also in the case that something unexpected will happen, that surprises or disappointment will occur. Possibilities for action or damage limitation in the case of disappointment are included with the structures of expectation (Luhmann 1994: 136).
2 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.
3 For organizations, one problem, among others, consists of the fact that this alternative consciousness itself becomes subject matter for decision-based program decisions and therefore gets caught up in the invincible borders of planning capacities.
4 Diffusion research (among others Attenwell 1992; Rogers 1995; Schenk *et al.* 1997) is, however, only one address in the scientific world that deals with this question in-depth.
5 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 (which can only be influenced to a limited extent) 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.

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

7 Subsequent to Parsons, the classical theory of modernization views modern societies (countries) in the West 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).

8 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 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 principles of development; J. A.] if it wants to remain survivable and autonomous" (Zapf 1975: 217).

9 The seven technologies are: tool technology, agricultural technology, technology of fire development, technology of urban development, technology of the machine, chemical technology, and electrical technology.

10 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).

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

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

13 With the invention of the technology of agriculture, humans themselves became the producers of their food. The land became an extensive production facility and was cultivated 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.

14 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 had created distance between the hand and nature; weapons increased this distance to animals through hunting. The question as to how much,

and how, nature should be incorporated into the city is increasingly a matter for discussion in urban development.

15 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).

16 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 development in a society of a 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. The ramifications of 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).

17 One further concept that describes the transformation or stagnation of industrial society through various innovations advances the thesis that the entire Western process of modernization is a result of four "logistical revolutions.

18 From an historical perspective, the cyclical "long waves" portray long-term phases of economic or social development. The cycles are composed of different subphases: 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.

19 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 supplied through price indexes, wage indexes, interest rates, security flotations, and the volume of investments and employment.

20 There are, of course, other prominent candidates (Fourastié 1954; Clark 1957). (in Literatur steht Clark 1940)

21 The movement of the "long waves" requires a society that structurally rewards added value. The question therefore is what happens when preferences change.

22 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 affect the economic 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.

23 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, and so forth.

24 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).

25 See the critical appraisal from Stehr (2003).

26 Different descriptions of art have been tried in the art system. If art was considered to be the 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.

27 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 it is abrupt, absurd, and in regards to the quality of service, incompatible with the concept of advancement.

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

29 Cf. Stichweh (1996).

30 "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: 123).

31 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.

32 Further consideration on the difference between network and cooperation can be found in Aderhold (2004, 2005b).

33 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 in and development of technology, qualified workers and technological know-how.)

34 Heidenreich (1997) mentions the following factors, among others. (1) Production determinants: these include the educational level of the labor force, regional markets, and infrastructure. (2) Conditions of demand: these include the domestic

demand in particular industries. Despite the existence of global markets, domestic demand is still important. 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 industries, 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: 151) develops in the course of close collaboration. The tempo of perceived innovations in the surroundings, in particular, has consequences for the business-minded observer. (4) Entrepreneurial strategies and structures: national differences accrue, in particular, from the way companies are structured and run by the management. The design and implementation of internationally effective company and management concepts is realized in very different ways.

35 An industrial cluster can be understood as a "place bound constellation of similar, mutually dependent or complementary companies, which collaborate closely and which intercommunicate and exchange information intensely" (Schienstock 1997: 80). The cluster-forming companies "use a specialized infrastructure together, they share opportunities and they face the same threats" (Schienstock 1997: 80).

36 "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: 147).

37 What kinds of processes are involved here, in particular, is controversial. A suggestion from Hauschildt *et al.* (1993) is worth considering. The 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 that 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.

38 "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: 33). In the Federal Republic of Germany, strong trade unions and extended rights of co-determination must be taken into account.

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# PART III

# THE SOCIAL DIMENSION OF NON-TECHNOLOGICAL AND NON-ECONOMIC INNOVATIONS

*Jari Kaivo-oja*

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

## Introduction

Innovation, creativity, and design are among the most frequently used words in business and society today. Most innovation studies focus on markets and the technical road mapping of future innovations. Less attention is paid to non-economic and non-technical innovations (Roth 2009a; Roth 2009b; Müller, Roth, and Zak 2010; Roth, Wetzel, and Müller 2011; Scheiber, Roth, and Reichel 2011).

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

In this chapter, my aim is to add a non-economic element to traditional innovation models. In this fashion, I will try to build up a new theory of NMI.

## Integrating Innovation and Foresight Research

According to Kaivo-oja (2006), we can connect foresight systems and innovation systems in seven alternative ways, which are non-linear rather than the conventional linear models (Nonaka and Takeuchi 1995) - see details in Figures 1–14. We present seven theoretical alternative interaction models, which all are possible in modern firms and corporations. We consider that foresight systems can play and often do play an important part in relation to innovation systems.

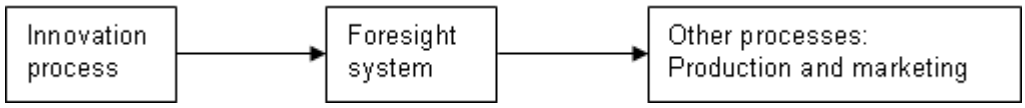


*Figure 1: Model I: Innovation–foresight–other processes (IFO) model*

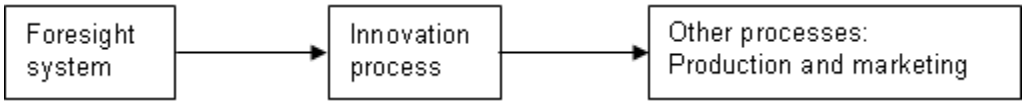


*Figure 2: Model II: Foresight–innovation–other processes (FIO) model*

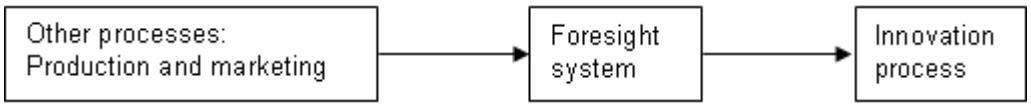


*Figure 3: Model III: Other industrial processes–foresight–innovation (OFI) model*

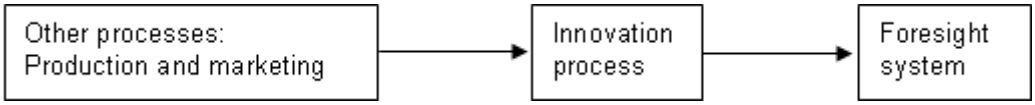


*Figure 4: Model IV: other industrial processes–innovation–foresight (OIF)*

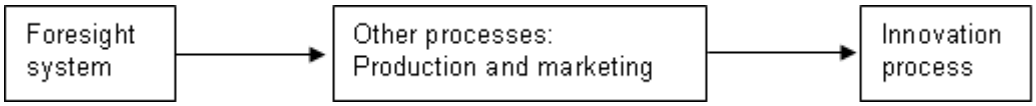


*Figure 5: Model V: foresight–other industrial processes–innovation (FOI)*

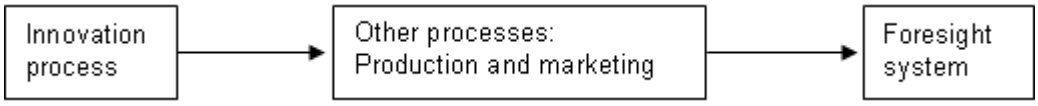


*Figure 6: Model VI: innovation–other industrial processes–foresight (IOF)*

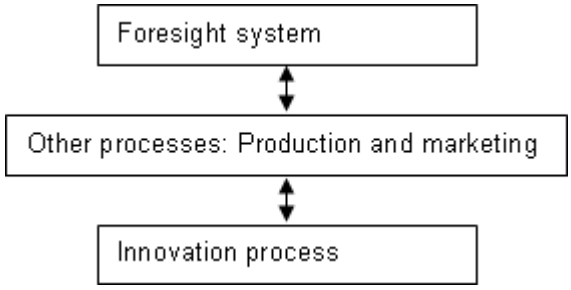


*Figure 7: Model VII: interactive simulative process model (ISP)*

All these innovation models include an economic element, production, and marketing. One way to extend these models to non-economic innovation models is just to add further social systems. In this way we have seven novel interaction models of innovation process. These models are non-economic social systems models.

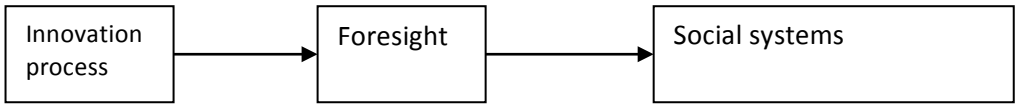


*Figure 8: Model VIII: innovation–foresight–social systems (IFSS) model*

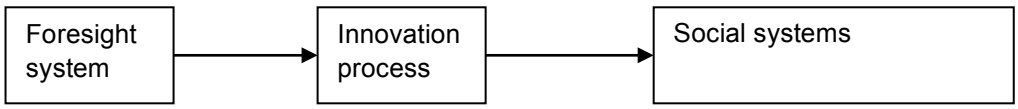


*Figure 9: Model IX: foresight–innovation–social systems (FISS) model*

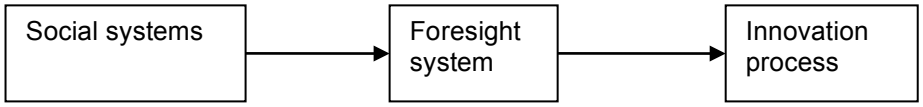


*Figure 10: Model X: social systems–foresight–innovation (SSFI) model*

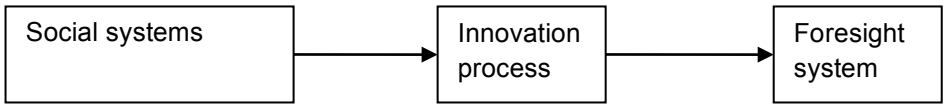


*Figure 11: Model XI: social systems–innovation–foresight (SSIF)*

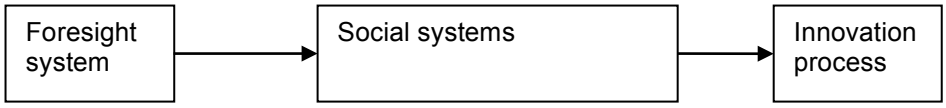


*Figure 12: Model XII: foresight–social systems–innovation (FOI)*

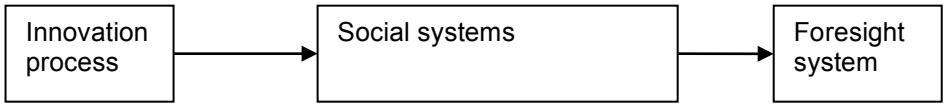


*Figure 13: Model XIII: innovation–social systems–foresight (ISSF)*

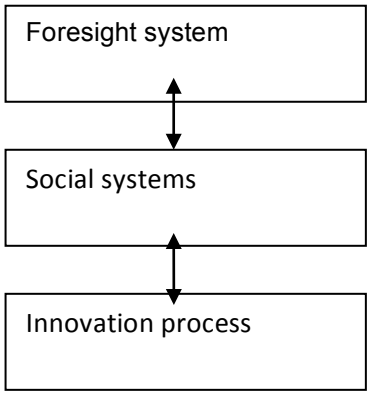


*Figure 14: Model XIV: interactive simulative process model (ISSP)]*

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. In particular, 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.

## Key Innovation Models and Reflections

In this section we discuss four 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 recently been 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 (De Breantani 1991; Sundbo and Gallouj 1998, 2000; Chesbrough 2003; De Jong *et al.* 2003; Roth, Kaivo-oja, and Hirschmann 2013).
Traditionally, new business development processes and the marketing of new products have taken place within the firm boundaries (Figure 15). The open innovation model is a very relevant new concept for non-economic innovations.

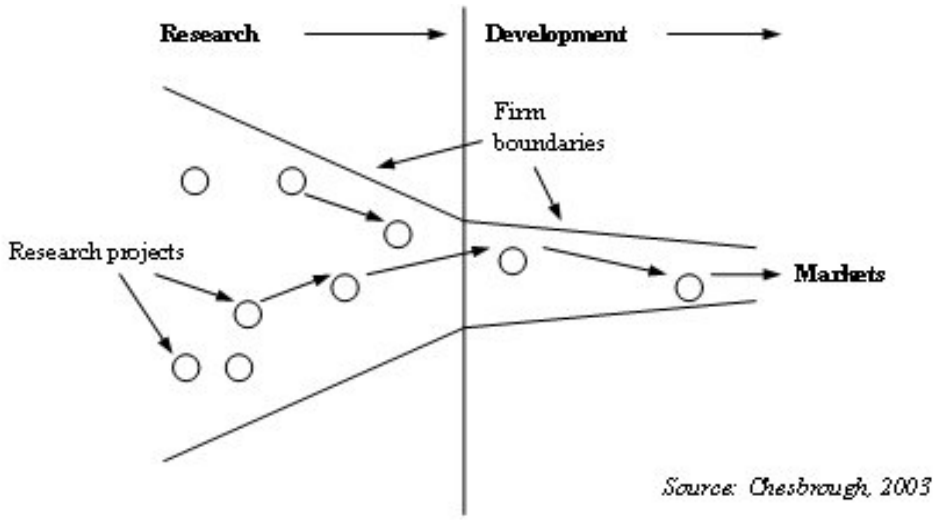


*Figure 15: Closed innovation paradigm (Chesbrough 2003: xxii)*

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 em-

ployees 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. Opportunities for further developing ideas and technologies outside the organization are growing, for instance, in the form of spinoffs or through licensing agreements. Finally, other organizations in the supply chain, for example 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.

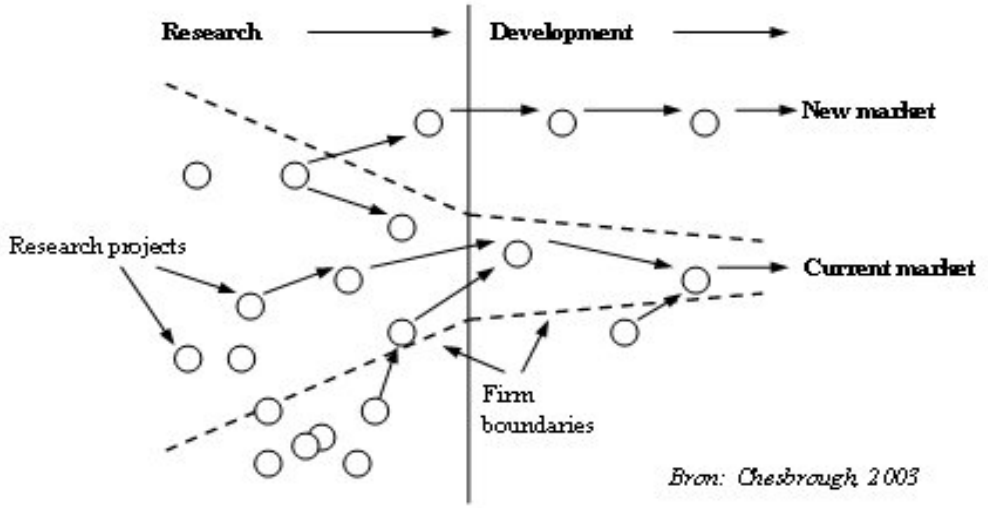


*Figure 16: Open innovation paradigm (Chesbrough (2003 xxv)*

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 Chesbrough's (2003) open innovation model is that it does not take non-economic innovations into consideration. New markets are described as potential places where innovations are out-

sourced (see Figure 16). This issue is analyzed more in the context of the innovation category model. Accordingly we can conclude that the open innovation model could be developed towards also taking non-economic innovations into consideration.

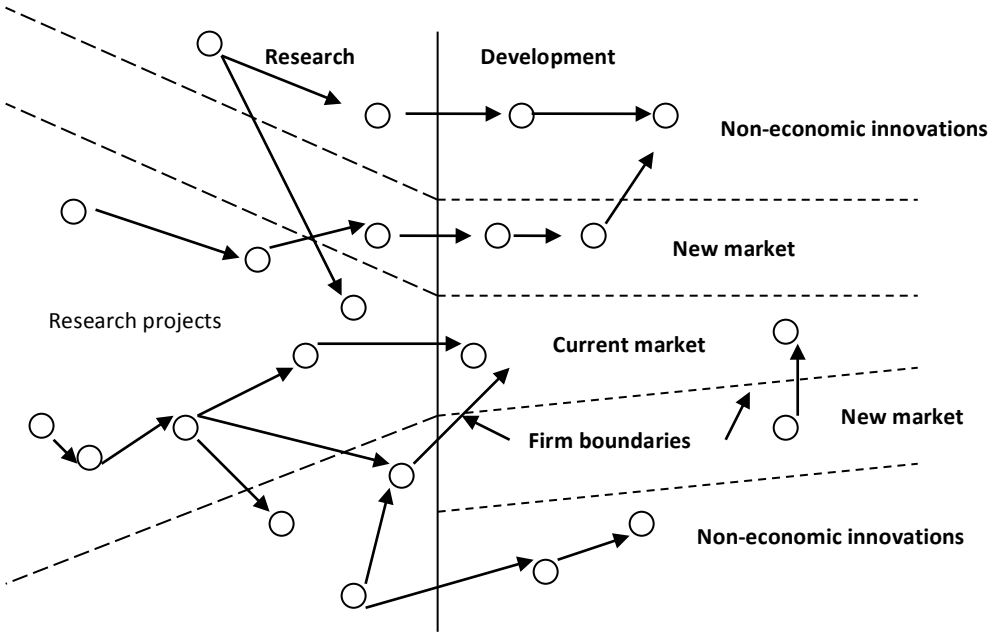


*Figure 17: Open innovation paradigm with non-economic innovations (Source: Chesbrough 2003)*

The existence of the 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.

| **Closed innovation principles** | **Open innovation principles** |
|---|---|
| The smart people in the field work for us. | Not all the smart people in the field work for us. We need to work with smart people inside and outside the company. |
| To profit from R&D, we must discover it, develop it, and ship it ourselves. | External R&D can create significant value; internal R&D is needed to claim some portion of that value. |
| If we discover it ourselves, we will get it to the market first. | We don't have to originate the research to profit from it. |
| The company that gets an innovation to the market first will win. | Building a better business model is better than getting to the market first. |
| If we create the most and the best ideas in | If we make the best use of internal and |

| Closed innovation principles | Open innovation principles |
|---|---|
| the industry, we will win. | 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. |

*Table 1: Closed and open innovation principles (Source: Chesbrough 2003: xxvi)*

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. Table 1 further illustrates this fact.

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, universities, and, of course, end-users. The essential point is thus that, in open-innovation operations, experts are found and they constitute the key operators. An open-innovation strategy can also connected to the Blue Ocean strategy (Roth 2014a) and actor-network theory, which are both very relevant approaches to 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 are six innovation categories (A, B, C, D, E, and F). Figure 18 presents conventional trends in markets and society. According to this approach, in the long-run innovations tend to develop towards incremental and existing market system. These conventional trends are linked to the closed innovation model, not to the open innovation model.

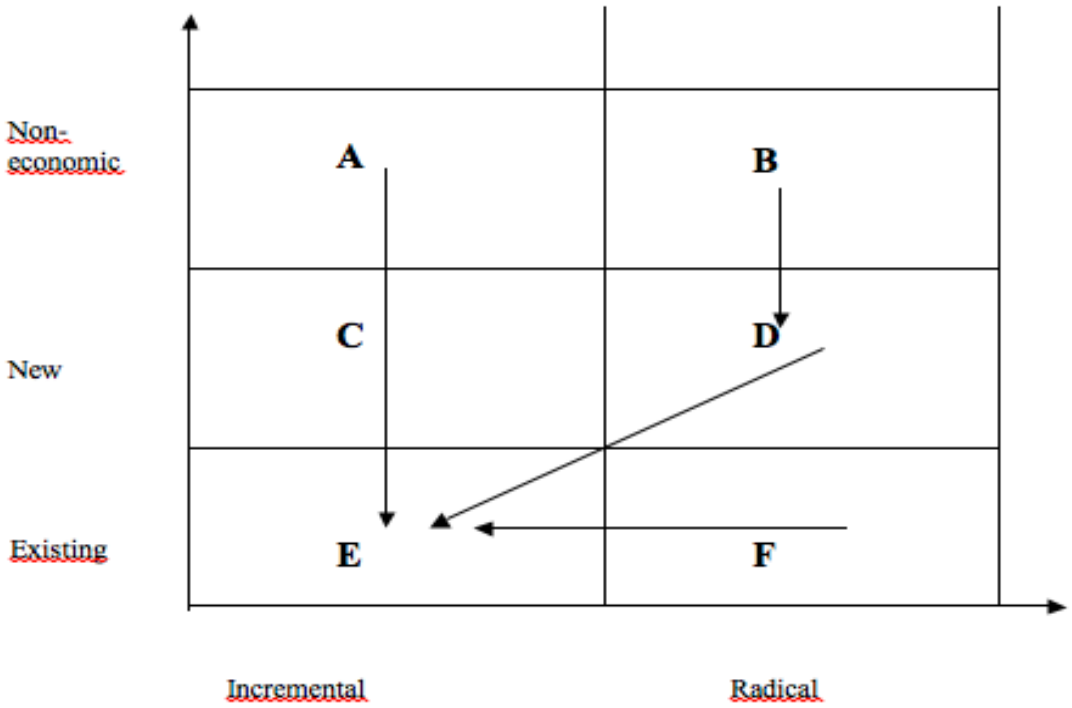


*Figure 18: Innovation category model: typical processes*

Figure 19 presents non-conventional, countervailing trends in markets and society. According to this alternative approach, innovations can also develop new markets 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 Schumpeter's notion of "creative destruction." 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 to 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 existing firms but at their foundations and their very lives" (Schumpeter 1934).

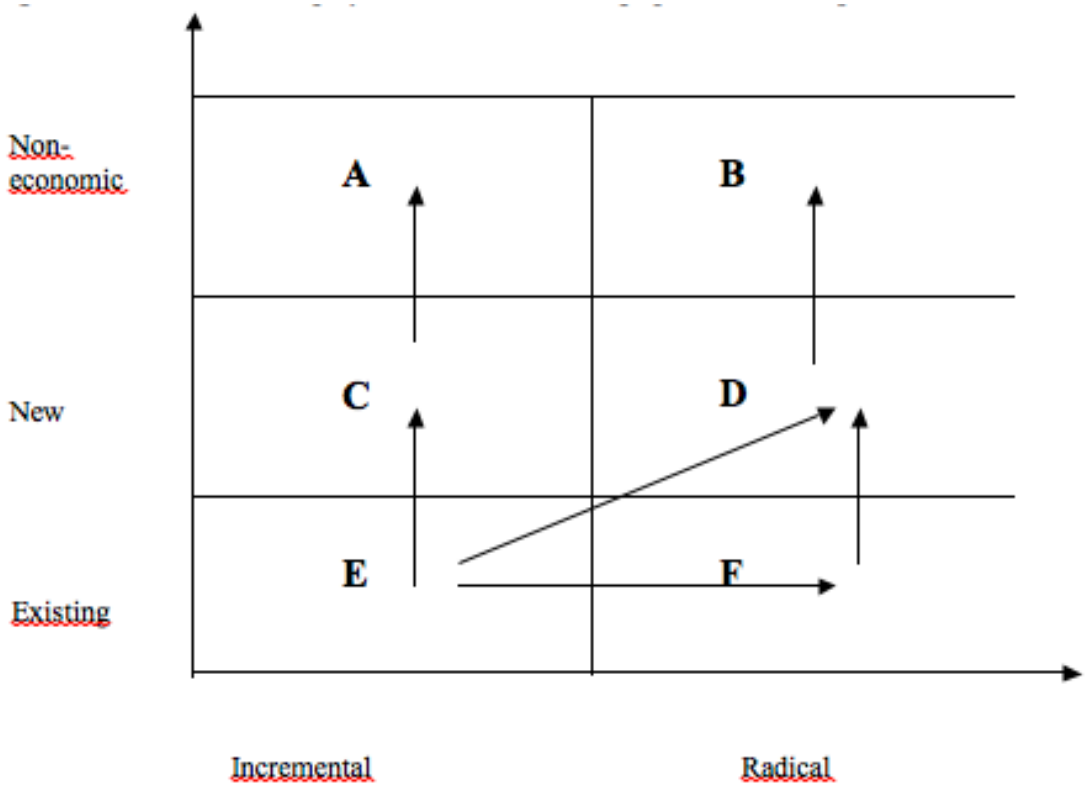


*Figure 19: Innovation category model: countervailing open innovation processes*

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 given in Figure 19 (Cohen *et al.* 1987; Symeonidis 1996).

- 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 once and hence diversify the risks of R&D.
- 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 *et al.* 1997):

- As firms grow large, efficiency in R&D is undermined through loss of managerial control.
- 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 the Schumpeterian research tradition, less attention is paid to large social systems, which 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 an advantage in innovation was interpreted as a proposition that innovative activity increases proportionately more than firm size (Cohen 1995). Other studies examined the relationship between market concentration and innovative activities measured by innovative inputs (R&D expenditure, R&D employment, and so forth) or by innovative outputs (patent counts, and so forth). 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 and 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 firm characteris-

tics. Joseph 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 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 five 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 be founded upon a scientifically new discovery; (3) the opening of a new 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 phenomenon, 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.

The 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 display 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).

## The Triple Helix Model and Non-Technical and Non-Economic Innovations

The active role of universities in relation to 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 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 focuses on the dynamic and intimate role of universities in the development of, for instance, a region. A successful, innovative network is often a community where actors from 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's (Etzkowitz 2006, 2008; Etzkowitz *et al.* 2007) 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 show 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.

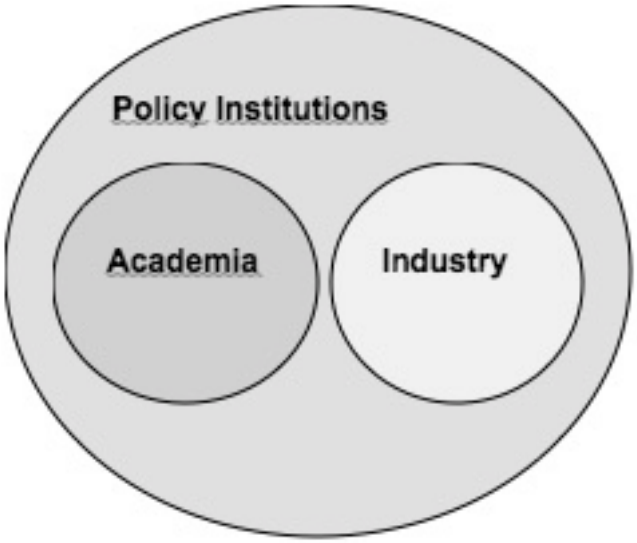


*Figure 20: An etatistic model of university-industry-government relations*

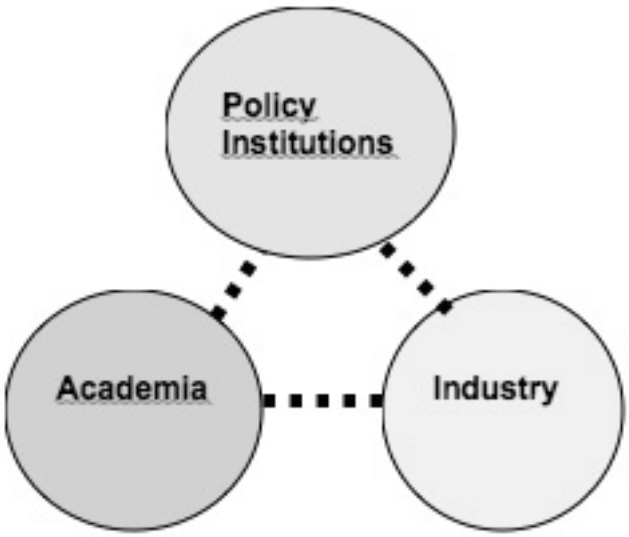


*Figure 21: A "laissez-faire" model of university–industry–government relations*

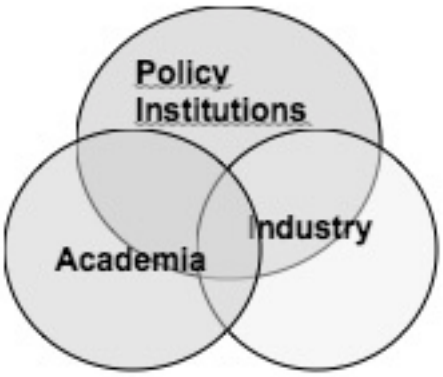


*Figure 22: The triple helix model of university–industry–government relations]*

The very special feature of triple helix model idea is that, in a specific way, it emphasizes the role of non-economic factors in innovation policy. However, on the other hand, one important logical aspect of the triple helix model is that industrial (wealth-generation) and economic factors are always in some way involved in innovation processes. In this way the triple helix model is not taking non-economic factors into consideration seriously (Roth 2014b). 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 bilateral and trilateral 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, the 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 (Roth 2014a; Roth 2014c; Roth 2014d) to the triple helix when system dynamics of innovation process can be seen to be more complex (see Figure 23). We can conclude that if we take non-economic factors seriously, we must develop the triple helix model, which actually goes beyond the triple helix.

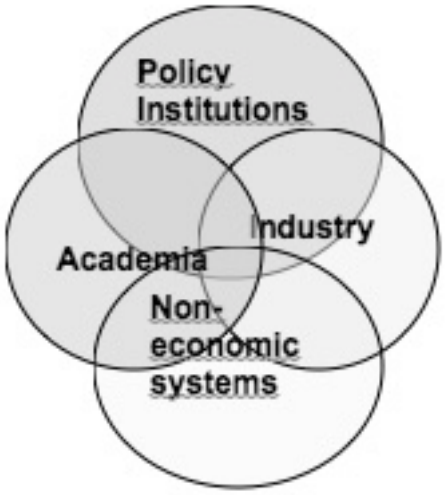


*Figure 23: Non-economic aspects and the triple helix]*

## Conclusions and Reflections

One way to analyze non-economic innovations is to present new versions of traditional innovation theories and models (Jokinen, Malaska, and Kaivo-oja 1998; Kaivo-oja, Katko, and Seppälä 2004; Kaivo-oja 2012). This chapter has focused on four interesting innovation models: (1) the open innovation model; (2) the innovation category model; (3) Schumpeter's classical innovation theory, and (4) the triple helix model.
Firstly, in this chapter I added the non-market sector to the open innovation model. In this way it is possible to understand that the innovation in-process and the innovation out-process can also be connected to non-economic systems and market organizations. This additional element gives a new perspective to the open innovation model and associated open innovation processes.
Secondly, in this chapter I also make a new extension to the traditional innovation category model of von Stamm. I added non-economic sectors to her model, where incremental and radical innovations can also emerge. I also discussed conventional trade-offs between different innovation types and added countervailing trade-offs.
Thirdly, I discussed 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 minor attention to some.
Fourthly, I presented three 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 chapter I have added a non-economic element to these models. In this way I have tried to build up a new theory framework of NEI. Less attention is given to non-technical innovations in this chapter (NTI, thus social and service innovations).
If we analyze the sphere of NEI and NTI, we can outline four new innovation research field categories. This kind of innovation categorization helps us to identify four critical research topics of innovation studies. We can say that both NEI and NTI analyses inspire us to build up four innovation research programs, which have specific background aspects. In this way NEI and NTI analyses and discussions can shift the paradigm of innovation research in interesting new directions.

| **Non-technical innovations** | A. Social innovations (NTI) in markets (EI) | B. Social innovations (NTI) in NEI social systems and environments |
|---|---|---|
| **Technical innovations** | C. Technical market (TI) innovations (EI) | D. Technical innovations in NEI social systems and environments |
| | **Economic innovations** | **Non-economic innovations** |

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

In this chapter I have outlined a new, broader 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.

| | | |
|---|---|---|
| **Non-technical innovations** | A. Incremental social innovations (NTI) | B. Radical social innovations (NTI) |
| **Technical innovations** | C. Incremental technical market (TI) innovations (EI) | D. Radical technical innovations |
| | **Incremental innovations** | **Radical innovations** |

*Table 3: Four new innovation categories inspired by NTI and conventional incremental/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-economic innovations.

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# FROM PROXIMITY TO MULTI-LOCATION TERRITORIAL KNOWLEDGE DYNAMICS: THE CASE OF THE SWISS WATCH INDUSTRY

## Introduction

In recent decades, territorial approaches have played an important role in the economy of innovation (Roth, Kaivo-oja and Hirschmann 2013). 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 synthesized by Moulaert 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 are ongoing processes. New theories on the knowledge economy indicate that, in new innovation processes, knowledge is mobilized more systematically, more permanently, and at longer distance. Furthermore, work on cultural resources, cultural clusters or creative cities, for instance, has 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. Having led the international watch market, new technological and structural changes have forced the Swiss watchmaking companies to mobilize new strategies since the late 1970s. Non-technological innovation provided new resources for differentiation and competitiveness. The traditional regional know-how of watchmakers has also been 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 ways 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 mobilize in order to generate, legitimize, 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?

This chapter tries, in the first section, to develop theoretical considerations about 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 section focuses on the case of the Swiss watch industry. The role of non-technological added value and the rise of new activities related to the traditional watch industry is analyzed. The new socio-economic dynamics between the watch industry and the consumer are also 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. In particular, diffusion and legitimization processes are central for the creation and economic valorization of image and authenticity. Finally, the role of the location 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 economics, 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 new development characterized by the succession of innovations that mobilize the basic techno-scientific principles of radical innovation. Innovation therefore takes place along new trajectories that appear inter-

mittently. 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 labor* 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 favors the cumulative dynamics of using and generating knowledge. These theories, but also theories 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 *et al.* 2006). On the one hand, there is *mono-functional* (Planque, 1991) or *strong focused* learning (Maskell *et al.* 2006), whose objectives are clearly identified from the outset and within which the division of labor 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 labor is organized and stable. The external effects are principally known, anticipated, and sought after by the organization (through 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 organization and convergence of interests makes up for those aspects.

On the other hand, there is *multi-functional* or *diffused focused* learning, which applies 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 characterized 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, and so forth) (Grossetti and Godart 2007). Since the cognitive division of labor is not stabilized and the external effects among the partners can take many forms, such learning usually traverses a lengthy socialization 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 recognized theories on regional development. Benko and Lipietz (1992) offered a panorama of these approaches (industrial districts, science parks, etc.). We should also mention the GREMI research program, 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 Moulaert 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 organizational change. Conversely, 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 words, 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 focuses on innovation processes rather 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; Maillart 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 organize space around this reality (in the form of technopoles).

## *Critical Recent Socio-Economical Changes*

Some important 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 decompartmentalized 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 labor 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 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) learning 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 various forms, and has been the subject of many research projects (Cooke and Lazeretti 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, the automobile industry, and so forth, are examples of traditional industries whose products are increasingly evolving 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, and so forth).

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 coherence. Knowledge dynamics are at present articulated in a cross-sectoral manner, around composite entities such as health, communication or tourism (Cooke *et al.* 2007). The 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) learning that can take place at distance seems to have become more relative today. 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 *et al.* 2007). This trend results in taking learning that arises from relations with consumers into account to a greater extent.

Reflection regarding the new spatial forms that rich learning is taking on clearly shows the justification for taking territory into account within the analysis of current economic phenomena. A genuine research program 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, economic actors have easier access to numerous spatially dispersed areas of knowledge. Their problem is one of identifying and mobilizing these resources within a coherent business model. Research highlights the combination of analytical (science-based) knowledge, synthetic (engineering) knowledge and symbolic (branding, design, advertising) knowledge, which all augment 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. By moving to more cultural resource and NTI, the role of consumer has also increased a lot. Production and consumption systems are partially integrated from now on.

If we base our hypothesis on the idea that numerous possibilities for learning and innovation via the combination of knowledge exist today at various external locations, the central question is that of the modalities by which this knowledge can be mobilized. 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 one of articulating it with knowledge from the exterior.

For Doz *et al.* (2001), it is necessary today to go beyond traditional theories of the spatial division of labor 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 today are 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 pro-

jects 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 the same sector (for example, rich interaction between Toulouse and Hamburg for aircraft engineering) or between different sectors (for example, interaction between local Japanese capabilities for miniaturization 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.

In this proposed paradigm, based on combinatorial and multi-location TKDs, the role regions are changing; this is especially the case for cities. On the one hand, work on *creative cities* (Landry 2000; Cooke and Lazzeretti 2008) reveals that certain cities are becoming central in the process of cultural and non-technological knowledge generation. Those cities, such as Paris, London, or New York, have long been aware of and have 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 chapter, the new conceptual 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. Until the middle of the 1970s, the Jura Arc was competitive on the global watch market due to 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 a new resource for innovation. First with design and later with branding in general, the Swiss watch industry 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*

Until the 1970s the Swiss watch industry presents many characteristics of the traditional paradigm described previously. Through specific and localized technical competences, the Swiss watch manufactories in the Jura Arc and in the city of Geneva are leaders in 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 subcontractors 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 example, the first mechanical wristwatch, and the first quartz wristwatch) and competitive industrial processes of increase productivity and standardization.
Over that time, the international demand for watches is higher than the global supply. The Swiss watch industry is leader on the market but losing 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 in production costs of the quartz technology in the 1970s and with the appearance of the international competition, the traditional Swiss manufactures experienced a crisis. Between 1970 and 1984, the number of employees within the sector fell 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 resolve this crisis, the Swiss watch industry made two fundamental changes (Crevoisier 2007). On the one hand, a strong valorization of non-technological innovations such as design, jewelry decoration or fashion was developed in order to place the Swiss watches in a growing socio-economical trend of moving closer to the distinction of consumers. On the other, concentration of activities within larger firms, standardization and productivity developments applied to electronic modules resulted in a drop of production costs. The role of technology changed and territorial knowledge dynamics became more complex.

### *Non-Technological Innovation, Customization and Combinatorial Knowledge Dynamics*

In the 1980s, in order to be competitive on the international market, the production of watch modules was mostly standardized by the concentration of production activities within larger companies on the one hand. On the other, watchmaking firms differentiated their product through design and fashion components. Progressively, Swiss watchmaking companies focused their strategy of differentiation on the creation of emotion related to the brand and the visible part of the watch (the most fa-

mous example is the *Swatch* watch). New actors such as foreign firms specialized in luxury and fashion (Cartier, Bulgari) implement in the Jura Arc and started to produce watches. Communication strategies and products became more oriented towards social distinctions among consumers (sport, business, popular . . .).
This situation stabilized until the late 1990s but there was a new development in the 2000s with the growth of the luxury sector (Figure 1).

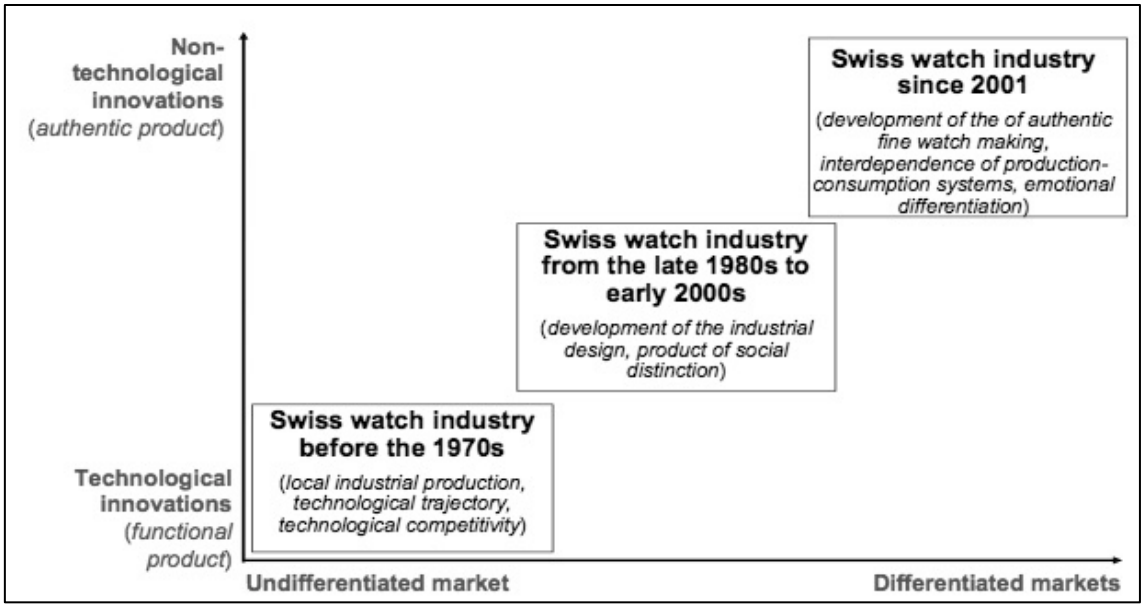


*Figure 1: Evolution of Knowledge Dynamics and Market Strategies in the Swiss Watch Making Sector (Source: Jeannerat and Crevoisier 2008)*

According to the theory of technological trajectories (Nelson and Winter 1982), traditional mechanical watches should have disappeared after having been replaced by a more competitive technology, in this case quartz technology. However, Swiss mechanical watch production has increased constantly since the late 1990s. The global value of exports has trebled over the ten last years and exceeds the global export value of electronic watches since 2001 (Federation of the Swiss Watch Industry FH, 1997–2007. Differentiation is still created through design but with the demand for luxury, emotional components of the product have increased. Consumers are also increasingly 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 idealized universes*. The

Swiss watch industry is no more constituted of watch production companies but of brands in competition.
This phenomenon can be regarded as a whole non-technological innovation system because technology is no longer the central driving force. Knowledge dynamics are not only articulated in a cumulative way but combine with diversified knowledge. Knowledge interactions have developed out of traditional watchmaking activities towards complementary activities such as medias, events, tourism, film production, architecture, and interior design. The creation of institutions by watch manufacturers (Rolex Institute and the Fondation de la Haute Horlogerie), which are responsible for organizing events, promoting watchmaking history or culture in general, is a good example of this situation.
Combinatorial knowledge dynamics take place inside and outside watchmaking firms (Figure 2).

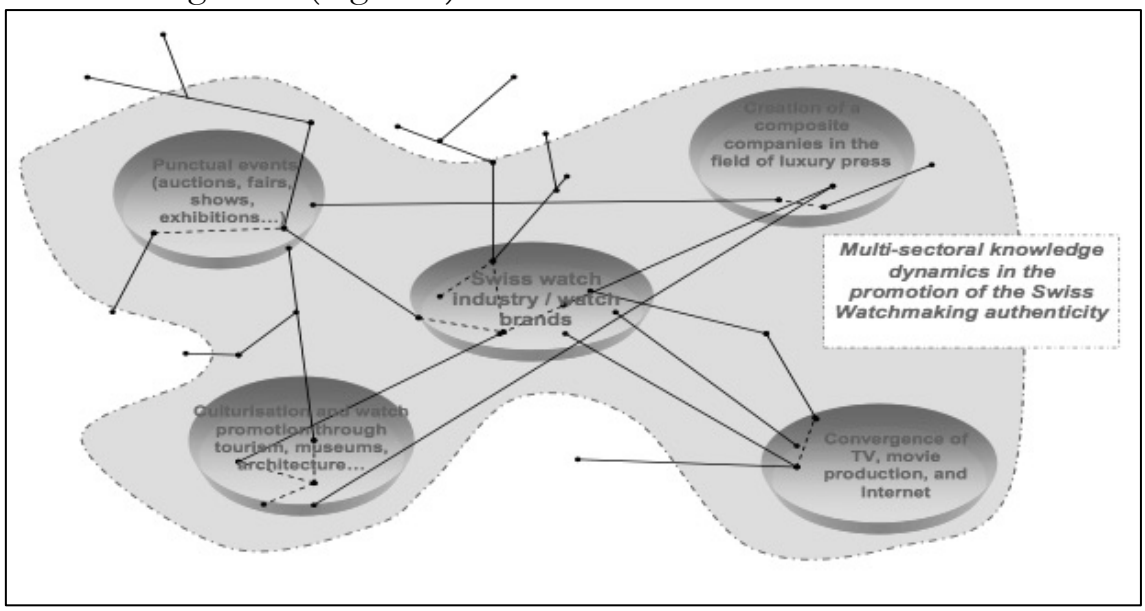


Figure 2: Combinatorial knowledge dynamics within the valorization process of the Swiss watchmaking industry (Source: Jeannerat and Crevoisier 2008)

More and more firms employ people from human sciences or the arts for event organization, communication, museum or exhibition creation, and design. Brand headquarters are now increasingly artistic buildings 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 were built where clients can experience the traditional fabrication of watches (they have the opportunity to see watchmakers at work), and learn about the

history of the firm. However, the most relevant development is characterized by the creation or reinforcement of activities that were not traditionally connected to the watch industry sector. Some film production companies dedicate part of their work to the promotion of watch brands. Web-TV, auction enterprises, exhibition and creation companies as well as communication and multi-media firms specialized in the field of watches have appeared. We can also observe some strategic cooperation between media activities, events organization and tourism, which valorize each other.

In the present watchmaking system, new economic opportunities exist for non-watchmaking activities. The interdependence of new-media, media, fashion and events in the development of emotion and experience is also 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) specializing in watches and luxury. This enterprise brings together different knowledge and territories (Swiss watch magazines, a fashion magazine from Paris, a watch-lifestyle magazine from Singapore but also an international center for watch documentation, a specialized website for actuality in the watch world and a famous award for watches implemented in Geneva).

The evolution of the world watch and jewelry show, Baselworld, also demonstrates the transformation towards a symbolic valorization of watches. Exhibition halls are no longer simple show rooms but are stages where clients have emotional experiences and experience fantasy worlds (the name of the halls explicate this idea: hall of emotion, hall of experience, hall of dreams, and so forth). Rather than just connecting producers and clients/consumers, the event brings together media (a special day and special place only for journalists) and multi-media (live video-diffusion of auctions happening at the same time in Geneva).

Although the sale of a part of the magazines or entry tickets at Baselworld provide a partial financial income from these complementary activities, this complex system of socio-economic exploitation and creation of non-technologically based added value is economically dependent on the watch industry (sponsoring, advertising, sub-contracts or mandates). The global business model remains mainly centered on one main source of income: watch selling. Swiss watch manufactures, in competition with each other on the international market, work together at the point where their business strategies intersect, and they strongly seek to

control the whole system. Complementary knowledge and activities have become crucial for the co-creation, stabilization, diffusion, and legitimating of the emotional universes sold by brands. Interdependencies are strong and territorial relations have changed.

## The Production-Consumption System: The Need for Diffusion and Legitimating of the Brand

In a traditional paradigm of industrial and technological product selling, distribution channels and quality certification are the keys to competitiveness on the global market. This was the case of the watch industry before the 1980s. Watchmaking 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. In the late 19th century, autonomous laboratories were established in Switzerland in order to control the precision 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. Also, the FH was in charge of the promotion of the Swiss watch image.

With the development of strategies of differentiation through the valorization of emotions and authenticity, the production system of watchmaking has changed. However, while technological quality can easily be certificated through functional characteristics (such as punctuality and waterproofing), non-technological value branding—as is the case here for watches—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 the commercialization of non-technologically based added value and with the customization of personal emotions and experiences, Swiss watchmaking firms need a more complex system of distribution and certification as well as control of the whole production-consumption system of emotion and experiences that they sell.

Firstly, watch brands today need to do more than simply distribute their watches. They need to *diffuse* the emotion or authenticity that is an integrated part of their product. Internally, many of them have developed mono-brand shops in most central cities in the world or have specific local managers or subsidiaries, which are responsible for the right diffusion of the brand emotions. Websites of enterprises have also become multi-media shows where the 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. The remaining multi-brand shops have developed new marketing strategies (for example, "the highest watch shop" on top of the Matterhorn mountain), magazines have developed special channels diffusing fashion, lifestyle, and so forth, in relation to watches, film producers or web-television create documentaries or movies to be diffused all around the world, and so forth. Still, watchmaking firms have a strong influence on these complementary activities because they provide the main financial income for them. It is crucial for firms that no inconsistent message distracts from the image they have created. Although such activities have strengthened, watchmaking firms are staying in the center of the system and try to control it.

Secondly, certification of the technical quality of watches is not 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 *legitimizing 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 is not 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 the non-technological added value in the Swiss watch industry requires a more complex construction of quality, the traditional manufac-

tures 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).

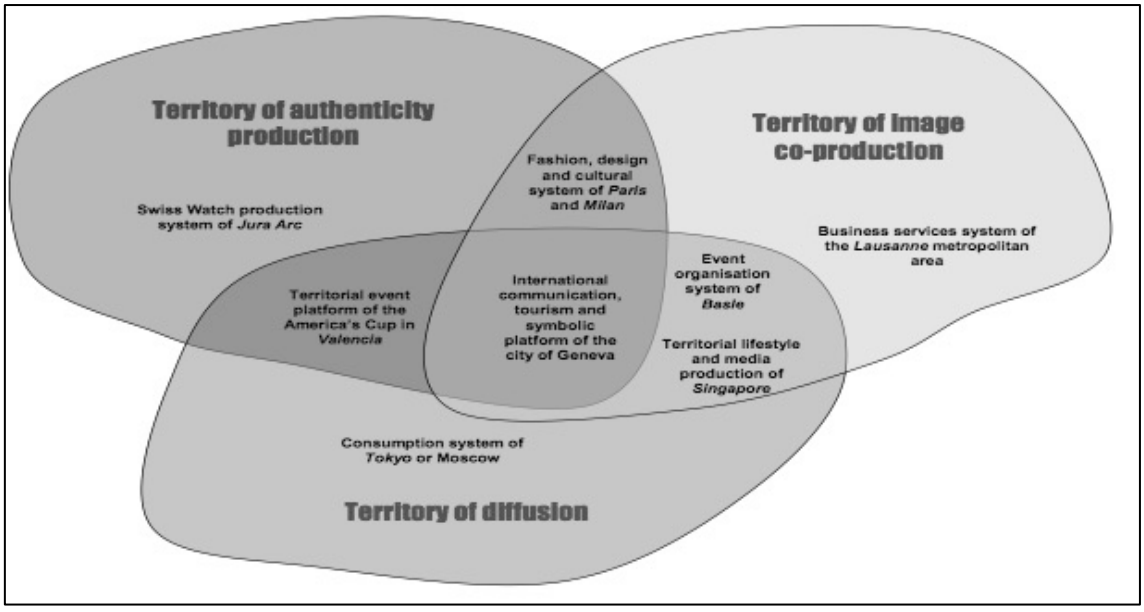


*Figure 3: Multi-location TKDs of the valorization process of the Swiss watchmaking system (Source: Jeannerat and Crevoisier 2007)*

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 the technical quality of watches but also legitimize the image of the regional tradition and know-how for watchmaking. Other institutions such as watchmaking museums or tourism promotion institutions have also 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 Sites of the UNESCO. However, most of the time, the image produced is not stabilized 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 been developed with other areas. As regional or neighboring 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. With the exception of its polytechnic university, the Lausanne metropolitan area was traditionally not part of the watchmaking region. Now, this area is becoming increasingly important for providing new services such as marketing and communication or media and multimedia production for the watch industry. More distantly, many communication and advertising campaigns are elaborated by offices situated in London.

Furthermore, cities like Paris or Milan are at the same time territories of image co-production (communication, art, design, marketing services) and territories driving complementary authenticity (historical tradition for fashion, luxury, jewelry, and so forth).

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 by creating an image adapted to the local market culture. For instance, a place like Tokyo is a platform where shows, shops or exhibitions are organized and where the emotion created around the product diffuses locally. Some other places are territories of diffusion as well as image co-producers. This has always been the case of the city of Basle, which is not directly involved in watch production but once a year becomes the international centre of the watch industry through its world watch and jewelry show. The city state of Singapore not only diffuses the image of Swiss watches to the local culture but also co-produces a complementary image by producing new kinds of lifestyle media dedicated to watches. It also appears that, at certain times, places become 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 (watch manufacturing) 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.

| | **Innovation and proximity** | **Territorial knowledge dynamics** |
|---|---|---|
| **Unit of analysis** | Innovation processes | Knowledge dynamics |
| **Mobilization** | Punctual/discontinuous | Generalized/continuous |
| **Knowledge articulation** | Cumulative and technological trajectories (mono-sectoral) | Combinatorial dynamics of technology and non-technology (multi-sectoral) |
| **Market interdependencies** | Specialized production systems in the global market | Complex production–consumption systems |
| **Territorial dimension** | Spatial division of activities/labor | Multi-location knowledge dynamics |

*Table 1: From innovation and proximity to territorial knowledge dynamics (Source: Jeannerat and Crevoisier 2007).*

The traditional articulation between the regional production system and the global market seems to loose pertinence. On the one hand, multi-location knowledge dynamics are increasingly complex on the value chain of image production. On the other, authenticity and the image produced have to be implemented within differentiated spaces of consumption and be diffused in a standardized and differentiated way. The new stake for the Swiss watchmaking region is to remain within these multi-location TKDs by continuously developing new combinatorial knowledge dynamics.

A synthesis of the considerations developed in the points made above is presented in Table 1.

## 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 area of watch production—non-technological innovations have become crucial in order to remain competitive in the global economy. The capacity to produce emotions or authenticity directly connected to the product permits the traditional watch industry to differentiate and to create an important value added in extra-regional markets. Furthermore, such innovations in non-technological fields depend strongly on the ability to combine other activities in the media, organization of events, auctions, tourism, museology, show production, and even architecture. Thus, traditional technological and cumulative knowledge dynamics anchor with combinatorial knowledge dynamics. The role of technological development (technical improvement of the functioning 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 selling of products whose added value is not based on technology requires a complex diffusion system and legitimation by 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. Watches represent the largest monetary income into the system, so all complementary activities in non-technological fields are coordinated in the same business model. The autonomy of *legitimizing third parties* is very important because a watch is no longer a functional object and its symbolic added value needs to be authenticated.

New territorial considerations 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, is 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, Milan, Singapore, and so forth). 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 to and from different territories and anchor locally.

New economic 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 image can be created and multi-location knowledge dynamics combine, circulate and anchor. In that respect, policy on multi-sectoral project development and institutional promotion of regional images are bound to play an increasing role. Non-technological transfers from more art or socio-cultural training to industry can also be considered to be important as traditional technological transfer policies. It seems that it is by interacting multi-locally, by matching technological and non-technological innovations, and by projecting and anchoring combinatorial knowledge dynamics, that territories are able to perform globally.

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# THE EDITOR, THE AUTHORS, AND ABSTRACTS

*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 the immense impact of non-technological and non-economic innovations on economic performance. Unfortunately, current discourses on non-technological innovations, non-economic, or social innovations lead to logical dead ends or case-study based detours, than consistent pathways towards competitive indicators and strategies of innovation beyond the "bringing technology to the 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, where it provides 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 in more than one market are more robust innovations. Thus, robust innovations can be defined as objects, processes, and

advantages that realize 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 direct link between innovation and economic markets seems to go without saying. The result of this is the close link between innovation and 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 economics. This focus on only two rationalities seems to be questionable—especially when a modern society shows substantial variety in its social systems. In addition to that theoretical standpoint the hard core of innovation seems to evolve in accordance to the shift of modern society to a so-called "next society" in which non-technological and non-economic communication could have a more visible impact on the 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 1990s, the topic of innovation management has been increasingly 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. However, services are very heterogeneous, so we suggest focusing on one case: the little-studied case of retail banking. 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 (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 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, 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, unlike product innovation. This characteristic means that such innovations are almost invisible to customers and competitors, but allow banks to obtain a durable competitive advantage.

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

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*Abstract:* The engineering industry of Rajkot represents the towering ambition of India's economic might. Industry is spread across a 20-mile industrial belt, and is home to more than 3,000 small and medium enterprises (SMEs); employing 100,000 people and generating an annual turnover of Indian Rupees 3,000 crore.
The engineering industry of Rajkot is divided into clusters of subprocesses like forging, casting, machining, machine manufacturing and turning. It has had a strong focus on product, process, and technological innovation. There has been some research on the product and technological innovation capabilities of the engineering industry of Rajkot.
The engineering industry of Rajkot has very successfully used non-technical innovations to move up the value chain. These innovations have fostered technical as well as product capabilities and have gone beyond organizational boundaries to affect the economy of the city at large. These innovations have generated less research but have a significant impact on the growth trajectory of the organization and beyond.
Qualitative research tried to identify the role of non-technical innovations on the growth of engineering industry of Rajkot using grounded theory approach. The researcher studied the top ten innovative organiza-

tions from the engineering industry and attempts to probe into unexplored aspects of non-technical innovations and the role that they have played in the growth of the organization. In the later part of the research, the researcher used focused group discussion among key industrialists, economists and social scientists from the city to discover the impact of non-technical innovations on the economy of the city and on society there.

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

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*Abstract:* At the beginning of the 21st century and the emerging knowledge society, social science seems to be in 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 no longer work in a satisfactory way. As a result there is unease about the efficiency and social importance of social science. New modes of producing social science, characterized by a more social process of science production, are therefore becoming the two faces of an increasingly relevant type of professional social scientific work. "Mode 2" has been a label tagged to this newly emerging type of knowledge production by Gibbons, Nowotny, and others, mostly referring to the 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 promotion of the self-reflection capacities of social actors, thus enhancing the democratic potential of civil society. The chapter provides a self-reflective discussion of new modes of innovation in the field of organizational 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 the 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*

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*Abstract:* Today there is growing evidence that the innovation process is determined by complex interactions between science, society, and industry. While a lot has been done to shed light on such interactions, many dynamic 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 government, enterprises and society. It is supposed that the relation between, and the interdependence of, NTI and TI has to be one of the starting points in the discussion on NTI, if we want to have a clear

vision of the role of NTI phenomena as a whole. The focus of our analysis of NTI is organizational and managerial innovation (OMI), which can take form either of rather slow and predictable adaptive changes or radical innovations. A methodological distinction between adaptive and radical aspects of OMI is proposed. Radical innovations are described in terms of deliberate and proactive action having influence upon enterprise value creation, networking and knowledge acquisition strategies in 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.

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

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*Abstract:* A recent study at the Center 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 chapter presents the typology of company and project characteristics, which resulted from 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 character-

istics shared by social and technical innovations: intention, institutional context, responsible actors, and so forth. This helped us to go beyond formal definitions and to apply the term "social innovation" to projects in private companies, which usually do not 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

*Abstract:* Innovations fascinate us. They work with suggestions and simplifications. They often appear to be something they are not, because they bring us very close to the action and things going on around us. 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. We can ask 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 obvious. Accordingly, in a second step we identifiy the patterns of rationality going along 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 single inventor working alone toward a complex network of structures. Hence, the last part of this chapter 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 situations, innovation studies focus on markets and technical road-mapping for future innovations. Less attention is paid to non-economic and non-technical innovations. Contrary to common trends, this chapter focuses on non-technical and non-economic innovations. Furthermore, in this chapter we discuss key models of non-economic and non-technical innovation. The chapter is not a fully comprehensive survey, but focuses on just four important models of modern innovation studies, which should be a part of the research agenda in the field of innovation research into non-technical and non-economic innovations. In this chapter I aim to add a non-economic element to traditional innovation models. In this way I try to build a new theory of NMI.

*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:* In recent 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. 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.
New theories on the knowledge economy suggest that, in new innovation processes, knowledge is mobilized 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, Swiss manufacturers have developed a new business strategy using culture as

new resource for innovation. Watch brands sell authenticity and the high-tech watch has become the material base.
Through 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-technological factors as well as their territorial consequences.

**Selected Publications of Steffen Roth**

Journal articles

1. *Roth, S. (2014), The multifunctional organization: Two cases for a critical update for research programs in management and organization, Tamara: Journal for Critical Organization Inquiry, Vol. 12 No. 3, pp. 37-54.*
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