

RETHINKING SYSTEMS OF INNOVATION

TOWARDS AN ACTOR PERSPECTIVE ON THE SYSTEM OF INNOVATION PERSPECTIVE

Alina Lidén

Blekinge Institute of Technology
Doctoral Dissertation Series No. 2016:05
Department of Industrial Economics



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Doctoral Dissertation in
Industrial Economics and Management



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Abstract

In 1987 a book by Chris Freeman with the title “Technology policy and economic performance. Lessons from Japan” was published. This book turned out to be the birth certificate of the systems of innovation perspective which came to enjoy a tremendous popularity the next three decades. The topic of this thesis is within the field of systems of innovation. This approach is extensively used today and the systems of innovation is an extensive field of studies; there is a growing interest and a well-established group of researchers deal with the concept and set the research agenda. Despite the great interest and the extensive work so far, the concept is challenged by noteworthy conceptual and methodological ambiguities and limitations.

The aim of this thesis is to advance a theoretical framework of the systems of innovation perspective by adopting an actor-based perspective. From a theoretical perspective, the dissertation pinpoints the system of innovation at the interplay between two rationales: a territorial rationale and a functional rationale. The intention of this theoretical framework is to shed light upon the variety of actors operating within a system of innovation. Based on different logics or rationalities, actors understand and behave differently which has an impact on the behaviour and performance of the system. The assumption is that the different rationalities influence the innovation process, and how activities are organized and carried out. In the empirical backdrop of the thesis, the Swedish system of innovation is analysed in terms of how innovation policy discourse and practice have developed over time. The territorial based system of innovation is analysed through three instances: Vinnova, the Swedish National Innovation Strategy and the Innovation Council, all considered to be relevant in understanding the embeddedness of ideas on innovation within Swedish politics and practice. The functional based system of innovation is addressed through the role of the large firm Ericsson in the systems of innovation. Ericsson has been chosen as an actor in a system of innovation, and therefore attention is paid to the interplay with the territorial actors, such as the state and universities. Several conflicts of interests characterize the relation between Ericsson on the one hand and the university and government on the other. The interplay between the two types

of systems of innovation is further concretized in the analysis of the Mobile Heights case, an innovation cluster programme. Three main analytical conclusions have been emerged from the empirical research, discussed in terms of policy makers, policy implementers and practitioners pinpointing to a fairly loose system where different interests, networks and practices can only be partially and temporarily aligned.

Table of Contents

Acknowledgments	9
Prologue	11
1. Introduction	15
1.1 Setting the scene – outlining the field of tension.....	15
1.2 Aim and research questions.....	20
1.4 Disposition of the study.....	22
2. Epistemological and methodological considerations	25
2.1 Epistemological consideration	25
2.3 Methodological considerations.....	33
2.4 Choice of the empirical case.....	37
3. The emergence and development of the systems of innovation perspective	41
3.1 The context of emergence	42
3.2 Systems of innovation as a descriptive science	45
3.3 Systems of innovation as policy analysis	53
3.4 Final remarks	56
4. On the theoretical foundations of the systems of innovation perspective	59
4.1 On the evolutionary theoretical underpinnings	62
4.2 The institutional underpinnings	66
4.3 Learning and knowledge	72
4.4 The systemic perspective.....	80
4.5 Final remarks	83
5. Territorial and functional systems of innovation – towards an actor perspective	85
5.1 Towards a territorial and functional understanding of systems of innovation	86
5.1.1 The actor perspective.....	89
5.1.2 The embeddedness argument	90
5.1.3 The concept of Interest	95

5.2	The territorial systems of innovation.....	98
5.3	The functional systems of innovation.....	103
5.4	The interplay between the functional and the territorial rationalities.....	108
5.5	Final remarks.....	111
6.	The emergence and development of the systems of innovation perspective in Sweden	115
6.1.	The context of the emergence. The crisis of the 1970s and 1990s.....	116
6.1.1	The crisis of the 1970s.....	116
6.1.2	The crisis of the 1990s and its consequences	119
6.2	The debate – the interplay of the academia and policy making	124
6.3	Final remarks.....	129
7.	Towards a territorial and functional understanding of the Swedish system of innovation.....	131
7.1	The territorial-based system of innovation.....	131
7.1.1	The case of Vinnova.....	132
7.1.2	The Swedish Innovation Strategy.....	138
7.1.3	The Innovation Council.....	145
7.1.4	Discussion	148
7.2	The functional-based system of innovation.....	149
7.2.1	Standardization.....	150
7.2.2	Understanding innovation from a firm perspective.....	160
7.2.3	Innovation Strategy	164
7.2.4.	Discussion	165
7.3	The interplay of the territorial and functional systems of innovation. The case of Mobile Heights.....	166
7.3.1	The beginnings	167
7.3.2	Standing on the shoulders of giants – the local embeddedness	169
7.3.3	Mobile Heights Business Centre	171
7.3.4	Mobile Heights and Academia-Industry collaboration.....	172
7.4	Final remarks.....	177
8.	Final conclusions.....	181

8.1 Rethinking systems of innovation. Towards an actor perspective on the systems of innovation perspective.....	181
8.2 Contributions and further research	193
References	197

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Olivia & Viveka – this is for you!

Lund, May 2016.

Prologue

Has Systems of Innovation research lost its value? Or is it stronger than ever? You can have your say in the plenary debate where famed debaters will lay out the positions. And you will, together with the rest of the conference, be asked to oppose or support the motion: “Let it be resolved that this conference believes that the system of innovation approach is no longer a promising line of research.

This was the theme of the 35th DRUID Celebration Conference 2013. The advocates of the system of innovation approach lost the debate; hence the conclusion of the conference was that the systems of innovation perspective is no longer a promising line of research.

PART I

Introduction

1.1 Setting the scene – outlining the field of tension

In 1987 a book by Chris Freeman with the title “Technology policy and economic performance. Lessons from Japan” was published. This book turned out to be the birth certificate of the systems of innovation approach¹ which came to enjoy a tremendous popularity the next three decades. The book was the result of the debate that characterized the 1960s and the 1970s when the question of innovation began to receive increasing attention, especially from policy makers. The rationality of the book was to understand the upsurge of Japan as an economic power after the Second World War and why the Western countries (i.e. the UK and the USA) started lagging behind. In this context, the concept of systems of innovation, more precisely national systems of innovation, was coined and defined as “the network of institutions in the public and private sector whose activities and interactions initiate, import, modify and diffuse new technologies”². The focus of the analysis is argued to be on the country’s institutions and experiences as “which has been the most successful in accelerating the rate of technological change over the past 30 years”³. At about the same time, Bengt-Åke Lundvall at Aalborg University was working with a similar concept, but having the user-producer perspective as starting point.

The topic of this thesis is within the field of systems of innovation. Emerged at the beginning of the 1980s, it quickly diffused among researchers and policy makers⁴. The approach is extensively used today, but its acceptance is

¹ In this thesis, the terms of approach, perspective or notion will be interchangeable used.

² Freeman, Christopher, *Technology policy and economic performance: lessons from Japan*, Pinter, London, 1987, page 1.

³ Freeman 1987, page 2.

⁴ Cf. Edquist, C., *Systems of innovation: Perspectives and challenges*, in Fagerberg, J., Mowery, D.C. & Nelson, R. R. (red.), *The Oxford handbook of innovation*, Oxford University Press, Oxford, 2005 and Lundvall, B-Å., *National Innovation Systems:*

still problematic (see the prologue for example). Nevertheless, the systems of innovation is an extensive field of studies; there is a growing interest and a well-established group of researchers deal with the concept and set the research agenda. Despite the great interest and the extensive work so far, the concept is confronted with noteworthy conceptual and methodological ambiguities and limitations; its applicability and relevance has also been challenged and scholars have attempted to deal with these problems – if the theoretical status should be strengthened or not, or how it should be applied. As mentioned in the prologue, the scholar community has declared the death of the system of innovation framework as a promising line of investigation.

The systems of innovation perspective emerged in a specific social and economic context in order to understand and explain the trajectories of economic growth of the late 1970s and after. The period of high economic growth after the Second World War, also known as the Golden Age, came to an end with the oil crisis and the “stagflation” of the 1970s. The Keynesian economic model became obsolete, economically unsustainable and politically rejected. In the academia, the 1980s provided a new development model as an answer to the crisis. Unlike the neoclassical framework, which focused on the static allocation of resources, the new framework focused on the dynamic and historical development of the economy (evolutionary economics). Traditionally, innovation and growth were understood as being solely steered by the R&D level of investment. R&D measurements were generally used as surrogate for most of the activities influencing the innovative capacity and economic growth⁵. The use of only R&D indicators provided a replicable and uniform method of comparison, but it also provided partial, uncompleted information on national systems. The strong focus on R&D statistics established the foundation for the linear model of innovation which in a simplified way can be described as a one-way relation between basic research/science, development, production and marketing. That is to say, the linear model of innovation was based on the assumption that R&D was the main source of innovation. Mainstream economic theories were largely focused in trade and market principles, less attention being paid to issues such as learning, knowledge, the role of institutions, technology or technological change. The system of innovation perspective emerged as a

Analytical Focusing Device and Policy Learning Tool, Working paper R2007:004, Swedish Institute for Growth Policy Studies 2007.

⁵ The use of only R&D statistics was internationally established in 1962 when OECD presented the Frascati manual, implementing the standardized and uniform way of measuring R&D, creating a framework for internationally comparative R&D statistics.

refutation of the neoclassical economics approach to the study of innovation whose focus on deductive mathematical model building was considered by many scholars as unsuitable to deal with the complex mechanisms of innovation. The 1960s and 1970s are characterized by a growing number of empirical studies in the field of innovation, several of them formulated as a rejection of the neoclassical economics and the linear model of innovation, thus proposing a new way of addressing knowledge and information. The systems of innovation approach stated that economic growth was to be reached through knowledge production and technological innovation.

The innovation system concept was developed in parallel by different researchers in Europe and in the USA in the 1980s and 1990s. There is no doubt that Christopher Freeman and Bengt-Åke Lundvall are the ones who coined the concept of systems of innovation (national systems of innovation). The concept became widely diffused with Chris Freeman's book on Japan⁶, and along with the seminal works of Bengt-Åke Lundvall⁷ and Richard Nelson⁸, the concept enjoyed major attention from economists and policymakers. The works mentioned opened up for a new research agenda and despite the authors' different initial assumptions, they are all seeking to explain differential patterns and levels of innovation performance by examining the role of institutions.

While it is unanimously accepted that the systems of innovation perspective emerged in a very specific set of economic and social circumstances, there is less clarity surrounding the academic or policymaking origins of the perspective. The founding fathers of the perspective, Freeman and Lundvall, occupied professionally dual roles, working both for the OECD and as academic researchers, making therefore difficult to clearly state whether the roots of the systems of innovation perspective are primarily academic or policy related⁹. The perspective has been perceived as an OECD concept and policy makers have been perceived as passive recipients of the perspective¹⁰.

⁶ Freeman 1987.

⁷ Lundvall, B.-Å. (ed.), *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, London: Printer, 1992.

⁸ Nelson, R.R., (ed.), *National innovation systems: a comparative analysis*, Oxford Univ. Press, New York, 1993.

⁹ I am not advocating for bringing clarity in this question. But I am more wondering how this ambiguity is affecting the scientific legitimacy of the perspective.

¹⁰ See for example the study by Ambert, M. and Laberge, S., *The Legitimation and Dissemination Processes of the Innovation System Approach: The Case of the Canadian and*

The OECD stamp gave the perspective legitimacy in policy making, but the scientific legitimacy was less evident. The literature is unanimous in agreeing upon the institutional and systematic characteristics of innovation but it is less unanimous (if at all) concerning which level(s) of analysis are most appropriate. In its original formulation, the territorial level of analysis was the national level, but this level came to be highly questioned. Freeman ascertained that globalization has greatly diminished, if not eliminated, the importance of the nation state¹¹. Instead, regionalization is seen as one important aspect of globalization¹². The literature on regional systems of innovation has grown rapidly since the 1990. In fact, in a paper published in 2003, Bo Carlsson found that a majority of the systems of innovation literature had a regional focus. To channel the discussion on the proper territorial focus of the systems of innovation perspective, Oinas and Malecki proposed the notion of spatial systems of innovation¹³. Another branch of literature focuses on sectoral or technological systems of innovation; i.e. Carlsson introduced the concept of “technological systems”¹⁴, while Breschi and Malerba formulated the notion of “sectoral systems of innovation”¹⁵.

Thus, the system of innovation perspective is facing several challenges which are well summarized in the following quote;

“While the concept of NIS is rich and has a strong foundations, it is too rich, too macro and broad – covering all aspects from institutional set up, interfirm relationships, organization of R&D, educational and training systems, natural resource endowments, financing mechanisms to even culture. Moreover, it is unable to deal with the diversity of industrial situations in one country. In other words, it is difficult to

Québec Science and Technology Policy, Science, Technology & Human Values, 32 (2), 2007, pp. 221-249.

¹¹ Freeman, C., *Continental, national and sub-national innovation systems – complementarity and economic growth*, Research Policy. V.31 (2) 2002, pp. 191-211.

¹² Isaksen, A., *Building Regional Innovation Systems: Is Endogenous Industrial Development Possible in the Global Economy?*, Canadian Journal of Regional Science, XXIV:1, 2001, pp. 101-120.

¹³ Oinas, P and Malecki, E.J., *The Evolution of Technologies in Time and Space: From National and Regional to Spatial Innovation Systems*, International Regional Science Review (25), 2002, pp. 102-131.

¹⁴ Carlsson, B., (ed.) *Technological Systems and Industrial Dynamics*, Kluwer Academic Publishers, 1997.

¹⁵ Breschi, S. & Malerba, F., *Sectoral Innovation Systems: Technological Regimes, Schumpeterian Dynamics, and Spatial Boundaries*, in: Edquist, C. and McKelvey, M. (eds.): *Systems of Innovation: Growth, Competitiveness and Employment*. Cheltenham, UK: Edward Elgar Publishing, 2000, pp. 261-287.

analyse NSI without going through in-depth studies at the meso-level. At the micro-level, much of the work on dynamic capabilities has focused on the issue of corporate competencies. In order to analyse dynamic capabilities at the national level, we need to accumulate studies in meso-systems, focusing on the internal dynamics of network evolution”¹⁶.

The quote above addresses the original version of national systems of innovation approach, the one formulated by Freeman and Lundvall, and also the one this dissertation is using as starting point. A major problem pinpointed by Kumaresan and Miyazaki was an overly macro perspective without anchoring in the meso and micro levels. By adopting such a strong focus on the macro level, it makes difficult to address the diversity and dynamics of the system; the systemic level takes over. What the authors are calling for is for a focus on the micro foundations of system, thus an increased focus on the elements of the system and the relation between these elements.

One of the main platforms attempting to strengthen the system of innovation research is Globelics, the Global Network for Economics and Learning, Innovation and Competence Building Systems. The focus is on applying it to developing countries, hence an alternative positioning of the perspective. Lundvall and Soete, presenting Globelics, take the innovation systems research towards new horizons:

“Our involvement over the last decades in numerous national and EU policy report, advice, studies, with many other scholars, might marginally have contributed to some improvements in policy making and the academic understanding of the processes of welfare increase associated with innovation and knowledge accumulation more generally, and its national distribution. However, compared to the utility of such research in the South, our personal utility has been marginal in the other meaning of the word. Hence, at the more personal level, we feel there is a need for scholars in the field of learning, innovation and competence building to start focusing on those parts of the globe where better insights might matter rather than by pecuniary led to focus on one’s own rich periphery”¹⁷.

¹⁶ Kumaresan, N. and Miyazaki, K., *An integrated network approach to systems of innovation-the case of robotics in Japan*, Research Policy 28, 1999, pp. 563-585, page 564.

¹⁷ Lundvall and Soete, no date, in Eklund, M., *Adoption of the Innovation System Concept in Sweden*, Acta Universitatis Upsaliensis, Uppsala Studies in Economic History 81, 2007.

This is an interesting turn and it is perhaps not in line with what is here referred to as the initial formulation of the systems of innovation perspective. On the other hand, it is once again expressing the belief that technological development and innovation can be planned for and managed by the state. In setting the scene for this thesis, there is (at least) one more aspect necessary to be mentioned, namely how the notion of innovation is conceptualized. The system of innovation perspective addresses innovation as a complex, interactive, non-linear process, which implies dynamics in the system. Cooperation and mutual trust in promoting competitiveness are two crucial aspects. Innovation is a process of interactive learning¹⁸.

The aim of this section has been outlining the field of tension of the system of innovation perspective. The perspective is, as argued, faced by several challenges regarding its emergence, theoretical underpinnings, which are the appropriate levels of analysis (territorial and structural), how the future of the perspective is looked upon.

1.2 Aim and research questions

The introduction has been made visible that the field of systems of innovation rests on a number of conceptual and methodological tensions. The novelty of the systems of innovation perspective has been considered to be its systemic and institutional perspective. However, these are also its main challenges. The systemic perspective implies the analysis of all the elements and relations between these elements. But, how are all these elements to be identified, and it is even possible to identify all relations between elements? How is this possible from a conceptual and methodological perspective? The problem that it is identified is that the systems of innovation perspective is missing an actor perspective. With its focus on elements and relations the systemic perspective is given a dominant position, while the actor perspective is usually undervalued.

Against this background, **the aim of the dissertation is to advance and contribute theoretically to the systems of innovation perspective by**

¹⁸ Isaksen (2001) calls this literature strand for the Nordic School of the learning economy.

adopting an actor based perspective. The following question will guide this dissertation.

1. What are the theoretical underpinnings of the systems of innovation perspective?

To answer this question, two steps will be made. First, it will be addressed how the system of innovation perspective emerged and developed. Secondly, the theoretical foundations of the perspective will be discussed. These theoretical accounts will thereafter serve as ground for the theoretical framework proposed in this dissertation. Hence, the next question this dissertation aims to answer is:

2. How can we further develop the systems of innovation perspective?

If the previous question aims to theoretically unpacking the system of innovation perspective highlighting the analytical grounds, this second question relates to the general aim of this dissertation - advancing the understanding of systems of innovation perspective.

This dissertation is grounded in a reflection on how the systems of innovation perspective is used or considered by different actors. The state is implementing a system of innovation perspective (innovation policy is anchored in a system of innovation perspective) which implies that actors like firms, for example, are required to acknowledge it and behave accordingly (of course, one can also argue that firms do not react, but I see this also as a type of action or behaviour). Thus, the third question is:

3. How the different actors are relating to the system of innovation perspective?

The premise of this dissertation is that actors are of different kinds and have different interests. To answer this question, this dissertation pinpoints the system of innovation as the interplay between two rationalities, a territorial rationality and a functional one, and it is grounded into an actor perspective. Namely, how different actors adopt, give meaning and implement the same perspective. How actors of a system of innovation interact with each other? Furthermore, what happens when they meet in practice under the umbrella of the system of innovation?

Hence, the aim of the dissertation is two folded in that the systems of innovation approach will be addressed on two levels: as a theoretical notion and as policy and practice.

1.4 Disposition of the study

The dissertation is divided in four parts.

Part I

Following the introductory chapter, chapter two addresses the epistemological considerations and the choice of research perspective, as well as the methodology used in carrying out this study. Epistemologically, the thesis is informed by historical institutionalism research perspective. Secondly, the methods of data collection and analysis will be addressed. This is a qualitative study.

Part II

The third chapter seeks to address the emergence and development of the systems of innovation perspective, discussed in terms of two stories; systems of innovation as academic concept and systems of innovation as policy making

I thereafter turn to analysing the theoretical underpinnings of the perspective (chapter four), and the following building blocks are addressed; the evolutionary underpinnings, the institutional underpinnings, learning and knowledge and the systemic perspective employed.

In the following chapter (chapter five) a theoretical framework is proposed to advance the understanding of the systems of innovation perspective. From a theoretical perspective, the dissertation pinpoints the system of innovation at the interplay between two rationales: a territorial rationale and a functional rationale. The intention of this theoretical framework is to shed light upon the variety of actors operating within a system of innovation. Based on different logics or rationalities, actors understand and behave differently which has an

impact on the behaviour and performance of the system. The assumption is that the different rationalities influence the innovation process, and how activities are organized and carried out.

Part III

In the empirical backdrop of the thesis, chapter six and seven, the Swedish system of innovation is analysed in terms of how innovation policy discourse and practice have developed over time. The territorial based system of innovation is analysed through three instances: Vinnova, the Swedish National Innovation Strategy and the Innovation Council, all considered being relevant in understanding the embeddedness of ideas on innovation within Swedish politics and practice. The functional based system of innovation is addressed through the role of the large firm Ericsson which has been chosen as an actor in a system of innovation, and therefore attention is paid to the interplay with the territorial actors, such as the state and universities. Several conflicts of interests characterize the relation between Ericsson on the one hand and the university and government on the other. The interplay between the two types of systems of innovation is further concretized in the analysis of the Mobile Heights case, an innovation cluster initiative. Three main analytical conclusions have been emerged from the empirical research, discussed in terms of policy makers, policy implementers and practitioners pinpointing to a fairly loose system where different interests, networks and practices can only be partially and temporarily aligned.

Part IV

Chapter eight of the dissertation is the concluding one. In this chapter a summarizing of the thesis is carried out, as well as a discussion of key conclusions from research findings with the aim to embed the Swedish case/the empirical background in general theoretical considerations about how innovation system evolve and how relations develop over time. The chapter ends with highlighting some of the contributions of this thesis to the field and proposals for future research.

Epistemological and methodological considerations

This chapter addresses the epistemological considerations and the choice of research perspective, as well as the methodology used in carrying out this study. The first section will explain the epistemological rationale behind this study and the choice of applying a historical institutionalism research perspective. The second section will describe the methods of data collection and analysis. Interviews, document analysis and literature review have been used in this study. The chapter will end by giving an account of the choice of the empirical case.

2.1 Epistemological consideration

From an epistemological perspective, an eclectic approach to the analysis of systems of innovation is adopted. Considering the general aim of this thesis, I argue that by adopting such an eclectic approach can vastly enrich our understanding of complex social systems, and greatly improve the theories and methods that we use to explain them. My claim is that an eclectic approach to such a complex process can point to fruitful lines of theoretical, methodological and substantive inquiry.

The systems of innovation emerged as a way to understand how to manage and improve the innovative capacity of a country. But the perspective is also about understanding the process of innovation and which are the determinants of innovation. Innovation is defined as a social process that takes place in the interaction between people. Hence, innovation is a relational process and to understand it as a process it has to be placed within its social, economic and political context. The institutional arrangement is intended to provide the resources, as well as the limits, and the context for

these interactions to happen. Innovation is no longer to be addressed as a black-box, a linear process or an activity carried out in isolation by a single individual. Innovation is defined as a dynamic and systemic process where institutions play a central role. The system of innovation perspective adopts an institutional, historical and contextual approach to innovation. When analysing a country or a region the answer is searched for in history; that is, it is an attempt to understand how a country or a region got where it got. One can also say that the view on innovation adopted by the systems of innovation is that of innovation as a social process that it is to be studied in time and place.

The systems of innovation scholars have been rather careful in addressing the status of the perspective; if it is a theory or not. The contribution of this dissertation is in line with what Richard R. Nelson has described as appreciative theory, rather than formal theory¹⁹. Formal theory is theory *per se*, when theory is used to report in a formal and logical way the results of empirical work designed to test a particular aspect of theory. Appreciative theory has its ground in the empirical subject matter, in the question *per se* and it is employed by economists when undertaking work of interest for policy makers or even for a wider audience. The language of the appreciative theory is less formal compared to the formal theory. Furthermore, the two categories of theories are orientated towards different audiences; while the formal theory is primarily employed in an academic environment, the appreciative theory is orientated towards a wider audience interested in a specific question, why something happened and how to solve it. Of course, the two types of theories can be clearly distinguished only as an academic exercise. There are strong connections between them and for a satisfactory understanding of the economic process both are necessary²⁰. Formal theory is the source of ideas that are invoked by appreciative theory. The appreciative approach places emphasis on the theory's practical utility. A theory should be "usable in practical applications – prediction and explanation should be able to give the practitioner understanding and some control of situations"²¹. Alvesson and Sköldböck warn about the drawback such a criterion endorses,

¹⁹ Nelson, R.R., *The Co-evolution of Technology, Industrial Structure, and Supporting Institutions*, Industrial & Corporate Change, Vol. 3 Issue 1, 1994, pp. 47-63.

²⁰ Nelson, R.R and Winter, S.G., *An evolutionary theory of economic change*, Harvard U.P., Cambridge, Mass., 1982, see page 46.

²¹ Glasser, B.G. and Strauss, A.L., *The Discovery of Grounded Theory*, 1967 in Alvesson, Mats & Sköldböck, Kaj, *Reflexive methodology: new vistas for qualitative research*, SAGE, London, 2000, page 19.

reducing research “to being the handmaiden of the practitioners”²²; a drawback the system of innovation is faced with. One of the main “missing pieces” of the system of innovation approach is the ambiguity surrounding both its emergence and the way it is used by researchers and policy makers or practitioners (as it will be discussed in the next chapter).

The system of innovation perspective can be considered to be at the crossroads between the two types of theories. It is in a way encapsulating a conflict between the two; on one hand there is an aspiration towards a more theoretic system of innovation and properly scientifically anchored. On the other hand, there are arguments that the strength of the system of innovation is exactly its looser theoretical status, in its accessibility and relevance as a tool (especially in policy making).

The emergence of the system of innovation perspective is deeply grounded in understanding a specific situation, an economic problem. I will here turn to Bent Flyvbjerg’s “Making Social Science Matter”²³ where the starting point is to comprehend the contribution of social sciences to the understanding or increasing the knowledge of our society. Flyvbjerg grounds his analysis in Aristotle’s three types of “scientific knowledge”, episteme, techne and phronesis. Episteme (know why) concerns the type of knowledge that is universal, invariable in time and space, achieved through analytical rationality. It corresponds to the modern scientific ideal as expressed in natural sciences²⁴. Techne (know how) is craft and art, is a concrete, context dependent activity, an application of technical knowledge towards a consciously formulated goal. Phronesis concerns the knowledge of how to behave in a particular circumstance; it is a pragmatic variable, context-dependent knowledge, orientated towards action. Phronesis is a sense of the ethically practical rather than a kind of science²⁵. Phronesis focuses on the analysis of values, of the concrete and the practical.

The sciences are supposed to concern themselves precisely with the explication of universals, and the conventional wisdom is that one cannot generalize for a particular case. Moreover, the ultimate goal of scientific activity is supposedly the production of theory.²⁶

²² Alvesson, M. and Sköldbberg, K., *Reflexive methodology: new vistas for qualitative research*, SAGE, London, 2000, page 19.

²³ Flyvbjerg, B., *Making social science matter: why social inquiry fails and how it can succeed again*, Cambridge University Press, Cambridge, 2001

²⁴ Flyvberg 2001.

²⁵ Flyvberg 2001.

²⁶ Flyvberg 2001, page 59.

The system of innovation perspective has been declared no longer a promising line of enquiry by the scientific community exactly because it failed to develop into a theory and because it was considered to be a pile of descriptive cases. The lack of theory hindered the possibility of generalization. By employing the analysis of the systems of innovation as a phronetic practice of social science, the intention is to focus the analysis of the systems of innovation as a praxis or action. There is no foundation of rationalizing it as episteme. Considering the systems of innovation perspective as phronesis focus is on the deep, concrete details of the particular, while the general is often empty and banal²⁷. The phronesis research is suggested as a way to solve the micro-to-macro problem²⁸. Social sciences tend to rather dichotomize the actors and the structure, lacking to link macro to micro level factors in a specific social or political phenomenon. When this link is made is most often done by theoretical inference (data at one level of analysis are coupled with theoretical accounts at the other level). The micro to macro problem is considered by Flyvbjerg in terms of duality or dichotomy; research emphasis either macro or micro level explanations. Coleman, on the other hand, considered more the move from the micro level analysis to the macro level explanations²⁹. For instance, learning is a micro level process, it is the individual that learns, but how is this learning transferred at the organizational learning?

2.2.1 Historical institutionalism

The field of innovation studies traces its intellectual heritage to Adam Smith, the Austrian School but most of all to Joseph Schumpeter, one of the pioneers in bridging history and economics. History in this thesis will be applied at different levels (different conceptualizations of history); history as “method” and history as “theory”. Arrow argued that history can be used in two ways; history as empirical evidence with which to test theory and history as a means of understanding the conditioning of economic phenomena³⁰. Solow, on the other hand, argued that history provides social and temporal context, which means an appreciation of the influence of different contexts and how the

²⁷ Flyvberg 2001.

²⁸ See Flyvbjerg 2001, pages 137 and fwd.

²⁹ Coleman, J.S., *Foundations of social theory*, new ed., Belknap, Cambridge, Mass, 1994.

³⁰ Arrow, K.J., *Increasing returns: historiographic issues and path dependence*, European Journal of History of Economic Thought 7:2 2000, pp.171-180.

present came to be³¹. Accordingly, history is employed two folded; first, to address the emergence and development of the concept of systems of innovation; and secondly, to understand the meaning actors connect to the perspective when using it. The analysis prompted in this thesis is in terms of history as process and not just as an illustration. In the tradition of historical institutionalism, historical studies mean not just looking at the past, but looking at processes over time. To understand the current situation extending the time frame of the inquiry widens the range and availability of data for examinations. Hence, this thesis uses as epistemological framework the historical institutionalism and two principles are at the centre: *the contextual logics of causality* (stresses the importance of context in explaining the workings and meanings of institutions) and *contingent relations between explanatory elements* (rather than following a logical and efficient trajectory, history is marked by accidents of timing and circumstances)³².

The literature of historical institutionalism is diverse but the different orientations also “share a theoretical project aimed at the middle range that confronts issues of both historical contingency and ‘path dependency’ that other historical perspectives obscure”³³. Three important features are to characterize historical institutionalism; (i) addresses big, substantive questions that are inherently of interest to broad politics as well as to academics; (ii) takes time seriously; and (iii) analyses macro contexts and hypothesis about the combined effects of institutions and processes rather than examining just one institution or process at a time³⁴.

Historical institutionalism works with a definition of institutions that includes both formal and informal rules and procedures that structure behaviour. It is an endeavour to illuminate how the behaviour of actors is mediated by the institutional settings in which they take place. The institutionalist perspective adopted here claims more than just *institutions matter too*. But institutions structure political elements and determine political outcomes by their impact

³¹ Solow, R.M., *Economic History and Economics*, The American Economic Review, Vol. 75, Issue 2, 1985, pp. 328-331.

³² Cf. Immergut, E.M., *The theoretical core of the new institutionalism*, Politics & Society, Vol. 26, Issue 1, 1998, pp. 5-34.

³³ Thelen, K. and Steinmo, S., *Historical institutionalism in comparative politics*, in Steinmo, S., Thelen, K. and Longstreth, F. (red.), *Structuring Politics: Historical Institutionalism in Comparative Analysis*, Cambridge University Press, Cambridge, 1992, pages 1-2.

³⁴ Skocpol T. and Pierson P., *Historical Institutionalism in Contemporary Political Science*, in Katznelson I. and Milner H.V., *Political Science: State of the Discipline*. New York: W.W. Norton, 2002. pp. 693-721.

on actors – on their behaviour, goals and interests, relations and cooperation with other actors³⁵. By adopting a historical institutional approach the intention is to examine the relationship between actors as objects and as agents of history. This approach, likewise the economic sociology, emphasizes that powerful actors shape their environments. However, following the historical institutionalist perspective, the focus of the analysis is the actors rather than power³⁶. Institutions lie between the political and economic field activating the interests of actors in both³⁷. The institutions that are at the centre of historical institutional analysis (i.e. party systems, business associations) can shape and constrain political strategies, but themselves are also the outcomes of deliberate political strategies, of political conflict, and of choices. Rothstein argued that focusing on these intermediate institutional features of political life, institutionalism provides the theoretical “bridge between ‘men [who] make history’ and the ‘circumstances’ under which they are able to do so”³⁸. Hence, a historical institutionalist perspective allows to move away from the primacy of system-level variables and focus on the role of actors in explaining outcomes, differences between countries which in fact share the same broader structure.

Why do I use this approach? First, because it gives a context to why the systems of innovation perspective emerged when it emerged and developed as it developed. The aim is to establish what precipitated the emergence of the concept and its implementation, if there is a disruptive event or sequence of events which set up the demand for a new approach. Second, the system of innovation perspective is often suspected for being static in its approach. By adopting a historical institutionalist perspective the aim is to situate the development of the systems of innovation perspective in a context, which will further provide the basis for understanding the dynamics of the system. Third, historical institutionalism has a strong focus on political history (with an explanation of the contingent nature of political and economic development, and especially the role of political agency, conflict, and choice, in shaping that development). The systems of innovation perspective emerged with a strong political agenda (as it will be discussed in chapter

³⁵ Thelen and Steinmo 1992, see page 9.

³⁶ Thelen, K., *How Institutions Evolve: The Political Economy of Skills in Germany, Britain, the United States and Japan*, New York: Cambridge University Press, 2004.

³⁷ See DiMaggio, P.J. and Powell, W.W., *The iron cage revisited: institutional isomorphism and collective rationality in organizational fields*, in Powell, W.W. & DiMaggio, P.J. (ed.), *The new institutionalism in organizational analysis*, University of Chicago Press, 1991.

³⁸ Rothstein, B., *Labor-market institutions and working-class strength*, in Steinmo, Thelen and Longstreth, (ed.), 1992.

three), where focus was on the role of politics (i.e. the role of the state) in influencing a country's innovative capacity and performance. Fourth, historical institutionalism avoids institutional determinism. Thus, the intent with adopting this epistemological framework is to break with mono causal or deterministic explanations of a system of innovation where focus most often is on the country's education and research system or/and R&D investments, or enumerating the institutions and organizations of impact for the innovation performance. The analysis undertaken in this dissertation is of process tracing, involving a substantial historical component, both in terms of systems of innovation as theory and systems of innovation as practice. A hallmark of historical institutionalism is a high level of attentiveness to temporally specified processes. The empirical backdrop of this thesis is built on identifying historically relevant processes and a detailed examination of processes.

The institutional focus of historical institutionalism does not diminish the attention to other variables (i.e. the players, the actors with their interests and strategies). The actors, or the players, are situated within a context, showing how they relate to one another. Concerns with issues of institutional development within historical institutionalism are strongly linked to theorizing about the causal relevance or origins, sequences, and temporal processes. Paul Pierson argued that historical institutionalism focuses mostly on the institutionalist aspect, while the historical dimension has been left rather unclear³⁹. Arguments of path dependence can help to understand the powerful inertial "stickiness" that characterizes many aspects of the systems of innovation perspective. Historical institutionalism is sceptical of functional explanations, in which institutional outcomes are explained by their consequences. In such functional accounts, institutions develop because of their capacity to solve certain collective problems. For example, the Swedish Innovation Council (which it will be discussed in the empirical chapter of this thesis) was established to deal with an experienced misbehaviour in the system; a lack of coordination of the innovation policy or activity. Functional explanations are most plausible when investigations take a one-time snapshot.

The assumption this thesis makes is that the preferences, strategies, and relative power of the relevant actors are defined by their institutional context. Adopting a historical institutionalist perspective, corroborated with economic

³⁹ Pierson, P., *Politics in time: history, institutions, and social analysis*, Princeton University Press, 2004.

sociology, the process of innovation is placed in time and place. It is often mentioned that the analysis of different systems of innovation are rather static and provide only a snap-shot in time. The aim here is to place the analysis into a temporal sequence of events and processes that stretches over time. It is an attempt to understand the development of the system of innovation concept and its use, as a complex social dynamic process.

2.2.2 On the micro to macro problem

This dissertation argues for an actor centred view of systems of innovation. Furthermore, the system of innovation perspective is formulated at the interface of two theoretical traditions; the evolutionary perspective and the institutional economics. As rooted in the evolutionary and institutional theory, the systems of innovation perspective inherits the micro to macro problem, namely the transition from the macro level to the micro level and back up again. This is the approach of methodological individualism.

The understanding of the systems of innovation perspective has been hampered by a lack of conceptual framework integrating micro level learning activities with macro level institutional and organizational forms. This is what John Coleman called the major problem of sociology or the micro to macro problem, meaning the problem of moving from the lower level (the level of the individual elements) to the system level, and back to the lower level again, “the transition from the micro level to the macro level, from the purposive action of individual actors to the functioning of a system of action”⁴⁰. The micro to macro problem is not a single problem, but several problems⁴¹. A first step is to recognize that “interests or goals of actors may stand in different relations to one another. These different relations bring about actions that result in different social processes and different kinds of social institutions result”⁴². These different relations take three different configurations. According to the first configuration actors are independent, with different private interests or goals and each with resources that can influence others’ realization of interest. Secondly, relations are envisaged in terms of market and hierarchy⁴³. A third configuration is that of common

⁴⁰ Coleman, J.S., *Social Theory, Social Research, and a Theory of Action*, The American Journal of Sociology, Vol. 91. No. 6, 1986, pp. 1309-1335, see page 1320.

⁴¹ Coleman 1986.

⁴² Coleman 1986, page 1323.

⁴³ Coleman depicts markets and hierarchies as follows ”In contrast to the market as a set of relations among independent actors, a hierarchy is a set of relations in which one actor’s

interest within a set of independent actors. Kumaresan and Miyazaki, for example, were suggesting that the analysis of a system of innovation is difficult without in-depth studies at the meso level⁴⁴. Hence, they conclude that it is necessary to accumulate studies in meso systems with focus on networks. An analysis at the meso level focuses on a scale below the national (macro level) and above the firms (the micro level)⁴⁵. This adds one more level to the micro to macro problem as described by Coleman. I argue that the micro to macro problem of the systems of innovation perspective resides in how innovation is conceptualized, as learning process, interactive, based on cooperation and mutual trust. These aspects are micro-aspects but it is not specified how the movement from the lower level to the system level is made possible.

2.3 Methodological considerations

This is a case study and the method employed in this thesis is a qualitative one, a triangulation⁴⁶ of document analysis, literature analysis and interviews. By employing a triangulation the aim was to provide “a confluence of evidence that breeds credibility”⁴⁷. It investigates the historical evolution of the systems of innovation perspective, as theory and practice. It is a qualitative study interested in processes; that is, the study is concerned to show how events and patterns unfold over time⁴⁸. Process is defined in this thesis as “a sequence of individual and collective events, actions, and activities unfolding over time in context”⁴⁹. Hence, the study is exploratory as the questions of the study are of how character. Exploratory studies adopt a historical approach to study operational links between factors and outcomes.

actions are carried out under the control of another and to advance the other’ interests” 1986, page 1324.

⁴⁴ Kumaresan and Miyazaki 1999.

⁴⁵ Oinas and Malecki 2002.

⁴⁶ Denzin defines triangulation as “the combination of methodologies in the study of the same phenomenon”. Denzin N. K., *The research act: A theoretical introduction to sociological methods*. New York: Aldine, 1970, page 291.

⁴⁷ Eisner, E. W., *The enlightened eye: Qualitative inquiry and the enhancement of educational practice*. Toronto: Collier Macmillan Canada, 1991, page 110.

⁴⁸ Bryman, A., *Social Research Methods*, 4th edition, Oxford University Press 2012.

⁴⁹ Pettigrew A., *What is a Processual Analysis?*, 1997 in Bryman 2012, page 402.

An important part of this thesis is built upon literature review and overview. The literature review served to address which is the point of departure, which are the theoretical traditions, which are the implications, how the different traditions and scholarships related to each other, how they build on each other, how they reflect their time and context etc. The literature of systems of innovation in particular, and the literature of innovation studies in general, has important characteristics that make literature review as a highly relevant and rewarding method. It is a reflective literature, often reflecting upon the status of the field. The literature considered here is covering a rather broad area of disciplines. As mentioned, the systems of innovation literature is an eclectic one and often characterized as an intellectual melting pot⁵⁰.

Document analysis is a common method in qualitative case studies, producing rich descriptions of single phenomena⁵¹. The study of the systems of innovation perspective in this thesis is a hermeneutic inquiry, designed within an interpretative paradigm and emphasising the complexity of the phenomenon under scrutiny. The analysis undertaken here can be described as a process to *understand*. The Swedish sociologist Johan Asplund wrote about the value of *understanding* and the “mystical intelligibility” that it is required; “The problem with modern sociology is of course not that it collects data or sees to its measurements methods [...] the problem is that often you settle with data, that you treat social phenomena as if they did not mean anything”⁵². When the system of innovation perspective was declared no longer a promising line of inquiry, the main accusation was that it tended to accumulate data beyond the level of saturation. It settled with data, as Asplund wrote, but did not go beyond that point, it did not use the data to *understand*.

Written in a hermeneutical tradition, the analysis of the texts will entail attention to the historical, political and social contexts within which the texts were produced. As I previously argued, the systems of innovation perspective is an expression of its time and to understand its foundation requires to be sensitive to the context within which it emerged and developed. A

⁵⁰ See Fagerberg, J., Martin, B.R. and Sloth Andersen, E. (ed.), *Innovation studies: evolution and future challenges*, 2014

⁵¹ Bowen, G.A., *Document Analysis as a Qualitative Research Method*, Qualitative Research Journal, Vol. 9, Issue 2, 2009, pp. 27-40. Stake, R.E., *The art of case study research*, Sage, Thousand Oaks, Calif., 1995, Yin, R.K., *Case study research: design and methods*, 2. ed., Sage, 1994.

⁵² Asplund, J., *Det sociala livets elementära former*, Bokförlaget Korpen, Göteborg, 1987, page 27.

hermeneutical analysis is also concerned with the theory and method of the interpretation of human action⁵³. Interpretation is here understood as a social process “in the sense that judgments of the relevant parameters of the situation are based on generalized expectancies which are, at least in part, intersubjectively shared”⁵⁴.

Documentary review implies making use of documents that have not been produced at the request of the social researcher, documents that are out there, ready or not ready to be analysed, presumably expected to be implemented or have some sort of impact. The bulk of documents are official documents deriving from the state, such as the national strategy for innovation. Focus has been on placing the document within a context; the document in focus has been linked to other documents and also with newspaper articles or other type of documents. Using documents as a source of data has been assumed to reveal something about an underlying social reality, where documents have been perceived as “windows onto social and organizational reality”⁵⁵. Other scholars have perceived this view with scepticism arguing that documents should rather be seen as a distinct level of “reality” in their own right⁵⁶. From this perspective, documents are to be analysed in terms of the context in which they were produced and what they were supposed to accomplish and their implied readership or whom they are written for⁵⁷. But documents do not stand alone. They are part and expression of an apparatus of institutions and agents; they have a history and are written under the influence of a specific context. Atkinson and Coffey consider documents as social facts produced, shared and used in socially organized ways⁵⁸. And they usually carry a message and have a purpose. Therefore, document analysis requires looking beyond the text itself into the context that produced it, who produced it and how it is related to other texts. When working with text, it is important to remember that the subject of analysis or interpretation is not data or facts, but texts. Data or facts are extrapolated from the text through analysis, hence they are results⁵⁹. The documents and literature sources have been viewed as

⁵³ Bryman 2012, page 28.

⁵⁴ Beckert, J., *Economic Sociology and Embeddedness: How Shall We Conceptualize Economic Actions*, Journal of Economic Issues No.3, 2003, page 773.

⁵⁵ Bryman 2012, page 554.

⁵⁶ Atkinson, P. and Coffey, A., *Analysing documentary realities*, in Silverman, D. (ed) *Qualitative Research: Issues of Theory, Method and Practice*, 3rd edition, Sage, 2011.

⁵⁷ Atkinson and Coffey 2011.

⁵⁸ Atkinson and Coffey 2011

⁵⁹ Alvesson, M. and Sköldböck, K., *Tolkning och Reflektion*. Studentlitteratur 2008, pages 205-206.

linked to each other and to other documents because they refer to and/or are a response to other documents meaning that “other documents form part of the context or background to the writing of a document”⁶⁰. Hence, documents are in a state of interconnectedness or inter-textuality⁶¹.

Document analysis is usually used in combination to other methods. The bulk of my study is built on written material but interviews have been used as complements. The scope of the interviews was to understand the interplay and the use or implementation of the concept from the perspective of the actors. The interview strategy was an active, conversational type of interviewing. This means that the respondent was not perceived as merely a repository of knowledge and the interview situation as a pipeline of transmitting information or knowledge. Adopting a strategy of active interviewing means that both the respondent and the interviewer engage in a conversation and where the respondent is a constructor of knowledge in collaboration with the interviewer. From this perspective, the interview is perceived as more than just a method to collect information, but to enter a process of understanding that develops through the conversation. Steinar Kvale used the metaphor of the interview as ore or as traveller⁶². In research, the aim of the interview is not to come to quantifiable and univocal results. But the aim is rather to describe as accurately as possible a phenomenon including the possible contradictions or differences that different interviews might result in. The contradictions are not always connected to structure, form or distribution of the interview, but it is an expression of how different individuals might have a different experience or perception of the same phenomenon. The two different images describe however the same phenomenon.

Interview guides were developed to help operationalize the research questions. The interviews can be characterized as a combination of semi-structured and open structured. The formulation of the questions before each interview followed an interview guide with the purpose of ensuring that all relevant themes were covered. The persons interviewed for this study form a rather heterogeneous group and it was therefore important to adapt the interviews according to each interviewer. The interviewees were informed on the topic of the dissertation beforehand and each interview was initiated by a short introduction to the study’s aim. Interview sessions lasted in average one

⁶⁰ Bryman 2012, page 555.

⁶¹ Atkinson and Coffey 2011.

⁶² Kvale, S., *Den kvalitative forskningsinterviewen*, Studentlitteratur, Lund, 1997.

hour and were simultaneously transcribed. The interviews were conducted face-to-face. The selection of the interview persons has been based on a mix of methods. Some interview persons were named on websites of the organizations, while other were selected using the snowball method.

2.4 Choice of the empirical case

The empirical backdrop of the dissertation was not given from the beginning, but it organically developed with time. If at the beginning a country comparison was thought, thereafter a focus on Sweden was decided upon. During numerous discussions and reflections, an interesting question arose; how the different actors in a system of innovation are to relate the perspective of the system of innovation. With Sweden implementing the systems of innovation perspective how are other actors relating to this? How was for example a company like Ericsson relating to this reality? How private companies like Ericsson interpreted and use the term system of innovation?

Sweden was chosen for different reasons, mainly because of access to material and knowledge of the system. Good accessibility to material, especially in Swedish, was an important factor as focus was on the context and history of the emergence and development of the perspective in Sweden. Secondly, Sweden has explicitly implemented the systems of innovation perspective, in a rather unique way, through the establishment of an agency.

The mobile telecommunication company Ericsson was chosen due to several reasons. It is one of the main world players in mobile telecommunications with headquarters in Stockholm and it had a great impact on the development of the Swedish telecommunication sector through private-public partnerships.

PART II

The emergence and development of the systems of innovation perspective⁶³

This chapter seeks to present and discuss the emergence and development of the system of innovation perspective. On a meta-theoretical level, this chapter draws attention to the emergence of ideas of great impact on policy making. It also draws attention to how these ideas co-exist in two different worlds, the academia and the world of policy making, and how they take rather different paths. The analysis, hence, differentiates between the intellectual and the political dimension of the approach, but it also argues that the two dimensions are (strongly) interrelated. If we consider Schon's argument that an idea "is manifest when it is not only broadly recognized and publicized but when it has become an issue for debate, when organizations begin to grow around it, and when it begins to be used to gain influence and money"⁶⁴ we can safely conclude that the systems of innovation idea is a powerful idea with a potent for change in policy making. Its influence in academia, despite its highly challenged status and relevance, is manifested through the attention innovation studies are now paying to institutions and to innovation as a social phenomenon. Schon distinguishes between the processes by which ideas come to awareness, diffuse and gain power. "But these processes also interrelate."⁶⁵

The remainder of the chapter is organized as follows. Section 3.1 seeks to presents the context of emergence by placing the concept in a historical context. The chapter presents two tales of the systems of innovation perspective. In section 3.2 the perspective is presented as a descriptive

⁶³ The bulk of this chapter has been previously been published in Lidén, A., *Three Stories About National Systems of Innovation* in Karlsson, C., Johansson, B., Stough, R.R., Innovation, Technology and Knowledge, London: Routledge, 2012.

⁶⁴ Schon, D. A., *Beyond the stable state: Public and private learning in a changing society*, Maurice Temple Smith Ltd, London, 1971, page 135

⁶⁵ Schon 1971, page 138.

science. Section 3.3 presents and discusses the system of innovation perspective as policy analysis. Section 3.4 is a summary of the chapter.

3.1 The context of emergence

Around 1950, Europe was having near 40 years of recurrent war behind it. So did Japan. Placing it in a historical, economic and political context, the system of innovation perspective has its roots in the oil crises 73/74 and 1979, the structural crisis that followed in the developed world and the changing role of the nation state. The Golden Age, the long period of economic growth and high levels of employment after the Second World War came to an end in the early 1970s, also when the oil crisis 73/74 occurred. Economies around the world were facing stagflation - an unknown phenomena at the time of slow/low growth resulting in high levels of unemployment combined with high inflation.

The recovering period that followed after the oil crisis of the 1973/74 took momentum in the Western world around 1983/1984. Lennart Schön described it as a period of high re-structuring with a new direction for both growth and the economic politics⁶⁶. The role of the nation states were about to change as a reaction to the post war industrialization period when the states took high financial responsibility resulting in a debt crisis in the beginning of the 1980s. This led to a shift towards neoliberalism. The end of the 1980s represented significant changes on a global level. Western Europe was set for a higher integration through the European Community/Union (Sweden became a member 1995). Eastern Europe was going through major events, breaking from the communist regime. The decade after the first collapse of the oil prices 1973 was a decade of crisis and slow growth, and only after 1983 the growth level started to slowly upswing again.

If investments in the industrialization period were primarily made in material assets in relation to the total production, after the 1970s this relation changed and investments were mainly directed towards education and research (i.e. non-material investments), which is a sign for the service and knowledge-based growing economy. But, as Schön is pinpointing, it is also a sign for a

⁶⁶ Schön, L., *En modern svensk ekonomisk historia: tillväxt och omvandling under två sekel*, 1. uppl., SNS förl., Stockholm, 2000.

new relation between investments and growth. Investments were not showing results at the same pace as before.

The last three decades of the 1900th century were characterized by stagflation and even if from 1980s the economic situation started to stabilize, the growth levels of the after war period were never reached again. The current Keynesian explanatory framework was no longer satisfactory and new possible explanations were looked for. An explanation was found in the long-cycle theories, especially the Kondratiev⁶⁷ cycles or long waves of economic development. The electronics were identified as starting a new wave cycle, which also meant structural and institutional changes at all levels - economic, political and social. Hence, this also initiated a growing interest among economists for the explanatory powers of long cycles and technological change in economic development. One of these economists was Christopher Freeman of the Science Policy Research Unit (SPRU) at the University of Sussex, UK. Freeman was interested in the role of R&D and innovations for economic growth and development. In a paper from 1982, Freeman considers that “Any explanation of the underlying process structuring the current economic crisis, must, in particular, take into account the theory of long cycles advanced by Joseph Schumpeter (1939), who more than any other 20th century economist attempted to explain growth largely in terms of technical innovation”⁶⁸. In the well-known theory of Schumpeter, the entrepreneur was the pivot who, drawing on the discoveries of scientists and inventors, was having the ability to create entirely new opportunities for investment, growth and employment⁶⁹. Against this backdrop, Freeman explained the up-waves through the growth of some key industries and technologies, which would open up for innovation and development in adjacent but also non-adjacent way.

Why was the Keynesian framework suddenly outdated and why did the Schumpeterian (or the long wave theory in general) theory gain momentum? The Keynesian framework was emphasising management of demand, while Schumpeter had focus on autonomous investment, embodying new technical

⁶⁷ Freeman, C., *Innovation and long cycles of economic development*, paper presented at the International seminar on innovation and development at the industrial sector, Economics Department, University of Campinas, 1982. Freeman specifies that the idea of long waves was not originated with Kondratiev, but already before the First World War explanations using tendency for long term series of prices, interest rates and trade were used, among others by Pareto.

⁶⁸ Freeman 1982, page 1

⁶⁹ Freeman 1982.

innovation which is the basis of economic development⁷⁰. Steam engine and textile innovations in the end of the 1800 century would be the first wave; the second, the railway systems and associated changes in the mechanical engineering and iron and steel industries; the third on electric power and internal combustion engine and the chemical industry. Such a radical innovation would generate a multitude of other innovations and the up come of new industries and new markets. This is a long-term process. Researchers at SPRU (Freeman and his colleagues) concluded that the Keynesian framework was no appropriate tool to revive the economy from such a long-term structural crisis as the down-turn in a wave represented. They were advocating for a technological policy orientated towards new technical systems and able to deal with technological changes. Freeman went to Japan to study how the Japanese government managed to steer the Japanese economy towards growth while other developed economies were going through a decline. The role of the Ministry of International Trade and Industry (MITI) was pinpointed by Freeman as the key factor.

The emergence of systems of innovation perspective occurred also at a time when Europe (Great Britain in particular) and the USA were being acquainted with the idea of neo-liberalism that emerged with Margaret Thatcher and Ronald Reagan in the 1980s. The state ownership and control was to be decreased. The opponents were arguing that this would lead to lower wages and poor working conditions, that the logic of the market would steer investments. This view represents the ideological roots of the system of innovation perspective⁷¹.

To a large degree, this is the context of the emergence of the system of innovation perspective; the fall of the Keynesian economics and the rediscovery of the long waves of economic development, and the emergence of the neo-liberalism. What the proponents of the systems of innovation approach were advocating was the importance of continuous development and diffusion of new technology, and if considering the leftist orientation of the perspective, this would be state led. In the Japan book, Freeman presents Sweden as the best example for this; a leading ICT country and an ambitious welfare system: “The Swedish example is of special interest because this is a case of a European country with fairly limited resources but which is nevertheless among the leading countries in the production and diffusion of robotics and in the design and manufacture of telecommunications

⁷⁰ Cf. Freeman 1982.

⁷¹ Eklund 2007

equipment. Sweden's rather successful diffusion of ICT has been achieved whilst maintaining excellent social services, a rather high degree of consultation with trade unions and safeguards for civil liberty. Swedish industry has made particular efforts to keep in touch with Japanese developments and in general to take the best from world technology. Sweden was also committed fairly early on to giving ICT a high priority and probably has the most advanced training and retraining system in Europe. This clearly demonstrates the feasibility of catching up with Japan and perhaps of doing better.⁷²

3.2 Systems of innovation as a descriptive science

The aim of this section is to draw a timeline of the development of the system of innovation concept. It is mainly a historical exercise with the aim to place in time the milestones in the development of the concept and trace its academic roots. To address this issue, I will show that the approach within the academia was formulated as an attempt to understand the factors behind the difference in economic growth rates between industrialized countries. Secondly, I will briefly discuss the theoretical status of systems of innovation approach as the major authors in the field address it.

Miettinen characterises the systems of innovation perspective as a heterogeneous concept, originated from different, independent sources⁷³. I disagree with his point of view, and I will show in the following that the establishment of the perspective was a homogenous process. The further development of framework, on the other hand, as Lundvall pinpoints, was heterogeneous, following different, often contradictory, paths and he is critical to the present development of the systems of innovation approach, considering that its content has been altered⁷⁴. On the other hand, he advocates for a theoretically flexible framework, which might lead to unwanted developments.

⁷² Freeman 1987, p. 90.

⁷³ Miettinen, R., *National innovation system: scientific concept or political rhetoric*, Helsinki: Edita, 2002.

⁷⁴ Lundvall, B-Å., *National Innovation Systems: Analytical Focusing Device and Policy Learning Tool*, Working paper R2007:004, Swedish Institute for Growth Policy Studies, 2007.

The first to use the concept in an empirical research was Christopher Freeman in his book *Technology Policy and Economic Performance: Lessons from Japan*, published in 1987. This is considered to be the first published work using the terminology of national systems of innovation. Freeman's concept of national systems of innovation found its inspiration in the work of Friedrich List and his book *The National System of Political Economy*, published in 1841. Freeman goes as far as to identify List the true originator of the national systems of innovation approach⁷⁵. List's 'national system of production' concept was focused on the technological/industrial innovation, arguing for the protection of infant industries. He was interested in how Germany might technologically catch up with England, and Freeman suggests that this prescription might just as well be called a national system of innovation. List's arguments for a strong interventionist government (especially in education and technological development) is one of the key aspects Freeman brings on board when developing his 'national system of innovation' approach. As List, Freeman was also interesting in a catching-up process, but this time the actors were Japan and the United States, more than a century later.

The collaboration between Freeman and the IKE Group at Aalborg University, Denmark, at the beginning of the 1980s, is looked upon as the foundation stone in shaping the system of innovation perspective. In the introduction of the volume of collected essays published in 2008, Freeman acknowledges this collaboration, attributing the first informal use of the term to Lundvall. Freeman picked it up during a visit in Aalborg⁷⁶. Lundvall, on his turn, attributes the first use of the term to Freeman, in a paper from 1982 written for the OECD (the paper was published 20 years later).

The IKE Group at Aalborg University, inspired by French structuralism Marxists and development economists, was established as a reaction to national economic policies defining international competitiveness on basis of wage costs⁷⁷. In parallel, at the University of Sussex, SPRU lead by Freeman, was carrying out important research focused on the role of innovation in economic and social change. The SPRU group is often linked with the emergence of the innovation studies as a separate field of research in the 1960s. Since its establishment in 1965, the SPRU established itself as a

⁷⁵ Freeman, C., *Systems of innovation: selected essays in evolutionary economics*, Edward Elgar, Cheltenham, 2008, page 3.

⁷⁶ Freeman 2008.

⁷⁷ Lundvall 2007.

central actor in the development of innovation studies as an independent research field.

Esben Sloth Andersen and Gert Willumsen developed the systemic approach of innovation within the IKEA Group. Furthermore, they were also interested in the idea of interactive learning between users and producers, which became central for the development of the concept⁷⁸. At the SPRU, important empirical findings through the 1970s and 1980s contributed to the development of what today is known as ‘national systems of innovation’. Lundvall mentions two studies carried out by scholars connected to SPRU, which were of special importance to inspire the systems of innovation approach, namely the Sappho Study and the Pavitt taxonomy⁷⁹. According to the Sappho study, for a firm’s innovation performance of crucial importance are interaction and feedback; the Pavitt taxonomy studied the interaction of different types of sectors and their functions in the innovation process.

In 1992, Lundvall and the IKEA Group published one of the major books on national innovation systems, “National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning”. The anthology is a theoretical introduction to the topic, explicitly orientated towards relating the national systems of innovation approach to innovation theory⁸⁰. Lundvall’s approach, as himself stated, is closest to Freeman’s “because we focus quite a lot upon organizational matters as related to processes of learning”⁸¹.

Lundvall’s systems of innovation builds upon his definition of innovation. In his perspective, the interaction producer-user is the crucial element for the process of innovation. The process of learning and the interaction between various actors are the main pillars upon which the process of innovation is carried out. Lundvall puts innovation in a systemic perspective and his main driving force is to move away from the linear view on innovation of the 1980s. In the 1992 book, he advocated for an economic theory that “puts interactive learning and innovation at the centre of analysis”⁸², and has as starting point the concept of knowledge: knowledge is the most fundamental

⁷⁸ Lundvall 2007.

⁷⁹ Lundvall 2007.

⁸⁰ Edquist, C., *Institutions and organizations in systems of innovation: the state of the art*, Univ., Linköping, 1997a.

⁸¹ Lundvall 1992.

⁸² Lundvall 1992.

resource, and learning the most important process⁸³. Lundvall's alternative to the neoclassical economic theory is therefore a theory of learning economy, and the focus is on social interaction in networks.

From a chronological perspective, 1993 represents another important cornerstone in the development of national innovation systems approach. Richard Nelson editing an empirical volume based on the case studies of 15 countries, "National Systems of Innovation: a comparative study". According to Nelson, the book "has been written more despite than because of the recent great interest in the topic considered."⁸⁴ And he continues, considering that "[t]o understand national innovation systems, it is essential to understand how technical advance occurs in the modern world, and the key processes and the institutions involved."⁸⁵

In the late 1990s, Edquist joined the discussion on systems of innovation, publishing in 1997 an anthology entitled "Systems of Innovation: technologies, institutions, and organizations". Edquist became aware of the approach through Lundvall and the IKE group. Together they participated in a number of conferences and wrote a comparative study of the Danish and Swedish systems of innovations, study published in the anthology published by Nelson in 1993. Edquist became one of the main supporters of the approach, and played an active role in its diffusion in the Swedish politics.

The systems of innovation approach is a multidisciplinary approach, a boundary object, involving scholars from a multitude of fields, stretching from social sciences to natural sciences. Furthermore, Miettinen discusses it as a 'transdiscursive' concept that crosses the world of academia with the world of policy makers⁸⁶. It is therefore the approach is often considered as theoretically ambiguous.

Research Policy is the central academic journal in the field, established in 1972 by Freeman, who was the first editor. The journal dedicated a number of special issues to the topic, playing an important role in the development of the concept. Additionally, there is an impressive number of journals that over time dedicated extensive space to the systems of innovation framework, covering a wide variety of fields, from economic geography, economics, sociology, to technological and industrial journals. The Oxford Handbook of

⁸³ See for example Lundvall, B-Å., *The Learning Economy*, Journal of Industry Studies, Vol. 1, Issue 2, 1994.

⁸⁴ Nelson 1993, page 3.

⁸⁵ Nelson 1993, page 5.

⁸⁶ Miettinen 2002.

Innovation⁸⁷ is another essential milestone, representing an important theoretical approach of innovation studies in general, and the systems of innovation in particular.

Lundvall⁸⁸ and Edquist⁸⁹ are some of the few scholars explicitly addressing the theoretical status of the concept. Nevertheless, Lundvall seems to have mixed feelings when addressing the theoretical background of the systems of innovation perspective. On one side, he questions the utility of such an exercise. To him, this is an activity lacking value or usefulness. More productive would be to consider the needs of policy makers and students of innovation. Lundvall has a pragmatic approach to the system of innovation approach, having not a theoretical value, but rather as a tool in policy making. On the other hand, he is one of the authors who over time had in several situations addressed the theoretical status of the perspective. He argues that the theory behind the concept is grounded theory. The system of innovation perspective is the result of an accumulation of empirical studies at different levels of aggregation showing that innovation is an interactive process. Furthermore, the origin of the concept has something in common also with critical theory. The establishment of the IKE group and their formulation of the system of innovation approach was based in these premises.

Edquist addresses as well this issue, and to the question if system of innovation is a theoretical concept he gives a negative answer. He raises the issue regarding the appropriate terminology - theory, concept, perspective, framework are used interchangeably both by scholars and policy makers, without critically being addressed. Edquist criticizes the use of the term theory, and he suggests that approach or conceptual framework is a more appropriate term⁹⁰.

There are strong disagreements surrounding the over-theorization of approach, and the above weaknesses of the NIS approach are as well questioned. Edquist argued that the concept definitely needs to be further clarified and it should be made more 'theory-like'⁹¹. Lundvall and others advocated for a looser and more flexible character of the concept. As showed

⁸⁷ Fagerberg, J., Mowery, D.C., Nelson, R.R., *The Oxford handbook of innovation*, Oxford University Press, 2005.

⁸⁸ Lundvall 1992.

⁸⁹ Edquist 2005.

⁹⁰ Edquist 2005.

⁹¹ Edquist 2005.

above, Lundvall adopts a more pragmatic approach, acknowledging the policy analysis nature of the approach.

In conclusion, as used in the research field, the term system of innovation was formulated to serve as an explanation of the “‘lock-in situations’ implied by the traditional policy”⁹² and it was used as a framework for empirical studies. Despite its rather short history, the systems of innovation approach has developed tremendously; nevertheless, from a theoretical point of view the approach is still problematic and open to criticism. However, there can be identified three aspects upon which scholars are in agreement: (i) the recognition of the economic importance of knowledge; (ii) the increasing use of the systems approach; and (iii) the growing number of institutions involved in knowledge generation⁹³.

Defining systems of innovation

Before moving on with the next story on systems of innovation, I will shortly present an overview of different definitions. A short overview of the literature will provide us with a considerable number of different definitions. The different definition of the systems of innovation concept share core assumptions, but they have different levels of generality. The intention is not to provide *the* definition, but rather to understand the different aspects and understandings of the concept as it has been developed over time. Some of the most widely definitions are listed below:

“... the network of institutions in the public and private sectors, whose activities and interactions initiate, import, modify and diffuse new technologies.”⁹⁴

“... the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state.”⁹⁵

⁹² Miettinen 2002, page 62.

⁹³ Schibany, A., *Co-operative behaviour of Innovative Firms in Austria*, Focus Group: Innovative Firms Networks, Study prepared for the OECD Project in National Innovation Systems, 1998, www.oecd.org (last seen 2008.05.26).

⁹⁴ Freeman 1987, page 2.

⁹⁵ Lundvall 1992, page 12.

“... a set of institutions whose interactions determine the innovative performance ... of national firms.”⁹⁶

“... the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country.”⁹⁷

“... that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies.”⁹⁸

“... all important economic, social, political, organizational, institutional and other factors that influence the development, diffusion and use of innovation.”⁹⁹

McKelvey¹⁰⁰ emphasises the importance to critically discuss and analyse the similarities and differences between the different versions of defining systems of innovation. The different versions share common theoretical assumptions, but there are clear discrepancies to how the system of innovation perspective is applied and how the empirical material is examined, often representing different parts of reality.

One common element all definitions above share is their emphasis of the role of institutions. The majority of authors researching systems of innovation emphasis the crucial role institutions play for innovative processes. However, despite its crucial role, the term institution is one of the concepts surrounded by ambiguity and used differently. Some authors (i.e. Freeman) define institutions as networks or organizations supporting technical innovation,

⁹⁶ Nelson, R.R. and Rosenberg, N., *Technical Innovation and National Systems*, in Nelson 1993, page 4.

⁹⁷ Patel and Pavitt 1994, page 12.

⁹⁸ Metcalfe, S., *The Economic Foundations of Technology Policy: Equilibrium and Evolutionary Perspectives*, in Stoneman, P. (ed.), *Handbook of the Economics of Innovation and Technological Change*, Oxford: Blackwell, 1995, pp. 409-512, page 462-463.

⁹⁹ Edquist, C., *Systems of Innovation Approaches – Their Emergence and Characteristics*, in Edquist, C. (ed.) *Systems of Innovation: Technologies, Institutions, and Organizations*, Pinter/Cassell Academic, 1997b, page 14.

¹⁰⁰ McKelvey, M., *How do national systems of innovation differ?: a critical analysis of Jamison, Freeman, Porter, Lundvall and Nelson*. Linköping: Univ. 1991, page 6.

while other (i.e. Lundvall) emphasize the role of “institutional set-up”, defining institutions as rules or regimes that determine behaviour. The term institution is acknowledged as being one of the elements adding to the problems and weaknesses associated with the innovation system approach¹⁰¹. Institutions play a decisive role for the long term economic development and growth¹⁰². A review of the definitions reveals a confusing way of using the terms of institution and organization. The two terms are often used as interchangeable entities, but there are also scholars that attempted to differentiate between the two terms¹⁰³. Regardless of how a system of innovation is defined¹⁰⁴, the concepts of institution and organization are at its core.

Following Lundvall’s taxonomy, the systems of innovations definitions can be divided into narrow definitions and broad definitions¹⁰⁵. Starting with Freeman’s definition from 1987 and ending with Edquist definition from 1997, it is easy to notice a change in the degree of generality and broadness. Freeman’s definition is a more targeted one, with clear reference to the technological innovation, while Edquist’s definition is considered to be the broadest one, where the system is including the entire societal and economic factors.

¹⁰¹ Johnson, B., Edquist, C., Lundvall, B.Å., *Economic Development and the National System of Innovation Approach*, Paper presented at the Globelics Conference, Nov. 2003.

¹⁰² North, D.C., *Institutions, Institutional Change and Economic Performance*, Cambridge: Cambridge University Press, 1990. Nilsson, J-E., *Regional tillväxtpolitik – det politiska möjliga*, in Giertz, E., (2008) *Då förändras Sverige*, Studentlitteratur, Lund, 2008.

¹⁰³ See Edquist, C. and Johnson, B., *Institutions and organisations in systems of innovation*, in Edquist, C. (ed.), 1997b.

¹⁰⁴ Lundvall 1992, distinguishes between narrow and broad definitions, and Jacob 2006 distinguishes between weak and strong definitions. Jacob, M., *Utilization of social science knowledge in science policy: Systems of Innovation, Triple Helix and VINNOVA*, Social Science Information, SAGE Publications, Volume 45(3), 2006, pp. 431-462.

¹⁰⁵ Lundvall B-Å, Johnson, B., Andersen, E.S., Dalum, B., *National systems of production, innovation and competence building*, Research Policy 31, 2002, 213 – 231.

3.3 Systems of innovation as policy analysis

The systems of innovation approach diffused surprisingly rapid, and is now widely use in policy making, as well as in academic circles. Since its emergence in the late 1980s, the concept rapidly attracted the interest of policy makers and international think-tanks such as the OECD and the European Union. The OECD has been an important factor in promoting the system of innovation perspective, transforming it into a buzzword.

First published source naming the systems of innovation approach was in 1987, and already in 1990 the approach was used in a national policy document on science and technology in Finland. Considering that the first OECD report using the framework was published in 1992, the approach has quickly been implemented in policy making. What made possible this fast diffusion among policymakers? Under a period of only five years the concept was already established as an important policy tool, being transformed into a normative concept already before it could properly be addressed by academia.

However, as I will show in this section, the concept has been from the very beginning formulated as a policy analysis, to serve as a tool prescribing actions needed to be taken. The first identified paper using the term was presented by Freeman for the OECD in 1982. Lundvall found this paper while he was working for the OECD years later, and took inspiration from it. Freeman has long worked for the OECD, already in 1963 serving as a consultant for the “Frascati Manual”, used by the OECD to gather R&D statistics. The paper he wrote in 1982 was prepared for the OECD expert group on Science, Technology and Competitiveness. Between 1992 and 1995, Lundvall worked as a Deputy Director of the DSTI at the OECD. The concept had been used in an OECD publication before Lundvall occupied this position. However, Lundvall had earlier connections with the OECD, as he served as advisor and the Danish delegate at the DSTI.

The approach is surrounded by the ambiguity if it first emerged in the academic or in the policy field¹⁰⁶. This is an important aspect to be considered, as it is often characterized as conceptually and methodologically ambiguous, but it was quickly adopted, diffused and implemented in policy making. Consequently, a pertinent question is if this process of establishing

¹⁰⁶ Miettinen 2002, Sharif, N., *Emergence and development of the National Innovation Systems concept*, Research Policy 35, issue 5, 2006, 745-766.

the origins of the systems of innovation perspective is of any importance. For instance, Lundvall considers that to determine the origins of the concept is an arbitrary chicken-or-egg exercise. I believe this ambivalence is important to be addressed, as it will offer answers to questions regarding the meaning and reason of the perspective.

Put tersely, there is no consensus among scholars on this aspect. However, two streams are identified: one saying that the concept is exclusively an academic concept (e.g., Edquist), and another saying the concept was developed as a policy making (e.g., Keith Smith¹⁰⁷). Nonetheless, it seems that there is a generally accepted opinion that the concept aroused simultaneously in the academia and policy making. The main architects of the approach, Freeman, Lundvall, Chesnais (ex-principal administrator of the science and technology policy division in the DSTI), had regular meetings during that period, at conferences, and other types of meetings (e.g. OECD meetings), and is therefore no doubt that the concept was heavily influenced by both worlds.

The IKE Group at Aalborg University and the SPRU at Sussex University played probably the central roles in the establishment and development of the concept. These were the arenas where Freeman and Lundvall coined it, and which served as a meeting place.

In the following paragraphs I will briefly discuss the systems of innovation concept as discussed by the OECD. The OECD role in the development, but most of all, in the diffusion of the concept is unquestionable, and it has been extensively addressed in the literature. In my opinion, the role of the OECD it is important to be considered, its competency both as a think-tank and as a policy making organ.

In the report published in 1997 and entitled “National Innovation Systems”, it is said that “The national innovation system approach stresses that the flows of technology and information (bolded in original) among people, enterprises and institutions are key to the innovative process”¹⁰⁸. Hence, the focus of improving technology performance is on the linkages among the different actors taking part in the innovation policy. Considering this, the OECD adopts a narrow definition, using Lundvall’s terminology. A number of common elements with the approaches developed by Freeman and Lundvall, in particular, but which could be identified to other scholars as well, include

¹⁰⁷ Smith, K., *Economic infrastructures and innovation systems*, in Edquist 1997b.

¹⁰⁸ OECD, *National innovation systems*, OECD, Paris 1997a.

ideas such as technological development, innovation as in interactive process, joint production. Referring to the actors involved in the flow of technology and information, they are referred to as “primarily private enterprises, universities and public research institutes and the people within them.”¹⁰⁹

Miettinen, analysing the contents of the OECD reports¹¹⁰ on a general level (not a systematic analysis), established the following common features: 1) anonymity; 2) a tendency to use clear-cut and converging definitions of basic concepts; 3) self-referentiality; 4) extensive use of unpublished papers prepared for the OECD, selective use of books and fairly scanty use of papers from scientific journals; 5) dependency on economic literature; 6) background knowledge and results of studies are presented in the form of separate text-boxes, tables of statistics and figures¹¹¹. I will not address the six features in detail, but I will choose to focus on those that I consider contribute to the ambiguity academia – policy making, and that stand for the policy character of the perspective. The reports are not revealing any clear connection to research. By assuming a character of ambiguity, self-refer, and scarce references, the reports are clearly written with the purpose of being objective, concessive and to serve to policy-makers by presenting a unitary “story”. The reports refer often to unpublished papers either from different OECD workshops and meetings. The availability of these documents it is practically unavailable to anyone who was not a participant¹¹². There is information about the participants in these meetings and workshops, which could serve as an indication of the discussions. However, this is a highly speculative process. Miettinen undertook an analysis of the reference lists of the two OECD reports mentioned above. He distinguishes between eight types of documents that can roughly be divided into OECD documents, political documents and academic documents. Among the most referred to or cited journals is *Research Policy*, a journal established by Freeman, which has published extensively on innovation systems. Some of the most prolific authors publishing in this journal are Freeman, Lundvall, Smith, Dosi, and Nelson. Some of these authors are also strongly connected to the OECD.

¹⁰⁹ OECD, *Small Business. Job Creation and Growth: Facts, Obstacles and Best Practices*, Paris, 1997b.

¹¹⁰ Miettinen’s analysis is based on two major OECD Reports: *National Innovation System*, published in 1997a, which I addressed in particular in this paper, and *Managing National Innovation Systems*, published in 1999.

¹¹¹ Miettinen, 2002, page 28.

¹¹² Miettinen 2002.

The OECD's importance for the diffusion of the systems of innovation approach has been tremendous, but its role in coining the approach is less evident and problematic to be established. It is however not clear-cut what was the influence of academia. Only about 10 percent of the references are referring to scientific journals, and among this 10 percent there is an overwhelming dominance of economic journals¹¹³. Nevertheless, it would be misleading not to emphasize the key role played by the OECD in the development and diffusion of the approach. The OECD is one of the largest international think tanks, with an extraordinary database on science technology and innovation. Lundvall underlines the importance of the different meetings and workshops organized by the OECD in bringing forward new ideas, despite the fact that the outcomes of some of these discussions are not made available for those non-participants, or are not transformed into practical use¹¹⁴.

As an organ of policy making, the position of the OECD is questioned, especially in terms of her influence over policy makers (national, regional or local) and scholars have addressed the passivity of national policy makers in adopting the systems of innovation framework¹¹⁵. In his dissertation on the Swedish innovation system, Magnus Eklund rejects this idea, and shows the active role played by the different actors in the implementation of the innovation system framework in Sweden¹¹⁶. Corroborated with the fact that the framework was implemented in Finland before it made its way to the OECD, I don't agree either with the idea of the passivity of the policy makers in implementing the NSI framework under the influence of the OECD.

3.4 Final remarks

The emergence of the concept is easily identifiable, but it is a rather difficult and controversial task to say if the approach emerged in the academia or in policy making. Researchers do not agree upon this aspect. However, the

¹¹³ Miettinen, 2002.

¹¹⁴ Lundvall, B-Å, and Borrás, S., *Science, Technology, and Innovation Policy* in Fagerberg, J., Mowery, D.C., Nelson, R.R. (ed.), 2005.

¹¹⁵ Godin, B., *The new economy: what the concept owes to the OECD*, Research Policy, 33 (5), 2004, 679 – 690, Eklund 2007.

¹¹⁶ Eklund 2007.

aspect they do agree upon is that the systems of innovation approach was formulated with an objective of serving policy making. The value of the approach is in its practical utility, an opinion agreed upon by Lundvall and Smith among others.

The systems of innovation perspective emerged against the positivist view of the world, the world as a mathematic formula, leading to, as Agger puts it, an uncritical identification of reality and rationality¹¹⁷. Instead, the theorists of the systems of innovation approach emphasised history, context, social capital, and institutions. The critical theorists prefer to focus on how the human activity affects the broader social structure, in opposition to the positivistic tendency to look upon the social world as a natural process¹¹⁸. From this perspective, the approach can be looked upon either as a model or a construction. If the systems of innovation was developed as a model, then it has a predictive role. It was developed as a model to steer technological and industrial development with the final goal of economic growth. As a model, it is then used to predict what the future would bring and steer the steps to be taken. The problem occurs when the model is identified with the reality. If we understand it as a construct, that it has a descriptive and explanatory role. It is applied to the history in order to understand it.

The emancipation goal is often present in the writings of some of the mainstream researchers. The target group are the policy makers, often regarded as uncritical and passive receivers and users of the mainstream economic theory. Edquist¹¹⁹ criticised the strong influence of the traditional economists on policy makers; traditional economists should no longer influence policy making as their theories were obsolete. He considered the innovation system approach as the only viable source of inspiration for a sound innovation and technology policy. However, the emancipation aspect can easily be argued against. The critic against a dominant way of thinking, in this context of policy making, is replaced by another dominant point of view. The policy makers are not only challenged to critically consider and implement the mainstream economic theories; they are not only informed about the obsolescence of the traditional economists, but are provided with the new framework, which is told to be the only viable source of inspiration. A dominant trend is replaced by another dominant trend. Policy makers are not to decide by themselves which is the dominant trend, but are to be told. A

¹¹⁷ Agger, B., *Critical Theory, Poststructuralism, Postmodernism: Their Sociological Relevance*, *Annu. Rev. Sociol.* 17:105-31, 1991, page 109.

¹¹⁸ Ritzer, G., *Sociological Theory* (7th edition). McGraw-Hill International, 2008 page 282.

¹¹⁹ In Eklund 2007.

relationship of power of researchers, and academia in general, over policy makers, practitioners in general, is at hand here.

Habermas expressed the opinion that expert knowledge and social engineering, sustained by a positivistic view on science, has come to account for solving all social and economic problems, while political and ethical discussions play a secondary role¹²⁰. In this sense, Habermas stated that science and engineering were transformed into “ideology”¹²¹; science and engineering are in power, while politics comes to be reduced just to an administrative function.

Implementing the systems of innovation approach implies a commitment to economic development and economic growth through increased support towards education and research, focus on knowledge and information, institutional learning. Hence, the approach implies an emancipation role both on a micro- and a macro-level. On a micro-level, the focus is on innovation as a result of the interaction and interrelationships between individuals, in formal or informal situations. On a macro-level, innovation becomes institutionalized, making it possible to be planned and steered. It is transformed in a system, in Habermas’ terms, the “system’s colonization of the lifeworld”¹²². In this context, system is understood as those aspects of the society that disconnect from the individuals’ immediate cultural context, and follows a more independent, objectified logic (and therefore, formalized, legitimized power)¹²³. It is a dual discourse the approach puts forward, to serve both the purpose of academia and policy making, contributing therefore to the previous mentioned ambiguity concerning the character of the concept as an academic concept, or a policy making tool.

This is an interesting point of view to be considered and beard in mind when analysing the systems of innovation approach. It opens the door for a number of speculations that one should be aware of. But it also sheds light from several points of view. Reading the major works of the mainstream researcher, this is a recurrent approach. The systems of innovation was meant to represent a revolutionary change in the way of thinking in terms of innovation and the role of the state. In more than one occasions, the novelty and uniqueness of the approach is stressed, but nevertheless strongly criticized.

¹²⁰ Alvesson & Sköldberg 2008, page 294.

¹²¹ Alvesson & Sköldberg 2008, page 295.

¹²² Alvesson & Sköldberg, 2002, page 116.

¹²³ Alvesson & Sköldberg, 2008, page 295.

On the theoretical foundations of the systems of innovation perspective

The aim of this chapter is to address the theoretical underpinnings of the system of innovation perspective. The starting point is that the system of innovation perspective is eclectic by its nature and to paraphrase Ben Martin and Jan Fagerberg, the system of innovation studies is an intellectual melting pot “characterized by diversity and eclectic borrowing of cognitive resources from others”¹²⁴. By saying that the system of innovation is eclectic in nature, I mean that it draws upon different theoretical traditions, and in order to understand its theoretical underpinnings one is required to move between different intellectual fields, both intellectual as well as methodological. This is both a strength and a weakness. It is a strength because it opens up for different interpretations and theoretical novelty. It is a weakness because it failed to clearly position itself and thereby often being perceived as theoretically messy, methodologically also.

The *de facto* theoretical underpinnings of the system of innovation are not easy to be identified. The starting point of the analysis here are the original formulations by Freeman, Lundvall and Edquist. The openness of the systems of innovation approach allowed for many different contributions and it took different theoretical and methodologically paths. As a basis of the analysis here, I start by identifying three main dominators of the systems of innovation literature. On one side, Freeman’s conceptualization as a network of institutions and organizations. Edquist is also focusing on the role of the institutions. This dimension is also in line with Nelson’s emphasis that the system of innovation perspective is par excellence an institutional concept. A second dimension is Lundvall’s conceptualization grounded in the interplay between users and producers with a strong focus on learning and knowledge. Lundvall argues that learning is the main process and knowledge the most

¹²⁴ Martin, R., *Innovation Studies: An Emerging Agenda*, in Fagerberg, J., Martin, R., Andersen, E.S., *Innovation Studies: Evolution and Feature Challenges*, Oxford, 2013.

important resource for innovation. The third dimension that is identified is the influence of the evolutionary economics with its focus on the firm and the market conditions. The firm is identified as the locus of innovation. Furthermore, through the evolutionary dimension the time dimension is introduced and it asks to explain something in terms of its journey over time. By adopting these three dominators as guiding the analysis in the following, the intention is to keep very close to what I call the original development of the approach.

Furthermore, according to the system of innovation literature and in line with the three dominators, four propositions are essential; (a) economic behaviour rests on institutional foundations and the approach highlights the importance of institutions, (b) learning is the most important process and knowledge the most important resource; (c) competitive advantage results from variety and specialization and it presents elements of path dependency (evolutionary economics); (d) innovation is a systemic process; hence all components of the system and the relation between the elements should be considered and addressed within the system boundaries.

The system of innovation has theoretically developed at the meeting point of three traditions in economics – neoclassical economics, evolutionary economics and institutional economics. While rejecting the underpinnings of the neoclassical economics, systems of innovation perspective expresses its affiliation with the evolutionary economics and respectively the institutional economics. Hence, this triangulation shaped and determined the theoretical characteristics of the system of innovation. In the following, I will briefly address the triangulation by considering three dimensions: the usefulness of formal modelling; the assumption debate; and the conceptualization of time¹²⁵. The same triangulation is also mentioned by Richard Nelson¹²⁶, however the focus is mainly on the evolutionary and institutional economics and the traditions of Adam Smith, T. Veblen and Friedrich von Hayek. Both evolutionary economics and institutional theory share a common interest. Nelson, for instance, argues that the two traditions have in common several assumptions and perceptions and therefore they should join forces:

¹²⁵ The discussion is inspired by Boschma, R. A. and Frenken, K., *Why is economic geography not an evolutionary science? Towards an evolutionary economic geography*, *Journal of Economic Geography* (6), 2006, pp. 273-302.

¹²⁶ See Nelson, R.R., *Bringing institutions into evolutionary growth theory*, *Journal of Evolutionary Economics* 12, 2002, pp. 17-28.

Both camps share a central behavioural premise that human action and interaction needs to be understood as largely the result of shared habits of action and thought. In both there is a deep-cutting rejection of ‘maximization’ as a process characterization of what humans do. [...] for scholars in both camps, pattern of action need to be understood in behavioural terms, with improvements over time being explained as occurring through processes of individual and collective learning. For economics evolutionary theorists, this exactly defines the nature of an evolutionary process. Scholars in both camps increasingly share a central interest in understanding the determinants of economics performance, and how economic performance differs across nations, and over time.¹²⁷

Going back to the three dimensions of the triangulation, the use of formal modelling unifies neoclassical and evolutionary economics but it is in opposition with the institutional economics. Institutional economics are very much against any kind of modelling, but it emphasis the contextual nature of economic and social life¹²⁸. Applying an institutional approach to innovation process it means to focus on the place-specific qualitative factors (culture and institutions). Secondly, the three intellectual traditions are built upon different (theoretical) assumptions. Evolutionary and institutional approaches argue that agents have bounded rationality and are influenced in their decisions by routines and institutions¹²⁹. Neoclassical economics depicts the economic agent as driven by utility-maximization implying therefore an exogenous and given context. The main critique the evolutionary and institutional economics make to the neoclassical economics is that it ignores the context of the human action; hence the importance of routines and institutions. The systems of innovation approach argues for an understanding of the economic action as embedded in structures of social relations. Accordingly, innovation is analysed as a contextual and relational process. This is also reinforced by the systems of innovation’s focus on learning and knowledge. Finally, evolutionary economics adopts a historical perspective for explaining the current state of affairs and it criticizes the neoclassical economics for its static analysis. Considering the historical context of the emergence of the system of innovation, in the decades around the 1970s and 1980s a marginalization of the neoclassical economic theory was happening for its

¹²⁷ Nelson, 2002, page 19.

¹²⁸ Martin, R., *Institutional approaches in economic geography*, in Sheppard, E. and Barnes, T.J. (eds) *A Companion to Economic Geography*, Blackwell Publishing, 2000, pp.77-94, North 1990. Scott, A.J., *A perspective of economic geography*, *Journal of Economic Geography* (4) 2004, pp. 479-499.

¹²⁹ Dosi, G. and Nelson, R.R., *An introduction to evolutionary theories in economics*, *Journal of Evolutionary Economics* (4), 1994, pp. 153-172.

downplaying of history and a lack of awareness of the time perspective. Some branches of institutional economics might appear static in their analysis; however they are largely evolutionary in character and often deal with institutional change. Institutional economics are occasionally presented as static when one looks at how context/place specific institutions influence the behaviour of actors. Institutions might have a high level of persistence, but they are not static, but subject to continuous small incremental changes. Nevertheless, institutional persistence is quintessential, otherwise stability of the system can be threatened.

The remainder of this chapter will discuss four theoretical underpinnings of the systems of innovation perspective: the influence of the evolutionary economics (section 4.1), the institutional underpinnings (section 4.2), learning and knowledge (4.3) and the notion of system (section 4.4). The chapter will end with some final remarks (4.5).

4.1 On the evolutionary theoretical underpinnings

The view of economic and technological advance as an evolutionary process is not a new idea¹³⁰. The evolutionary economics has two main characteristics; firstly, it explains the movement of something over time, specifically it explains the status of something in terms of how it got there, or why something is what it is in terms of its journey over time, which argues for a dynamic analysis. A second characteristic is that an evolutionary explanation involves two types of mechanisms, learning and discovery, and selection¹³¹. Evolutionary economics emphasised that the development of new technology is path dependent, interactive and localized. Learning and discovery take place through adaptation and variation – two fundamental building blocks of the evolutionary theory. On one hand, agents follow rules of behaviour which are context specific and also event independent (adaptation). On the other hand, the evolutionary theory recognizes that agents are capable of “innovative” behaviour, experimenting and introducing new rules of behaviour (variation). Assuming this, focus is on the actor who

¹³⁰ Dosi, G. and Nelson, R.R., *Technical Change and Industrial Dynamics as Evolutionary Processes*, LEM Working Paper Series, No 7, Laboratory of Economics and Management Sant’Anna School of Advanced Studies, 2009.

¹³¹ Dosi and Nelson 1994.

has the capability to change or adapt to the system. Hence, the core concern of evolutionary economics is with the dynamic processes by which firm behaviour patterns and market outcomes are jointly determined over time¹³².

Dosi and Nelson identified another four evolutionary characteristics of the firm inspired by biology: (i) a fundamental unit of selection; (ii) a mechanism linking the genotypic level with the entities which actually undergo environmental selection (mechanisms and criteria of selection); (iii) some processes of interaction, yielding the selection dynamics; and (iv) some mechanisms generating variations in the population of genotypes and, through that, among phenotypes¹³³. This is not to say that the evolutionary biology is the basis for the evolutionary economics, but there are some important aspects that are essential for the formation of the evolutionary thinking, such as the unit of analysis, mechanisms and criteria of selection, and the fundamental blocks of adaptation and variation. In their evolutionary economics, Nelson and Winter¹³⁴ compare firms' routines with the genes in a plant or animal.

Adaptation and variation relate to the process of learning and to how novelties are introduced in the system or on the market. The assumption is that actors follow context specific rules of behaviour. But actors also have the ability to experiment and discover, challenging the existing rules and able to introduce new rules of behaviour in the system¹³⁵. Actors are moulded by their environment and their actions have meaning in relation to the set of rules and the context(s) in which they are embedded. Nevertheless, the rules and the characteristics of the context are not decisive for the behaviour of the actors. Actors are not passive in relation to their context, but they are portrait as reactive. The behaviour of actors is determined by external factors and actors on their turn act upon changing their environment introducing novelties in the system. One can argue that this is an explanation of how social values and institutions persist, change and influence the choices or behaviour of actors. To take the argument one step further, the evolutionary

¹³² Nelson and Winter, 1982, see page 18.

¹³³ Dosi and Nelson 1994, see page 155

¹³⁴ Cf. Nelson and Winter 1982.

¹³⁵ Dosi and Nelson 1994, where they write "Our basic hypothesis is that agents follow various forms of rule-guided behaviours which are context-specific and, to some extent, event-independent (in the sense that actions might be invariant to fine changes in the information regarding environment). On the other hand, agents are always capable of experimenting and discovering new rules and, thus, they continue to introduce behavioural novelties in the system". (page 157)

thinking assumes that those rules or behaviours that are not up to standard or no longer fit with the conditions of the current situation are amended or eliminated by the actors themselves. This is, in a nutshell, the process of adaptation and selection, processes of learning through trial and error¹³⁶, imperfect adaptation and mistake-ridden discoveries¹³⁷. Learning is in the evolutionary economics tradition path dependent; the current situation is to be explained by considering how it got there¹³⁸. The system of innovation perspective assumes that learning takes place in relation to routines and institutions, along the entire production value chain, and produces important inputs and stability to the innovation process¹³⁹.

The concept of routines is a central one in the evolutionary economics and a unifying concept for the evolutionary and institutional economics¹⁴⁰. In their seminal book from 1982, Nelson and Winter used routines as a general term for all regular and predictable behaviour patterns of firms:

We use this term to include characteristics of firms that range from well-specified technical routines for producing things, through procedures for hiring and firing, ordering new inventory, or stepping up production of items in high demand, to policies regarding investment, research and development (R&D), or advertising, and business strategies about product diversification and overseas investment. In our evolutionary theory, these routines play the role that genes play in biological evolutionary theory. They are a persistent feature of the organism and determine its possible behaviour (though actual behaviour is determined also by the environment); they are heritable in the sense that tomorrow's organisms generated from today's (for example, by building a new plant) have many of the same characteristics, and they are selectable in the sense that organisms with certain routines may do better than others, and, if so, their relative importance in the population (industry) is augmented over time.¹⁴¹

¹³⁶ See for example Dosi and Nelson 1994 who write that “More generally, evolutionary theory can be viewed as a theory about how society, or the economy, learn: in very special cases learning leads to the convergence to some repertoires of “optima behaviour”; normally it entails more or less temporary, and highly suboptimal, adaptation to what are perceived to be the prevailing environmental constraints and opportunities, and also a lot of systematic errors, trials, and discoveries.” (see page 158)

¹³⁷ Dosi and Nelson 1994.

¹³⁸ Dosi and Nelson 1994.

¹³⁹ Lundvall, B-Å., *Introduction* in Lundvall, B-Å., (ed.) *National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning*, Anthem Press, 2010, and also Johnson, B., *Institutional Learning*, in Lundvall (ed.) 2010.

¹⁴⁰ Cf. Nelson 2002.

¹⁴¹ Nelson and Winter 1982, page 14.

To bring further clarity in how the notion of routine is employed, three kinds of routines are distinguished between¹⁴². A first kind of routines are defined as “standard operating procedures”, which determine and define how much a firm produces under various circumstances. The second type of routines are those which determine the investment behaviour of firms. And finally, there are those routines that influence the deliberative process of firms, routines that are pushing towards better ways or more efficient ways of doing things.

The evolutionary economics is important for the system of innovation perspective also due to its actor perspective. By acknowledging a variation in the behaviour of actors and that actors are capable to both adapt but also induce change, the evolutionary theory adopts a less probabilistic view on the system than the neoclassical economy. In the neoclassical theory the actor is considered as having perfect information and behaving rationally; the actor’s objectives and constraints are perceived as given. The neoclassical economics was not interested in institutions, and perhaps this is one of the main differences between the neoclassical and evolutionary economics – their quest towards understanding how social values and institutions (the institutional framework) affect the behaviour and choices of actors. Understanding the particular institutional context is essential from the standpoint of the evolutionary economics. The context of the actor is a complex one and presumed as familiar only to a certain degree. This is an assumption that is also adopted by the systems of innovation perspective – to understand the process of innovation and why some countries, regions or firms perform better than other, than social, cultural and institutional influences need to be considered.

Nevertheless, we need to keep in mind that the evolutionary economics, as in the tradition of Nelson and Winter, was orientated towards capturing capabilities and behaviour of firms operating in a market environment. The primary aim of the evolutionary economics is to understand firms’ behaviour and response to market changes, competition through innovation and economic and technological growth. The evolutionary economics is, thus, a theory of the firm envisaged as motivated by profit and in constant search for new ways to increase profits, but, and this is important, the choices of the firm are not pre-defined and exogenously given¹⁴³. Hence, these are micro-foundations that the original formulation of the system of innovation perspective did in fact not consider.

¹⁴² Nelson and Winter 1982.

¹⁴³ Nelson and Winter 1982.

Thus, in what way is the system of innovation perspective an evolutionary perspective? Or which are the evolutionary underpinnings of the system of innovation? And what are the implications for the system of innovation of following the tradition of the evolutionary economics? Most of all, it implies that the systems of innovation perspective focuses on change and/or development, that innovation is assumed to be an interactive and systemic process. The Schumpeterian take on innovation anticipated the evolutionary orientation of the system of innovation perspective.

There are several aspects evolutionary economics claim to be of importance for innovation (and economic development at large)¹⁴⁴. Evolutionary theory sought to explain how novelty emerges and diffuses. In this process, uncertainty plays an important role. Evolutionary economics rejected therefore the neoclassical assumptions of perfect rationality, and invoked instead the concepts of bounded and procedural rationality. The second point the evolutionary theory made was the important role of heterogeneity and variety as sources for novelty and development. Finally, the evolutionary theory invoked the time dimension in which learning and the emerging of novelties take place.

As much as routines are necessary for economic action, they are in the same time hinders for innovation. Innovation requires a break from routines, occurring when actors don't answer to a situation with a routine but search for new solutions to the problems they are faced with. Actors are forced to search for new solutions when there is a discrepancy or a miss match between a problem and the solution offered by routines.

4.2 The institutional underpinnings

The importance of institutions for economic growth and development is now mainstream economics, but this has not always been the case. The system of innovation perspective gave institutions a great powerful explanatory force for the behaviour of the economic actors. Institutional differences were also the explanations to one of the oldest and most profound questions of

¹⁴⁴ See in this regard Pyka, A., *Innovation networks in economics: from the incentive-based to the knowledge-based approaches*, European Journal of Innovation Management, (5), 2002, pp.152 – 163.

economics; why some economies perform better than others. Hence, the system of innovation perspective has come to be considered as a given institutional concept¹⁴⁵. Moreover, the concept of institution has become central to economic analysis and the role of institutions for economic growth and development is unanimously accepted and acknowledged by economics nowadays.

From the perspective of the systems of innovation, the main advantage for employing the institutional approach is indicating the social underpinnings of innovation and the existence of national or social innovation trajectories, that innovation is determined by the actors' and firms' social context¹⁴⁶.

Nevertheless, the system of innovation perspective is challenged by noteworthy uncertainties regarding the contents of the concept and the scope of the specific institutions that are considered¹⁴⁷. The underlying argument of the systems of innovation perspective is that innovation is an interactive process involving a variety of actors. The interaction is embedded within and regulated by an institutional framework. Furthermore, the approach is concerned with institutional regimes supporting or hindering innovation. It is also concerned with how institutional environments vary across space, and how they shape local economic processes and outcomes. Differences between firms, sectors and countries are explained in terms of institutional (and organizational – later on I'll come back to the discussion regarding the distinction between institutions and organizations) differences.

The institutional approach can be understood in two ways: 1) what institutions are beneficial for the economic/innovative performance (the tradition of institutional economics – focus on the framework); and 2) how it affects the behaviour of actors and the interaction between these actors (the tradition of Douglas North and neo-institutionalism, but also the tradition of economic sociology where the focus is on actor).

To begin with, the system of innovation perspective defines institutions as

¹⁴⁵ For example, Nelson 2002 claims that the system of innovation perspective “clearly is an institutional concept”, as well as Filippetti, A. and Archibugi, D., *Innovation in times of crisis: National Systems of Innovation, structure, and demand*, Research Policy 40, 2011, pp. 179-192.

¹⁴⁶ Coriat, B. & Weinstein, O., *Organizations, firms and institutions in the generation of innovation*, Research Policy, V.31 (2), 2002, 273-290, page 273.

¹⁴⁷ Coriat and Weinstein, 2002, p. 278, Jacob 2006.

[...] sets of common habits, norms and routines, established practices, rules, or laws that regulate the relations and interactions between individuals, groups, and organizations¹⁴⁸.

Hence, institutions are defined as set of regulations on the interactions between various actors, both individual actors and collective. Another definition is the one proposed by Lundvall who defines institutions in relation to the learning process:

Institutions provide agents and collectives with guide-posts of actions. [...] Institutions make it possible for economic systems to survive and act in an uncertain world. Institutions may be routines, guiding everyday actions in productions, distribution and consumption, but they may also be guide-posts for change. In this context, we may regard technological trajectories and paradigms, which focus the innovative activities of scientists, engineers, and technicians, as one special kind of institutions.¹⁴⁹

From this perspective, institutions are guiding and are allowing for both persistence and change. The definition has both a macro and a micro focus. Lundvall's definition bears obvious elements of the evolutionary economics as well as of North's neo-institutionalism. As with North, institutions are tools to deal with an uncertain world. But Lundvall is taking the notion of institutions closer to the innovative activity and to those that undertake these activities, the actors. The innovative activities that Lundvall refer to are those of the scientists, engineers, and technicians which tells us something about what kind of innovation Lundvall is having in mind. Technological trajectories and paradigms are considered as a special kind of institutions. If we consider both definitions presented here we can notice that there are some recurring aspects: institutions as constraints, institutions as rules of the game, the distinction between formal and informal institutions, the distinction between institutions and organizations – all these issues are taken up by this definition and there are clear connections to the institutional tradition of Douglas North.

There is a lack of agreement regarding which institutional approach the innovation system perspective adopts relative to the process of innovation. As I have already discussed, the system of innovation perspective is considered as institutional by nature, but there are also voices questioning the institutional nature of the system of innovation perspective exactly because of

¹⁴⁸ Edquist and Johnson, in Edquist 1997b, page 49.

¹⁴⁹ Lundvall, B-Å., *Introduction* in Lundvall (ed) 2010, page 10.

a lack of theorization around the concept of institutions¹⁵⁰. However, the literature on innovation systems uses institutions in three ways¹⁵¹. First, as formal institutions operationalized as intellectual property rights, firm-specific rules, government regulations etc.¹⁵². A second branch of literature focuses on the role of informal institutions and the rules for the innovation capacity. This branch of literature applies concepts such as embeddedness¹⁵³, social capital¹⁵⁴, trust and networks¹⁵⁵ to analyse how culture, networks, trust or reputation influence the innovative capacity of an economy. Third, literature has studied the quality of intervention and the question this literature is asking is how the quality of institutions influences the innovative performance. This branch of literature is a mix of the previous two and it is less developed due to difficulties of operationalization and measurement.

The most outspoken theoretical anchoring the system of innovation is making is in the institutional theory of the Nobel laureate Douglass North. In his most famous formulation, North defines institutions as follows

Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. In consequence, they structure incentives in human exchange, whether political, social, or economic.¹⁵⁶

Organizations are defined as

Groups of individuals bound by some common purpose to achieve objectives. [...] Organizations are created with purposive intent in consequence of the opportunity set resulting from the existing set of constraints (institutional ones as well as the traditional ones of economic theory) and in the course of

¹⁵⁰ See for example Jacob 2006.

¹⁵¹ This taxonomy is inspired by a presentation by Rodriguez-Pose held at Blekinge Institute of Technology, summer 2013.

¹⁵² See for example Chaminade, C., and Edquist, C., *Rationales for public policy intervention in the innovation process: A systems of innovation approach*, in Kuhlman, S., Shapira, P., Smits, R. (Eds.), *Innovation policy – theory and practice. An international handbook*. London, UK: Edward Elgar Publishers, 2010; Edquist, C., and Chaminade, C, *Industrial policy from a systems-of-innovation perspective European Investment Bank (EIB) Papers*, 11(1), 2006, pp.108-132.

¹⁵³ Granovetter, M., *Economic Action and Social Structure: The Problem of Embeddedness*, *American Journal of Sociology* 91, 1985, pp. 481-510.

¹⁵⁴ Coleman 1990, Putnam, R., *Bowling alone. The collapse of revival of American community*, New York: Simon & Schuster, 2000.

¹⁵⁵ For example inspired by Gluckler, J., *Economic geography and the evolution of networks*, *Journal of Economic Geography*, 7 (5), 2007.

¹⁵⁶ North 1990, page 3.

attempts to accomplish their objectives are a major agents of institutional change.¹⁵⁷

There is a relation of mutual causality between institutions and organizations. The institutional framework is decisive for what organizations are formed or established and how they evolve¹⁵⁸. Furthermore, the institutional evolution of an economy is to be understood as the result of the interaction between institutions and organizations. An interesting observation North was making is that the character of the organizations reflects the opportunities made available by the institutional matrix¹⁵⁹. Institutions have been previously defined as humanly devised constraints. Institutions are devised to deal with uncertainty, to bring a level of certainty and thus make action possible. Institutions are constraints that structure human interaction; they are the rules of the game. North argued that the most important institution in the human civilization and for economic development is the property rights law; by formulating consequences for trans-passing it took away the high level of uncertainty and made it available for the land owners to exploit it¹⁶⁰. Institutions are hence opening up for opportunities. It opens up the opportunity for humans to design organizations for their own (firms) but also to represent them. Accordingly, argued North, for an institutional analysis and for the understanding of institutional persistence and change, it is essential to consider both institutions and organizations.

Five propositions define the essential characteristics of institutional change¹⁶¹. First, the continuous interaction of institutions and organizations in the economic settings of scarcity and competition, is the key to institutional change. Second, competition forces organizations to continually invest in skills and knowledge in order to survive. The skills and knowledge individuals and their organizations acquire will shape evolving perceptions about opportunities and hence choices that will incrementally alter institutions. Third, the institutional framework dictates the kinds of skills and knowledge perceived to have the maximum pay-off. Fourth, perceptions are derived from the mental constructs of the players. And finally, the economics

¹⁵⁷ North 1990, page 5.

¹⁵⁸ North 1990.

¹⁵⁹ North, D., *Economic Performance Through Time*, Lecture delivered in Stockholm at the Alfred Nobel Memorial Prize 1994.
(<http://www.ppge.ufrgs.br/giacomo/arquivos/diremp/north-1994.pdf>).

¹⁶⁰ North, Douglass C., *Understanding the process of economic change*, Princeton University Press, Princeton, N.J., 2005.

¹⁶¹ North, D., *Five propositions about institutional change*, 1993
(<http://ecsocman.hse.ru/data/874/750/1216/9309001.pdf>).

of scope, complementarities, and network externalities of an institutional matrix make institutional change overwhelmingly incremental and path dependent.

The system of innovation perspective is emphasising the distinction between institutions and organizations and it used North's terminology of institutions as rules of the game and organizations as the players. However, the system of innovation perspective is criticised to have focused on institutions as organizations (i.e. universities, research institutes, venture capital etc.) rather than broadly on the institutional environment (i.e. the legal system, norms etc.)¹⁶². The paradox is that the preponderance of studies in the system of innovation literature is focusing on organizations such as public authorities/governments, universities and research institutes, venture capital¹⁶³. There is an obvious predisposition towards addressing the presence and role of universities, research and funding organizations and from here drawing conclusions upon a country's innovative capacity. The country reports produced by the OECD are an example of this predisposition. With its focus on education and research as enablers of innovation, the system of innovation perspective is in fact not so different from the linear perspective of innovation that it has criticized the neoclassical economics for. It is interesting to mention what Vannevar Bush pointed out already in 1945 - on its own, science provides no panacea for individual, social, and economic ills and that only as part of a network/system can benefit national welfare¹⁶⁴.

But it is not only the distinction between institutions and organizations that the system of innovation perspective is employing. Another taxonomy of institutions, also inspired by North, is the one differentiating between formal and informal institutions. There is a general belief that informal institutions matter for economic development in general, and for the innovative performance of an economy in particular¹⁶⁵.

This is an important distinction for the system of innovation approach considering that it explains performance in terms of institutional arrangements, how institutions have different impacts on the behaviour of actors. Formal institutions are the articulated ones, physically materialized

¹⁶² Cf. Farole, T., Rodriguez-Pose, A. and Storper, M., *Human geography and the institutions that underlie economic growth*, Progress in Human Geography, 2010.

¹⁶³ See the critique formulated by Farole et al 2010.

¹⁶⁴ Bush, V., *Science: the endless frontier: a report to the President, July 1945*, U.S. Government Printing Office, Washington, 1945.

¹⁶⁵ See for example Robert Putnam's work.

and diffused through written documents or materials. Thus, these types of institutions are also easier to be copied or imitated and there is in fact a rather high level of homogeneity between countries in terms of formal institutions. Therefore, the role of informal institutions has come to be considered as an essential explanatory factor for differences in innovation performance. The importance of informal institutions, of informal forms of networking and relating, the importance of what is often referred to as the local culture have been used as arguments in the debate around which spatial level is most appropriated for the analysis of innovation, i.e. if it is the national or regional, or another one. Because they are anchored in the minds of individuals, informal institutions become behavioural relevant. Hence, the distinction between formal and informal institutions implies different levels of analysis, a macro and a micro level.

In conclusion, I argue that the institutional underpinnings of the system of innovation perspective can be found in the institutional tradition of North and the new institutionalism. This has an important consequence for the system of innovation approach and the academic and policy making dualism. New institutionalism emphasis the political process as a critical factor in the performance of economies, to explain diverse economic performance and “inefficient” markets. Furthermore, as humanly devised, institutions imply power relations. To quote Douglass North, institutions “are not necessarily or even usually created to be socially efficient; rather they, or at least the formal rules, are created to serve the interests of those with bargaining power to create new rules”¹⁶⁶.

4.3 Learning and knowledge

Learning and knowledge has been cemented as two building blocks of the systems of innovation perspective by Lundvall’s famous formulation that knowledge is the most important resource and learning the most important process¹⁶⁷. If we go back to the three dimensions identified at the beginning of this chapter, there is a certain difference between the way learning and knowledge are considered by Freeman and Lundvall. Freeman’s account of

¹⁶⁶ North, 1994, page 3.

¹⁶⁷ Lundvall 1994.

the Japanese economic success can be looked upon as a framework for well-integrated learning organizations; a history of reverse engineering where focus was on incremental engineering, with few if any cultural differences between blue and white collar workers. Thus, focus is on the role of informal institutions and how these have an impact on the learning process. To further strengthen the learning aspect, Freeman emphasised two elements, a well-functioning educational system and training at the workplace/on the floor. Lundvall, on the other hand, was interested in the relationship between users and producers of technology as source for innovation and growth, rather than the pure R&D investments. Moreover, Lundvall's primary interest was with knowledge that was of a tacit and qualitative kind. In this context, he introduced the notion of learning by interacting¹⁶⁸ and he also emphasised the socioeconomic context in which the interaction took place.

The study of how institutions structure, constrain and/or enable innovation integrate a concern with knowledge and learning. The argument is that economies with appropriate institutions support learning and are more innovative in the long run by being more adaptive to changes in the surrounding context. Innovation is defined as an interactive process, dependent on searching, finding and securing resources (people, knowledge, technology) and institutions have a great impact on all these processes.

The role of learning for economic development and the innovative performance has been emphasised in other contexts as well. North, for instance, argued that the rate of learning determines the speed while the kind of learning determines the direction of economic change¹⁶⁹. Hence, the knowledge base of innovation and production activities varies across sectors. Institutional change is connected to learning.

Placing learning and knowledge at its core, the systems of innovation approach emphasises the importance of social structures for the innovation process. Learning is a social process that takes place in the interaction between humans. The systems of innovation approach addresses learning both at the individual level and as a collective process. The focus is argued to be on institutional learning. Hence, the analysis is moved to the system level. A system of innovation can therefore be characterized as a learning system. Edquist argues that innovation is in fact learning. With learning as the most

¹⁶⁸ Lundvall's notion of *learning by interacting* draws upon Rosenberg's notion of *learning by using*.

¹⁶⁹ North 1994.

important process, one can argue that the object of study is innovation as process and not as product. A well-functioning system is one that creates endless opportunities for learning and is highly supportive for the innovative activity. Thereby, the system of innovation perspective is about the institutional support for learning and innovation. The innovative performance of an economy is not only about the performance of specific organizations or elements of the system, but there is a turn towards the quality (and quantity) of the interaction process. The interaction becomes the locus of analysis.

The key concept is interactive learning. But learning is by definition an interactive process, triggered by interactions between individuals and their surroundings. Learning is a result of experience. Learning is not the mere accumulation of information or knowledge facts from a book, but it implies an interaction and a reaction – we can say that learning took place only when what has been learnt is also applied¹⁷⁰. Learning in the system of innovation perspective is envisaged as taking place at different levels; institutional level (macro level), firm level (meso level) and individual level (micro level).

The system of innovation perspective talks about institutional learning as a precondition for institutional change. But what is institutional learning? And if distinguishing between institutions and organizations, then one can also talk about organizational learning. Organizational learning is an established conceptual framework in management studies, and therefore would perhaps be useful to follow it and thereafter extrapolate useful knowledge in dealing with institutional learning. The concept became rather popular in the 1990s with the work of Peter Senge¹⁷¹ who applied a system dynamics perspective on organizational learning. The concept is mainly applied at the firm level as a tool to develop a systemic perspective for change. According to this, organizations learn in order to trigger and be able to absorb change, but because it happens at the organization level, it also implies planning or strategy. Thereby, there are obvious similarities with institutional learning which can also be defined as a tool to develop a systemic perspective for change and the same reasoning can be applied to policy making. In order to allow change, learning needs to take place, learning being a continual process

¹⁷⁰ There is here a mere similarity with the invention-innovation conceptual pair. Invention would correspond to knowledge, while innovation would correspond to learning.

¹⁷¹ The concept was coined by Argyris, C. and Schon, D.A., *Organizational Learning: A Theory of Action perspective*, Addison-Wesley Reading, MA, 1978.

of discovering – inventing – producing – reflecting, in the formulation of John Dewey’s full learning cycle¹⁷².

However, we deal here with social systems and, as Donald Schon prompts, “a social system is dynamically conservative in its structural, technological and conceptual dimensions”¹⁷³. A change in the system is triggered by a demand for new ideas or a set of events that question the current state of the system. This is an argument to actually distinguishing between institutional and organizational learning in the same way as distinguishing between institutions and organizations. Firms (economic actors) and policy makers (political actors) react differently to changes in the system and the surrounding environment; they do not react to the same crisis or set of ideas or they react differently; they are simply driven by different logics and different set of goals.

Another scholar discussing mechanisms of learning at an institutional level is the political scientist Paul Pierson. Actors identify gaps between the functioning of institutions and their preferences and they will take the necessary steps to correct or redesign institutions so that they operate more effectively. Institutional design is the result of assessed changed circumstances¹⁷⁴. Pierson also distinguishes between learning processes in the political context and learning processes in the market settings. He questions the strengths of learning processes in political context due to the great complexity and ambiguity of the political world. In the political world, markets are also highly complex and often confusing. But markets have mechanisms and features that makes it much easier to correct mistakes over time. Politics, on the other hand, “is simply a far, far murkier environment” as Pierson puts it¹⁷⁵.

Change is understood as disruption, internal to the system or external. Yet, globalization makes it difficult to really distinguish what is internal and what is external, therefore the system of innovation is often criticized for its focus on geographical borders. The very idea behind the systems of innovation perspective is a change in the economic order of the world, where Japan’s economic growth was threatening the United States’ and Europe’s positions as economic leaders. What was Japan doing better than its competitors?

¹⁷² Dewey, J., *Experience and Education*, New York: Simon and Schuster, 1938/1997.

¹⁷³ Schon 1971, page 128.

¹⁷⁴ Pierson 2004.

¹⁷⁵ Pierson 2004, page 125. Pierson is also mentioning North for drawing the same conclusions.

Firms are primary vehicles for the diffusion of innovation, and they play an important role as agents of social learning for the society at large¹⁷⁶. To exemplify the firm as a learning system, the case of 3M (Minnesota Mining and Manufacturing)¹⁷⁷ will be briefly discussed. 3M started by making minerals with sandpaper as their classical business product. One employee in the research department came one day with an invention, a transparent tape that you could stick on things; the Scotch tape. If at first it was believed that the tape was a good product for saving money, for example, by mending books instead of throwing them away. But once the product entering the market, new usages of the tape were discovered. The paper came to be used at wrapping presents, hang things on the wall, etc. By noticing how the consumers were using the tape, the company came to develop more and more products, as the hair-fixing Scotch tape. Hence, 3M has become a learning system¹⁷⁸. What makes the 3M a learning system? The company was first open to new ideas developed by its employees, but most of all, was carefully paying attention to signals from the market and the consumers. The company was willing and able to follow the consumers' behaviour and how they used the product, change their marketing, adapting the product and further develop it. Hence, a learning company is a company that is open to new ideas, allows development of new ideas and displays capabilities for adaptation. From a system of innovation perspective, the internal organization of a firm is the element determining how the information flow and the process of learning affects the innovative capability of the firm. Organizational learning and routines deal with the coordination of the economic action, in general, and innovation activity, in particular.

The notion of knowledge has been rather extensively addressed by the system of innovation literature, especially its regional version. The nature of knowledge has been often used as an argument for why the regional level is a more appropriate level of analysis. The dichotomy tacit – non-tacit knowledge is probably the most common when addressing the spatiality of knowledge creation. The more articulated knowledge is, the easier it is to be 'transported' and therefore less dependent on actor or location. On the other hand, tacit knowledge is locally embedded, and therefore interaction and

¹⁷⁶ Schon, 1971.

¹⁷⁷ The case is borrowed from Schon, 1971.

¹⁷⁸ Schon 1971, page 66

exchange is dependent of the spatial proximity between actors¹⁷⁹. Put tersely, tacit knowledge is local, while codified knowledge is global in character. Tacit knowledge is shared through face-to-face interactions between partners or through interplay, provided that they share some basic commonalities, such as language, norms and conventions, personal knowledge¹⁸⁰. Furthermore, tacit knowledge is constantly enriched and transformed through learning and socialization¹⁸¹. Consequently, learning by interaction is, according to this approach, the cornerstone of its conceptual framework¹⁸². Codified knowledge is the articulated knowledge that can be written down and transmit via tangible meanings. The distinction is considered by critics¹⁸³ to be a too narrow approach to understanding the complexity of knowledge, learning and innovation and they emphasise the need to go beyond this rather simplistic line of argumentation.

Another distinction is made between analytical, synthetic and symbolic mode of knowledge creation¹⁸⁴ to explain the different geographies of innovation for different industrial sectors¹⁸⁵. Analytical knowledge is science-based knowledge, orientated towards explaining natural systems by employing scientific laws. It is applied at generating new knowledge. This type of knowledge prevails in activities where scientific knowledge dominating, and knowledge creation is based on formal models, codified science, and rational processes¹⁸⁶. Synthetic knowledge is engineering based, prevailing in activities applying or combining existing knowledge in new ways. It is produced through interactive learning with customers and suppliers. If analytic knowledge is codified and highly abstract, synthetic knowledge is only partially codified knowledge, with a strong tacit dimension, and it is more context-specific. Symbolic knowledge, on the other hand, is artistic based, prevailing in activities orientated towards creation of alternative

¹⁷⁹ Moodysson, J., Coenen, L. and Asheim, B., *Explaining Spatial Patterns of Innovation: Analytical and Synthetic Modes of Knowledge Creation in the Medicon Valley Life Science Cluster*, Environment and Planning A, 40, 2008.

¹⁸⁰ Asheim, B.T. and Gertler, M.S., *The Geography of Innovation: Regional Innovation Systems*, in Fagerberg, J., Mowery, D. and Nelson, R. (eds.), 2005.

¹⁸¹ Bathelt, H., Malmberg, A. and Maskell, P., *Clusters and Knowledge: Local Buzz, Global Pipelines and the Process of Knowledge Creation*, Progress in Human Geography, 28(1): 31–56, 2004.

¹⁸² Bathelt et al, 2004.

¹⁸³ For instance Bathelt et al, 2004.

¹⁸⁴ Asheim and Gertler 2005

¹⁸⁵ Moodysson et al 2008.

¹⁸⁶ Moodysson et al 2008

realities and having a cultural meaning. It is primarily produced through learning-by-doing, in studios and project teams. This type of knowledge is highly context-specific. Similarly to synthetic knowledge, symbolic knowledge is sensitive to proximity effects between the involved actors, being therefore more locally based. The novelty of this taxonomy lies in the fact that it makes it unnecessary to talk about the superiority or inferiority of different types of knowledge. The underlying idea is to characterize the nature of knowledge input of the innovation activity¹⁸⁷. It has therefore important implications for policy-making, and argues for a broader approach to innovation policy. The formulation of an innovation policy should be carried out according to the profile of the region and not vice-versa. Furthermore, it argues for a re-consideration of the definition of innovation.

Different modes of knowledge-based economies imply different modes of innovation and learning¹⁸⁸. Two modes of innovation are addressed in the literature; the STI mode, science, technology, innovation; and the DUI mode, doing, using, and interacting. The STI mode is characterized by a science-based approach, formalization and codification. This type of innovation is based mostly on science push/supply driven high tech strategy, able therefore to produce rational innovation¹⁸⁹. On the other hand, the DUI mode of innovation refers to experience-based implicit knowledge based mainly on competence building and organizational innovations, therefore prone to incremental innovation¹⁹⁰. The modes of innovation are often addressed by the literature as conflictual¹⁹¹. Addressing the tension between the two modes of innovation, Lundvall considered that there is tension at all levels of knowledge politics¹⁹²: (i) scientist as analytical machine (STI) versus scientist as human with “personal knowledge” (DUI); (ii) knowledge management as computer orientated management information system (STI) versus knowledge management as frameworks of learning (DUI); (iii) innovation

¹⁸⁷ Asheim, B.T., *Next generation regional innovation policy: How to combine science and user driven approaches in regional innovation systems*, Mimeo, 2009.

¹⁸⁸ Asheim 2009.

¹⁸⁹ Asheim 2009.

¹⁹⁰ Asheim 2009.

¹⁹¹ See for example Jensen, M.B. et al., *Forms of knowledge and modes of innovation*, *Research Policy*, 36, 2007.

¹⁹² Lundvall, B.-Å., *Modes of innovation, innovation system and economic development*. Globelics Academy, Lisbon, 2005.

http://www.globelicsacademy.net/2005pdf/L3_presentation.pps

systems as extended science-technology systems (STI) versus innovation systems as competence-building systems (DUI); (iv) innovation policy as science policy (STI) versus innovation policy as competence building policy (DUI). However, the two modes of innovation are rather complementary, and they are not to be found in pure forms in reality. Differentiating between the STI and the DUI has mainly an analytical purpose and it helps to avoid a too one-sided focus on high tech sectors, at the expense of user-driven, experience based innovation¹⁹³. This is important to keep in mind, especially considering Lundvall's critique that the focus of innovation policy is too much on STI orientated policy in high tech sectors¹⁹⁴ and that more attentions should be paid to innovation based on experience and low-tech sectors.

The discussion on knowledge in the system of innovation framework requires us to address the context of knowledge production. In 1994 Gibbons et al published a book claiming that the production of knowledge and the process of research were being radically transformed¹⁹⁵. The book argued for a change of paradigm in knowledge production from Mode 1 to Mode 2. Mode 1 was characterized by the hegemony of disciplinary science, strong hierarchies of disciplines, autonomous scientists and universities. This mode of knowledge production was to be replaced by a new paradigm of knowledge production - Mode 2, a trans- and multidisciplinary, socially distributed, application- and problem solving orientated. Erik Arnold argued however that this paradigm shift of knowledge production "is a truth with modification" and that the authors got the history wrong¹⁹⁶; Mode 2 is the original form of knowledge production and that Mode 1 is a new invention. So, there is in fact no change of paradigm but just going back to how it was before. When saying that the Gibbons et al got the history wrong, Arnold made references to Wilhelm von Humboldt and Vannevar Bush. Humboldt reformed the German education system by separating faculties and disciplines. This was rather different from the precedent types of universities that were organized around professions. Nevertheless, Humboldt was the first to introduce the unity of research and teaching.

¹⁹³ See Asheim 2009.

¹⁹⁴ See Lundvall 2005.

¹⁹⁵ Gibbons, M., *The new production of knowledge: the dynamics of science and research in contemporary societies*, Sage, London, 1994.

¹⁹⁶http://www.vinnova.se/upload/dokument/VINNOVA_gemensam/Kalender/2006/Innovation_imperative_050427/Erik%20Arnold.pdf (This is a presentation given by Erik Arnold of Techonopolis Group, on 27 April 2006 at VINNOVA, Stockholm)

4.4 The systemic perspective

It is often argued that a novelty of the system of innovation perspective lies in the systemic approach to innovation, thereby arguing that innovation is the result of continuous feedbacks and dynamic relations between a wide diversity of actors (elements). Nevertheless, the systemic approach is also a much contested one. As in the case of institutions, the system of innovation literature is rather scant in developing the notion of system, thus, opening up to criticism. Because, as Niklas Luhmann is arguing, when one introduces the notion of system into an economic and social analysis without further elaboration or clarification, “then an illusionary precision arises that lacks any basis”¹⁹⁷.

Roughly considered, one can distinguish between two main traditions in the system theory; one tradition with focus on the relation whole-parts; and a second tradition where the focus is on the relation between system and environment. Consequently, several aspects need to be considered when employing a systemic perspective. By defining innovation as a systemic process, then it is argued that all components of the system and the relation between all these elements are to be analysed or considered. For example, Edquist¹⁹⁸ is arguing that a system of innovation is defined by all its elements and the relations between these elements which makes it almost impossible for empirical research to operationalize it¹⁹⁹. Another problem with this aspect is that most often studies focus on the elements of a system of innovation. The relations between the elements are often less addressed, considered to be more difficult to be identified and studied. The difficulty lies in the fact that by arguing that all elements should be considered, when should one know that all elements are identified? Hence, the relations are either possible to study so long the elements are not identified. A second underpinning of the system approach is the necessity to define the borders of the system. By adding the suffix national or regional, then the borders are geographically defined. Borders can also be defined in terms of industry or technology²⁰⁰. Others argue that this task should be guided by the research question²⁰¹ and that defining the borders of the system is essential for the

¹⁹⁷ Luhmann, N., *Social systems*, Stanford University Press, 1995, page 1.

¹⁹⁸ Edquist 1997

¹⁹⁹ Broström, A., *How can we study innovation systems? -introducing an actor-centralised perspective*, CESIS Electronic Working Paper Series, Paper no. 124, 2008.

²⁰⁰ See for example technological innovation systems, i.e. Carlsson 1997.

²⁰¹ Such an argument is put forward by Broström 2008

research design process²⁰². A system is also defined by its components interacting with the boundaries²⁰³. There are also those arguing that it is not necessary to deliberately design the system or to assume that the elements of the system work together smoothly and coherently²⁰⁴. In the end, argues Edquist, “there is no given demarcation between a system and its surrounding context”²⁰⁵.

Which are the elements of a system of innovation? Scholars have tried to categorise the institutions that are part of a system of innovation²⁰⁶ and the following elements are usually identified: internal organizations of firms, inter-firm relationships, role of the public sector, institutional setup of the financial sector, and R&D – intensity and R&D – organization²⁰⁷. These elements, is argued, reflect differences in historical experience, language and culture, and have therefore an explanatory power for why national economies differ in terms of production system and institutional set-up. Patel and Pavitt identified four sets of institutions as central features of systems of innovations: (i) business firms, firms are often placed at the core of a system of innovation; the focus is on those firms performing change-generating activities; (ii) universities and similar institutions; (iii) public and private institutions of general education and vocational training; and (iv) governments, both as investor and performer of activities of technical/technological change²⁰⁸.

The system perspective of the systems of innovation approach is theoretically anchored in Ludwig von Bertalanffy’s system-environment distinction and the difference between closed and open systems. Closed systems are immune to their environment. Thus, the innovation systems perspective followed the system – environment dichotomy and Bertalanffy’s open systems. Bertalanffy’s system theory was rooted in the theory of organism, thermodynamics, and evolutionary theory (obs. not evolutionary economics). Accordingly, it has its roots in biology and physics. The analogy between

²⁰² Carlsson, B., Jacobsson, S., Holmén, M. and Rickne, A., *Innovation systems: analytical and methodological issues*, Research Policy, V.31, 2002, pp. 233-245.

²⁰³ Metcalfe, S., *Policy for innovation*, mimeo, ESRC Centre for Research on Innovation and Competition, University of Manchester, 2004, page 18.

²⁰⁴ Nelson, and Rosenberg 1993, page 4.

²⁰⁵ Edquist 1997, page 27.

²⁰⁶ See Patel, P. and Pavitt, K., *National Innovation Systems: why they are important, and how they might be measured and compared*, Economics of Innovation and New Technology, Volume 3, Issue 1, 1994, Edquist 1997, 2005.

²⁰⁷ Lundvall 2010.

²⁰⁸ Patel and Pavitt 1994.

social systems and physical or biological systems is not without risks as it misleadingly suggests that similarities are essential²⁰⁹. The system of innovation perspective is scarcely discussing the theoretical foundations of its systemic approach. The risk is that the usage of the term system is in a rather mundane and average way, without any really theoretical or analytical underpinnings.

As one of the aims of this dissertation is to advance the theoretical understanding of the system of innovation approach, I will in the following try to anchor it into Luhmann's system theorization. Luhmann's theory is assessed as relevant as it is developed for social systems. The key concept of the Luhmannian theory is self-referential systems. What are self-referential systems? They are systems with an ability to establish relations with themselves and differentiate these relations from the relations with their environments²¹⁰. Systems are orientated by their environment (structurally) and they cannot exist without an environment; a system is defined in relation to its environment. If the system of innovation literature often focuses on the need to specify borders, Luhmann's theory focuses on the exchange processes between systems and their environments. A crucial distinction that Luhmann is making is between the environment of a system and systems in the environment of this system. How the system separates from the environment, is a relevant question for the system of innovation perspective to consider. This question draws upon Luhmann's concept of autopoiesis. Having social systems as object of study, Luhmann argues that the social systems that social sciences deal with, are characterized by a common standard of communication. For a social system, communication is then the specific element based on which it differentiates itself from its environment and other systems in the environment. Hence, as a self-referential system, a national system of innovation, for example, is a system that differentiates itself from the environment, which could be the world economy. What does the self-referential system perspective add to the systems of innovation perspective? It adds the relations with the environment and with the other systems in the environment. It sheds light upon the fact that the system studied is one of the many systems in the environment, that there is an environment through which the system defines itself, and that the system is a part of an environment (the system has differentiate itself from the environment).

²⁰⁹ Luhmann 1995, page 14

²¹⁰ Luhmann 1995, see page 13.

In conclusion, there is no unitary understanding of the notion of system as used by the systems of innovation perspective. It mainly appears to be a concept adopted without further theoretical underpinnings and to paraphrase Luhmann, system “is a catchall concept for very different denotations and very different levels of analysis”²¹¹. Nevertheless, as Carlsson is concluding, a systems framework brings out three things; (i) it requires specifying the elements and the boundaries of the system, (ii) the need to analyse the relationships among the components of the system, and (iii) the need to specify the attributes or characteristics of the components (competences and functions)²¹².

4.5 Final remarks

In conclusion, the aim of this chapter has been to discuss the theoretical underpinnings of the systems of innovation perspective. Of course, many aspects have most likely been omitted, not least because the starting point of the analysis is in the ‘original’ formulation of the perspective. Therefore, the study delimits itself to the analysis of the institutional theory, evolutionary economics, learning and knowledge and the notion of system.

Considering the theoretical underpinnings of the systems of innovation, what does it tell us about the conceptualization of innovation? What kind of innovation is the approach considering? What kind of innovation is to be sustained through adopting a systems of innovation perspective? Innovation is perceived by systems of innovation as rooted in the institutional set-up, it is about innovation as process and not innovation as product. The systems of innovation approach brings on the agenda the social dimension of the innovation process. The limits of innovation are seldom technological but social. Lack of ideas is rarely a problem, human imagination and creativity is rarely a limiting factor. The problem of innovation is turning these ideas into commercial products and technologies, and diffusing them.

²¹¹ Luhmann 1995, page 1.

²¹² Carlsson, B., 2007, *Innovation systems: a survey of the literature from a Schumpeterian perspective*, page 859, in Hanusch, Horst & Pyka, Andreas (red.), *Elgar Companion to Neo-Schumpeterian Economics*, Edward Elgar Publishing Limited, Cheltenham, 2007

Hence, one of the main assumptions of the systems of innovation approach is that innovation is shaped by institutions and institutional change²¹³. The premise of the approach is innovation as a cumulative process. A second premise is that interactive learning and collective entrepreneurship are fundamental to the process of innovation²¹⁴. Edquist, in fact, going so far as saying that learning is also a type of innovation.

The theoretical underpinnings reflect some internal conflicts that are probably due to its eclectic nature. If we consider Freeman's systems of innovation, the level of the analysis is macro – the institutions or the networks of institutions; hence an institutional analysis. The same applies to Edquist's systems of innovation. On the other hand, the two other dominators identified, learning and the evolutionary economics, move towards a more meso (sometimes even micro level if we consider that sometimes Lundvall talks about how individuals learn). Lundvall is strongly emphasising the role of institutions and the systemic perspective, but he is also acknowledging the role of the firm. The core of the evolutionary economics is the firm. Hence, the difference is as follows: Freeman is talking about the network of institutions and their role for innovation; Lundvall is emphasising the role of the institutions, but it is also acknowledging the firm as the locus of innovation. The focus of the evolutionary economics is on the firm in the market context.

Based on the theoretical discussion undertaken here, the next chapter will take a step further. If this chapter has addressed the *de facto* theoretical underpinnings, the next chapter will introduce some new theoretical elements to allow us to formulate a theoretical framework with an actor-centred view.

²¹³ Johnson 2010, page 23.

²¹⁴ Lundvall 2002, page 9.

Territorial and functional systems of innovation – towards an actor perspective

The aim of the present chapter is to advance the territorial framework of the system of innovation approach by adopting an actor perspective. The system of innovation literature has been criticized for the absence of an actor perspective²¹⁵. With its systemic perspective, the systems of innovation focuses on the elements of the system and the relations between these elements and it is addressing actors (the elements) only as a general category. That is, the systemic perspective takes a dominant position, while the role of the actor tends to be underestimated. The systems of innovation perspective tends to apply the goals and means of the system at the actor level as well. The argument here is that there are different categories of actors with different goals, logics, interests, working methods etc. The behaviour of the actors have significant impacts on the behaviour of the system as a whole, being able to (re)direct it or change its course. The relations between the actors (the relations between the elements and the system) are shaped by the actors involved. Hence, a first step should be in specifying which are the actors to be considered; what type of actors. The functioning of the system is dependent upon how actors (at least particular actors) behave. This is not to deny the system perspective, but it is only one side of the coin; the behaviour and interests of the actors are the other side of the coin. And both sides should be considered for a complete analysis.

Thereby, the aim of the present chapter is the analysis of the system of innovation as the interplay between two rationales or logics; a territorial rationale and a functional rationale. The intention with proposing this theoretical framework is to shed light upon the variety of actors within a

²¹⁵ Balzat, M. and Hanusch, H., "Recent trends in the research on national innovation systems," *Journal of Evolutionary Economics*, Springer, vol. 14(2), 2004, pp. 197-210, Carlsson 2007; Doloreaux, D. and Parto, S., *Regional innovation systems: Current discourse and unresolved issues*, *Technology and Society* 27, 2005, pp. 133 - 153.

system of innovation. The premise of this dissertation is that with their different logics or rationalities actors understand and behave differently and this has an impact on the behaviour and performance of the system. The territorial and the functional systems of innovation imply different rationalities, interests or goal orientations. The assumption is that the different rationalities influence the innovation process, thinking, the learning process and how activities are organized and performed. Following this line of argumentation, the question is: what characterizes the territorial and functional systems of innovation or rationalities and what is the impact on the innovation activity. The two rationalities are not to be addressed only between categories (which is most evident) but also within the same category. The system of innovation perspective has a territorial perspective, nonetheless because of its institutional nature. If innovation is a social action and it is socially situated, then which logic dominates is defined by the actors involved.

The remainder of the chapter is organized as follows. In the next section (5.1) the theoretical conditions for a territorial and functional understanding of the systems of innovation are outlined. Section 5.2 will address the territorial system of innovation while section 5.3 will turn to the functional one. Section 5.4 will attempt to present a territorial framework for the analysis of the interplay between the two systems of innovation. Section 5.5 summarizes and concludes the chapter.

5.1 Towards a territorial and functional understanding of systems of innovation

Based on the theoretical underpinnings of the systems of innovation perspective, the theoretical framework proposed here is based on the following assumptions: (i) innovation is a social action, where learning is the most important activity (hence the actor perspective); (ii) innovation is socially situated or embedded (the networks); (iii) the institutional arrangements that have an impact on innovation are social constructions. Thereby, an appropriate frame for analysing the process of innovation is proposed to be the economic sociology founded upon Weber's focus on the

interpenetration of economic organization and social institutions²¹⁶. Consequently, the conception of economic action as socially situated combines the notions that economic action is embedded in social relations²¹⁷ and shaped by interests²¹⁸. Considering that economic sociology informs our theoretical framework, focus is on the external variables which influences the action process and outcome (while economics are more concerned with the internal structure of action). In view of that, the actual understanding of the innovation process is not in terms of means and ends, but in terms of the external variables that contribute to innovation and in terms of learning and knowledge.

This thesis distinguishes between institutional environments and institutional arrangements. If the systems of innovation framework argues that institutions matter for the innovation capacity, this implies that intervention is required. Nevertheless, institutional forms (which go back to the neoclassical tradition) do not map the “successful” institutional environments which are propitious for innovation. The territorial based innovation system and the functional based innovation system depict two different institutional arrangements, nevertheless interconnected. The assumption is also that each institutional arrangement is configured in relation with other institutional arrangements²¹⁹. The general frame of reference proposed in this thesis requires the treatment of the subject matter in substantive terms, meaning the instituted process of interaction between the elements of the system and with their environment.

In view of that, this dissertation addresses the interplay between firms and policy making (both addressed here as actors) and how these two actors interact with each other. The firm that is considered here is a large international firm, occupying a dominant position both nationally but also internationally. This relation is containing the territory-functionality dichotomy; policies are territorially targeted and therefore institutions are place-based, while firms flow between different territorial levels (and hence institutional levels), driven by fulfilling a goal without a direct territorial focus (nevertheless, with a possible great territorial impact/ and it is this impact that policy makers can take advantage of). The argument is that the two categories of actors considered here are driven by different interests,

216 Zukin, S. and DiMaggio, P.J., (ed.) *Structures of Capital: The Social Organization of the Economy*, Cambridge University Press, 1990.

217 The embeddedness theory of Granovetter 1985.

218 See Swedberg, R., *Principles of Economic Geography*, Princeton University Press, 2003.

219 Hollingsworth, R.J., *Doing institutional analysis: implications for the study of innovations*, Review of International Political Economy, 2000.

logics and visions, while their actions might in the end have similar impacts. Firms (especially if we consider multinational firms) might seem driven by their economic interests and therefore with less territorial focus. However, as the empirical analysis will discuss, firms (might) flow between spaces, but they are also quite embedded in a territory.

The territorial and the functional-based systems of innovation is a way of abstracting from empirical phenomena and deal with complexity. The two types of innovation systems are formulated in line with Weber's conceptual tool of *ideal type*²²⁰. Weber argued that no scientific system is able of reproducing all concrete reality. The reality is too complex for any science to be able to reproduce the infinite diversity of empirical phenomena. However, the scientist is faced with the dilemma of balancing between very general concepts and the particularization of the object of study or phenomena. An ideal type is an analytical tool allowing selection and abstraction, to find similarities and deviations in concrete cases.

The conceptual framework I present here is made possible by making three moves. First, rather than focusing on the systemic aspects, it focuses on the actor. By making the actor rather than the system the unit of analysis, it facilitates addressing the dynamics of the system. Second, the theory of embeddedness and the notion of interest are introduced. The argument of embeddedness is introduced for two reasons; first, it focuses on the actor, therefore useful to avoid a generalization of the actor and institutional determinism; and secondly, to answer the question of how actors make use of institutions. Furthermore, it also allows addressing the innovation activity in terms of both its territoriality²²¹ and social aspects; it can also be seen as a way to integrate the role of formal and informal institutions in the innovation process. The notion of interest is introduced to study what determined an action and why one path of action was taken, rather than another one. Third, it broadens and relaxes the institutional approach of the systems of innovation approach. The approach considers the institutional arrangement of an economy to support innovation. By introducing the concept of interest,

²²⁰ Weber, M., *The Theory of Social and Economic Organization*, The Free Press: New York, 1947.

²²¹ Martin Hess talks about the over-territorialization of the embeddedness concept and emphasis that this is not in line with the early literature of embeddedness in the work of Polany and Granovetter; in Hess, M., '*Spatial*' relationships? Towards a reconceptualization of embeddedness, *Progress in Human Geography* 28, 2, 2004, pp. 165 – 186.

actors are here considered as constituting institutions²²² and focus is more on the institutional environment.

5.1.1 The actor perspective

The analysis here proposes an actor-orientated analysis of the systems of innovation. The systems of innovation perspective establishes that there is a system and there are elements of the system, but it does not have the tools to analyse the dynamics of the system, i.e. the relation between the elements of the system. Furthermore, the system perspective takes over and the actor perspective is rather marginalized.

I talk about the actor and not agency to avoid a conceptual ambiguity. The concept of agency is used in somewhat different ways by different disciplines and theoretical traditions. In economics is used in the principal-agent relationship and it is applied to the internal organization of the firm. Sociologists have also attempted to use the economist's version of the agency theory, adopting it in different ways. Therefore, to avoid ambiguities, the notion of actor is used throughout this dissertation. The actor is approached as following its own interests and goals and having a great deal of power to influence the behaviour of the system (this power is both conscious and unconscious).

The theoretical framework of the systems of innovation approach requires an avoidance of the atomization implicit in the neoclassical tradition (and the under socialized conception of action and agency). The view of the actor adopted here is that s/he does not behave or decides as atom outside a social context, nor that their action is strictly determined by an institutional arrangement or environment or by roles or positions occupied. An actor behaves with a purpose which is embedded in concrete, ongoing systems of social relations²²³. The concept of actor is useful and important for avoiding an institutional determinism (the assumption that institutions exercise isomorphic pressure on social actors and companies).

²²² This has important implications for the more contemporary development of the NIS perspective and its application on developing countries. It is not only about putting up or importing (or exporting for that matter) a proper institutional arrangement. It is also about considering the actors, their interest and their own institutional arrangement. Because if we consider actors as institutions, we make the institutional framework much more flexible and move away from its deterministic aspects. If an institutional arrangement is no longer of use to the incumbents of the system, than it will not survive.

²²³ Granovetter 1985, see page 487.

A system of innovation is many different actors with different logics, interests, mental maps, learning mechanism etc. The functioning of the system is determined by how actors behave. Even though the systems of innovation emphasises the importance of the institutional arrangements or structures, how these institutional arrangements are internalized by actors has impact on how they behave and the actors' behaviour has direct impact on the behaviour of the system. Furthermore, the dynamics of the system are not possible to be studied without considering the behaviour of the actors. The dynamics of the system are here understood as the interplay between the actors of the system.

To deal with the actor perspective, a categorization of actors is required. Hence, we talk about economic and non-economic actors (here referring to political actors). The categorization of the actors is based on two theoretical assumptions; (i) actors are embedded in a territory as much as they are embedded in networks of relations; (ii) the role of interests in understanding the rationale of actors and their behaviour and the way they interrelate (elements and relations of the system). For the purpose of this dissertation, two types of actors will be addressed; policy making/makers and firms (non-economic and economic types of actors).

5.1.2 The embeddedness argument

In his seminal article from 1985, the American sociologist Mark Granovetter introduced the concept of embeddedness as a reaction to the rational, self-interested, a-social behaviours of the classical or neoclassical economics. The embeddedness theory argues that the behaviour of actors and institutions is constrained by their social context and “to construe them as independent is a grievous misunderstanding”²²⁴. Focus is on the role of concrete personal relations and structures of such relations in generating trust and discouraging malfeasance. Originally, the concept of embeddedness was defined as related to firms, networks and systems, denoting much more than territorial affiliations. Actors engage in relations with other actors and they all are influenced by their social and cultural heritage. Furthermore, the actors in a relation are perhaps located in different places, creating networks that are discontinually territorial²²⁵.

²²⁴ Granovetter 1985, see pages 481-482.

²²⁵ Hess 2004, see page 181.

By introducing the theory of embeddedness, the aim is to contribute to the discussion on the elements of the system (that is, the actors) and the relation between them. By adopting this perspective, actors are considered in their context and their actions are influenced by the institutional environment or arrangement in which they are situated or embedded. The embeddedness approach helps us to shed light upon the different logics of the actors within a system. Actors are embedded in different institutional arrangements which impact upon the logic of their action or their behaviours. The systems of innovation approach contends that the institutionally embedded nature of innovation demands a continued and accentuated role for the national/regional/local context²²⁶. One of the central concepts of the systems of innovation, namely interactive learning, is socially embedded, implying that organizational forms and institutional set-ups are crucial to the outcomes of the different interactions. On the other hand, the concept of learning gives space to the actor. Furthermore, the systems of innovation approach emphasizes that a country's ability to influence innovation is not dependent only on the science and technological structure²²⁷, but it is also dependent upon social capabilities²²⁸.

Initially developed by Polanyi in the 1940s²²⁹, the purpose was to distinguish traditional, institutionally embedded societies from modern market societies, characterized by lower (and decreasing) levels of embeddedness. Granovetter's embeddedness theory attempts to understand how behaviour and institutions are affected by social relations. Polanyi's argument diverges from previous schools of thought that have over time dominated the economic understanding of how actors behave. It diverges from the so-called substantive school which asserted a high level of embeddedness (typical for non-market economies) or the neoclassical school which asserted that economic behaviour was independent of social relations. It also diverged from the new institutional economics²³⁰ which argued that behaviour and institutions are to be better understood as resulting from the pursuit of self-interests by rational, more or less atomized individuals²³¹. The position of

²²⁶ Gertler, M.S., Wolfe, D.A. and Garkut, D., *No place like home? The embeddedness of innovation in a regional economy*, Review of International Political Economy, Vol. 7, Issue 4, 2000.

²²⁷ A trend referred to as 'technonationalism' based on Nelson's conceptualization; see for example Filippetti and Archibugi 2011.

²²⁸ Lundvall 1992, Lundvall et al 2002.

²²⁹ Polanyi, K., *The Great Transformation*, Boston: Beacon Press, 1944.

²³⁰ I.e. North 1990.

²³¹ Cf. Granovetter 1985.

Granovetter is a middle one, arguing for a more substantial level of embeddedness than the neo-classicists or the new institutionalists allow for. His focus was on the analytical scales of actors and networks of interpersonal relations²³², on the individual and collective agency.

How is Granovetter conceiving the notion of actor? He makes a distinction between rational and structural embeddedness. Rational embeddedness describes the nature or quality of dyadic relations between actors. Structural embeddedness refers to the network structure of relationships between actors. Hence, the actor is conceptualized both at the individual and collective level. Granovetter's argument emphasises the existence of embedded relations and social structures in the context of market societies. He has been criticized for focusing on the embeddedness in ongoing social relations and neglecting the importance of the embeddedness into a larger institutional structure. The focus of the embeddedness argument is on the importance and the role of social relations and most of all structures ('networks') of such relations as a framework for action. Embeddedness generates trust and discourages malfeasance – institutions are the rules of the game; that is, both embeddedness and institutions play about the same role – create a framework for action. Of course, at different levels. Embeddedness implies also a higher level of access to information²³³ – about the rules of the game, about the other actors, about the context in general. Even though some of this information can be achieved through other means as well, embeddedness implies quicker and direct access. Granovetter names four reasons why this information is better; 1) it is cheap; 2) one trusts one's information better; 3) individuals with whom one has continuing relation have an economic motivation to be trustworthy; and 4) departing from pure economic motives, continuing economic relations often become overlaid with social content carrying strong expectations of trust and abstention from opportunism²³⁴. Granovetter's theory aims to provide a balanced relation between institutional arrangements and social relations/networks of relations and their impact on economic life (mainly in terms of the production of trust). Within the framework of systems of innovation, this corresponds to the relation formal – informal institutions. As previously argued, to understand why some economies perform better (in terms of innovative performance) it is not enough to only address a country's

²³² See Hess 2004.

²³³ One can argue that this is true for the incumbents of the system, but that it might represent a problem to the challengers of the system. In this thesis we consider relations or interplay between incumbents of the system, and for this reason I take the liberty of not dealing with this aspect.

²³⁴ Granovetter 1985, page 28.

infrastructure of formal institutions. It is necessary to have well-functioning formal institutions, nonetheless this is not sufficient. The role of informal institutions is also to be considered, and as North argues, for a comprehensive analysis, one must consider both types of institutions²³⁵. Both formal and informal institutions are necessary, but they are not sufficient on their own.

The embeddedness literature has been distinguishing between different dimensions or mechanisms of embeddedness. Granovetter talked about structural embeddedness to indicate that not only personal relations matter but also the structure of the networks of relations²³⁶. Zukin and DiMaggio identified four kinds of embeddedness of the economic action: cognitive, cultural, structural and political embeddedness²³⁷ while Hagedoorn distinguishes among environmental embeddedness, inter-organizational embeddedness, and dyadic embeddedness²³⁸. Hess distinguishes between societal embeddedness, network embeddedness and territorial embeddedness. Societal embeddedness considers the societal (political, economic, cultural etc.) background of the actor²³⁹. Network embeddedness describes the networks an actor or organization is involved in. Territorial embeddedness considers the extent to which an actor is anchored in particular territories or places. What they all have in common is that they place the economic action, or the economic actor, within a social, political, cultural and cognitive surrounding and that between the actor and its surrounding there is an indissoluble connection. The surrounding, or the context, is perceived as a source of meaning, helping to understand the action of the participants in the system. To avoid the danger of applying a broad, indiscriminating conceptualization of the context, the literature distinguishes between a macro- and a meso- level of embeddedness²⁴⁰. The macro level of embeddedness relates to specific country differences, in an international context. The meso level applies to the industry or sector level.

The systems of innovation perspective has been stressing the role of the institutional context in explaining a country's innovation performance and why some countries perform better than other. More specifically, the importance of the cultural space has been emphasised. This cultural space is

²³⁵ North 1990.

²³⁶ Granovetter 1990, see pages 98-99.

²³⁷ Zukin and DiMaggio 1990.

²³⁸ Hagedoorn, J., *Understanding the cross-level embeddedness of interfirm partnership formation*, *Academy of Management Review*, 31, 2006, pp. 670–680.

²³⁹ Hess 2004, see pages 176-177.

²⁴⁰ See Hagedoorn 2006.

understood in terms of the general institutional framework, i.e. norms and codes, which represents the context of action. How actors (institutions and organisations) are understanding and using information depends on this context²⁴¹. The idea of cultural space stresses the importance of institutions for learning and innovation, which are processes of social interaction governed by norms, rules, habits etc.²⁴². The role of social capital is also stressed, by Lundvall for instance, among others. For example, the production of learning is argued to be dependent on social capital. Moreover, as interactive processes, innovation and learning depend on trust and other elements of social cohesion²⁴³. To place it in a broader context, research has shown that there is a correlation between social capital and economic growth and development²⁴⁴. Cultural aspects have been also emphasised by studies in regional economics/regional systems of innovation, for example the Third Italy districts or the Saxenian analysis of Silicon Valley. Even Freeman's analysis of the Japanese innovation system has cultural implications, for example the keiretsu system.

The advantage of using the embeddedness argument is that it focuses on other territorial arenas besides the regional or national ones²⁴⁵. Or, in fact, the advantage is that it does not focus on the territoriality of the economic activity but on the importance of relations and networks, on the social nature of the economic activity. The argument of embeddedness has been over-territorialized, especially by work in economic geography²⁴⁶. The systems of innovation approach has been prone in using a spatial logic on the innovative activity. Embeddedness is considered in relation to social and professional relations, and not to the territorial arenas *per se*. If territoriality is to be considered, it is in terms of social, organizational and/or cognitive proximity of actors. The focus of the analysis is on the role of the embedded actor and it is in line with a more sociological line of inquiry or a more process-orientated view. This line of inquiry argues that institutions not only reflect the preferences of those that shaped them, but institutions also shape and

²⁴¹ Lundvall, B-Å., *Innovation, Growth and Social Cohesion. The Danish Model*, Cheltenham: Edward Elgar, 2002.

²⁴² Johnson 1992.

²⁴³ Lundvall et al 2002.

²⁴⁴ Nielsen, K., *Social capital and the evaluation of innovation policies*, International Journal of Technology Management, Vol. 26, Issue 2-4, 2003, but also the work of R. Putnam.

²⁴⁵ Cf. Heidenreich, M., *The social embeddedness of multinational companies*, Socio-Economic Review 10 2012, pp. 549-579.

²⁴⁶ See Hess 2004.

constrain the actions and/or interests of actors, interests that emerge within particular normative and historical contexts²⁴⁷.

With insights from the theoretical tradition of the embeddedness theory, the interplay between systems of innovation as policy making and systems of innovation as firm strategy will be addressed. It will address the relation between politics and firms within a system of innovation and it can help us understand how actors make use of institutions. Moreover, it makes it possible to address the active role of actors in constructing, forming and changing the environments in which they are embedded (or in which they act). The assumption is that institutions, organizations and social actors reciprocally affect each other's evolution. Hence, they are in a state of co-evolution, as Nelson calls it; while technological development takes place within an institutional contexts that defines the background, technological development also triggers the development of new institutions in line with the new technologies²⁴⁸.

5.1.3 The concept of Interest

With learning and knowledge as foundation bricks of the systems of innovation approach, I argue that there is a need to combine the analysis of the economic aspects of innovation with an analysis of the social and political view of innovation. Drawing upon the literature of economic sociology, the concept of *interest* is proposed. The literature of economic sociology analysis interests as the drives of economic action and institutions as constellations of interests and social relations²⁴⁹.

The concept of interest has an interesting history in social analysis which can be traced back to the medieval time. Initially, it had purely an economic connotation, and it gained recognition when adopted in the political life. It became rather popular during the seventeenth century, especially through the work of Machiavelli and it was synonym with ruthless. David Hume had an important contribution to the development of the concept, from a rather stable and rigid view towards the conceptualization of interests as products of human nature and biology. The concept of interest is an important one in social sciences for the reason that it made possible a more flexible type of

²⁴⁷ Powell and DiMaggio 1991.

²⁴⁸ Nelson 1994 (in Heidenreich 2012, page 555).

²⁴⁹ See Swedberg 2003.

social analysis, with interests being in conflict or reinforcing one another²⁵⁰. Nevertheless, the concept came later on to be restricted to economic interests, and it was often replaced by utility and preferences. This led to a limited type of interest analysis which replaced the previously type of social analysis, characterized as a rich and complex type of interest analysis. The limited economic type of interest analysis is the one that informs the utility concept of the neoclassical economics, with its focus on the isolated, all-knowing and maximizing economic agent. From a sociological perspective, interests are placed within a societal framework and the analysis requires an integration of social relations.

Hence, interests are in this dissertation conceptualized as socially embedded. Actors are driven by interests, but it is the social element that outlines what expression and direction these actions will take²⁵¹. In the framework of this dissertation, the social element is understood as the rules of the game, hence the institutional context of the actor. Thus, an analysis of interests requires the incorporations of social relations²⁵². The institutional framework becomes therefore important to understand the interests of the actors and why they took the action they did. The institutional context of the actors is not a homogenous one, actors are of different kinds and have different interests, and they act in different spheres. Scott developed an institutional framework based on three pillars; the regulative pillar, the normative pillar, and the cultural-cognitive pillar²⁵³. In this framework institutions are defined as providing stability and meaning to social life²⁵⁴. Institutions constrain and regularize behaviour, through both formal and informal incentives, according to the first pillar – the regulative one. The regulative pillar has been emphasised by many institutionalists, even by Douglass North, who has tended to see institutions as resting primarily on the regulative pillar where the state has the function of the guardian and to enforce regulations. The normative pillar includes values and norms, and they define the actors' interests and objectives and how to pursue them. Because some norms and values apply to some groups and other to other groups, they give rise to roles and consequently to social positions. The normative rules are perceived as imposing constraints on social behaviour, but also empower and enable social action; they are prescriptive, evaluative and obligatory. The enforcer varies

²⁵⁰ Swedberg 2003.

²⁵¹ Weber discussed in Swedberg 2003.

²⁵² Swedberg 2003.

²⁵³ Scott, W.R., *Institutions and organizations: ideas and interests*, 3rd ed., Sage, 2008.

²⁵⁴ Scott 2008.

depending on the category of norms one considers. There are norms applying to all members (of a society or a group) while other rules apply to a specific group or to specific actors. Norms and values also confer rights as well as responsibilities. The cultural-cognitive pillar addresses the shared conceptions in a society and the framework in which actors' behaviour is given a meaning²⁵⁵. Meanings are constructed through interactions with the context. Moreover, the cultural-cognitive pillar emphasises that the internal interpretative processes are shaped by the external cultural framework, which implies that the focus lies on the central role played by the socially mediated construction of a common framework of meaning²⁵⁶. Adopting an actor perspective, how actors internalize and appropriate the rules of the game or the institutional context is important to be considered.

The analysis here subscribes to the sociological concept of interest. However, for a dynamic analysis, the sociological analysis needs to be complemented by the economic conceptualization of interests. There are several reasons why I introduce the concept of interest and all are anchored in the actor approach that informs this dissertation; to distinguish between political and economic interests; to realize that the actors of a system of innovation can take many different forms. Firms can take many different forms each with its own interest²⁵⁷, institutional arrangement and profile. Accordingly, an analysis should have as its starting point the actors in order to understand which interests lay behind their decisions or choices. By understanding interests from the perspective of who the actor is it is also to say that the approach adopted here avoids the opportunistic view of the actor. Interests can be looked upon as motivation – the interests motivates an actor for a specific action, for a specific decision or choice, or for entering a collaboration with other actors. In conclusion, the advantages of using the concept of interest is double folded; it helps understand the strength that underlies an action, and secondly it may help to explain why one path of action was taken, rather than another one²⁵⁸.

²⁵⁵ Scott 2008.

²⁵⁶ In Scott's initial model form 1995, the third pillar was called only for cognitive. The cultural aspects were added later on in his book from 2008, acknowledging that the internal processes (that is the cognitive one) are shaped by cultural frameworks. This implies a shift from a singular focus on the individual towards the individual in a social context. The definition and consideration of innovation follows a similar path – from innovation as an act of a singular person that innovates in isolation, to innovation as interactive learning.

²⁵⁷ Some are product orientated, while some more service orientated, some are research-based while other only manufacturing.

²⁵⁸ See also Swedberg 2003.

When analysing interests, conflict of interests are unavoidable. To paraphrase Granovetter, “conflict is an obvious reality”²⁵⁹. The two categories of actors this dissertation is focusing on, the economic and the political actors, are often motivated by different interests. Conflict of interests manifests not only between the territorial and functional rationale but also within the same rationale. If we consider the research system in Sweden there is an obvious conflict of interest between the two ministerial departments that have an interest in the way the research and innovation policy is formed and financed. The patent system is another example of conflict of interests between the industry and the academia. The industry wants patents, the academia is interested in publishing – hence a conflict of interests.

5.2 The territorial systems of innovation

With its institutional focus, the systems of innovation perspective requires a territorial focus. There are different depictions of the level of territoriality which have been discussed in terms of relevance. However, the relevance of the level of territoriality depends on the question that is posed. The regional innovation system emerged as a reaction to the national one which was considered not to be the appropriate level for analysing innovation. The national systems of innovation focuses on the role of the public sector or policy making for innovation, and from this perspective, depending on the organization of the state, the national level is to be considered.

The system of innovation perspective emerged in a period characterized of restructuring of both growth and the economic politics, a decreasing role of the public sector and a weakening role of the state – the era of Regan and Thatcher. The systems of innovation perspective addressed the role of the state (in terms of policy making) in relation to innovation and technological development within nations. Analysing the role of the state in the Swedish politics, Lindvall and Rothstein talk about the fall of the strong state, where state actions (establishment of institutions or organizations) are not designed to implement policies or laws, but they are engaged in the production of

²⁵⁹ Granovetter 1985.

ideological positions²⁶⁰. Birgitte Gregersen compares the role of the state in developing and maintaining a national system of innovation with the role played by a pacer in a bicycle race:

If public sector demand in both qualitative and quantitative terms races ahead it loses contact with the innovative capability of national suppliers. On the other hand, if public sector demand slows down too much, national suppliers may slow down their process of renewal and stick to pure routinizing. As optimal pacing in a bicycle race requires a mutual understanding between the racing cyclist and the pacer, optimal pacing leading to an upgrading of national systems of innovation requires a mutual understanding between the public and private participants in interactive learning and searching processes.²⁶¹

The state is here depicted as a catalyser and optimizer. From a system of innovation perspective the role of the state is not only to support R&D, but to support the whole system in which innovation is developed, diffused, applied, produced, and utilized²⁶².

In the analysis carried out in this dissertation the national system of Sweden is considered. In line with the actor perspective adopted, it means that the state is considered as an actor; the challenge thou is to situate the state as actor, which is not unproblematic. To make it possible, I address the state in the tradition proposed by the economic sociology and the work of Neil Fligstein. From this perspective, the state is considered through its role in the economy²⁶³. Fligstein²⁶⁴ talks about the intimate relationship between the state and the creation of markets. The state owns several instruments which are used to construct a market (if to roughly categorize these instruments they would be laws and rules, which corresponds to the conceptualization of formal institutions as discussed in the previous chapter). Against this backdrop, the state (operationalized as policy making) is here considered as an actor that helps to construct the (national) system of innovation through laws, rules and policy making, but also informal institutions. Developed within the framework of economic sociology, the state is also conceptualized

²⁶⁰ Lindvall, J. and Rothstein, B., *Sweden: The Fall of the Strong State*, Scandinavian Political Studies, Vol. 28, No. 1, 2006.

²⁶¹ Gregersen, B., *The Public Sector as a Pacer in National System of Innovation*, in Lundvall 2010, page 133.

²⁶² Edquist 1997, Fagerberg, J., Mowery, D.C., and Nelson R.R. 2005.

²⁶³ Cf. Swedberg 2003

²⁶⁴ The discussion on Neil Fligstein is based on Swedberg 2003.

as an actor with interests²⁶⁵ and situated between different rationalities. Van de Donk and Snellen²⁶⁶ discussed government policy as situated between four types of rationalities which are summarized by Gregersen as follows:

Political rationality implies that government actions and decisions (for instance in relation to public procurement and regulation) reflect the – at any time – dominating political and economic interest groups or coalitions. Legal rationality means that government policy must have its foundations in law ensuring equality before the law and legal security due to the independent position of the legal establishment with respect to politics. Scientific rationality (or ‘paradigmatic rationality’) is to a certain degree sector specific and related to individual professions or social-scientific disciplines. [...] Economical rationality implies that budgetary cycles put restrictions on government policy.”²⁶⁷

One of the fundamental hypothesis of the systems of innovation, especially the national systems of innovation, is that all countries have particular institutional arrangements and institutional environments and that the country’s innovative performance depends upon these. Hence, the territorial logic of the system of innovation states that differences between countries are due to their different institutional arrangements. The focus here is on formal institutions which are historically and spatially bounded. Applying a social constructivist approach, Dobbin asserts that countries have particular ‘objective’ conceptions about how to organize the economy which are rather different in different countries; “history has produced distinct ideas about order and rationality in different nations, and modern industrial policies are organized around these ideas”²⁶⁸. Dobbin is also arguing that “it is socially constructed logics of state action, more than the organizational resources of states that persist to produce policy continuity”²⁶⁹. This is in line with the territorial argument of the systems of innovation perspective, because the organizational arrangement could be possible to be reproduced in another territory, but the social conditions are specific to a society within demarcated territorial borders. Following the same line of argumentation, Dobbin also

²⁶⁵ Swedberg (2003) writes that the notion of the state as an actor with interests of its own became popular with the neo-Marxists in the 1970s. Eklund (2007) pinpoints in his dissertation that many of the leading scholars of systems of innovation concept have a Marxist past. He continues and argues that the first usage of the term can be seen as a reaction to the neoliberalism of Margaret Thatcher and Ronald Reagan.

²⁶⁶ In Gregersen 2010.

²⁶⁷ Gregersen 2010, pages 127.

²⁶⁸ Dobbin, F., *Forging industrial policy: The United States, Britain, and France in the railway age*, Cambridge University Press, 1994, page 2.

²⁶⁹ Dobbin 1994.

stressed the importance of viewing economic action as cultural action, same as Jessop who stressed the cultural and social embeddedness of economic and political institutions and power relations²⁷⁰. Similar arguments are also expressed by Paul Pierson in his theory of path dependency²⁷¹. Self-reinforcing processes are more likely to be observable in the political life than in the economic sphere. Path dependency is stronger in the political sphere because once internalized in the people's way of thinking and established in the institutional 'rule of the game' often generate self-reinforcing dynamics. Hence, once a path was chosen it is difficult to reverse the course of action²⁷². Institutional formation is also path dependent. For example, Zukin and DiMaggio argued that the institutional outcomes of the national economic policies are a result of a two-step result. First, patterns of social relations influence the capacity of both capital and labour to employ collective as opposed to individual forms of rationality. Second, the relations between labour and capital are historical in character and are influenced by the state's capacity to serve in a mediating role²⁷³.

The systems of innovation perspective that is adopted here tries to keep close to its initial formulation by Freeman. Freeman's analysis of the Japanese system was an attempt to disentangle the web of causalities between innovation and institutions²⁷⁴ and he argues that the performance of a system of innovation is largely dependent on the ability of actors and institutions to change and accommodate change. Freeman's analysis of Japan is territorial as it mainly focuses on the role of a public actor, the Ministry of International Trade and Industry (MITI), and a great deal of attention is paid to the social structure in which the political actors are embedded. MITI is the central node in the network of institutions and organizations that form the Japanese system of innovation. The centrality of MITI is due to two complementary aspects; on one hand the type of agent the MITI stand for and the roles it assumed; and on the other hand, the fact that it acted in close collaboration with other components in the system. MITI was in charge with formulating a long-term strategy or vision and implement it²⁷⁵. Due to the fact that this vision or

²⁷⁰ Jessop, B., *The Future of the Capitalist State*, Polity, Cambridge, 2002, page 7.

²⁷¹ Pierson, P., *Increasing Returns, Path Dependence, and the Study of Politics*, *The American Political Science Review*, Vol. 94, No. 2, 2000. Pierson 2004.

²⁷² See Pierson 2004.

²⁷³ Zukin and DiMaggio 1990, see pages 24-25.

²⁷⁴ And organizations, because Freeman refers mostly to organizations.

²⁷⁵ Freeman 1987.

strategy was anchored in the collaboration with other actors from the industry and the academia, it had a high level of acceptability and credibility.

The focus on territorial aspects has important consequences for policy making, as there is a tendency towards adopting a one size fits all strategy. Politicians/policy makers are seeking quick solutions with rapid and observable outcome. Therefore the practice of benchmarking is quite popular in policy making. Researchers have, for example, argued that the diffusion of knowledge and practices (i.e. management styles, work practices, policies) across countries and/or regions could lead to system convergence²⁷⁶. Kenney and Florida for example argued that the Japanese production system consists of organizational practices whose fundamental “genetic code” can be diffused into other systems and reproduce the same economic success into another environment²⁷⁷. Hollingsworth argued that even if aspects of the Japanese management style may be adopted by firms from other countries, their social system of production will not converge²⁷⁸.

It is in this way I understand the territorial based system of innovation. There are, no doubt, institutions, organizations or policies that can be copied and implemented in another systems. But there are social aspects that will alter the result of the equation, and those social and cultural aspects are specific to a territory, regardless if it is a country, a region or a city. Institutions are not a-territorial, at least not formal institutions. However, there is a lack of unanimity among researchers regarding the relevance of the territoriality of institutions. Amin, for example, argued that spatial delimited institutions are no longer relevant to political processes in a society of transnational flows and networks²⁷⁹, while Hudson highlighted the extent to which the devolution of political institutions in the UK is associated with economic success²⁸⁰. Each country has a legal system that it applies to a geographically defined space. And in this sense, a territorial perspective has always to be considered. If to consider national systems of innovation, the territorial perspective

²⁷⁶ See for example Kenney, M. and Florida, R. (ed.), *Locating Global Advantage*, Stanford University Press, 2003. Oliver, N. and Wilkinson, B., *The Japanisation of British Industry*, 2nd ed., Oxford Blackwell, 1992.

²⁷⁷ In Hollingsworth 2000.

²⁷⁸ Hollingsworth 2000.

²⁷⁹ Amin, A. and Cohendet, P., *Architectures of Knowledge. Firms, Capabilities, and Communities*, Oxford University Press, 2004.

²⁸⁰ Hudson, R., *Regional Devolution and Regional Economic Success: Myths and Illusions about Power*, *Geografiska Annaler: Series B, Human Geography*, Vol, 88, Issue 2, 2006.

becomes the dominant one and takes over the dynamics in the territory, in the same way as the system perspective takes over the actor perspective.

5.3 The functional systems of innovation

The functional logic is built on the idea that interests are the driving forces of actors. Functional is here adopted not in the sense of function, but to depict that actors are functionalists – they have as starting point their own interests and goals and make use of the system to fulfil these goals and interests. Hence, the institutional context is both a resource and a restriction. It is a resource in the sense that it allows actors to behave in a certain way – it creates the institutional framework for their action; actors adjust to their institutional arrangement and use it for their benefit. On the other hand, it also provides actors with information regarding the behaviour of the other actors (as rules of the game). Institutions are also restrictive as they are less prone to change and require longer time to adjust to the reality. But through their functionalistic logic actors are important in triggering change. This is an important difference from the territorial system of innovation.

To illustrate the functional logic the main focus will be on the firm. How are firms relating to systems of innovation? How are firms behaving as actors of a system of innovation? Firms are important in the study of a system of innovation as it has been established that it is the locus of innovation. The firm stands here as representing the economic actor in a system of innovation. From this perspective, it becomes more difficult to distinguish between innovation as process and innovation as product. The system of innovation perspective has a process-orientated view of innovation. But, introducing the firm in the analysis, innovation as product must also be considered because firms measure innovation in terms of patents or products, hence a physical type of innovation, and this cannot be ignored. For example, Ericsson is still measuring innovation in terms of patent, while also introducing a more process view of innovation.

Traditionally, the firm is addressed from the perspective of the resource-based theory²⁸¹ or the competence-based theory²⁸². The key insight of the

²⁸¹ Penrose, E. T., *The Theory of the Growth of the Firm*. New York: John Wiley, 1959.

²⁸² Richardson, G.B., *The Organization of Industry*, *The Economic Journal* (82), 1972, pp.

system of innovation perspective (or innovation studies more general) is that firms do not innovate in isolation and innovation cannot be understood as an independent decision-making at the firm level. Hence, for a firm to innovate it needs to be supported by a context that fosters innovation. A firm's innovation strategy is formulated in relation to internal values, goals and interests, but it is also shaped by external or contextual factors often considered to be specific to a geographical unit (local, regional or national context). Firms differ in several accounts from other organizations. First of all, firms have as objective profit-making, and this influences the structure of their organization as well as their behaviour. Secondly, law treats firms differently from other organizations. Third, firms have their own institutional features, and these have a different history from those that characterizes other types of organizations. Forth, many different kinds of economic interests play a crucial role in firms and deeply influence their behaviour²⁸³.

The role and size of the firm has been under continuous discussion²⁸⁴. The innovation studies literature has focused mainly on the role of small- and medium-sized firms, the role of spin-offs, start-ups²⁸⁵ and there is an increasing interest on the role of entrepreneurs. The role of large, international firms has been scarcely addressed but it is increasingly gaining attention in the context of globalization and internationalization. This can be illustrated by the Swedish innovation thinking debate that preceded the adaptation of the system of innovation. The discussion is still present in the Swedish context, where the role of the entrepreneur and the entrepreneurial climate are dominating. Much of the literature focuses on the opportunities and constraints of the institutional landscape for firms, but less research is on the firm as an active actor and the firm's capacity on adjusting to and altering the institutions of its context. The role of firms as active agents and the impact of firms' initiatives on the wider environment is largely ignored²⁸⁶. Older, larger firms come in their maturity to dominate their environment rather than adjust to them²⁸⁷. Large firms exert important positive

883-896, Winter, S.G., *On Coase, Competence, and the Corporation*, Journal of Law, Economics and Organization (4), 1988, pp. 163-180.

²⁸³ Cf. Swedberg 2003, page 98.

²⁸⁴ Dosi, G., Marsili, O., Orsenigo, L. and Salvatore, R., *Learning, Market Selection and the Evolution of Industrial Structures*, Small Business Economics, 7, 1995, pp. 411-436.

²⁸⁵ In fact, this depends on the geographical focus of the innovation systems.

²⁸⁶ Cantwell, J., Dunning, J.H. and Lundan, S.M., *An evolutionary approach to understanding international business activity: The co-evolution of MNEs and the institutional environment*, Journal of International Business Studies (41), 2010, pp. 567- 586.

²⁸⁷ Freeman 2002.

externalities on the surrounding environment; on other firms but also on policy making.

The firm that will be considered in the empirical backdrop of this dissertation is the telecommunication multinational company, Ericsson. Ericsson is a Swedish company, with the headquarters in Stockholm, but highly international; one of Swedish international companies, because despite being a small country, Sweden has several large international companies. Against this background, it is hence relevant to consider the relationship of multinationals to their national context. Literature argues for a growing significance and integration of multinational firms, therefore posing new challenges and consequences for policy making. Research shows that the main impact of multi-nationality of firms has not been on the level of economic activity and/or trade of the country in which they operate, but on the structure of these variables²⁸⁸. Nevertheless, literature on international business literature addressing the relation between institutions and firms have been criticized for mainly focusing on the constraining role of institutions and neglecting their enabling role, and most of all the role of the actor. As we will discuss in the next chapter, the institutional arrangement of Sweden has probably been a beneficial factor for Ericsson and not only a constraint. On the other hand, the leading position of Sweden in ICT and telecommunication had probably not been possible without the active role of Ericsson and the partnership with public organizations.

Scholars share a view of multinationals as social systems²⁸⁹ which interact with their environment and thus generate new frames of behaviour and action; that is, multinationals are no longer perceived as only knowledge banks. Hence, the context adapts to the multinational company as much as the multinational adapts to its context²⁹⁰, emphasising an active attitude of the multinationals towards their institutional environment. This is also referred to as institutional entrepreneurship²⁹¹. Large companies are not indifferent to

²⁸⁸ Dunning, J. H., *Location and the Multinational Enterprise: A Neglected Factor?*, Journal of International Business Studies. V.29 (1), 1998, pp. 45-66.

²⁸⁹ Morgan, G., *The Multinational Firm: Organizing Across Institutional and National Divides*, in Morgan, G., Kristensen, P. H. and Whitley, R. (eds) *The Multinational Firm. Organizing Across Institutional and National Divides*, Oxford University Press, 2001, pp. 1–24., Cantwell et al 2010, pp. 567- 586, among others.

²⁹⁰ Forsgren, M., Holm, U. and Johanson, J., *Managing the Embedded Multinational. A Business Network View*, Cheltenham, Edward Elgar, 2005, page 186.

²⁹¹ See for example Maguire, S., *Institutional entrepreneurship*, in International encyclopedia of organization studies, S. Clegg, and J.R Bailey, (eds.), Sage, London, 2007.

their environment and their multinationalism or internationality does not make them immune to their environment. Morgan characterizes multinational companies as transnational social spaces²⁹² while Heidenreich describes this transnational social space as characterized by cross-border perceptions, common practices, benchmarks and relationships, common discourses and patterns of identification, cross-border conflicts and strategic games²⁹³. They have an interest in closely interacting with their environment and, as will we see in the empirical backdrop, location is more important than one may think.

Adopting a perspective inspired by economic sociology, the focus of the analysis is on the social construction of firms, the influence of its social context of corporate innovation and learning strategies. Corporate strategies are analysed as socially constructed and focus is on the role of societal institutions for analysing corporate practices, processes and strategies. Firm embeddedness can be considered both from a macro-institutional and a micro-institutional perspective²⁹⁴. The macro-institutional perspective analyses how societal institutions (i.e. the legal system, the educational and R&D system, the political system etc.) shape organizational patterns, corporate strategies, networks. The macro-institutional perspective is believed to reduce uncertainties. Macro-institutions shape the relationships between companies and their employees, employer associations, unions, schools, capital owners, competitors, suppliers and customers. Nevertheless, the approach adopted here is a normative and constraining one, where a rather deterministic view of the actor is adopted. How firms can influence these institutions is not taken into account. The role of other social contexts beside the national ones is also not taken into account. The micro-institutional perspective adopts a view of multinationals as “contested terrains” characterized by; (i) contradictory “contextual rationalities” which open up margins for manoeuvre for local actors; (ii) local resource-building strategies which influence the transfer of centralized organizational practices; and (iii) the crucial role of competent social actors in micro-political games played within the company²⁹⁵.

²⁹² Morgan 2001

²⁹³ Heidenreich 2012.

²⁹⁴ Heidenreich 2012.

²⁹⁵ Geppert, M. and Dörrenbächer, C., *Politics and Power in the Multinational Corporation: An Introduction*, in Dörrenbächer, C. and Geppert, M. (eds) *Politics and Power in the Multinational Corporation: The Role of Institutions, Interests and Identities*, Cambridge, Cambridge University Press, 2011, pp. 3–38, in Heidenreich 2012, page 568.

Against this background, one can apply two perspectives on the relation between the firm and its institutional environment. The power perspective focusing on the firm's ability to influence their institutional environment and the adaptive perspective focusing on the firm's ability to adopt (or adapt) to its institutional context. By adopting these two perspectives I account for the dynamic configuration and evolution of firms and institutions as a result of the interplay between the two. The argument is firms co-evolve with their environment as well as the environment is shaped and altered by its components (the interplay between the territorial and functional systems of innovation). Research argues that national as well as regional embeddedness (hence, the territorial system of innovation in the terminology used here) are still important sources of knowledge and networks with customers and suppliers, competitors, R&D partners, political support and qualified labour force²⁹⁶. This is not to deny that large, international competences rely to a large extent on external competencies, but by being embedded may facilitate learning processes, network building. The traditional organization theory has long addressed how firms engage in adaptive responses to maintain their positions in a particular competitive environment. The national environment (the macro-institutional level) is considered as the most important non-economic context for the multinational firms, as the state provides vocational training, education and social security; organizes political participation and regulates labour relations, markets, public administration etc.²⁹⁷ Hence, argues Heidenreich, "social embeddedness of micro-political processes means that the use of power in bargaining and exchange relations is not context-free. Both the existence and relevance of resources and the rules of their use are shaped by social norms, rules and understandings"²⁹⁸.

²⁹⁶ Cantwell, J. A. and Mudambi, R., *MNE Competence-creating Subsidiary Mandates*, *Strategic Management Journal*, 26, 2005, pp. 1109–1128. Lane, C. and Probert, J., *Domestic Capabilities and Global Production Networks in the Clothing Industry: A Comparison of German and UK Firms' Strategies*, *Socio-Economic Review*, 4, 2006, pp. 35–67.

Heidenreich 2012.

²⁹⁷ Heidenreich 2012, see page 570 – 571.

²⁹⁸ Heidenreich 2012, page 568.

5.4 The interplay between the functional and the territorial rationalities

The interplay of the two rationalities is defined by two aspects; the embeddedness of the actors in an institutional arrangement (which can be both territorial and non-territorial) and the instrumentality of the actor. Actors are differently embedded in their environments or contexts and their interplay is argued to be determined by their degree of embeddedness and their internalization of the context (in terms of institutions/rules of the game). As previously mentioned, the embeddedness literature puts forward several taxonomies of embeddedness. For the purpose of the analysis at hand, the taxonomy of Zukin and DiMaggio will be used. They talk about four kinds of embeddedness. Cognitive embeddedness refers to how economic reasoning is limited by the structured regularities of mental processes²⁹⁹. It draws attention to the individual's limited capacity to deal with the complexity of the reality, and it hence lies in contrast with the rational perspective of the individual employed by the neoclassical economics. The cognitive embeddedness is placed at the individual level and is referring to the mental processes the individual is deploying when faced with a situation. Individuals are faced with a series of limitations, such as uncertainty, complexity, and the costs of information and they act accordingly. These limitations are however differently appropriated by individuals, triggering therefore different behaviours. Humans are faced with high levels of complexity in the everyday life and therefore are in need of mental maps or paradigms as a way to tackle the complexity and these mental maps are formed in relation with the social environment³⁰⁰. Cultural embeddedness emphasizes the influence of shared collective understandings on economic strategies, interests and objectives³⁰¹. Culture is defined as ideologies and beliefs, taken for granted assumptions, formal rule systems. There are, hence, similarities to how informal institutions are defined in the tradition of North. Economic behaviour is culturally embedded in the way that shared collective understandings are shaping economic strategies and goals. The role of culture for economic institutions is dual; culture is the structure in which economic self-interest is played out; and secondly, culture constraints the free play of market forces,

²⁹⁹ Zukin and DiMaggio 1990.

³⁰⁰ Berger, P. and Luckmann, T., *The Social Construction of Reality*, Penguin Books, 1966.

³⁰¹ Zukin and DiMaggio 1990.

hence, culture sets limits to economic rationality³⁰². Structural embeddedness is defined as the contextualization of economic exchange in patterns of ongoing interpersonal relations³⁰³ and it is given a higher status than the cognitive and cultural embeddedness by Zukin and DiMaggio. Political embeddedness refer to the manner in which economic institutions and decisions are shaped by a struggle of power that involves economic actors and non-market institutions, particularly the state and social classes. Hence, it refers to the power asymmetries between actors and their consequences. Political embeddedness has a strong territorial component due to its affiliation to a set of institutions that are connected to a territory. Power asymmetry is, among other things, closely related to acting in accordance to the set of institutions that govern within a particular territorial area, hence to understand the political conditions. The political context of economic action is made up of a complex web of interrelations and expectations. The four types of embeddedness imply different levels of analysis, both at the micro and macro level. The four types of embeddedness also acknowledges different types of actors and how culture and institutions are differently appropriated by the different actors.

This taxonomy sheds light upon the way actors are interacting with their context and it has a time perspective – it allows understanding how the context has formed the interests and objectives of actors, how their behaviour in present time can be explained and it also gives the tools to understand the behaviour of actors in future. Furthermore, it helps to understand the interplay between the functional and territorial rationalities as a continuous and not as being in opposition.

The interplay between the functional and territorial-based systems of innovation is anchored in Freeman's original definition of systems of innovation as the network of institutions in the private and public sector which initiate, import, and diffuse new technologies³⁰⁴. I consider that the key concept in this definition is the notion of network. But it is also a rather problematic use of the concept of institution – which in the light of the discussion in the previous chapter, is more in the sense of organizations. Thus, Freeman defined systems of innovation as the network of private and public organizations whose activities are focused on innovation. And this re-consideration of Freeman's definition brings the system of innovation

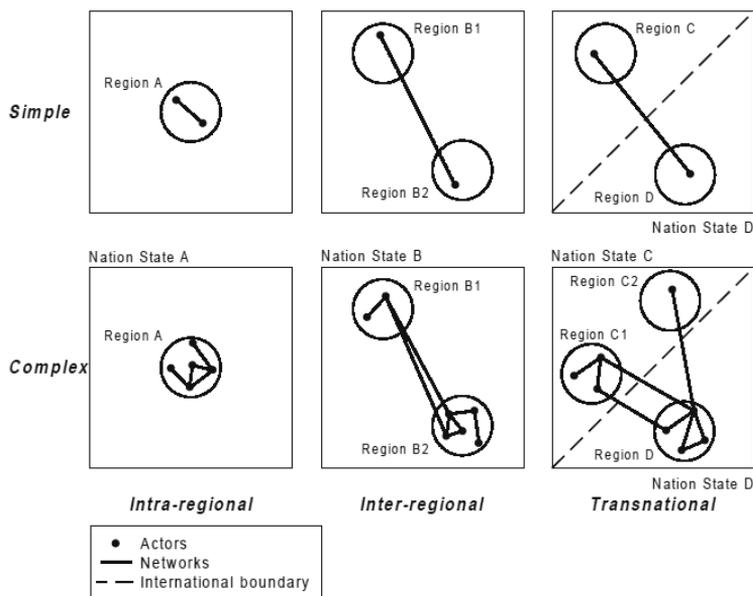
³⁰² Zukin and DiMaggion 1990.

³⁰³ Granovetter, 1985.

³⁰⁴ Freeman 1987, page 1.

perspective closer to the actor perspective proposed by this dissertation. The actor is embedded and is part of different networks as they are embedded in particular places. Coe and Bunnell, for example, argue that innovation should be understood beyond the context of particular spatial scales³⁰⁵. They suggest that systems of innovation are a combination of intra-local, extra-local and transnational network connections and hence focus should be on the network linkages and social relations between various types of actors that are embedded in particular places. Thereby, they emphasise the importance of network relationships operating between and across different scales, and between firms but also other type of actors (extra-firm networks) that contribute to innovative activity and the movement of ‘knowledgeable’ people³⁰⁶.

Figure 1: Configurations of innovation networks



Source: Coe and Bunnell 2003.

³⁰⁵ Coe, N.M. and Bunnell, T.G., ‘Spatializing’ knowledge communities: towards a conceptualization of transnational innovation networks, *Global Networks* 3, 4, 2003, pp. 437-456.

³⁰⁶ Coe and Bunnell 2003.

As the figure shows, by saying that actors are embedded in a particular place implies that actors are embedded within a country, a region or city, that they find themselves within a territorial defined system of innovation. Actors relate across borders and their behaviour has impact at different scales as well. The network of the actor brings two systems of innovation, for example, in interplay. And the way the interplay deploys might be independently of the actor's initial motives.

5.5 Final remarks

The aim of this chapter has been to advance the theoretical framework of the systems of innovation perspective. Grounded in an actor-centred perspective, the chapter proposes an analysis of systems of innovation as territorial-based and functional-based. The problem identified was a lack of problematizing the notion of actor when considering systems of innovation. The systems of innovation perspective focuses on the macro-foundations of innovation. The context in which innovation is usually addressed is an industrial or technological one – hence innovation as product, as something that belongs to the industry or to the realm of the firm.

The actor-based approach is made possible by introducing the embeddedness theory and the concept of interest with the intention to distinguish between different logics and interests of action or behaviour. Actors are driven by interests, but the course of their action is determined by the social context. In other words, actors follow their interests but they must also follow the rules of the game. Having in place a well-functioning infrastructure of formal institutions is necessary but not sufficient. Informal institutions, in terms of norms, culture etc. are identified as making the difference. Considering that innovation is defined as a social and interactive process, than the interplay between actors are determinant factors for innovation. The argument is that culture, social structures and networks have a decisive impact on the extent and source of innovation and its diffusion.

A categorization of the actors is made in economic and non-economic actors. The non-economic actor is operationalized as the state or politics. The state is hence addressed as itself an actor in a national system of innovation; an active actor with power to shape a country's system of innovation. The

category of economic actor is operationalized through the large, multinational firm that is dominating in a national context (i.e. Ericsson). There is a power relation between the two actors considered here, as both have own interests, as well as shared interests. The two actors are also embedded within the same cultural, institutional structure, as well as they are also embedded in rather (if not very) different institutional structures and cultures. However, all these differences do not hinder their activities nor their interplay within the same system. The embeddedness categories proposed by Zukin and DiMaggio are introduced to account for how actors develop different types of embeddedness. Hence, the two logics are from this perspective not in opposition but rather a continuous. Furthermore, the embeddedness approach to networks of social relations is used to further shed light on the interplay between the territorial and functional from an actor perspective.

PART III

The emergence and development of the systems of innovation perspective in Sweden

The aim of this chapter is to trace the discussion about innovation and how the innovation policy came to be anchored in the innovation system perspective. The discussion is centred on the political context and historical legacy of the adoption of the system of innovation perspective in Sweden. The system of innovation perspective is directly related to the reformation process of the research and university system, and it mainly touches upon the relation between research and industry; how should research and the university system be organized and financed in order to be relevant to the industry and societal needs. The political context that accompanied the development of the innovation policy and innovation thinking has been characterized by a conflict between research and university policy and industry policy; more exactly a conflict between two different logics or mental maps. Hence, two are the pillars of the systems of innovation policy and practice in the Swedish context: the research and education system and the industry sector. The analysis carried out here is informed by the historical institutionalist perspective and its emphasis given to history and context. Hence, the historical moments that form the empirical backdrop of this dissertation are looked upon as “formative moments”³⁰⁷ of the Swedish system of innovation perspective.

The remainder of the chapter is organized as follows. Section 6.1 seeks to address the context of the emergence of the concept in Sweden. Section 6.2 discusses the intellectual climate surrounding the innovation discussion in Sweden by identifying four pillars. Section 6.3 will present some final remarks.

³⁰⁷ See Hall, P., and Taylor, R., *Political science and the three new institutionalism*, *Political Studies*, 31, 1996, pp. 1-23.

6.1. The context of the emergence. The crisis of the 1970s and 1990s

When Chris Freeman wrote “Technology policy and economic performance. Lessons from Japan” book, his starting point was the economic stagnation or decline of the two “super-powers” the UK and the USA, and the growth of Japan. Why was Japan growing while the UK and the USA were declining or stagnating? The OECD’s adoption of the perspective was at a time when the Western economies were going through rougher times, experiencing decline or stagnation. The first time the system of innovation perspective was used in policy making was by Finland as a way to fight the economic crisis the country was going through in the beginning of the 1990s. Hence, there seems that the systems of innovation perspective emerged and was implemented as a tool to understand and deal with economic crisis and decline. Sweden seems to have been following the same pattern.

6.1.1 The crisis of the 1970s

In the after match of the 1973/1974 oil crisis, Sweden as well as the rest of the world, entered a relatively long period of economic crisis. The Swedish economic historian Lennart Schön pinpointed that if Sweden has been successful during previous structural transformations, the story of the structural transformation triggered by the oil crisis of the 1970s was a rather different story. Explanations of the economic crisis triggered by oil prices in the 1970s are questioning the famous Swedish model. Lennart Schön discusses the development and consequences of the 1970s crisis from two perspectives³⁰⁸. According to the first perspective, the slow growth and economic decline were consequences of system errors due to an inadequate economic policy. A second perspective is the structural perspective. Sweden’s recovery after previous crisis was due to an alignment of Sweden’s economic and industrial structure and the character of the crisis. The previous industrial restructurings were in line with the structure of the Swedish industry in terms of resources, competences and institutions. Nonetheless, argues Schön, the factors that contributed to the successful recovery of the Swedish economy after previous crisis, turn out to be at Sweden’s disadvantage following the crisis initiated by the oil crisis in the early 1970s. The industrial structure was mature and not in line with the increasing

³⁰⁸ Schön, 2000.

knowledge intensive industries, an aspect that was also highlighted by the Boston Consulting Group in a report from 1978 which attempted to understand and explain the causes of the crisis of the 1970s³⁰⁹. The report provided a state of the art of the Swedish economy and had a significant impact on the internal debate as its views were further elaborated in reports by IVA, SIND and STU, actors which played a highly significant role in the innovation discussion and the adoption and implementation of the systems of innovation perspective.

The Boston Consulting Group addressed the vulnerability of the Swedish economy from an international perspective. For Sweden to maintain its competitive advantage in the international market, an industrial restructuring was required. The report investigated how the Japanese industry transformed from an industrial economy towards a knowledge-based economy. If in 1950 the Japanese economy was dominated by labour intensive industries, by 1974 knowledge-based economy came to be the preponderant one, and with a forecast of further development. What the report was communicating was that the Swedish industry had to become more knowledge intensive. Industries such as the steel industry or shipbuilding were facing cost competition and a market shrinking. The report was also emphasising that the industrial restructuring should not be left only to market forces, but that the government, the industry and the trade unions should collaboratively identify the sectors or industries to be prioritized. Furthermore, the role of the large companies in the renewal process was emphasised. The focus on a knowledge intensive industry triggered discussions on the role of research and research funding.

In the late 1980s, the Swedish government appointed a commission to investigate the causes of the low productivity and vulnerability of the Swedish industry³¹⁰. The commission concluded that Sweden's industrial structure was outdated and no longer in capacity to support the high level of productivity prior the oil crisis. The commission emphasised that if Sweden was to come out the crisis, structural and institutional changes were required. The report was suggesting that a modernization of both the industrial structure and the educational and research systems were required. The report was also touching upon another problem of the Swedish economy; namely there was little new innovations being produced. The main bulk of

³⁰⁹ Boston Consulting Group, *En ram för svensk industripolitik*, Stockholm, Liber Förlag, 1978.

³¹⁰ SOU 1991: 82 Drivkrafter för produktivitet och välbefinnande?

innovations produced in Sweden were incremental changes. These issues were in line with the findings and recommendations that the Boston Consulting Group also made almost a decade later. The report pinpointed also accountabilities of the research system with critical repercussions upon the innovative capacity of the Swedish economy. More exactly, the report pointed at and warned for the large financial investments in large national research programmes. The main problem identified was that such programmes were conveying too little novelty to the system. The 1960s and the 1970s witnessed an increased state or governmental interest for research, especially for research with social benefits. In this context, several national research programmes were initiated (need-based research). STU, Styrelsen för Teknisk Utveckling, was established with the mission to coordinate the technical and industrial research³¹¹. The oil crisis pushed the energy question up on the political and research agenda and an energy research programme was established, still today the largest state financed research programme ever in Sweden. The programme's structure and financial scheme contributed to a yawning chasm between applied research and the educational system. The programme was mainly making use of the already existing research and competence at universities, but made no investments in new research or competence development, either of students nor researchers. Despite its size, the energy national programme made no significant contribution to the development of new knowledge or competences in the field. Therefore, the commission recommended that these kind of efforts or investments should be avoided. Instead, efforts should be canalized towards importing knowledge and improving incitements for research and education. What the commission was recommending was that the Ministry of Education should be given full responsibility for the public research system. The report raised some fundamental questions regarding the organization of the educational and research system, what kind of research should be financially supported, by whom and how. The report emphasised the importance of coordinating research and higher educational programmes, and warned that different funding schemes could cause a separation between these two (research is not grounded and it is not contribution to education). In a broader context, this is a question of research for the sake of research or research to meet societal needs. Within the systems of innovation framework, the question could be reformulated as follows: what kind of research should be funded in order to

³¹¹ Weinberger, H., *Nätverksentreprenören. En historia om teknisk forskning och industriell utvecklingsarbete från den Malmska utredningen till Styrelsen för teknisk utveckling*, Avdelningen för teknik- och vetenskapshistoria, Kungl. Tekniska Högskolan, 1997.

assure for innovative competitiveness, but also how research should be organized. The organization of the research system is an important question for the systems of innovation perspective, with focus on the collaboration between the different actors of the systems and the organization of learning.

6.1.2 The crisis of the 1990s and its consequences

During the 1980s, the Swedish economy stabilized and even grew. Measures taken to tackle the 1970s crisis, such as devaluation of the Swedish crown and boosting exports, had positive effects on the Swedish economy, managing to keep low unemployment levels³¹² but also to undertake a restructuring of those industries that were hit by the crisis and considered as obsolete. However, a second economic crisis hit the Swedish economy in the early 1990s. Sweden was facing negative growth, high unemployment and company bankruptcies. Innovation measures were not a priority in this context of rapid decline and policy makers were driven more by defensive panicking rather than by strategic deliberation³¹³. At the same time a power shift was taking place. The election held in 1991 brought a governmental shift. The Swedish social democratic party was defeated after nine years of power and the centre-right conservative party was to form a coalition government with Carl Bildt as prime minister. The centre-right government was in power one term until 1994, a period characterized by severe economic problems, the economic stagnation being followed by a growing inflation. Beside stabilisation measures concerning the labour market, the tax system, devaluation, concurrence policy, reformation of the education and research funding system were adopted. The traditional financial investments in education and research were no longer sufficient; they needed to be corroborated with investments in the import of knowledge and stronger incitements for education and research³¹⁴. The centre-right government paid scarce attention to industrial and technology policy, focusing more on promoting growth through scientific research³¹⁵. The reformation of the research and university system initiated by the centre-right government turned out to be one of the fundamental shifts in the governance of the

³¹² Between 1980 and 1985 unemployment increased with 50% to approx. 350.00. From 1986 unemployment started to decline and the unemployment in 1990 was only marginal higher than in 1980.

³¹³ Benner, M., *Innovation Policy in Hard Times: Lessons from the Nordic Countries*, European Planning Studies, Vol. 20, Issue 9, 2012, pp. 1455-1468, see page 1459.

³¹⁴ Nilsson 2008.

³¹⁵ Benner 2012, Eklund 2007.

university system when the government university regulation was replaced by goal steering. The reform initiated in 1993 implied an act of balance for universities between autonomy and utility. Universities were given considerable autonomy, while resources were channelled to areas identified as potential engines for growth.

Dismantle of the wage-earner funds represents an important milestone in the reformation of the research funding system, likewise the research-industry collaboration. It was an ideologically driven reform. The wage-earned funds were designed by the social-democratic party in a truly socialistic spirit. In 1971 the Swedish Trade Union Confederation (LO) commissioned Rudolf Meidner to formulate a proposal on how to increase the power of the workers relative to the capital owners. Meidner's proposal was the establishment of the wage-earned funds, thereafter instituted by the social democratic government in 1983; however in a modified form. The wage-earned funds were stipulating that a share of the yearly profit be transferred to collective shareholding funds so that trade unions, while owning a gradually increasing share of stocks as owners, be able to influence company decisions (it has to be mentioned that in the implemented version of the wage-earner funds the state replaced the trade unions as owners of the funds). The government led by the prime-minister Carl Bildt was keen to eradicate the socialist wage-earner funds, if mostly for symbolic reasons. But the big question was how the money were to be used. Returning the money back to the industry was not that simple or practical. The solution agreed upon was for the funds to be used for financing research and education of societal relevance and with a long-term perspective. Hence, the money were to be returned back to the industry but framed in terms of research to stimulate economic growth and production. This solution will come to imprint the research funding system in Sweden still today. It is referred to as strategic research, articulated as a meeting point between public research and private interests³¹⁶.

This was materialized through the establishment of research foundations or research institutes. Three foundations were established; SSF, MISTRA and a third one that later on was integrated into the Bank of Sweden Tercentenary Foundations. These three foundations became powerful players in the Swedish research system and the Swedish innovation system. In 2000 they allocated more than 1.4 billion Swedish crowns to the university sector³¹⁷.

³¹⁶ See Sörlin, S., *I den Absoluta Frontlinjen, En bok om forskningsstiftelserna, konkurrenskraften och politikens möjligheter*, Nya Doxa, Nora, 2005.

³¹⁷ Benner, M. and Sörlin, S., *Shaping strategic research: power, resources, and interests in Swedish research policy*, Minerva, 2007.

Later on, seven more foundations were established, namely the Foundation for Internationalization of Research STINT, Vårdal Foundation for research in care and allergy, the Foundation for the Culture of the Future, Innovationscentrum and the Foundation for Baltic and East European Studies (Östersjöstiftelsen). In 1994 the Knowledge Foundation KKS was established which focuses on financing of the universities colleges and strengthening their regional/local position and influence. Vinnova, the agency for innovation systems, is also a product of the reformation of the research system as a consequence of dismantle of the wage-earners, established later on in the 2000s by Research 2000. The purpose of the research foundations was to handle public money, yet without state intervention. Nonetheless, the establishment of the research foundations was a state decision. The organizational form of these research foundations make state interference almost impossible, but they would be supporting trade and industry. The establishment of these research foundations or agencies was part of the efforts to link research and technological development, expected to enclose an innovative impact on the Swedish research system.

The crisis of the 1990s and the discussions regarding the consequences of the crisis and the solutions to the crisis were infused by ideological confrontations and the political debates specific for the time. The analysis is hence the analysis of a territorial system of innovation with a high level of embeddedness in the national context but also characterized by conflict of interests. Dismantle of the wage-earner funds and the establishment of the above mentioned research foundations were a clear ideological demarcation of the centre-right government. Another ideological confrontation was caused by a report from 1993 on the new circumstances for economy and politics³¹⁸. This report was presented by a commission appointed by the centre-right government to evaluate the causes of the economic crisis and also to come up with economic and political suggestions. The crisis of the 1990s was a consequence of several price bubbles (especially housing and shares) and an over-valued currency. What the report concluded was that that had both economic and political causes and that it was a crises of the macro-foundations of the economy. The report identified three main economic problems: stability problems, effectivity problems and growth problems. The political dimension was a combination of stability and growth problems; while the economic problems were mainly rooted in an outdated and obsolete institutions and norm systems. The conclusion of the commission was that the economic problem of Sweden was a problem of the Swedish welfare

³¹⁸ SOU 1993: 16 Nya villkor för ekonomi och politik.

model. These conclusions raised great scepticism among the opposition parties and ideological differences became even more obvious in the Swedish politics.

These ideological differences came to be very present even in the discussion and investigations of the research system that resulted in the controversial Research 2000³¹⁹. Research 2000 is an important milestone in the adoption and implementation of the system of innovation perspective in Sweden, not least because one of its main outcomes has been the establishment of the Agency for Innovation Systems, Vinnova.

The debate on the reformation of the university and research system was dominated by two interests. On one side were the interests of the academic sector, keen on emphasising the importance of a curiosity-driven research, flexible and open to changes. The academia's main argument was that one cannot foresee which research areas will come to dominate and therefore to name which areas are of relevance beforehand was not the way to go. On the other side of the debate were the representatives of the industry, sectoral research and trade unions whose interests in research were societal. This group was for a steered research. This debate sheds light upon one of the most fundamental conflict of interests in a system of innovation, the one between the academia and the industry. The interplay between the academia and the industry is considered to be one of the cornerstone of a well-functioning system of innovation and policy making is strongly orientated towards supporting this interplay or collaboration. But as I will discuss later on in this chapter this interplay is not without frictions. The Research 2000 brings forward not only frictions between the academia and the industry (functional rationalities) but also conflicts of political kind.

In 1997 the parliamentary investigation Research 2000 was presented. The proposition was formulated along the more traditional line of debate, namely the academia line of curiosity-driven, independent research. The university autonomy and scientific quality were emphasised. The proposition was highly controversial and it caused a political conflict. As a consequence, the government decided to delay the adoption of the research proposal and further investigate how the research funding system should be optimally organized. The Ministry of Industry choose to conduct an own investigation (the research proposal was under the Ministry of Education and the Ministry of Industry was concerned upon the objectivity of the proposal). To conduct

³¹⁹ SOU 1998: 128 Forskningspolitik.

the investigation was appointed Anders Flodström, professor of physics and vice-chancellor of the Royal Institute of Technology (KTH). In the report³²⁰ that resulted from the investigation, the system of innovation expression was used. Before becoming chancellor for KTH, Flodström served as a vice-chancellor for Linköping University, being colleague with Charles Edquist. Flodström's investigation is considered to be milestone for the introduction of the system of innovation perspective in Swedish politics. In his dissertation, Magnus Eklund mentioned that Flodström was unable to recount when and how he came in contact with the system of innovation concept³²¹. But Flodström and Edquist wrote in 1997 an article together where the system of innovation concept was used, nevertheless in passing. One can therefore wonder how Flodström made use of the concept in the report prepared for the Ministry of Industry; if it was used in its academic meaning or in a mundane manner.

The crisis of the 1970s and the 1990s triggered a series of structural and institutional reforms. Along these reforms, a new discourse of socio-economic development emerged, with the systems of innovation and knowledge-based society as the key concepts³²². The institutional restructuring after the 1970s and 1990s crisis within the area of innovation policy proved to be an asset for Sweden when facing the 2000s crisis³²³. The reformation of the research funding institutes and research system continued in the 2000s, and in 2001 the nine research foundations were reduced to four; the Research Council (Vetenskapsrådet) responsible for ground research in all disciplines, Formas, Fas and Vinnova, the agency for innovation systems. The aim of the reform was to improve the research funding system by channelling funds to prioritized scientific areas, to strengthen the collaboration between research and industry and make public the results of research. The partnership or collaboration public – private, or research – industry came to play a central role in the area of innovation. In this spirit, the government initiated a process of dialogue with the industry which was materialized in the “Innovative Sweden”³²⁴ and an increased level of R&D subsidy for strategic industry branches. According to Arnold et al, this

³²⁰ Flodström, A., *Utredning om vissa myndigheter*, Ministry of Industry. 1999.

³²¹ Eklund 2007.

³²² Benner 2012.

³²³ Bitard, P., *Reconsidering the paradox of high R&D input and low innovation: Sweden*, in Edquist, C. and Hommen, L., (eds) *Small Country Innovation Systems*, Cheltenham: Elgar, 2008, pp. 237–280

³²⁴ Ds 2004:63 *Innovativa Sverige – en strategi för tillväxt genom förnyelse*.

resulted into a change of perception of the priority of innovation on the policy makers' agenda³²⁵. In 2005 the Research Act was presented.

The analysis of the emergence and development of the system of innovation thinking in the Swedish context is informed by the actor perspective and the focus is on the conflict of interests and the role of the governmental parties in shaping the rhetoric and direction of the innovation thinking. The conflict of interests considered in this section are within the territorial based system of innovation. The system of innovation thinking in Sweden can be characterized as steered by several political interests which will also be reflected in the four debate strings the next section will deal with.

6.2 The debate – the interplay of the academia and policy making

The discussion in the previous section focused on differences of nuances in the innovation thinking in Swedish politics which was matched by the intellectual climate surrounding the innovation discussion in Sweden. The discussion was anchored in the debate on the Swedish growth crisis³²⁶. Magnus Eklund identified four strands in the innovation thinking in Sweden; the entrepreneurial strand, the small firms strand, the policy making strand and the network/research foundations strand. The purpose of the discussion in the following is to account for the intellectual context around the emergence of the system of innovation perspective in Sweden. The four debates that will be presented highlight the interplay of the academia and policy making in the emergence and development of the perspective in the Swedish context and how the two groups have actively tried to influence each other. The analysis of the political and intellectual context of the emergence of the system of innovation perspective in Sweden is grounded in the actor perspective introduced in the previous chapter. Adopting an actor perspective, it sheds light on the complexity and conflicts that preceded the adoption of the system of innovation. These aspects are crucial for further understanding in what way, with what meaning and for what purpose the systems of innovation

³²⁵ Arnold, E., et al, *The Role of Industrial Research Institutes in the National Innovation System*, Vinnova, VA: 12, 2007.

³²⁶ This discussion is inspired by Eklund 2007.

were adopted - as the system of innovation perspective was not the only perspective circulating at the time, and the analysis here also highlights this.

The oil crisis that erupted in the 1970s was identified in Sweden as an industrial crisis; see for instance the conclusions of the Boston Consulting Group or the government investigation that were previously earlier. The debate came to focus on the role of firms, large firms or small firms, and the role of the entrepreneurs. Eklund identified an entrepreneurial strand where focus was on the entrepreneur as the individual inventor, the genius. This perspective was embedded in the intellectual context of the time characterized by a growing believe in the market forces and in a Swedish economy dominated by mature industries. A strong supporter of this strand was Bengt-Arne Vedin.

Sweden has a long list of successful entrepreneurs and innovators, such as Alfred Nobel, Gustav de Laval, Sven Winquist, Gustav Dalén, Baltzar von Platen and Carl Munters. Nevertheless, this pattern of individual innovators and entrepreneurs was gradually replaced by another trend; innovations were produced by already established firms. Firms such as LM Ericsson, Astra or Tetra Pak are relevant examples of this trend. What Vedin was missing was the entrepreneurial spirit. It was not only the lack of entrepreneurs and innovators that Vedin was criticizing. One of the main problems of the Swedish economy, according to Vedin, was that innovations were mainly produced within the frame of the already established companies³²⁷ and that new firms were not established. The debate around what is here called the entrepreneurial strand, pinpointed that Sweden was in need of a policy or/and an environment with focus on innovations that will spin into new firms³²⁸. In a true Schumpeterian spirit, it was through entrepreneurs and the entrepreneurial activity that the industry would be able to widen and restructure its platform and move towards a technology and knowledge base one. In arguing against the linear model of innovation, Vedin was criticizing the view of economic growth as a function of R&D, proposing instead considering innovation as an analytically distinct intermediary variable³²⁹. The position of Vedin was that investments in R&D only were no guarantee for more innovations. This idea is a fundamental one in the system of innovation policy. In fact, Vedin was emphasising the importance of an

³²⁷ Nilsson, J-E., *Tillväxtpolitik som alternativ till tillväxt*, in Tio tankar om tillväxt, Svenska kommunförbundet/Landstingsförbundet, Stockholm, 2004.

³²⁸ Cf. Eklund 2007.

³²⁹ See on this regard Eklund 2007, page 49.

innovation policy³³⁰, an innovation policy which should support the individual actor, the inventor coming up with an idea and the entrepreneur commercializing it. Vedin was a strong advocate of the genius firm, of the entrepreneur as engine of economic growth. Institutions and organizations were not a priority - in Vedin's view institutions were perceived as established structures constraining the activity of innovators and entrepreneurs. Hence, as part of a restructuring or renewal process of the Swedish industry, an innovation policy should support radical innovations and start-up firms. Vedin was proposing a temporary innovation committee under the Ministry of Industry (temporary because it was meant to only take Sweden out of the crisis). The role of the committee was to work for a better innovation environment but it also meant to coordinate and facilitate the cooperation between ministries³³¹.

The centre-right government (the Bildt government) asked Vedin in 1993 to run an investigation of the Swedish innovation climate and propose policy measures. The investigation emphasised the role of the inventor or innovator and the small-business owners, but Sweden's sector of medium-sized firms was rather small and firms were reluctant to grow into large ones. At the elections held in 1994, the centre-right government lost and the social democratic power comeback in power after four years of opposition. This power shift implied also a shift in the innovation debate, towards a stronger focus on the role of policy.

The policy strand argued for an active government innovation policy and a research and university system that was again state directed. There was a shift of focus from the individual inventor and the role of the entrepreneur that dominated the previous strand towards the role of institutions and organizational structures. This strand is mainly associated to Charles Edquist, one of the main supporters of the system of innovation perspective in Sweden. Already in 1989 Edquist was commissioned by the Ministry of Industry to evaluate the governmental support for technology in the engineering industry. The investigation resulted in a report presented in

³³⁰ However, Carlsson, B., Elg, L and Jacobsson, S., *Reflections on the Co-evolution of Innovation Theory, Policy and Practice: The Emergence of the Swedish Agency for Innovation Systems* in Smits, R., Shapira, P. and Kuhlmann, S. (red.), *The theory and practice of innovation policy: an international research handbook*, Edward Elgar, Cheltenham, UK, 2010 mention that the first official use of the term "innovation policy" in Swedish documents as late as a government bill in 1999.

³³¹ There are interesting similarities with the role of the newly established Innovation Council.

1991³³² where it was argued that the financial support was going to those areas Sweden was already occupying a leading position, namely in fast spreading process technology. Edquist was suggesting support to be canalized towards product technology, identified as more relevant for growth and employment. The report was also identifying STU as part of the problem which was considered to hold too much influence over the Swedish technology policy. Instead, the Ministry of Industry was suggested as main owner of the technology policy.

If Edquist was asked by the social democratic opposition³³³ to run an investigation with the starting point in industrial policy, Vedin was asked by the centre-right government to run an investigation with a starting point in the role of the entrepreneur and the individual innovator. This shows the ideological differences in the Swedish politics and how they had different influences on the public – private relations and how it should be organized. The differences in focus of the two investigations point out the differences on innovation thinking of the two political groups, anchored in different ideologies but also in different intellectual and academic traditions. The commission of Vedin and Edquist also shows that policy makers tend to employ those that will support and strengthen their line of argumentation. This can raise questions on the role of the researcher or the role of academia in relation to policy making, and how academia comes to serve the purposes of the policy making (consciously or unconsciously). Edquist, in line with the academic story of the system of innovation perspective, was criticizing the focus on investors, R&D investments and the view of universities as knowledge producers, especially in technical and natural sciences, as solutions to the industrial crisis.

A third strand in the debate emerged as a critical reaction to the welfare state, perceived to have distorted the incentives to innovate (for example, through the wage policy) which affected mainly small companies. Eklund is

³³² Edquist, C., *Utvärdering av statligt stöd till verkstadsindustriell teknik*, Rapport om statligt stöd till FoU och teknisk utveckling skriven för det svenska Industridepartementet, september 1989. (Also published as Tema T Report 22, Department of Technology and Social Change, University of Linköping, January 1991).

³³³ Responsible for industrial policy issues within the Social Democratic party were at the time Göran Persson, later prime minister, and Anders Sundström, later minister of industry. Sundström wrote in the introduction of one of the reports “Sweden of today has no industrial policy. For the centre-right government this is an area to be dismantled. We Social Democrats offer an alternative. It is a new and active industrial policy, with cooperation and pragmatism instead of ideological rigidity [...]”, in Eklund 2007, page 60.

pinpointing Lennart Ohlsson as one of the main advocates of this strand. Influenced by the wave-cycle theory of economic development (he shared the same point of departure in long-waves cycles with Chris Freeman), Ohlsson considered the 1970s crisis as a “secular crisis” and that only through radical innovation a recovery was possible³³⁴. Radical innovations or ideas could come from four sources; R&D within big companies, university research, individual inventors and entrepreneurs within small companies. Ohlsson re-emphasised the role of basic research or university research in producing radical new ideas which should be supported by governmental efforts (funding). He was in fact supporting the academic side in the Research 2000 debate. Furthermore, he considered as especially important to support small companies³³⁵. Large companies had maybe the resources, but Ohlsson found them rather conservative. Public investment and large companies are in fact both, according to Ohlsson, organizations that are generally conservative and not prone to invest in radical ideas that departed too far from the traditional.

Ohlsson adopted a rather different position to university research compared to the main stream; he draw a signal for the underestimated role of the university research for the creation of really radical ideas. This is important to consider when considering the strong relation between Ericsson and universities. As it will be discussed later on, Ericsson has many and strong collaborations with universities around the world. In fact, one of the factors considered when choosing location is the presence of a university with relevant research. Ohlsson took also up the discussion upon the role played by the government in deciding what areas of research should be supported, but also what kind of ideas are steaming from university research and their status. University research was mostly to be looked upon as generator of ideas or ‘raw materials’ which should thereafter find ‘investors’ interested in their commercialization. It is a discussion that is highly relevant, as the role of the university and academic science is pending between its traditional role of knowledge producer and its new role as economic engine³³⁶. Ohlsson emphasised the importance of nurturing the capacity of absorbing knowledge and/or of importing knowledge in the context of emergence of a knowledge base economy. He was emphasising the role of the university in this context, both for the Swedish economy in general and for firms in particular. This was

³³⁴ Ohlsson, L., *Sverige som innovativ industrimiljö*, Stockholm 1993.

³³⁵ This can partly be also explained by the fact that Ohlsson was chief economist at the Federation for small and medium-size firms.

³³⁶ See for example Berman, E.P., *Creating the Market University. How Academic Science Became an Economic Engine*, Princeton University Press, 2012.

incorporated in a critique of the welfare state which due to its labour legislation and solidary wage policy proves to be rather inflexible and obsolete in a world where knowledge was considered the most important resource.

Eklund identifies a fourth strand, namely the network/ research foundations strand. This fourth strand is not really comparable with the other three. While the other strands represent ideas about innovation and address ideas of policy making and ideas of the academia influence each other, this fourth strand is about practice. The other three strands can be characterized as intellectual debates on the relation between industry and academia, on research and industrial policy.

In 1990 NUTEK, the Swedish Business Development Agency, was established and it will come to play a central role in the interstice between research and industrial policy and initiated a large number of long-term partnerships between academia and industry³³⁷. Nutek working method was primarily orientated towards setting up collaborative and interactive research programmes based on public-private partnership³³⁸. As successor of Nutek, Vinnova inherited this collaborative view of innovation and it academically anchored it in the system of innovation perspective implementing it thorough the triple helix principle. Hence, the public – private was refined into academia – industry – public sector.

6.3 Final remarks

The section above has addressed the emergence and development of the innovation thinking in Sweden. The systems of innovation perspective emerged as a way to understand Japan's economic growth and why countries like the USA and the UK were lagging behind. In Sweden, the discussion is linked to similar questions. Why was Sweden recovering at a slower pace after the crisis of the 1970s and 1990s? Several investigations were initiated all pointing out to a decreasing competitiveness of the Swedish economy and

³³⁷ Benner 2012.

³³⁸ Eklund 2007, Benner 2012.

several explanations were provided, which could be categorized and structural and institutional.

To organize the discussion, four strands were identified. The four debate strands had the role to shed light upon the different logics of the actors involved and how these different logics have influenced the course of the innovation policy. Freeman identified MITI as the central player in the Japanese system of innovation. In Sweden the debate on innovation has been going back and forth between the ministries of education and research and industry. Consequently, the analysis of the context of emergence of the system of innovation in Sweden is discussed as based on two pillars; the research and education system and the industry sector. It can also be looked upon as the normative and the academia story as in chapter three. This is also connected to the argument of the Swedish paradox; one of the system faults identified were that Sweden was one of the countries with highest investment in R&D but poor outputs. The poor performance was considered to be systemic. The different investigations commissioned by the state were pinpointing that a reformation of the education and research system was required and how to assure that it contributes to Sweden's innovative competitiveness. In this context the relation research – industry was dominating the discussion which culminated with the dismantling of the wage-earner funds and the reformation of the research funding system in the 1990s.

Another interesting aspect that emerges from the discussion here is the role of the governing party in the appropriation and implementation of the system of innovation perspective in Sweden. This factor has been largely omitted by previous studies³³⁹. The analysis of the innovation thinking witnesses important ideological differences in the Swedish politics that are structured under the four debates. Furthermore, in chapter three it was discussed how the system of innovation perspective emerged almost simultaneously in the academia and policy making. In Sweden the concept emerged also at the crossroads between the academia and policy making, and the Vedin strand and the policy strand have both emerged as a result of policy-based research.

³³⁹ Same opinion is also expressed by Persson, B., *The Development of a New Swedish Innovation Policy. A historical Institutional Approach*, CIRCLE WP 2008/02.

Towards a territorial and functional understanding of the Swedish system of innovation

In the previous chapters I have been arguing for an actor-centred perspective on systems of innovation. For this purpose, two theoretical contributions were made to the current intellectual body of the systems of innovation; the embeddedness theory and the concept of interest. This is operationalized by proposing to analyse the systems of innovation as the interplay of a territorial-based system of innovation and a functional-based system of innovation. As the starting point of the analysis is the actor, the two are also referred to as rationalities or logics.

Two actors are considered for the empirical backdrop, one a political actor – Sweden, and second an economic actor, a firm, namely Ericsson.

7.1 The territorial-based system of innovation

The previous chapter focused on the context and the intellectual debate around the adoption and implementation of the system of innovation perspective in Sweden. There were many different actors that were involved in the debate and the intention was to show how actors influence the intellectual context and how actors pair themselves according to a common ideology or intellectual tradition. Furthermore, the intention was also to shed light upon the multitude of actors that were involved in the debate and in forming the system of innovation perspective that Sweden adopted.

The aim of this section is to account for the territorial perspective of the system of innovation. To do this, I will address the establishment of Vinnova, the Swedish National Innovation Strategy and the newly established

Innovation Council. Why are these three cases representative for the territorial system of innovation? In what way are they representative for the territorial rationality? I argue that they are all three initiatives of the Swedish government whose actions are directly orientated to a well-defined territorial unit. Their very existence and their activities are governed by formal institutions specific for a territory.

7.1.1 The case of Vinnova

This aim of this section is to account for Vinnova as an actor of the Swedish system of innovation. Analysing it on the basis of historical institutionalism, I will address its development ‘in the light of history’, trying to understand the factors explaining the dynamics of its emergence and implementation. From this perspective, the emergence of Vinnova will be discussed mainly as the outcome of the political struggles of the 1990s around the organization and structure of the Swedish research system. Its development over time is presented as contextually and historically situated. The point of departure is Vinnova as an actor embedded in its context but also with an own agenda and how this might give rise to conflicts.

As established by the state, the activity of Vinnova has a territorial focus and impact. Vinnova is a central actor in the particular institutional arrangement and institutional environment of Sweden. Analysing Vinnova as an element of a territorial-based system of innovation, thus steered by a territorial rationality, implies that focus is on how history has produced it; focus is on self-reinforcing processes. The analysis of Vinnova is informed by Zukin’s and DiMaggio’s taxonomy of embeddedness to account for how Vinnova has developed different types of embeddedness and how it has an impact on the manner the systems of innovation perspective has been appropriated by Vinnova and how it has changed over the years.

Vinnova was established 1st of January 2001, it currently (2016) has some 200 employees, many of them active or former researchers knowledgeable in the field of innovation studies and with the systems of innovation perspective in particular. Vinnova has offices in Stockholm, Brussel and Silicon Valley. Vinnova is a government agency operating under the Ministry of Enterprise, Energy and Communications. It is the contact agency for the EU framework program for research and innovation. Vinnova serves as the expert agency for the government’s innovation policy. Vinnova is Sweden’s innovation agency and its main task is to promote sustainable growth by improving the conditions for innovation and financing need-based research. Vinnova has

formulated the following vision: “Our vision is for Sweden to be a world leader in research and innovation and an attractive place to invest and do business in.”³⁴⁰ The objective of Vinnova is that at least 80 per cent of the investments the agency makes should contribute to a green and/or socially sustainable society³⁴¹. When first established, the term of systems of innovation was included in the title, the agency for innovation systems. But a change took place and today it is called the innovation agency. Nevertheless, the idea of systems of innovation was not given up and it still is the “working method”. Vinnova applies the term systems of innovation as referring to the system of organizations, individuals and rules and regulations under which the creation, dissemination and innovative exploitation of technology and other fields of knowledge takes place³⁴². The term of institutions is not explicitly used, but it refers to rules and regulations which, applying the North perspective, qualify as formal institutions. The definition suggests also that the main focus of the agency is on technological knowledge or technological innovation, while the other fields of knowledge are acknowledged but seem to be a secondary priority.

The role and mission of Vinnova, the way it works and behaves in the system, follows a territorial rationality in the sense that it is the product of institutions, organizations and relations which are spatially bounded. This stresses the agency’s embeddedness in the national political and economic institutions and power relations³⁴³ and refers to the extent an actor is anchored in particular territories or places. The establishment of Vinnova is embedded in the Swedish ideological and political context of the late 1990s. Sweden is the only country implementing the systems of innovation perspective through an agency, an agency that is the result of the specific conditions of Sweden. Vinnova is a result of the struggles over the direction of the research and education system that culminated in the late 1990s³⁴⁴, more exactly of the Research 2000 process. As discussed above, the Research 2000 proposition was highly controversial, causing political conflict regarding the role and organization of research and the relation to industry. In this context, the

³⁴⁰ Vinnova Information VI 2014:10.

³⁴¹ Vinnova Information VI 2014:10.

³⁴² Vinnova Information VI 2014: 04.

³⁴³ See Jessop 2002 as discussed in chapter five.

³⁴⁴ Persson, B., *Constructing an innovation policy agency: The case of the Swedish Governmental Agency for Innovation Systems*, in Rickne, A., Laestadius, S., Etkowitz, H., *Innovation Governance in an Open Economy*, Routledge, 2012, see page 169.

establishment of a new agency for R&D was proposed³⁴⁵. The name and the role of the agency were to be specified in the Research Bill presented in autumn 2000. The agency was to be called The Swedish Agency for Innovation Systems, Vinnova. As it is mentioned by Eklund, the name of the agency was to follow the ideas presented in the investigation led by Anders Flodström. Nevertheless, the fact that the agency was proposed in a research bill will come to imprint the character of the innovation discussion, as there is no explicit distinction between innovation policy and research policy. The establishment of Vinnova has also been described in terms of the garbage can theory³⁴⁶ of organizational decision making³⁴⁷. According to the garbage can theory, organizations are characterized by a collection of problems and solutions which are collected in a garbage can of possibilities. What were the possibilities? The most obvious one was the technology policy that NUTEK and STU were based on. Another one was the systems of innovation perspective advocated by OECD and the triple helix concept. So, the establishment of Vinnova and the formulation of its mission were the result of a long-lasting struggle to define the role of research, the relation research-industry and the organization and funding of the research system. In the formation of Vinnova not only the innovation paradigm is to be considered, but also that of the triple helix and the third mission of the university.

The establishment of Vinnova was a manifestation of the focus on innovation and innovation policy of the growth policy. Vinnova's main role was to contribute to the economic development by developing an innovation system and the mean was economic support to need-based research. With the establishment of Vinnova focus was moved from innovation to innovation systems³⁴⁸. This implied that focus was no longer on the role of the innovators and entrepreneurs as it was advocated by Vedin or Ohlsson and the debates around them. Innovation was now defined as a process, taking place in a system, as in interplay between actors, which can be linked to the debate represented by Charles Edquist and ideologically representative for the social democratic party.

³⁴⁵ Prop. 1999/2000:81 *Forskning för framtiden – en ny organisation för forskningsfinansiering*.

³⁴⁶ Carlsson et al 2010.

³⁴⁷ As formulated by Cohen, M. D., March, J. G., and Olsen, J. P., *A Garbage Can Model of Organizational Choice*, *Administrative Science Quarterly*, 17(1), 1972, pp.1-25.

³⁴⁸ Nilsson, J-E. *Vinnväxt – ett innovativt program i takt med tiden*, Vinnova Analys VA 2016:01.

In this dissertation, Vinnova is depicted as embedded in a specific territorial system of innovation. Its embeddedness is also strengthened by the fact that it had been established as an off-spring or merger between parts of NUTEK, Swedish Council for Work Life Research (Rådet för Arbetslivsforskning in Swedish) and the Swedish Transport and Communications Research Board (Kommunikationsforskningsberedningen in Swedish). This has probably imprinted the character of the agency in several ways. In an interview with a Vinnova official, the rationality of the Swedish innovation policy is described as dominated of the linear model. Despite the fact that the systemic view of innovation is advocated, a linear model appears to dominate the Swedish context and the proposed explanation is that it is an easy way to explain the reality. This view is confirmed by Carlsson et al³⁴⁹ who stated that policy makers in Sweden were supporters of the mainstream neoclassical economics, much more than in other countries, and that the linear model of innovation was the primary mental framework of Swedish policy makers³⁵⁰. This linear model in the Swedish organization context has been defined as the belief that technology is applied science and it depicted stages in the process of innovation for basic research to market introduction of product or process³⁵¹. NUTEK had a strong technology policy orientation and STU was a “network-orientated” agency. This can be interpreted as a self-reinforcing process of how a way of thinking becomes institutionalized. A new organization was established, Vinnova, but this does not necessarily imply an institutional change as well. In its initial stages, the role of Vinnova was mainly funding applied research, so it had in fact a more limited mission than its predecessors³⁵².

Over the years, the role of Vinnova has changed and become more complex. Its primary role is no longer that of a financier, but it adopted a catalyser role

³⁴⁹ Policy effects were measured only in terms of changes in the volume of industrial R&D, “not in terms of changes in direction or organization of R&D efforts or in any other way” and the need for innovation policy was discussed only in the narrow framework of the market failure (Carlsson et al 2010).

³⁵⁰ “This has been fuelled by both self-interest from the academic lobby and mistrust of government policy by industry. One reason it has survived so long is the structure of Swedish industry, where most of R&D has been concentrated to a small number of large firms. These firms were able to internalize some of the innovation system’s translation functions between discipline-based academic knowledge and multidisciplinary industrial needs.” (Carlsson et al, 2010).

³⁵¹ Weinberger 1997.

³⁵² Persson 2008.

or the role of a broker³⁵³. This role of a broker indicates a change in Vinnova's role in the systems of innovation from preponderantly a research financier (a more passive role) to a more active role of connecting, bringing together actors from different sectors to work together – thus, an active role in building a system of innovation. In this sense, Vinnova perceives itself as an important platform or meeting arena for actors of the innovation system. And its role in the Swedish system of innovation is to allow for actors to meet and support their interplay. Vinnova formulates its role in terms of contributing to an effective system of innovation. From this perspective, Vinnova seems to adopt a “helicopter perspective” to detect weaknesses in the system³⁵⁴. On the other hand, Vinnova might also have been keen in breaking with the legacy of STU and NUTEK, keen in establishing itself as a new type of agency and gain legitimacy. Vinnova emerged as a strong advocator of the triple helix perspective, which can be interpreted as an attempt to distance itself from the linear perspective.

Vinnova can be looked upon from two perspectives; one is that of constructor of the Swedish innovation system and the second one is that of an actor of the system of innovation. The difference between these two perspectives can be observed in the way the agency's working methods has changed over the years. If at the beginning all work was performed internally and the agency was striving for having all expertise in the house, today it increasingly relies upon external expertise. This is also reflected in the bottom up orientation the agency has adopted at the project level. If previously the agency was specifying within which area the applications should be, now the area of application is left rather open. This method also allows the agency to be better equipped at detecting the “hot” areas. So, if previously the agency was more proactive in identifying the priority areas, now it seems to have adopted a more reactive attitude. The agency works through calls for proposals and assessment, allowing for a wider project turnovers in the application phase; a bottom-up strategy. In this way it is believed to get a more accurate picture of the status of the system of innovation and which are the areas in need of funding. Of course, the risk is the calls will be dominated by applicants with experience and already having a dominant position in the system (this risk is

³⁵³ In an interview with a Vinnova official 2015, the role of Vinnova today is compared to that of a broker explained as follows: “We have more and more gone from research financier to a more active role in the innovation system ... like a broker, connecting different actors and we have a strategy that our money [...] to have an impact we need to involve others as well”. (broker - mäklare in Swedish).

³⁵⁴ Interview with a Vinnova official 2015.

also pinpointed by the OECD Review of the Swedish innovation system that was presented in December 2015). It is argued that through accurate and continuous evaluations and follow-up this risk can be tackled. Based on the results so far shows this approach is assessed as profitable³⁵⁵.

Nevertheless, this does not imply that priorities are not made by Vinnova. The following fields are named of being of supported in particular; health and healthcare, transportations, environment, services, ICT, manufacturing and innovation management. The broadness of the supported areas reflects the broader approach the agency has adopted, as previously mentioned. It is no longer a technological focus, but also a focus on social innovation and services. Furthermore, the following target groups are identified by Vinnova as particularly important to be supported and increase their innovative capacity; innovative small and medium sized businesses, world-class research and innovation milieus and the public sector.

But Vinnova is a governmental agency and its role in the Swedish system of innovation is also to be understood from this perspective. Vinnova is the expert agency in charge of preparing analysis and reports commissioned by the government. From this perspective, the role of Vinnova in the Swedish innovation system is rather complex, especially from an actor-based perspective. How much is Vinnova an independent actor and how much a governmental agency, serving the interests of the government? The political scientists Johannes Lindvall and Bo Rothstein discussed the role of the Swedish public agencies as “ideological agencies” and their role in implementing public policies³⁵⁶. Governmental agencies such as Vinnova are not established to implement laws the government is adopting but more like “central nodes in networks” with the role of disseminating information, evaluating public policies (i.e. Vinnova evaluating the Swedish Innovation Strategy), running contact networks (i.e. Vinnova’s role as national contact agency for the EU Framework Programme in Research and Innovation). As ideological agencies or ideological bureaucracies, they are primarily established with the purpose to formulate ideological positions in different areas³⁵⁷. In an interview with Vinnova official the relation between Vinnova and the government has been expressed as follows: “Swedish politics don’t change without its agencies”, considering the fact that government departments are rather small, with few employees, and therefore they are

³⁵⁵ As it has been pinpointed in an interview with a Vinnova official.

³⁵⁶ Lindvall and Rothstein 2006.

³⁵⁷ In public administration this is known as a trend known as “from government to governance”; see Lindvall and Rothstein.

dependent on agencies such as Vinnova. As mentioned, one of Vinnova's mission is to prepare reports and analysis for the government. Thus, through these reports and analysis Vinnova has a highly active role in shaping the innovation policy.

The premise is that development of Vinnova is an expression of how the systems of innovation paradigm has been interpreted in the Swedish context. It is also a reflection of the interplay between ideas (systems of innovation and academic concept) and the interests of the political class. Bo Persson is arguing that "The discourse and practical ideas associated with the innovation paradigm, offered a suitable way to package a new and broader technology policy strategy. It was also suitable for Social Democratic ideology; it offered an alternative to market solutions and a more passive industry policy, forming a 'new' corporatist structure, although on a sectoral, rather than national, level."³⁵⁸

7.1.2 The Swedish Innovation Strategy

With the establishment of Vinnova an institutionalization of the system of innovation perspective took place. However, Sweden has up until 2012 never formulated an innovation strategy. Innovation as policy has always been part of the Ministry of Education and it has been incorporated in the research strategies.

In October 2012 the Swedish government published The Swedish Innovation Strategy. It was the first innovation strategy that Sweden it was about to write and the challenge was taken with a high level of enthusiasm³⁵⁹. And this enthusiasm it shows in the extensive work that was employed in the process of writing the strategy. Under a period of two years more than 1400 firms, consultants, academics, research institutes, entrepreneurs and other actors were involved through interviews, workshops, meetings, focus groups etc. The strategy was formulated under a centre-right government, a coalition government of four parties. The strategy was formulated under the Ministry of Enterprise with a minister from the Centre party.

The strategy has been rather controversial and criticized, mainly for being too open, too broad and difficult to be concretized in tangible measures. Even difficult to be evaluated, something that has also been pinpointed by

³⁵⁸ Persson 2008, page 40.

³⁵⁹ Interview with Ministry of Enterprise official 2015.

Vinnova³⁶⁰, the responsible agency for the evaluation process. Nevertheless, paying attention to the context and the intentions motivating the strategy, helps to shed new light on *why this* strategy.

The strategy takes-off from the assumption that Sweden is a leading country when it comes to innovation. The actions that Sweden needs to take in order to improve the innovative climate and innovation performance are formulated with the belief that Sweden is already rather well equipped. It is a strategy for a country that it is at the front of the innovation pace, capable of radical and incremental innovations, and not just able to adjust to whatever happens outside its borders. It is not a catching-up strategy. This view is anchored in the EU's Innovation Scoreboard according to which Sweden is the most innovate member state in the EU³⁶¹. Sweden has a good position, but the world changes at a fast pace and this is a challenge Sweden needs to consider. However, the leading position of Sweden has been questioned and criticized for relying on previous merits³⁶². The leading position of Sweden in the Innovation Union Scoreboard is argued to be due to old merits previous to 2012; the companies that are the backbone of the Swedish economy are grounded before the first World War and are living on incremental innovations and product improvement; most of the small firms that are established are spill-offs from the large firms.

A question is the opening act of the strategy; *why Sweden needs an innovation strategy*. Three reasons are mentioned; (i) to meet global societal challenges; (ii) increase competitiveness and create more jobs in a global knowledge economy, and (iii) deliver public services with increased quality and efficiency. But in what way are these three reasons for an innovation strategy and not for a growth strategy, for example. Hence, the three *raison* lack specificity. On the other hand, if one considers how the concept of innovation is defined than the vagueness is explicable.

The strategy mentions two definitions of how the concept of innovation is employed. First, the definition from the Swedish National Encyclopaedia; NE.se is quoted; "Events through which new ideas, behaviours and procedures are introduced into a society and then spread". The second definition quoted is an OECD definition³⁶³, "the implementation of a new or

³⁶⁰ Interview with Vinnova official 2015.

³⁶¹ Innovation Union Scoreboard 2010, Brussels 2011.

³⁶² See, for instance, the IVA Final Report *Innovationskraft Sverige*, 2012-2013.

³⁶³ OECD Oslo Manual, Guidelines for Collection and Interpreting Innovation Data, 3rd edition, 2005.

significantly improved products (goods or services), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations”. The two definitions are rather different, in terms of the type of who delivers it and scope; while the first definition is a more mundane type of definition, the second one was formulated with the scope of measuring innovation. The Oslo Manual was one of the first attempts made to come with a unitary set of tools to measure innovation. Once innovation defined, the strategy turns towards the actors of innovation and it argues that several roles are required; “visionaries, inventors or creators who have ideas, users and customers who have demands and who to an increasing extent participate in the creation of new products, services and processes, entrepreneurs who run and organize the realization of ideas, salesperson who communicate ideas and financiers who believe in the potential value of ideas and provide capital and often business competence as well”. I argue that the diversity of actors enumerated and the variety of their tasks in the innovation process is an expression of the inclusiveness the strategy aimed for. Furthermore, the following organizations are mentioned of special importance for the innovative climate; universities, public agencies, county councils, regions and municipalities. A special focus is in the role of the public sector, more specific on the commitment of the public sector to a strong innovative climate. The public commitment translates into practical policies within three areas; (i) well-functioning framework conditions; (ii) innovation in public services and the public sector generating demand for innovation³⁶⁴; and (iii) direct measures targeting innovation processes³⁶⁵.

It has been argued that the strategy was highly driven by an intention to do something new, to move away from the traditional view of innovation as product and technologically based, to incorporate more that the “usual suspects”³⁶⁶. The main intention was to activate those actors that usually were the outsiders, those that were not perceived as the main target group of a strategy for innovation, non-traditional areas such as tourism, genus and a strong focus on social innovation. Why this choice? At a first glance, it might seem to increase the risk for failure due to increased difficulties to influence the Swedish innovation climate or gain acceptance or legitimacy. The

³⁶⁴ It refers to two aspects; first, the capability of public services to be innovative, and second, the public sector should contribute to the demand for innovation in society at large.

³⁶⁵ Such measures can be financed by innovative activities and entrepreneurship, or financing of knowledge and innovation infrastructure etc.

³⁶⁶ Interview Ministry of Enterprise, Energy and Communications official, November 2015

Swedish context is dominated by a series of given actors highly dominating the innovation field. But this was a consciously-made decision by the team of civil servants in charge with drafting the strategy, to break with what was considered to be the traditional way of dealing with innovation, namely of relying on the already established companies. From this perspective, the strategy had an intention to break with self-reinforcing processes that were dominating the innovation thinking and innovation policy. On the other hand, one should also keep in mind that to the strategy no clear or specific instruments of implementation (i.e. a budget) were associated; furthermore, elections were to take place less than two years later. The question is if this not provided a liberty for the strategy to spheres new to the innovation policy and innovation thinking in Sweden. Nevertheless, the work with the strategy was infused by a strong feeling of achieving something original.

In line with the systems of innovation perspective, the strategy acknowledges innovation as a relational process and with learning as a central process. Furthermore, the strategy also acknowledges that it adopts a broad view to innovation in the sense that it is more than just the creation of value based on R&D. The broader view adopted here appears to be in line with Lundvall's broad definition that was discussed in chapter three. Furthermore, a holistic view to innovation is also adopted as inspired by OECD and the EU, in the sense that innovation policy needs to integrate environmental mitigation with technological development, for example.

The vision put forward in the strategy is articulated as follows:

Sweden is a creative country characterised by pioneering ideas and new ways of thinking and doing in order to shape our future in a global community. People in all parts of Sweden can and want to contribute to creating value for people, the economy and the environment through new or improved solutions.

A strong innovation climate by 2020 will enable:

People and actors, by being more innovative, to contribute solutions to big societal challenges, in Sweden as well as globally.

Businesses and environments, by being more innovative, to create value, increase their competitiveness and attract expertise, investments and cooperation partners from around the world.

Actors in the public sector and their partnership with private and civil society organisations, by being more innovative, to supply public services of a high quality and efficiency³⁶⁷.

³⁶⁷ Government Offices of Sweden, the Swedish Ministry of Enterprise, Energy and Communication, *The Swedish Innovation Strategy*, 2012.

The lead theme of the vision seems to be “by being more innovative”. The challenges mentioned in the introduction seem to be addressed by being more innovative. However, “being more innovative” it is not really specified what it is supposed to mean. But it is left open for interpretation and the question is if it is meant more than the ordinary meaning of being more innovative. A vision is about dreaming big, but the vision quoted here is more about incremental improvements, about making small steps. It is a rather careful vision.

The strategy has been described as a popular movement³⁶⁸, a description that is corroborated by the inclusive character of the strategy. Both in the preparing phase but also considering the actors the strategy is targeting – who has been left out? Some priorities were made, but the intention was that everybody should be included. From this perspective, the strategy is intellectually adopting the principles of the systems of innovation perspective of considering all actors in the system.

The Swedish Innovation Strategy raises questions upon the state as an actor in the system of innovation. What kind of role is the state adopting in this context? The strategy had no tools for implementation, no directly allocated budget. Lindvall and Rothstein talk about the fall of the strong state, where state actions are not designed to implement policies or laws, but they are engaged in the production of ideological positions³⁶⁹. From this perspective, the Swedish Innovation Strategy can be interpreted as a discursive effort to establish a new way of thinking or a new ideological position. The strategy has a strong focus on the “soft” aspects of innovation, talking about a good climate for innovations, learning, and collaborations, building networks and social capital, and the role of the individual. For example, it is stated that “it is the individuals in collaboration that ensure Sweden retains and strengthen its position as a global leader in creativity and innovation capacity”³⁷⁰. Furthermore, in reaching a world-class innovative climate central is “people’s ability and willingness to contribute to innovation”. The strategy is called to be national, but it is important to point out that the strategy was primarily the result of an initiative from the Ministry of Enterprise, Energy and Communication, in a coalition government of four governments. The minister of the Ministry of Enterprise, Communication and Energy was a Centre party member and it this way partly reflected the political agenda of this party.

³⁶⁸ In the interview with both the Ministry of Enterprise official and the Vinnova official.

³⁶⁹ Lindvall and Rothstein 2006.

³⁷⁰ The Swedish Innovation Strategy, page 19.

For the implementation of the strategy the following principles are mentioned; a holistic view through collaboration; continuous dialogue; a learning innovation policy. The holistic view is to be achieved through collaboration – and collaboration appears to be the red-thread throughout the strategy. Once again, the strategy emphasizes that its vision and goals are in line with the policy recommendations of the OECD and the EU. Thus, one can assume the strategy is in line with the systems of innovation perspective as informed by or as recommended by the OECD evaluations of the Swedish system. Regarding the second measure, continuous dialogues, meeting places or platforms for dialogue and integration of the different areas and levels are proposed. The implementation of the strategy requires both a thematic approach as well as collaboration at the regional, national and international levels. An innovation policy is to be knowledge-based, that is evidence-based and the strategy acknowledges best practices and learning from experience. Effective evaluations and feedback mechanisms adopting a long term perspective are needed as base for future development. Learning is also to take place through an external monitoring of research and technological development. The implementation of the strategy is of concern not only for the Swedish government, but for various other actors as well. Therefore, the government takes upon itself the task to regularly report upon the progress of the innovation climate.

Vinnova is the responsible agency for the evaluation of the strategy. A first (and the only one so far) evaluation report was published in 2014. In this report it is mentioned that a key meaning in the following is “The strategy will be implemented in concrete initiatives from the Government’s side, but will also contribute to other actors’ initiatives to strengthen innovation capacity in Sweden with 2020 in sight”³⁷¹. Hence, the evaluation should focus on concrete actions and how actors are mobilised as a consequence of the strategy. Vinnova concludes that it needs to include even activities previous to the formulation of the strategy in the evaluation process.

Vinnova pinpointed difficulties for carrying out the strategy and also difficulties in operationalizing the goals of the strategy. In order to make possible the evaluation, Vinnova chose to link the three reasons that justifies the strategy to responsible categories (see table 1). In the report it is mentioned that this is only a rough categorization and that in the end all organizations, agencies and authorities share the responsibility to meet the goals put forward by the strategy. For example, it is stated in the strategy that

³⁷¹ The Swedish Innovation Strategy, page 21.

“the vision for 2020 will be a target for initiatives in many policy areas”, hence it aims guiding the inputs and achievements of many political areas, however not specifying which these political areas would be. The principle Vinnova is applying is that the innovation policy should inform all policy areas and the agency also advocates for a stronger public sector (related to innovation). The listing of the organization in table 1 should be seen in the light of this principle.

REASONS FOR THE STRATEGY	RESPONSIBLE ORGANIZATION
Meeting global societal challenges	VINNOVA, Energimyndigheten, RISE, Tillväxtverket, PRV, Naturvårdsverket, Jordbruksverket, SGU, The Swedish Institute
Increase competitiveness and create more jobs in a global knowledge economy	Tillväxtverket, VINNOVA, ALMI, PRV, RISE, Energimyndigheten, Bolagsverket, Konkurrensverket, Post och telestyrelsen
Deliver public services with increased quality and efficiency	VINNOVA, Energimyndigheten

Table 1
Source Vinnova³⁷²

It is obvious that the Swedish Innovation Strategy has been influenced by ideas of the systems of innovation perspective. The strategy aligns to a systemic view on innovation, it makes learning and collaboration central concepts. However, the strategy is also mirroring one of the main limits of the system of innovation perspective, namely its inclusiveness. When a highly inclusive theory is to be used as ground for policy making the result is a very inclusive strategy which makes is vague or loose. The Swedish Innovation Strategy is a relevant example of how theory and practice/policy making struggle to relate to each other.

The formulation of the strategy was also impacted by what can be referred to as disruptive politics. In an interview with a government official it was mentioned how documents and reports, strategies and propositions are literally thrown in the garbage bin or carried down in the basement when governments are changed. Nevertheless, this has two implications. A dichotomy is present in this process; a dichotomy between a long term and a

372

http://www.vinnova.se/PageFiles/750551075/Slutrapport_%20Nationella_innovationsstrategi_in_2014-09-30.pdf (last seen 20160421)

short view. The process of innovation implies a long term view; it is not something that happens overnight through some institutional/organizational repositioning and increased R&D. The implementation of the system of innovation perspective through a strategy with a political character is doomed to always adopt a short term perspective; election are held every four years and as previously been discussed, the role of the governing party played an important role in the appropriation and implantation of the system of innovation perspective in Sweden. This is an example of disruptive politics - politics changes with the “color” of the government and decisions are made following the political will of the day, which has implications regarding the time perspective and commitment. The civil servants working with the Swedish Innovation Strategy were aware of the fact that elections were to come in less than two years and a government change might take place. They knew that this might imply that the strategy they were working on, will be not considered, that will be carried down to the basement.

7.1.3 The Innovation Council

On 3rd of October 2014, the prime minister of Sweden Stefan Löfvén, announced the establishment of a national innovation council – the National Council for Innovation and Quality in the Public Sector – under the direct responsibility of the prime minister’s office with the aim of strengthening Sweden’s innovation capacity and competitiveness. When the prime minister himself is establishing an innovation council under his direct jurisdiction, than the role of innovation is placed rather high up on the political agenda.

But Sweden is not the first country establishing a national council for innovation; in the past years several countries have established national councils for innovation or for science, technology and innovation. In November 2015, Vinnova published an analysis of 14 national councils in 12 countries around the world³⁷³. The report does not include the Swedish Council (the report was in fact initiated before the decision of establishing the Swedish Council). As the Swedish Council is its infancy, the analysis is meant to contribute to the process of defining the role, working practices etc. The aim is rather, based on the analysis of other councils, to draw lessons or

³⁷³ Serger, S,S., Wise, E. and Arnold, E., *National Research & Innovation Councils as an Instrument of Innovation Governance* VINNOVA ANALYSIS VA 2015:07 Stockholm 2015.

provide suggestions that could be of relevance for the Swedish Innovation Council.

The members of the Innovation Council, five ministers and ten advisers from the industry and academia, are a mix of representatives of public and private organizations, large and medium and small companies, some with political background some without³⁷⁴. Both traditional but also new industries are represented. Most discussed and criticized has probably been the mix of politics with business³⁷⁵.

The overall mission of the Council is argued to support coordination and a holistic thinking around innovation. The Council is having the following three roles; (i) to work as forum for continuous exchange between the government and the industry, research and the labour market actors; (ii) to identify new challenges and suggest new initiatives to strengthen Sweden's innovation and concurrence capacity; and (iii) to identify cooperation areas of strategic importance for the development of the innovation policy³⁷⁶. It is argued that the many questions and answers that can make the Swedish system of innovation more effective and stronger are spread between many departments. The placement of the Innovation Council under the direct jurisdiction of the prime minister is interpreted as a way to integrate the work of the different departments and between the different policies.

One of the members of the Innovation Council is Charles Edquist. Preceding the announcement of the establishment of the Council, Edquist wrote several debate articles in one on the major Swedish daily newspapers Dagens Nyheter. In one of these articles Edquist characterises the proposition from

374 The members of the Innovation Council as for 2015 are: Ola Asplund, senior advisor IF Metall, Mengmeng Du, board member Skandia, formal global marketing director Spotify, Charles Edquist, professor in innovation at Lund University, Pam Fredman, vice chancellor Gothenburg University, Darja Isaksson, IT-entrepreneur, media engineer and founder of Ziggy Creative Colony, Johan Rockström, professor environmental science, Karl-Henrik Sundström, CEO Stora Enso, Jane Walerud, business angel, Hans Vestberg, CEO Ericsson, Carola Öberg, project manager Innovationsfabriken in Gnosjö, and from the government, Magdalena Andersson (S) minister of finance, Mikael Damberg (S) minister of industry, Helene Hellmark Knutsson (S) minister of research and education and Stefan Löfven (S), prime minister.

³⁷⁵ Ax:son Johnson expressed it as follows "Efter 25 år som politiker och 35 som företagare har jag lärt mig att blandar man ihop en politikers roll och en företagarens blir det dyrt och dåligt." (*Industrikansler job som inte locker*, Dagens industri, 10.02.2015)

³⁷⁶ <http://www.regeringen.se/regeringens-politik/innovationsradet/innovationsradets-roll/> (last seen 20160126).

2012 “Research and Innovation” as based upon a linear view of innovation system thinking, which is defined in the article as a system where many different activities influence the innovation process; R&D, education, demand, organizational changes (through entrepreneurship for example), interactive learning, the law system, incubators and financing schemes³⁷⁷. Edquist was also emphasising that this is an innovation advisory group, not research and innovation. And this is important, argues Edquist, because this means that Sweden left behind the linear view of innovation policy. Furthermore, he advises the government to formulate an innovation strategy that should include the following aspects; it should consider the research proposition but also be specific for innovation issues, organizational changes, restructuring of Vinnova, support interactive learning, deal with the law system, establish incubators, public investment in the early stages of a project, etc. Edquist advocates a holistic view on innovation which he calls for innovation system. It is not so much the investments in innovation he finds to be the problem but it is rather a structural or institutional problem. The system of innovation perspective is considered to be the solution, with the state having the main role to generate the proper conditions for the innovation process. He is also advising for a restructuring of Vinnova. Innovation should have higher status in the political discourse or the governmental policy.

Ericsson is represented by the CEO, Hans Vestberg. He commented his presence in the Innovation Council as follows: “If a Swedish government is asking for advice from me or Ericsson on innovation I appreciate that it is a social responsibility and given to stand up. What the government is deciding to do with our advice is of course their decision, but it is positive that they want to consult with many actors³⁷⁸”. The presence of Ericsson in the Innovation Council is also following the company’s own interests³⁷⁹. It is an opportunity to make the company’s needs and expectations known for the government. Moreover, it is an opportunity to influence the innovation policy and the government’s innovation thinking.

It is too early to carry out a more extensive discussion on the role of the Innovation Council in Sweden, if it represents a (radical) shift or if it is just a minor modification of existing practice, an add-on or another ‘layering’

³⁷⁷ *Innovationspolitiken måste samlas i egen proposition*, Dagens Nyheter, DN Debatt 20150511.

³⁷⁸ Hans Vestberg to SVT Nyheter, *Här är Löfvens nya innovationsråd*, 20150224, my translation.

³⁷⁹ As mentioned in the interview with Ulf Ewaldsson, 2016.

process using Kathleen Thelen's concept. What it is interesting to discuss is what the signals that it is sending are. Innovation is pinpointed as a top priority for the government. The composition of the Council provides a hint on which players the government regards as relevant in this context. The establishment of the council positions the state in the innovation debate. If previously the debate has mainly been at the ministerial level, the innovation issue has been now moved at the highest political level.

Furthermore, one should also consider the expectations of the Council's members. Their participation is also to be seen as an expression of own interests. The theme of the Council's meeting in December 2015 was research, innovation and education and how to strengthen its. The discussion focused on the role of an educated labour force, the role of education in building a competent and knowledgeable society, rather than focus on patents and products. The vice-chancellor of Chalmers University holds a presentation. Ericsson expressed that the government's research and education policy is of high relevance and the possibility of influencing it is one of the reasons for Ericsson's membership (as will be discussed in chapter seven). This is also to be understood in relation to the fact that in autumn 2016 the government will present a proposition for research, innovation and higher education for a ten year period.

7.1.4 Discussion

In this chapter an account of the territorial based system of innovation has been attempted. The main actor in this analysis is the state; however it is difficult to talk about the state as a homogenous actor, and different internal conflicts have been pinpointed.

The discussion has followed the debate that preceded the implementation of the system of innovation perspective in Sweden. The discussion is to a great extent a discussion of a *political game*, shaped by different interests, strategies and ideologies. The role of the governing party in shaping and determining the direction of the discussion appears to have played a crucial role, an aspect that has been rather underestimated in the analysis of national systems of innovation.

Addressing the role of the state, a historical institutionalist perspective has been adopted, thereby a historical and contextualization account of the role of the state. The measures taken by the state, among other the establishment of Vinnova, of the Innovation Council or the Swedish Innovation Strategy, are

measures that only added to the already existing framework or tool box. Kathleen Thelen talks about two mechanisms, layering and conversion, of understanding change in institutional framework from a historical institutionalist perspective. Layering refers to process of adding new institutional structures to an existing organization, while conversion implies a totally new set of goals or purposes which bring a redirection of the existing institutions³⁸⁰. But, as Bo Persson is emphasising, a new discourse have been used, the effects of which are hard to measure³⁸¹, a discourse of legitimation, where the main aim was to embed innovation in a broader societal discourse.

From this perspective, Vinnova, for example, can be understood as a new layer added in to an existing structure. Vinnova acts often reactively to political steering, changes in society or to what it is perceived to be the needs of different stakeholders. The agency's activity is steered by state directives and governed by rationalities of the policy level. Therefore, the activity of Vinnova can sometimes appear to be pragmatic or opportunistic. One of Vinnova's main activities is to produce reports and evaluations commissioned by the government and it has from this position a great deal of influence of the formation of the innovation policy in Sweden.

7.2 The functional-based system of innovation

In this section a somewhat unorthodox use of the system of innovation perspective is attempted. The system of innovation perspective will be applied on a firm, a large international company in the field of mobile telecommunication, Ericsson. The framework of systems of innovation will be used as glasses to understand how Ericsson is working with innovation and moreover the role of Ericsson in the Swedish system of innovation (the actor perspective). Considering that an actor perspective was adopted and that the assumption is that actors in the system are different, behave different and are steered by different logics, the case of Ericsson is used to illustrate a rather different logic from the actor presented in the previous chapter.

³⁸⁰ Thelen, K., *How institutions evolve. Insights from Comparative Historical Analysis*, in Mahoney, J. and Rueschemeyer, D. (ed.) *Comparative Historical Analysis in the Social Science*, Cambridge University Press, 2003.

³⁸¹ Persson, 2008.

The assumption of the thesis is that to understand a system of innovation one should adopt an actor perspective in order to understand the dynamics of the system. The history of the Swedish telecommunication industry is to a large extent the history of Ericsson and vice-versa, the history of Ericsson is the history of the Swedish telecom industry. The aim is to shed light on the interplay between Ericsson with its environment. The starting point is that this interplay is influenced by the interests and goals of Ericsson. Ericsson acts according to an agenda, or according to own interests which are assumed to impact the company's relationships with the other actors in the system. In this equation it is also important to specify the character of the actor that it is considered. Ericsson is an economic actor and the assumption is that it has greater flexibility in adjusting its behaviour to the context or the actors it is interrelating with; therefore it is important to specify it is an economic or non-economic actor. This thesis addresses the relation of Ericsson with non-economic actors. The discussion can be summarized as follows: how is the territorial based system of innovation approached to serve a functional based system of innovation. Ericsson is here addressed as an actor that has always adopted an active role towards its institutional environment and it therefore had an important impact upon it. But Ericsson has also come to dominate its context or environment, both in terms of policy making and the behaviour of other firms.

The section is organized as follows. To illustrate how the territorial based system of innovation is organized to fit the functional system of innovation the process of standardization will be addressed. Thereafter, I will turn towards depicting the innovation thinking of a functional system of innovation by addressing two tracks; innovation in terms of patents and innovation as collaborative idea management. The intention is to depict complementarities and conflicts that are of relevance at the system level.

7.2.1 Standardization

The story of standardization is analysed here as a method of organizing the territorial based system of innovation to serve the purposes of the functional system of innovation.

The 'historical episodes' that are chosen for the purpose of this section are the development of the AXE system (and the adjacent collaboration with Televerket and the establishment of Ellemtel) and the development of the NMT standard system. It has to be mentioned that this is only a selection of the numerous standards, hence it is not a complete picture. The reason the two

episodes were selected was that they give a national, Scandinavian and European perspective. Considering the territorial framework that informs this analysis, an overview over the deregulation of the national but also European market for mobile telephones are addressed to further illustrate the territorial and functional logics.

Standardization is an activity aimed at formalizing technical knowledge and creating a common standard. There is a strong link between innovation and standardization and the central question is if standardization enables or constraints innovation³⁸². Standardization is more often voluntary than government imposed. Participation in standardization processes is an important and integral part of product development and marketing strategies in the information technology sector³⁸³. Standardization can in a way be seen as the establishment of a system, where different types of actors are involved and defined by borders. The elements and borders of such a system are rather well defined.

The AXE digital switches has been the result of a long term public/private partnership between Ericsson and Televerket. Historically, public procurement has been an important driver of innovation and economic development in Sweden. In the 2012 review of the Swedish Innovation Policy, the OECD emphasised the importance of this framework for public-private interaction and cooperation for the Swedish system of innovation³⁸⁴. Other such partnerships were ASEA/Vattenfall (energy), ASEA/SJ (transport), Bofors/FMV (military technology).

The Nordic Standard

In a report from 1967 the chief engineer of the Swedish Telecom Radio, Carl-Gösta Åsdal, discussed the future of the Swedish mobile telecommunications. The report concluded that the Swedish Telecom/Televerket should establish a national system, a fully automated system. The decision to extend on the national level was based on the experience accumulated in the previous phase, where there was a major interest shown by trade and industry. Nevertheless, none of the fully automated mobile telephone systems in the

³⁸² Grøtnes, E., *Standardization as open innovation: two cases from the mobile industry*, Information Technology & People, Vol. 22, Issue 4, 2009, pp. 367-381.

³⁸³ Glimstedt, H., *Competitive dynamics of technological standardization: the case of the third generation cellular communications*, Industry and Innovation, 8:1, 2001, pp. 49-78.

³⁸⁴ Another critical pillar OECD (2012) emphasis is the high levels of education and social partners.

world were suitable for a national expansion. The development work conducted by Ragnar Berglund and Östen Mäkitalo, appointed by Åsdal, showed that technological progress was needed for a national expansion to be possible. Åsdal concluded that it would be more profitable for the Swedish Telecom to initiate a collaboration with the other Nordic countries and develop a common standard³⁸⁵. This would form a market of 23 million inhabitants, making profitable to develop systems and mobile telephones. As a result, in 1969 a working group was set up, the Nordic Mobile Telephone Group (the NMT group), with the mission to develop a fully automated common Nordic mobile telephone system³⁸⁶. The Nordic Mobile Telephony standard based on the 450 megahertz bandwidth was established in 1970 as the first (civilian) standard for modern cellular telephony³⁸⁷.

In Sweden, the NMT 450 was implemented in October 1981, followed the year after by Denmark, Finland and Norway. It took ten years to specify the standard and implement it. For the Swedish NMT network, it was Ericsson that supplied all mobile telephones switches³⁸⁸. Interestingly, the NMT 450 was firstly implemented in Saudi Arabia in August 1980³⁸⁹, providing Ericsson financial gain.

The analysis of the standardization process reveals the interplay between the territorial and functional logics. With the fast development and the challenges posed by developing a network to cover the whole nation, it was discussed if it would be possible for Swedish Telecom to purchase a fully developed system, a solution that was advocated by representatives from the industry but not favoured by Swedish Telecom³⁹⁰. This is how Mölleryd describes the process: “Åke Lundqvist at Ericsson Radio tried, without success, to convince Swedish Telecom to select a standard that was already developed. But Carl-Gösta Åsdal, responsible at Swedish Telecom Radio, responded that

³⁸⁵ Mölleryd, B.G., *Entrepreneurship in technological systems: the development of the mobile telephony in Sweden*, Doctoral Dissertation, Economic Research Institute, Stockholm School of Economics, 1999.

³⁸⁶ Mölleryd 1999.

³⁸⁷ McKelvey, M., Texier, F. and Alm, H., *The Dynamics of High Tech Industry: Swedish Firms Developing Mobile Telecommunication Systems*, A research project funded by the Targeted Socio-Economic Research (TSER) program of the European Commission (DG XII) under the Fourth Framework Program, European Commission (Contract no. SOE1-CT95-1004, DG XII SOLS), coordinated by Professor Charles Edquist of the Systems of Innovation Research Program (SIRP) at Linköping University (Sweden), 1998.

³⁸⁸ Mölleryd 1999.

³⁸⁹ McKelvey et al 1998.

³⁹⁰ Mölleryd 1999.

in such case they should purchase equipment from an American company. Lars Ramqvist, Ericsson Radio's managing director, also tried to convince the Director General at Swedish Telecom, Tony Hagström, to select an AMPS system, but Swedish Telecom rejected that proposition. Ericsson wanted to benefit for the work that had already been carried out regarding the development of a system towards the American and British standards. [...] Ericsson did not believe in a public mobile telephone network and was working on a closed radio system. In the co-operation between Ericsson and Swedish Telecom, Ericsson often played a minor role. Swedish Telecom co-operated to some extent with the Danish Storno during the early period in mobile telephony development."³⁹¹ The quote illustrates the differences between the territorial and functional logics or rationalities. While the Swedish Telecom was interested in a standard for Sweden and Scandinavia (therefore the collaboration between the Swedish Telecom and the Danish Storno), Ericsson was interested in a standard that was already adopted by other markets which would imply an even larger market than only the Scandinavian one.

This was not the first time Ericsson was trying to influence decisions made by the Swedish Government or Swedish Telecom in particular. Another noteworthy case is when LM Ericsson took the side of Swedish Telecom when Comvik³⁹² tried to break the monopoly, thus showing reluctance to open the market for competition. Ericsson, through the then Chief Executive Officer Björn Svedberg, sent a communicate to the Government where the company expressed its support for Swedish Telecom's restrictive policy and that the Swedish Telecom should be able to establish a national network without competition from a private network operator³⁹³. Why were the reasons for Ericsson to adopt such position? According to Mölleryd, the reason was that a private competitor "could challenge NMT's expansion since it was anticipated that the private operator primarily would expand in profitable areas. Svedberg emphasised that a rapid deployment of NMT in Sweden was a prerequisite for NMT's as well as Ericsson's success on international mobile telephone markets, thereby securing employment in Sweden"³⁹⁴. It was hence in Ericsson's interest to take an active position in

³⁹¹ Mölleryd 1999, page 95

³⁹² Comvik is a Swedish prepaid mobile phone brand. It was established in 1991 as an attempt to break the monopoly of Swedish Telecom.

³⁹³ Cf. Mölleryd 1999.

³⁹⁴ Mölleryd 1999, page 103.

this matter and also make use of its central position in the Swedish telecom industry to try to influence a decision of the government.

The AXE standard

The collaboration between Ericsson and the Swedish Telecom took a step further when Ellemtel Utvecklings AB was established in 1970, as a joint R&D company. At first, Ericsson and the Swedish Telecom were developing different switches, but they soon realized that this required more resources than they could afford, as well as “that the numbers of engineers available in the country was limited”³⁹⁵. Therefore they decided to collaborate. The first project of the new firm came to be known under the code name AX, and it was meant to develop a new and cost-effective SPC-system for the local telephone station³⁹⁶. But the main task of Ellemtel came to be the development of the AXE system, which came to represent a breakthrough for both Ericsson and the Swedish telecommunication industry.

The beginnings were not smooth. Ellemtel was a partnership between two actors of different types, actors with different interests and logics, actors with conflicting and competing interests. On one side, the Swedish Telecom was interested in a system that could serve the internal market, developed according to the requirements of the Swedish system (a territorial based system of innovation). On the other side, the intentions or interests of Ericsson were much broader in scope, as they were systems possible to be exported, more exactly they were after a switch suitable to as many international telephones as possible³⁹⁷ (a functional based system of innovation/ a functional rationality). The first specification for the AX system was ready in 1971 and in 1972 the systems was finalized and ready for development. The Swedish Telecom and Ellemtel wanted to start it as quickly as possible but Ericsson took the decision to participate in the development of the AX system as late as February 1972. The project was managed by Bengt-Gunnar Magnusson, one of Sweden’s most preeminent engineers³⁹⁸. Perhaps Ericsson had not recognized from the beginning the

³⁹⁵ McKelvey at al 1998, page 24.

³⁹⁶ Meurling, J. and Jeans, R., *The Ericsson chronicle: 125 years in telecommunications*, Informationsförl., Stockholm, 2000.

³⁹⁷ <http://www.ericssonhistory.com/products/the-switches/Development-of-the-AXE-system/> (last seen 20151009, author of the article Mats Fridlund)

³⁹⁸ <http://www.ericssonhistory.com/products/the-switches/Development-of-the-AXE-system/> (last seen 20151009, author of the article Mats Fridlund)

potential of the AXE system, but it however came to play a fundamental role for the company as Vedin also mentioned “it was AXE that moved Ericsson from a respectable position in the minor league among telecom suppliers to a major league player”³⁹⁹. It was the interplay between the two rationalities, the territorial and the functional one, that made possible a fundamental technique for the development of the telecom industry and the survival and expansion of Ericsson. This interplay was possible due to the institutional framework of the telecom industry in Sweden and its commitment to the public-private procurement or partnership system.

The first AXE station (pilot station) was opened in 1976 as an analogue system. The first digital station was established two years later in 1978 in Åbo. Ericsson had first mentioned the AXE system in 1973 when it was also presented for external clients, the Helsinki Telephone Company. Interestingly, Ericsson’s main interest was not in the mobile telephone system, but in the mobile radio systems, especially radio systems used by emergency services, such as the transport sector⁴⁰⁰. The company’s interest for the radio system has a history of about 100 years, going back to 1919 when the Swedish Radio Company (Svenska Radioaktiebolaget in Swedish) (SRA) was founded and Ericsson was one of the co-founders. But the international market showed interest for the mobile telephony, and through the orders placed at Ericsson (especially from the Nordic countries and Saudi Arabia), the company secured a central role on the domestic market, and also getting access to the network for mobile telephony. The AXE system proved to be a winning card for Ericsson, a system that was also able to support the growing numbers of subscribers.

The oil crisis of the 1970s represented an unexpected opportunity for Ericsson. The state companies were not in capacity for further investments, at least for the time being. This was a period of respite for Ericsson, who was in capacity of investment but the situation was not the same for the potential buyers. Ericsson was to celebrate the centenary in 1976 and the company was keen to celebrate it by presenting the revolutionary AXE system for the market. But the introduction of AXE was also depending on national investments in the national telecommunication system, which was not a priority at the time. As it has been discussed in the previous chapter, the 1970s marked a period of crisis for Sweden. The introduction of AXE

³⁹⁹ <http://www.ericssonhistory.com/products/the-switches/AXE--a-ticket-to-the-major-league/> (last see 20151009, author of the article Bengt-Arne Vedin)

⁴⁰⁰ See Mölleryd 1999.

required an extended system adaptation, the transformation from an analogue system to a digital one. At the same time, Ericsson was also facing increasing competition from all over the world. The Swedish telecommunication market had always been too small for Ericsson whose development was from the beginning building on export and international expansion.

Owning the AXE system, Ericsson came to dominate the domestic market but also to expand and develop a competitive advantage on the international market as well. However, it should be mentioned that Ericsson had all along focus on the international market, as they early realized that the Swedish market was too small for the development of a competitive and most of all profitable telephone or radio mobile system. Ericsson's collaboration with different state owned companies (such as the Swedish Telecom) played a significant role in the development of the company and its international extension. The most obvious argument supporting this is that the AXE switch system was developed at Ellemtel. Ericsson was hesitant at the beginning but Swedish Telecom pushed forward the idea.

The development of AXE is a result of the interplay between a territorial system of innovation and a functional systems of innovation, through the collaboration between the Swedish Telecom and Ericsson. Fridlund and Helgesson have been pointing out that the cooperation between Ericsson and the Swedish Telecom "was firmly rooted in the social interaction between the parties. The informal contact networks between the two organizations were particularly significant. The relationship was one of equals, with both parties taking initiative and contributing ideas for new joint projects"⁴⁰¹. The relation between the two companies have been characterized both by cooperation and competition, thereby no user-producer constellation in the conventional sense⁴⁰². Berger and Laestadius proposed the concept of "development pair" as appropriate to describe the relation between Ericsson and the Swedish Telecom, pointing out that "Swedish Telecom was not only a sophisticated user, but also a research organization and a producer of telecom equipment, cultivating a powerful engineering ethos. Several times Televerket took the initiative to advance development efforts rather than defending existing investments or procuring development from external suppliers"⁴⁰³. Despite

⁴⁰¹ <http://www.ericssonhistory.com/company/competition-and-cooperation/Ericsson-and-Televerket-Partners-in-development/> (last seen 20151210)

⁴⁰² Berger, C. and Laestadius, S., *Co-development and composite clusters – the secular strength of Nordic telecommunications*, Industrial and Corporate Change, Volume 12, Number 1, 2003, pp. 91-114.

⁴⁰³ Berger and Laestadius 2003, page 94.

being a state owned organization, Swedish Telecom was never financed through state funds but it financed its own R&D. Hence, telecommunication R&D has in fact never been founded by the state. Swedish Telecom was able to develop by loaning money on its own which implied no dependence on the state. Ericsson was the dominating company in the switching field and it has been expressed that the “history of Swedish business in switches for mobile telecommunications is almost exclusively a history of Ericsson”⁴⁰⁴.

In the 1980s and 1990s a process of liberalisation of the market was initiated, a process that established an enabling institutional framework for Ericsson. As it has been discussed in chapter five, it is often that the literature on the relation between institutions and firms focus on the constraining role of institutions and neglecting their enabling role. Up until 1970, the Swedish telecommunication market was totally controlled by Swedish Telecom. Only in 1971 the first deregulation took place, and the market for mobile telephones was opened up to other suppliers as well, which were now given the possibility to market their products directly to end-users. But Swedish Telecom had to approve the mobile telephones before they could be used. The Swedish Parliament promulgated in 1980 an order to open the telecommunication market, and the monopoly of the Swedish Telecom was limited to equipment to speech communication, exchanging information between people over the public network, and modems for data communication⁴⁰⁵. As with July 1st 1993, the new telecommunication act and the revised act on radio communication were promulgated, and the monopoly of Swedish Telecom was determined. In 1993, the National Post and Telecom Agency was established, which represented the separation of the commercial and operational functions within telecommunications. These are aspects of a territorial based system of innovation that are of crucial importance for a functional based system of innovation such as Ericsson. These deregulations allowed for a phase of expansion of the mobile telephone operations that nurtured the expansion of Ericsson. As Mölleryd argues, these institutional adjustments represent a phase when Sweden “emerges as a mobile telephone country”⁴⁰⁶. Moreover, it is during this period that Sweden becomes the leading country in mobile telephony.

⁴⁰⁴ McKelvey et al 1998, page 29.

⁴⁰⁵ Mölleryd 1999.

⁴⁰⁶ Mölleryd 1999.

Ericsson and its context

The dominant position of Ericsson for the Swedish telecommunication industry makes it one of the key players of the Swedish innovation systems. This has been acknowledged by the presence of Ericsson in the Innovation Council. If it is rather obvious why the prime minister invited Ericsson, the more interesting question perhaps is why is Ericsson interested in the Innovation Council? From a traditional organization theory perspective, the presence of Ericsson in the Innovation Council would be explained as an adaptive response to maintain its position (see chapter five). In the theoretical framework of this thesis, the national environment has been depicted as the most important non-economic context for the multinational firms. Thereby, Ericsson is depicted as embedded in its social and most of all political context. Ericsson's presence in the Innovation Council has at least two explanations⁴⁰⁷; to form an understanding on what the government and other actors think about innovation and how they work with innovation; but also to mediate the company's interests and expectations with the purpose to have an impact on the work of the government. Against these explanations, the perspective that fits to the relation between the firm and its institutional environment is the power perspective focusing on the firm's ability to influence its institutional environment (see chapter five).

The university and the research system are important elements of the non-economic context of Ericsson and the following numbers confirms it: Ericsson has about 24 000 employees working with R&D, out of this about 1000 work with pure research while the rest of 23 000 with product development. The university serves as an indispensable recruiting base for the company and Ericsson has a proactive position and it is early on trying to identify students to carry out research projects in collaboration with Ericsson, KTH is the largest collaborator, but also Chalmers and Lund University. But the relation is mutual, and the two parts are dependent on each other. Ericsson is an important collaborator for the universities in Sweden, and it is not only about Ericsson but about the entire ecosystem around Ericsson⁴⁰⁸. But these collaborations are not without conflicts, as it will be discussed in the next section. Moreover, these requirements for collaboration raise issues of independence at the level of university research, an aspect that affects the relationship.

⁴⁰⁷ Interview Ulf Ewaldsson, 2016.

⁴⁰⁸ Interview Ulf Ewaldsson, 2016.

As a research based company, collaborations in research projects have a high priority for Ericsson. Due to the character of research projects, Ericsson finds it crucial for the state to be the main financier of large research projects and the company participates in a large number of such programmes or projects, both internally but also on an European and international level (Horizon 2020, but also in China and the USA)⁴⁰⁹. Ericsson has a unit that is depicted to only work with applying for projects and financing. This is because Ericsson perspective on the role of the state is that of a risk taker. Long-term research projects are imperative for Ericsson but these kind of projects are time consuming, financial expensive and present a high level of risk. Ericsson is therefore not willing to embark on these kind of projects on its own, and argues that this should be the role of the state - through Vinnova, for instance. But then again, as it has been pinpointed in interviews, the interplay is market by organizational differences, different interests and rationalities. Vinnova is the innovation agency of Sweden and it aims at covering the territory, hence steered by a territorial rationality. Ericsson on the other hand has its specific interests related to the internal activity of the company. From this perspective, Ericsson characterizes the activity of Vinnova as too segmented or fragmented, as focusing too much on applications and less on basic research⁴¹⁰. This can be seen as an indication of a mismatch of how the two actors perceive each other's role. From Ericsson's perspective, the state and agencies such as Vinnova should have an inclusive perspective to research, financially supporting research in its very early stage and being the risk taker of such projects. Observable here is a tension between the territorial and the functional rationalities. This conflict is grounded in how the state is conceptualized from an economic sociology perspective as situated between four types of rationalities; political, legal, scientific and economic rationality. Hence, a mismatch occurs not only between the two types of rationalities or systems of innovations or actors, but the state as actor is characterized by on-going internal conflicts that become noticeable in these kinds of interplays. Moreover, when analysing the Swedish National Innovation Strategy in the previous chapter, the idea of policy continuity is contested, the orientation of the innovation policy changing with shifts in the government. The lack of continuity is also emphasised by Ulf Ewaldsson, in terms of policy, Vinnova programmes and even in terms of university profiles which appear to be rather opportunistic. This segmentation and lack of continuity is to be linked to one of theoretical fundamentals of the systems of innovation perspective,

⁴⁰⁹ Interview Ulf Ewaldsson, 2016.

⁴¹⁰ Interview Ulf Ewaldsson, 2016.

the learning process. Vinnova's and the universities' pragmatism and segmentation are hindering learning at the system level, as knowledge accumulation and systemic adaptation to what has been learned are not given a chance as new ways of working and new profiles and new orientations are constantly adopted.

Despite the presence of Ericsson, Sweden has in fact no pure telecommunication educational programme, something that Ericsson has tried to influence but yet without success⁴¹¹. Ericsson is interested in having closer collaborations with the larger universities like KTH, Chalmers and Lund, more intense and extensive collaborations than they have today, both in terms of research and education. But due to bureaucratic reasons and the university's quest for autonomy, closer collaborations are difficult to develop. For instance, one bureaucratic aspect that poses difficulties to the collaboration is the professor privilege principle. According to this principle, academics at Swedish universities automatically own the right to inventions they produce. Inventions of a university researcher are exempt from the individual property rights law. Another reason is also that the research projects carried out by universities lack a level of concreteness that Ericsson is after, but this is a problem at the European level, where USA is much better.

There are two pictures of how companies work with innovation, which is of relevance for policy making and politicians to understand. And to understand this it requires close cooperation and interactions between politicians and industry/firms, but also the ability to understand each other.

7.2.2 Understanding innovation from a firm perspective

In the following, an attempt will be made to understand the innovation thinking and innovation practice of Ericsson. The usage of the word 'attempt' is intentionally used. To understand the innovation thinking and practice of Ericsson is a highly complex task. To deal with this complexity I will focus on those aspects that are relevant from the perspective of Ericsson as an actor in the Swedish system of innovation. Hence, I will be interested in those aspects that are related to and of relevance for policy making and the university system. I will address how Ericsson's innovation work is organized. The aim is to understand how Ericsson understands innovation,

⁴¹¹ Interview Ulf Ewaldsson, 2016.

how it organizes it, and how it relates to other actors in the system, especially the university.

The analysis will follow two tracks which are coexisting but serve different purposes, as I will discuss it. Academia and policy making tends to increasingly discuss innovation as process. But if we consider the firm, innovation is product and measured in patents as Ericsson is doing. However, Ericsson is adapting to its environment and adapts its profile accordingly. For example, services have become a very important part of Ericsson which is mirrored in their strategy for a Network Society. External factors require the company to make understandable their innovation process.

Applying the system of innovation perspective, the Idea collaborative management and IdeaBoxes fit rather well with the ideas of interactive learning and collaboration. But, there is another side of Ericsson as well that is much stronger and dominates the company. Innovation is in the end patents and incentives to take patent are a much more powerful and effective tool than the IT tool IdeaBoxes. The two “stories” are not excluding each other, but are rather emphasising the complexity of innovation. The two stories are also placed at two opposing poles which is in a nutshell the conflict of understanding innovation from a policy making and even academia perspective, and from the perspective of business. Ericsson is one of the most innovative company with one of the largest patent portfolio. For example, a Vinnova report describes Ericsson as an “innovation generator in the Stockholm region”⁴¹².

Ericsson’s work with innovation is based on a structure that supports innovation, which was also emphasised when Ericsson established the Ericsson Business Incubator AB with the aim to develop ideas from entrepreneurs inside Ericsson to commercial success⁴¹³. In the opening announcement of the company’s website, Jöran Hoff, the president of the EBI at the time made the following statement “Ericsson is one of the most innovative companies in the world and one of the reasons for our success is that we put in place structures to support innovation. This new company is the right model for today’s business environment”⁴¹⁴. The EBI has been shut

⁴¹² Förhandsutgåva av en kommande Vinnova-publikation, *Ericsson som innovationsgenerator i Stockholms region*, November 2002.

⁴¹³ <http://news.cision.com/ericsson/r/ericsson-launches-new-incubator-company,c24932> (last seen 20151010)

⁴¹⁴ <http://news.cision.com/ericsson/r/ericsson-launches-new-incubator-company,c24932> (last seen 20151010)

down but the statement is still representative for how Ericsson is working with innovation, a belief in a structure that supports innovation. The structure is steered by the business environment. Hence, the two descriptions put forward here are to be considered in connection to their environment.

The collaborative idea management concept is defined as a “structured process for the collaboration, handling, selection and distribution of ideas. It may include support for gathering, storing, improving, evaluating and prioritizing ideas by providing methods and tools, such as templates and guidelines”⁴¹⁵. The collaborative idea management is a method that works across larger groups of people and it is theoretically anchored in the literature that deals with creativity and knowledge of the collective and is integrative part of the entire innovation process. The collaborative idea management acknowledges that innovation is not something that just happens or that is emerging from a single source of insights. But innovation is a collaborative process and active management is required. Idea generation, the collection of new ideas and the channelling of these ideas to the right place is a process that requires a more careful consideration. All types of ideas are considered, both from internal and external sources, but focus is placed on encouraging and engaging the own employees. Nevertheless, the method builds on the belief that the organization has a fertile ground that it is embedded in an ecosystem and can “play the game”.

In 2008 the IdeaBoxes was implemented, which is the IT tool for the idea collaborative management. The intention was to replace or to easily be integrated with other ongoing collaboration tools using the same IT platform. The platform is meant to be used by all employees, on a global level. As by 2013, there were about 35 000 ideas in the system, 70 000 comments, about 450 “idea boxes” each reflecting a specific innovation needed, and about one out of every 30 ideas was marked as implemented⁴¹⁶. Applying the systems of innovation perspective, the IdeaBox is closely corresponding to the idea of interactive learning. It is a tool to strengthen the relations in the system. The principles of the collaborative idea management and IdeaBox are also sharing the same inclusive philosophy of the Swedish National Innovation Strategy. The IdeaBox emerged from the idea that innovation is at its best on a global scale. Ericsson was not lacking tools and platforms for fostering ideas from

⁴¹⁵ Karlsson, M.P., *Collaborative Idea Management – Using the creativity of crowds to drive innovation*, Applied Innovation Management, Innovation Management, No. 1, 2010, page 8.

⁴¹⁶ Björk, J., Karlsson, M.P., Magnusson, M., *Turning ideas into innovation – introducing demand-driven collaborative ideation*, International Journal of Innovation and Regional Development, Vol. 5, Issue 4-5, 2014.

the employees, but those tools were ‘local’. IdeaBox represented a method to connect all Ericsson’s employees but also external stakeholders on a global level. Several borders were erased with the IdeaBox; geographical borders, discipline borders, borders between the internal and the external. The focus is on *ideas*, on encouraging ideas, ideas that are of value for Ericsson nevertheless.

One could compare the Swedish Innovation Strategy with Ericsson’s collaborative idea management. There are several similarities between the two; both bring forward the role of the individual, the role of ideas and how the *system* should be one that fosters ideas, how innovation is based on learning and interaction. But by applying the actor perspective and by understanding systems of innovation as territorial and functional based, these similarities are mostly linguistic and not factual. Ericsson understands ideas in term of patents, which gives a totally different connotations to ideas. Ideas for Ericsson are only those that bring value to the company, and this value is measured in patents and financially. Interaction is in the form of a project carried out by a team of employees which’s outcome is a patent. If for the Swedish Innovation Strategy interaction is a goal in itself, for Ericsson interaction is only a means (one of many others) to produce patents.

Ericsson is a company with a rather long history in an industry characterized by fast technical changes and market dynamics. The company has traditionally been characterized as a company heavily dominated by engineers, with an engineering way of thinking and acting. And over the years it has employed some of Sweden’s most prominent engineers within radio and telecommunications and it made a reputations in being Sweden’s prominent patent taker, having Sweden’s largest patent portfolios and one of largest in Europe. Patent is a key word for Ericsson and it still is what defines innovation for Ericsson⁴¹⁷. How easy is to take a patent – this is the key factor for innovation and trigger innovation. Patent incentives are a key tool to trigger employees. The company has a payment scheme to reward employees for each patent they take and according to the importance of the payment.

In conclusion, a functional rationality informs both types of thinking. Research and development is defining Ericsson and it is materialized in patent taking. Furthermore, from this perspective, the elements of the ecosystems related to R&D are crucial for Ericsson and collaboration with the university, participation in state-financed projects are important for the company and drives them even in terms of location. On the other hand, in the

⁴¹⁷ See interviews with Sven Matisson, 2011 and Ulf Ewaldsson, 2016.

last years the company turned increasingly towards providing services and building a network society, which also implies closeness to customers. Therefore, a more understandable way of presenting their activity was required and the practice of IdeaBox and collaboration idea management are included in this trend.

7.2.3 Innovation Strategy

Ericsson formulated a vision for a Network Society as follows: “We are on the brink of an extraordinary revolution that will change our world forever. In this new world everyone, everything and everywhere will be connected in real time. We call this the Networked Society, and it will fundamentally change the way we innovate, collaborate, produce, govern and sustain. When people are connected, their life changes. With everything connected our world changes.”⁴¹⁸ The vision builds upon a sense of urgency, the world will be revolutionized forever. One of the leading authors on leadership and management, John P. Kotter, acknowledged that if a change is to be made than a sense of urgency will trigger this change⁴¹⁹. This sense of urgency will convince people that a change is needed and will put them into action. The Swedish Innovation Strategy follows the same principles, taking about the challenges Sweden has to tackle for maintaining its leading position. The Network Society vision is an overarching vision which might be seen as territorial-based, with the world as its territorial base, in the same way as Sweden is the base of the Swedish Innovation Strategy.

In the Annual Report from 2012, the vision that is formulated moves to a slightly level of concreteness. “The Company’s vision is to be the prime driver in an all-communicating world. Ericsson envisions a continued evolution, from having connected 6 billion people to connecting 50 billion ‘things’. The Company envisions that anything that can benefit from being connected will be connected, mainly via mobile broadband in the network society that is beginning to come to life”⁴²⁰. And under the vision, the company’s strategy is formulated as follows; “The Company’s strategy builds on a long-term vision and mission which is translated into a business strategy that should generate value for the company’s key stakeholders; customers, employees and shareholders. Four pillars form the foundation for

⁴¹⁸ <http://www.ericsson.com/networkedsociety> (last seen 20121121)

⁴¹⁹ Kotter, J.P. & Cohen, D.S., *The heart of change: real-life stories of how people change their organizations*, Harvard Business School Press, Boston, Mass., 2002.

⁴²⁰ Ericsson, *Bringing the Network Society to Life*, Annual Report 2012.

our business strategy: Excel in Networks, Expand in Services, Extend in Support Solutions and Establish leading position in enablers of the network society”⁴²¹. The vision of the Network Society is informed by the social context of the firm. The profile of Ericsson has changed towards a service provider. The corporate strategy and vision are in this thesis addressed through a perspective inspired by economic sociology, hence strategies and visions are analysed as socially constructed. The role of the environment is emphasised and therefore a territorial rationality informs the functional one.

7.2.4. Discussion

One of the reoccurring themes is the access to a well-educated labour force. This was one of the reasons why Ericsson and Swedish Telecom entered into collaboration and formed Ellementel, this is why Ericsson and Lund University established Mobile Heights, and this is also one of the reasons (even of indirect) why Ericsson keeps a close relation to the Swedish government. Ericsson is an intense research based company in need of well-educated engineers within rather specialized disciplines. Hence, they are dependent upon a labour market that can provide them with a relevant labour pool. For this to be possible, Ericsson is directly interested that the universities educate and conduct research that is of relevance for Ericsson. And Ericsson has been adopting an active position in this respect, for example by early on recruiting students to conduct their thesis under themes of relevance for the company and in close collaboration with departments at Ericsson.

The analysis of Ericsson as an actor in the Swedish system of innovation emphasis several conflicts that characterizes this relationship. One of the main causes of conflicts is the mismatch in expectations. Ericsson considers that the role of the state should be that of a risk taker. Even regarding the role of the university and research system there are mismatches in expectations which are connected to the institutional framework of the university system. The financial scheme and the Third Mission require the universities to establish close collaborations with the industry; while the university is also institutionally required to be independent. In the next chapter this conflict will be further developed.

⁴²¹ Ericsson Annual Report 2012.

7.3 The interplay of the territorial and functional systems of innovation. The case of Mobile Heights

As it has been discussed in the theoretical section (see chapter five) multinationals are viewed as social systems, influenced by and influencing their environment, interested in their environment. According to this perspective, location is an important factor, in the sense that actors and their activity are embedded in a network of relations and an institutional arrangement that have a territorial logic. This is the starting point of this chapter. Yet, as Coe and Bunnell were arguing, the innovation activity should be understood beyond the context of particular spatial scales, arguing that the focus of the analysis should be on network linkages and social relations between various actors that are embedded in particular places. So, the analysis here is emphasising the role of location, but not merely as a geographical unit. Following Bathelt and Glückler, territoriality is conceptualized as perspective, where territory is used to ask “particular questions about economic phenomena but space is not our primary object of knowledge”⁴²². The interesting aspect is what makes location important; what makes location important for a multinational firm. More concrete, why is Ericsson choosing to be located in Lund and moreover, why is Ericsson choosing to be a member of a local system of innovation such as Mobile Heights?

The suggestion made in this thesis is to analyse a system of innovation as the interplay between a territorial-based and a functional-based system of innovation. The case of Mobile Heights will be used to illustrate this interplay. The analysis is driven but also delimited by the following questions/research interests: the background of Mobile Heights and the creation of a system of innovation; how Mobile Heights is functioning; Ericsson’s role and presence in the system. The Mobile Heights is used here as an exemplification of the interplay between a territorial-based and a functional-based system of innovation. This interplay has been already touched upon in the previous section (i.e. standardization). With the Mobile Heights case this interplay is further elaborated. This case allows to further elaborating upon the system-network-ecosystem discussion. The focus is on the interplay and the roles different actors and their interests play within a system of innovation. By being theoretically anchored in the concept of

⁴²² Bathelt, H. and Glückler, J., *Toward a relational economic geography*, Journal of Economic Geography (3), 2003, pp. 117-144, page 124.

interest, the analysis will necessarily focus on conflict of interests as well. More specifically, Mobile Heights is a concrete case of how the local conditions trigger a certain behaviour of a firm, and how the behaviour of the firm triggers a certain behaviour of the local regional government. The triggered behaviours are nevertheless anchored in specific interests that not always have a territorial logic, but have territorial repercussions. Furthermore, functional rationalities can for legitimacy reasons be formulated as territorial. In the spirit of Swedberg's economic sociology of interests, I combine the analysis of economic and political interests with an analysis of social relations. The analysis of Mobile Heights is also a way to highlight a new perspective upon the system of innovation perspective; the ecosystem perspective.

7.3.1 The beginnings

Two factors are pinpointed as the main driving forces behind the establishment of Mobile Heights⁴²³. A factor was that Lund Technical University (LTH) was experiencing a critical declining number of students. This was a problematic situation for Ericsson Mobile Platform⁴²⁴ in Lund (EMP) as well, which was facing poor labour pool of recruiting engineers with relevant skills. Furthermore, there was an idea that despite a flourishing activity in the region there was little awareness about it outside the regional borders. To be more concrete, EMP in Lund was considering that the headquarters in Stockholm were not really aware of the ICT cluster flourishing in the southern Sweden.

These specific reasons were corroborated by some more general and global factors that were affecting companies and stakeholders in southern Sweden. It was not only EMP but also other companies that were facing difficulties in finding relevant competence in the region. LTH was experiencing significantly decreasing governmental funding for research in areas relevant to mobile communication. And so, EMP and LTH in the first instance,

⁴²³ Interviews with Marianne Larsson 2011, Björn Ekelund 2011, Sven Mattisson 2011.

⁴²⁴ Ericsson Mobile Platforms was established in September 2001 and is based on the R&D group that developed the core technology for Ericsson's mobile phones throughout the 1990s. Since 2005 EMP became a Business Unit within Ericsson and its main headquarters are in Lund, Sweden. EMP's mission is to "help customers sell more phones", that is it provides mobile terminal technology to customers who want to develop and produce mobile phones for the GPRS, EDGE and WCDMA standards. (The EMP story by Michael Kornby, http://www.ericsson.com/ericsson/corpinfo/publications/review/2005_01/files/2005013.pdf, (last seen 20151010).

decided to contact the regional government and ask for support in dealing with these challenges. Lars Tilly, the research director at EMP, played a key role in contacting the regional government, Region Skåne. Several meetings took place between EMP, Region Skåne and Vinnova which led to the establishment of the Mobile Heights cluster initiative. Mobile Heights was established as a non-profit association bringing together companies, industry associations, academic institutions, and public organizations. The founding members are Ericsson Mobile Platforms, Sony Ericsson, Lund Technical University and Region Skåne. The four founding members have permanent seats on the board. Additional board members include TeliaSonera and Malmö University. The initiative of Mobile Heights was grounded in a functional rationality that had territorial consequences as well.

At the time, the vision was to establish Mobile Heights as the core of research, innovation and entrepreneurship in mobile communications, leveraging the entire value chain of mobile communication - hardware, software and services. It is expressed that the role of Mobile Heights is to boost the mobile ecosystem⁴²⁵. Hence, Mobile Heights looks upon the region as an ecosystem, a view expressed also in the interview with Björn Ekelund. What brings the ecosystem perspective different into discussion? The Economist, in an article from 1997⁴²⁶, writes the following: “Do not regard Silicon Valley as some sort of economic machine, where various raw material are poured in at one end and firms such as Apple and Cisco roll out the other, but rather as a form of ecosystem that breeds companies, without the right soil and the right climate, nothing will grow.” The idea of ecosystems is used in terms of companies co-existing in the same milieu, taking advantage of each other⁴²⁷. Ecosystems are not subject to organization or structuring, but are self-organizing systems which define the rules of the game.

The analysis of Mobile Heights will consider the actors of the system/network and the interplay between these actors. Three main categories of actors are considered that follow the triple helix principle; the industry - the universities - the public authorities. Thus, the taxonomy introduced by the theoretical framework is further specified in this empirical analysis for increasing the precision. More specific, the focus of this analysis will be on Ericsson (economic actor), LTH and Region Skåne (non-economic

⁴²⁵ <http://mobileheights.org/> (last seen 20151009)

⁴²⁶ The Economist 27 March 1997.

⁴²⁷ Interview Björn Ekelund, 2011

actor). To this I will add a fourth player, the organization Mobile Heights⁴²⁸. The first three players are members of Mobile Heights, however Mobile Heights should not be addressed as the sum of the different members, but it is also an organization, a separated organization with its own agenda. However, it is rather difficult to only depict the interplay between two or three actors. The Mobile Heights represents rather a multilateral cooperation between many different actors. Nevertheless, this is an academic exercise and a delineation of some relations. As a way of structuring the analysis, the relations that will be primarily depicted are those between the EMP, the university and the regional government. Nevertheless, to take into account the ecosystem perspective, the interplay with other stakeholders or companies will also be considered.

To further spin on the idea of ecosystem, Mobile Heights has also established the Mobile Heights Centre, which is basically a physical place or a workplace. It is described as “venue specifically designed for innovative activities specific needs”⁴²⁹. It is a physical translation of the importance of collaboration and cooperation for innovation. It is also take advantage of the physical proximity to some of the major players in the field, which are also members of Mobile Heights.

7.3.2 Standing on the shoulders of giants – the local embeddedness

Mobile Heights is built upon already existing contacts and networks which existence and functioning are independent of the existence of Mobile Heights.

Ericsson has a long tradition of collaboration with the university. It has always been in need of highly skilled and specialized labour force as well as access to top-quality research. One of the main criteria Ericsson has when choosing a location is proximity to university and possibilities of research collaborations. The importance of this proximity⁴³⁰ is also clearly emphasised by Sven Mattisson⁴³¹. He considers the proximity to LTH as the main presence of EMP in Lund. He is even saying that if the university would be to move from Lund or that the research at LTH would not be of relevance

⁴²⁸ This is based on the interview with university researcher, Lund University, 2015

⁴²⁹ <http://mobileheights.org/mobile-heights-center/> (last seen 20151020)

⁴³⁰ In this local context. Remember also that Magnus Karlsson also pinpointed the close collaboration Ericsson in Kista has with KTH.

⁴³¹ Interview with Sven Matisson, 2011.

longer, than EMP would most likely move from Lund⁴³². A historical account of the presence of Ericsson in Lund reveals in fact the importance of personal relations and how elements of embeddedness are decisive in anchoring a new establishment in its context. The venture in Lund was established in the 1980s and the decision met resistance from Stockholm. SRA was in the late 1970s in need for new unit for mobile telephones and it created the Ericsson Mobile Telephony Laboratory in Lund. Two members of SRA worked hard for getting Ericsson to Lund: Thure Gabriel Gyllenkrok, owner of Björnstor Manor, and Nils Hörjel, governor of the county of Malmöhus⁴³³. At the same time, negotiations were carried out for the establishment of Ideon⁴³⁴, a science park in Lund. Gyllenkrok and Hörjel were determined to get Ericsson as their first tenant. The headquarters in Stockholm were at first not eager or not interesting to establish a venture in Lund⁴³⁵. The reason might be that the plant in Lund would focus on mobile telephony, at the time not the core activity of Ericsson. But they accepted (or maybe therefore they accepted). However, an immediate challenge was to get qualified people to come and work in Lund. If the plant in Lund was ever to gain legitimacy and be considered relevant to Ericsson, it needed to attract qualified and talented engineers. A re-location to Lund was not popular among Ericsson employees⁴³⁶. The turning point was the employment of Nils Rydbeck, an engineer with a PhD from Lund University and a local. Collaboration with LTH was established from the very beginning.

This shows that people are not so easy to be moved and can function as an argument to the discussions around the movement of companies. Yes, companies can move, but companies are people and people are less easy to move. People are embedded on several levels and a movement implies disembeddedness at all levels. The establishment of Ericsson in Lund is a good example for how the new unit needed to be connected to a local dimension to gain legitimacy and commitment. A territorial rationality was

⁴³² Interview with Sven Matisson, 2011.

⁴³³ <http://www.ericssonhistory.com/changing-the-world/World-leadership/Venture-in-Lund/> (last seen 20160428)

⁴³⁴ <http://www.ericssonhistory.com/changing-the-world/World-leadership/Venture-in-Lund/> (last seen 20160428).

⁴³⁵ This is interesting if we consider one of the reasons why Mobile Heights was initiated, to make the headquarters in Stockholm aware or interested of the activity in Lund.

⁴³⁶ <http://www.ericssonhistory.com/changing-the-world/World-leadership/Complications/> (last seen 20151010, author of the article Svenolof Karlsson & Anders Lugn)

the determinant factor for Ericsson to make the decision of locating in Lund, a territorial rationality that was at first rejected by the functional rationality.

7.3.3 Mobile Heights Business Centre

In April 2009 the Mobile Height Business Centre was initiated by Marianne Larsson, Business Advisor at Teknopol AB. The MHBC is operated by Teknopol. It all started with an idea from Marianne Larsson and Lars Tilly. Marianne Larson managed to convince Ericsson and TeliaSonera to open up their patent bank and made it available for licensing. The idea was that local entrepreneurs pick up a patent and receive support and assistance from business advisers. Mobile Heights has a strong territorial logic. One of the main conditions is that the entrepreneurs establish their businesses in the region. This territoriality is not required only by Region Skåne, but also by the member companies who are keen in establishing a flourishing local ecosystem. Hence, a way of organizing the territorial system of innovation to match the needs of the functional one. But this also shows how the two rationalities complement each other. Moreover, the practice of “power hour” was implemented, where the entrepreneurs were given the opportunity to meet the industry; EMP, Sony Ericsson (today Sony Mobile), TeliaSonera and others are present. Nevertheless, the idea of using patents from the industry⁴³⁷ sounds much better in theory than in practice. The reality showed how difficult it was to develop a new business on other’s ideas⁴³⁸. There was only one company that came out from this, Qubulus.

At the “power hour” (which takes place every Friday), the entrepreneurs have the opportunity to present their ideas and receive feedback. These meetings are highly dependent on the commitment of the participants⁴³⁹, especially of those delivering the feedback. This is rather dependent on the matching between the idea presented and the profile of those giving the feedback. From this perspective, the presence of Ericsson in the MHBC is interesting for several reasons. Ericsson is a permanent member of the “power hour” and the kind of help it provides to the entrepreneurs varies from case to case. Most often, materialized as feedback on the viability of the idea but also by putting entrepreneurs in contact with relevant actors from their network. The hitherto outcomes of Ericsson’s presence in MHBC are considered as rather minor by

⁴³⁷ Even Sony Mobile Communication had opened up for its employees to use ideas/patents in relation to the closing down of a large part of Sony.

⁴³⁸ Interview with Marianne Larsson, 2011

⁴³⁹ Interview with Marianne Larsson, 2011.

Ericsson, with scarce opportunities for new business to be created⁴⁴⁰. This could be explained by the fact that the Ericsson is represented by Ericsson Research, which is, as the name suggests, focused on research and very little on production.

The company is known for their strict patent policy and strict policy restricting employees to make use of ideas outside Ericsson. All ideas emerged at Ericsson belong to Ericsson. The company has very clear stipulated rules regarding spin-offs⁴⁴¹. Nevertheless, the company did let go to a number of patents. But, as Marianne Larsson of MHBC/Teknopol mentioned⁴⁴², it is difficult to make a business out of solely a patent.

From 1st of January 2015, MHBC is part of Innovator Skåne AB. Innovator Skåne AB brings together three organizations (Teknopol, Clin Trials and Innovator Skåne) and seven trademarks (Mobile Heights Business Center, Cleantech Inn Sweden, Teknopol Startup Inn, Nordic Connected Health Star Track, Teknopol, Clin Trials and Innovator Skåne). Innovator Skåne is driven under the auspices of Region Skåne and focuses on Region Skåne's employees.

7.3.4 Mobile Heights and Academia-Industry collaboration

In relation to the overall vision, three research centres were affiliated to Mobile Heights. The research centres are run as Industrial Excellence Centres (IXC) and follow Vinnova's outline for research and innovative milieus. The existence of these centres is a territorial manifestation of the innovation policy implemented through Vinnova. The three research centres are: System Design on Silicon (SoS), Embedded Applications Software Engineering (EASE) and Network for Mobile Services and Applications (NMSA). In 2012, the Mobile and Pervasive Computing Institute (MAPCI) was established, with a dual character; scientific research and industrial innovation. MAPCI was designed to include $\frac{2}{3}$ research, $\frac{1}{3}$ innovation, and the project is owned by Lund University. It has no legal bound to Mobile Heights, but only to Lund University.

However, the three research centres are not the direct product of Mobile Heights. These centres are rather separated entities that emerged parallel to

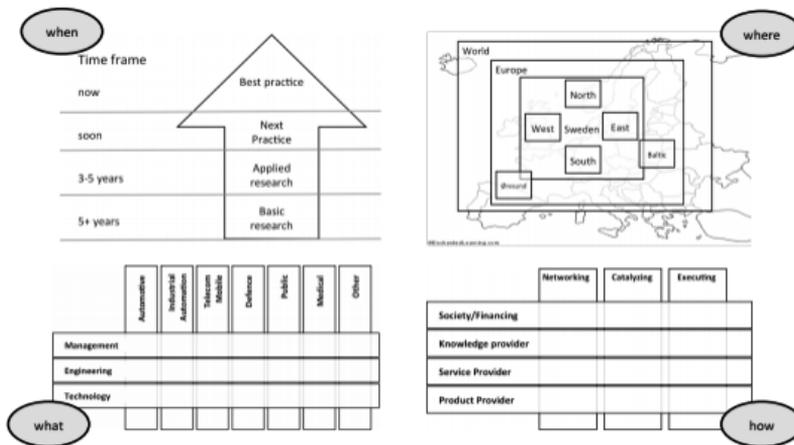
⁴⁴⁰ Interview with Sven Mattisson, 2011.

⁴⁴¹ Interview Martin Wallin, 2012. The same was emphasised by Åsgård and Ellgren in their book on the history of Ericsson published in 2000.

⁴⁴² Interview with Marianne Larsson, 2011.

Mobile Heights⁴⁴³. Legally, these centres are linked to Lund University, the only link with Mobile Heights were only information reporting. Moreover, at the beginning, the leaders of those centres were participating in the board meetings, but this ceased after a while. The advertisement of the three research projects under the Mobile Heights label has been criticised⁴⁴⁴.

Figure 2: The architecture of Industry-academia collaboration



Source: Per Runeson and Sten Minör, 2014

The constellation Mobile Heights - the research centres touches upon important cultural but also institutional and structural differences. These differences shape the way the different actors behave when collaborating and how they look upon the collaboration (in term of how, why, what, when). The three research centres and the MAPCI institute stand for the academia-industry collaboration and roles the different actors have. This question is obviously larger than Mobile Heights. But with the starting point in the Industrial Excellence Centre EASE, Per Runeson and Sten Minör developed a model (see figure 2) to address the ‘architecture’ of industry-academia collaboration⁴⁴⁵.

⁴⁴³ Interview with university researcher Lund University, 2015.

⁴⁴⁴ Interview with university researcher Lund University, 2015.

⁴⁴⁵ The model is inspired by Kruchten’s software architecture model, see Runeson, P. and Minör, S., *The 4+1 View Model of Industry-Academia Collaboration*, WISE ’14 Proceedings of the 2014 international workshop on Long-term industrial collaboration on software engineering, pp. 21.24, ACM New York, 2014.

The model is constructed upon four views of a) time, b) space, c) activity and d) domain, corresponding the questions when, where, how and what. In this model, the *how* question refers to the forms the activities undertaken in industry-academia collaboration. And the model identifies three forms; networking, catalysing, executing. The network is to be elaborated by connecting it to the configuration proposed by Coe and Bunnell⁴⁴⁶. Hence, actors have connections in the region but also interregional and transnational. The model also identifies four principal types of actors that which are involved in industry-academia collaboration: financing, knowledge provider, service provider, and product provider. Mobile Heights defines itself as a network organization, yet a hierarchical organization as well. By acknowledging that activities in industry-academia collaboration may take different forms and what types of actors are involved and what roles these actors have it provides a tool for analysing “complex contexts of various stakeholders, time perspectives, and goals”⁴⁴⁷. The model is a tool for in a systematic way address the roles of the actors involved in a collaboration, i.e. industry-academia collaboration. The Mobile Heights as organization incorporates all four types of players, and all three types of activities. But the question is what kind of activity is Mobile Heights standing for? It is quite obvious that the executing type of activity is from the beginning out of discussion. Is Mobile Heights driving a networking or a catalysing type of activity? It is not possible to place an organization within only a box⁴⁴⁸ but it is also rather important to specify which the core activity is. But what is at least as important is that Mobile Heights needs to be well aware of what is the core activity of their members, and their needs. Otherwise projects can be established which are not clearly linked to the core activity of the members. The Catalysing role can also be interpreted as an intermediary role.

Organizations such as the Mobile Heights are built on already existing networks and projects. There is a network that it is established around a number of key actors, who are the driving force of the network Mobile Heights has been established upon an already available network. These key actors and their networks are embedded within a social structure that has developed over time, and the relations of the key actors with the actors (nodes) in the networks can be conceived as ongoing interpersonal networks⁴⁴⁹. Ericsson is member in four research projects which are EMP’s

⁴⁴⁶ Coe and Bunnell 2003, see chapter five.

⁴⁴⁷ Runeson and Minör 2014, page 1.

⁴⁴⁸ Interview university researcher Lund University, 2015.

⁴⁴⁹ Cf. Granovetter 1985.

main interest in Mobile Heights. From a quantitative point of view, the interplay Ericsson, LTH, BTH is rather rich with many projects and collaboration taking place over time.

Nevertheless, the collaboration is not without frictions. These frictions are mainly rooted in the different cultures and institutions the actors belong to. For structural and bureaucratic reasons it is difficult to combine research and innovation at the university level⁴⁵⁰. It is positive to combine research and innovation, but as an institute not coupled to the university. What happens when a business minded actor meets the academia⁴⁵¹? They have rather different conceptions of a research project. Often university research projects are lengthy in time and rather theoretically orientated, while Ericsson works with projects with a shorter time span and with a concrete outcome⁴⁵². The collaboration materializes in projects and people⁴⁵³. In Karlskrona, for example, there is an intense collaboration in terms of student internships, thesis writing, and industrial PhD students⁴⁵⁴. If today the collaboration between Ericsson and the university (in our specific case, with LTH and BTH) is mutually originated and beneficial, the history provides us with another side of the coin as well. For example, Arnold et al⁴⁵⁵ wrote that “From Ericsson’s perspective, a key to making use of the research community’s interest in technology relevant to mobile telephony was to be asking the community questions based on its own internal development”⁴⁵⁶. And, they also mention that “Ericsson was traditionally a company that focused on practical engineering and skipped the intellectual stuff”⁴⁵⁷. Furthermore, “The universities were both enablers of Ericsson’s success through their research and education activities and also beneficiaries of it – not only through research and teaching to meet the growing needs of the mobile telephony industry but also because there is positive feedback from

⁴⁵⁰ Interview university researcher, 2015 and with Ulf Ewaldsson, 2016.

⁴⁵¹ Of course, in the interviews carried with Sven Mattisson and Martin Wallin this was considered from Ericsson’s perspective. Another perspective to this was expressed in an interview with Susana Bill, 2011, which took up the engineering orientated view of Ericsson (and Sony Ericsson) as sometimes a hinder.

⁴⁵² Interview with Martin Wallin, 2012. Similar views were expressed also in interviews with Sven Mattisson, 2011, and Magnus Karlsson, 2012.

⁴⁵³ Interview with Sven Mattisson, 2011.

⁴⁵⁴ Interview with Martin Wallin, 2012.

⁴⁵⁵ See also interview with Susana Bill, 2011.

⁴⁵⁶ Arnold, E., Good, B., Segerpalm, H., *Historien om GSM - Effekter av forskning i svensk mobiltelefonutveckling – Sammanfattning*, Vinnova Analys VA 2008: 07, page 101-102.

⁴⁵⁷ Arnold et al 2008, page 97.

Ericsson in particular in the form of funding, collaborative projects and a continuing flow of information about engineering problems⁷⁴⁵⁸.

The industry-academia cooperation is challenged by institutional arrangements of the intellectual property rights. Sweden applies the so-called “professor’s privilege”, which is perceived as a problematic institutional arrangement both by the academia and the industry⁴⁵⁹. Companies such as Ericsson and Sony Mobile measure their performance in terms of patents, while the university researchers are focusing on publications and on making the results of their research public. The logic of the academia is “publish or perish”. The logic of the patent is secrecy and securing that the competitors are not having access to information until patent is not secured. For the academia the intellectual property rights legislation is a rather complicated system of which they have rather limited experience, knowledge and resources (financial and time resources), especially if compared to the industry⁴⁶⁰. Generally there is a rather weak IPR holding and management arrangements at the university level. In fact, the weaknesses of the “professor’s privilege” system are also pinpointed by the OECD in their review of Swedish innovation policy 2012.

These cultural differences make their presence noticed also in the contact between the academia and Mobile Heights. Academia works rather different when they initiate a project; future partners are to be found in the already existing networks, and from this perspective the networking function of Mobile Heights as it looks today is rather redundant⁴⁶¹. This raises questions regarding the networking function of Mobile Heights and what role should the organization appropriate, to provide contacts with financiers and other companies, or rather to function as a platform for actors to meet and establish contacts and collaborations.

⁴⁵⁸ Arnold et al 2008, page 9.

⁴⁵⁹ Interview with Sven Mattisson, 2011 and interview with university researcher, 2015.

⁴⁶⁰ Interview with university researcher, 2015.

⁴⁶¹ Interview university researcher, 2015.

7.4 Final remarks

The aim of this chapter was to address the Swedish system of innovation in terms of a territorial based rationality and a functional based rationality informed by an actor perspective. Three main conclusions can be drawn from the empirical backdrop.

The policy level, as expressed in the innovation strategy, but also more generally in the articulation with Vinnova and with industrial stakeholders. This level is shaped by the aim to embed innovation in a broader discourse with societal relevance (employment, entrepreneurship, gender etc.) but with limited specific commitments or long-term specific plans. Instead, broad goals are outlined as well as an outline of the administrative system. The Swedish Innovation Strategy and even the newly established Innovation Council have no specific goals or implementation tools of the innovation policy. Commitment and time-span are determined by the time the specific government has at power. It has been pinpointed that change of government implies also obliteration of documentation. This is an important aspect of disruptive politics where the systemic nature of the systems of innovation perspective template is not reflected in how policies are shaped or developed.

The administrative level. This level functions primarily as an intermediary level which acts often reactively in relation to political steering signals and to perceived needs and interests among its various stakeholder. Thus, creating a certain degree of pragmatism. This is the case of Vinnova, for example, whose one of the main activity is to produce reports and evaluations commissioned by the government. Furthermore, Vinnova is also the direct organ of the state for the implementation of the innovation policy. The mentioned disruptive policy to characterize the policy level has direct repercussions on the administrative level. The activity of Vinnova is orientated by state directives and the areas pinpointed by the state. The activity of Vinnova is considered by stakeholders such as Ericsson to be lacking continuity and orientation. But the activity of Vinnova is governed by rationalities of the policy level. It is therefore sometimes opportunistic and in its search for legitimacy the aim of embedding innovation in a broader discourse with societal relevance dominates over continuity and specific goals; again not in alignment with the systemic expectation of the systems of innovation literature.

The practice level, consisting of universities and (as in the case of this dissertation) industry, which develop their specific networks and practices

primarily to compete in markets and through technological enhancement, and which therefore tend to see politics as a rather vague and administration as overly flexible and non-committed. This is the case of Ericsson – several conflicts of interests characterize the relation between Ericsson and the university and between Ericsson and the national and/or regional governments. These conflicts are anchored in an incongruity of expectations.

The conclusion that can be drawn from these three analytical conclusions, in combination, is that what innovation policy comprises in terms of policy makers, policy implementers and practitioners, is a fairly loose system where different interests, networks and practices can only be partially and temporarily aligned. Hence, innovation policy cannot be seen and done in a highly integrated and rational way, at least judging from the Swedish case, but rather by piecemeal interactions between the different levels.

PART IV

Final conclusions

This chapter is set to conclude the dissertation by returning to the aim that motivates it and the related research questions. The aim of the dissertation has been to advance and contribute theoretically to the system of innovation perspective by adopting an actor-based perspective. This aim has been addressed by answering to three questions: 1. What are the theoretical underpinnings of the system of innovation perspective?, 2. How can we further develop the systems of innovation perspective?, and 3. How the different actors are relating to the system of innovation perspective?

The chapter is organized in two main sections. Section 8.1 seeks to discuss the answers to the three questions posed by this thesis, and to link the answers to the general aim of the thesis. Section 8.2 will discuss some of the contributions this thesis makes to the field and pinpoints some future research.

8.1 Rethinking systems of innovation. Towards an actor perspective on the systems of innovation perspective

This section will summarize and discuss the three questions that informed this dissertation.

1. What are the theoretical underpinnings of the systems of innovation perspective?

The first question was answered in two steps. I first discussed the emergence and development of the system of innovation perspective. Informed by epistemological tradition of the historical institutionalism, the aim of this

exercise was to argue that the relevance of the perspective is to be understood in relation to the context it emerged - situated in the period following the oil crisis of the 1970s, a period of economic instability, stagflation; a period of restructuring of both growth and the economic politics, and a new role of the state. But the risk is that this argument is also undermining the relevance of the concept. When the initial conditions are disappearing than the relevance of the concept is obsolete. Thus, the question is how the relevance of the perspective is changing with the change of the context.

Secondly, the emergence and development of the systems of innovation perspective was presented as two stories; the system of innovation as an academic or descriptive science and as policy making or political rhetoric. Thus, the analysis differentiated between the intellectual and the political dimension of the perspective, but it also argued that these two stories are strongly interrelated. One of the assumptions made by this thesis was that the systems of innovation perspective has a high status among policy makers, while its status in the academia is questioned. By presenting the emergence and development of the systems of innovation perspective as two stories, the aim was in fact to show how the two worlds are intertwined in the formulation of the perspective, but also that this intertwinement impacted upon the further development and status of the perspective in the academia.

The question that was posed was: what are the theoretical underpinnings of the systems of innovation perspective - which were addressed in the fourth chapter of the dissertation. The premise of this question is that the systems of innovation perspective is eclectic, analytically and methodologically borrowing from diverse disciplines. This is not without problems, especially considering its institutional character (see for example the critic of Merle Jacob). Four theoretical fundamentals are identified: (a) economic behaviour rests on institutional foundations and the approach highlights the importance of institutions, (b) learning is the most important process and knowledge the most important resource, (c) competitive advantage results from variety and specialization and it presents elements of path dependency, thus the anchoring of the perspective in the evolutionary economics, and (d) innovation is a systemic process. What does this tells us about how innovation is conceptualized and how is it considered? First of all, the starting point of the perspective is in innovation as a process, as differentiated from innovation as a product. One of the main achievements of the system of innovation perspective is its acknowledgement of the institutional underpinnings of the innovation process. This implied an understanding of innovation as socially situated, determined by the social, economic and political context. Another outcome of the institutionalization of innovation is that institutions become an explanatory factor of the innovation performance

of an economy and it emphasizes the existence of national or social innovation trajectories. This connects to the evolutionary economic tradition the perspective is subscribing to. Thus, the system of innovation is placed in a context, both geographically and historically. A system of innovation is to be understood as organically developing over time and to understand its current condition, answers are to be found in how it got there. The evolutionary perspective is also emphasizing the interactive nature of innovation, making learning an important process for a system of innovation. One of the main themes of the system of innovation is that learning is the most important process and knowledge the most important resource. The systemic perspective emphasizes that feedback loops and dynamic relation between the actors of the system are essential elements for the functioning of a system of innovation.

To connect to the general aim of the dissertation, the answer to this first question could be formulated in terms of the system of innovation perspective as conventional wisdom or paradigmatic shift. Accordingly, on one side it is argued that the system of innovation is only an improvement or updated concept; while on the other side is argued that the system of innovation perspective represents a paradigmatic change to innovation studies.

The systems of innovation perspective had a considerable political impact; adopted as one of the central tools of the OECD and Finland adopting it already in 1991 when the perspective was only in its academic infancy. Hence, the question is if the policy adoption of the system of innovation perspective is not following what Galbraith called for *conventional wisdom*, an expression used to capture the idea of loose theoretical systems that can be politically influential despite their limited empirical base⁴⁶². The looseness of the perspective combined with the context of its emergence – a time of economic crisis and weakening of the role of the state – is assumed to have contributed to its acceptance among policy making. Furthermore, the approval of the OECD had also contributed to its legitimacy.

The four theoretical underpinnings are formulated as introducing a new perspective on innovation, as a paradigmatic shift in the approach of innovation. But one can also argue that some of the central claims are already well established. Already in 1776 Adam Smith argued that places differ in their innovative ability. Alfred Marshall coined the expression of “institutions matter”. That interaction is important for innovation has been emphasised by von Hippel, (open innovation), by Freeman, or by Rothwell, all talking about

⁴⁶² Galbraith, J.K., *The New Industrial State*, 1967, in Freedman, L. *Strategy. A history*, Oxford University Press, 2013, page 418.

the importance of interactions and linkages. The field of economic geography is grounded in the idea that geography (place and space) matters for innovation. Perhaps the main contribution of the system of innovation perspective is bringing together all these ideas into a systematic way. It systematized the way of thinking about innovation, geography and institutions. The institutional conceptualization of innovation is argued to be the main contribution of the systems of innovation perspective.

2. How can we further develop the systems of innovation perspective?

The rationality of this question is in a reflection or a question that arose in the process of developing the research focus of this dissertation – how the different actors in a system of innovation are relating to it and to each other? For instance, Sweden is implementing a system of innovation, how are stakeholders such as Ericsson reacting to it? Is Ericsson aware of the systems of innovation perspective? Has the implementation of the approach by Sweden any impact on Ericsson? What these questions or reflections were pinpointing at was actors, recognizing that actors have motivations of their own.

The literature on systems of innovation has been criticized for the absence of an actor perspective. I argue in this thesis that with its systemic perspective, systems of innovation focuses on the elements of the systems and the relations between these elements, while actors are addressed as a general category. The tendency is that the goals and aims of the system are projected on the actors as well; it is a schematic and over-socialized concept of actors as they adhere to system's logics rather than to their own motivations and aspirations. Therefore, the argument put forward by this dissertation is that a system of innovation is composed of different types of actors with different goals, logics, interests, working methods etc. The behaviour of the actors has significant impact on the behaviour of the system as a whole, being able to direct it or even change its course. The relations between the actors are shaped by the very actors involved. Hence, a first step should be in specifying the actors that are to be considered. The functioning of the system is dependent upon how actors behave.

The fifth chapter of the dissertation was devoted to develop a theoretical framework introducing the actor. To deal with the actor complexity, the theoretical framework proposed the analysis of a system of innovation as the interplay between two rationalities or logics; a territorial rationale and a functional rationale. The objective is emphasising the variety of actors that form a system of innovation and to suggest that their different logics or

rationalities influence their behaviour in the system/in relation to the system. The territorial and functional systems of innovation imply different rationalities, interests or goals. The assumption is that the different rationalities influence the innovation process, thinking, the learning process and how activities are organized and performed. The two rationalities are not to be addressed only between categories but also within the same category.

To make possible the actor-based approach and the analysis of the dynamics of the system, the embeddedness theory and the concept of interest were introduced. Considering the theoretical underpinnings previously discussed, the embeddedness theory is linked to the institutional underpinnings by acknowledging the context. As mentioned, the systems of innovation perspective emerged as a reaction to the neoclassical economics' linear model of innovation and the assumption of a rational actor and a rational optimizing behaviour. The systems of innovation perspective is arguing for a view of the actor's action as based on routines, bounded rationality and an over-socialized concept of actors. In this context, the notion of interest was introduced to acknowledge the different logics that guide action and how the social framework shapes and gives meaning to interests. By introducing the notion of interests, it imposes that conflict of interests are also acknowledged which brings new layers in terms of system dynamics.

By adopting an actor perspective informed by the embeddedness theory and the notion of interest, the analysis of systems of innovation is proposed as the interplay between two logics, a territorial logic and a functional logic. This analysis is anchored in the idea that a system is formed by different types of actors and for the purpose of this dissertation a categorization of the actor is made in economic and non-economic actors. The non-economic actor is portrayed by considering the role of the state or policy making in a system of innovation and it represents the territorial rationality. The institutional underpinnings of the perspective emphasize the role of formal institutions which have a territorial connotation. Furthermore, the system of innovation perspective is highlighting the role of policy making and/or the role of the state in establishing and managing a support structure for innovation. Emphasising a territorial rationality it raises questions on the role of the state in a system of innovation. Consequently, this also requires a consideration of how the state – as an actor in the system – relates to the other actors in the system. What role is the state to play – the role of a catalyser optimizer of the system, a steering role? In the spirit of the evolutionary-learning perspective, the systems of innovation perspective conceptualizes the state as part of a learning and interaction processes. But this thesis argues that the state is following a territorial rationality, hence it is part of a given geographical

location, with a much more mandate to cater for, and where learning is but one of many aspects.

The functionalist rationality is portrayed through the economic actor – the firm as an actor in a system of innovation. From the perspective of the evolutionary economics, the firm is the locus of innovation. In this tradition, the firm is given a central position in a system of innovation. The system of innovation perspective assumes that firms do not innovate in isolation and innovation is not the result of an independent decision-making at the firm level. The perspective that it is adopted here is that firms and their operations and interests are shaped by their social and geographical location and their interests are having meaning in this light.

The territorial and the functional-based systems of innovation is a way of abstracting from empirical phenomena and deal with complexity. The two types of innovation systems are formulated in line with Weber's conceptual tool of "ideal type"⁴⁶³, thus the two rationalities are analytical tools to make possible selection and abstraction, to find similarities and deviations in concrete cases.

Reflecting upon the theoretical framework in the light of the findings of the empirical inquiry, a further elaboration of the actor perspective is required. A third type of actor emerged when discussing the innovation thinking in Sweden – the academia. The assumption made when categorizing the notion of actor was that the academia is part of the non-economic category. The empirical inquiry defined the research system or the academia as an actor on its own, with its own motivations and goals that might fall in between the two categories already proposed.

What are the main implications of the theoretical framework proposed here? First, it provides the tools to address the dynamics in the system. Second, institutional determinism is avoided as the starting point of the analysis are the actors. Third, it avoids a discussion on the geographical level appropriated for analysis. It is the logic of the actor that steers the analysis, hence the geographical level the actor. Nevertheless, I position my use of the systems of innovation perspective as in line with what refer to as the original formulation. The question is if the theoretical framework proposed here is in line with this original formulation. I believe that the theoretical perspective proposed here further elaborates the initial framework and it is in line with its theoretical underpinnings.

⁴⁶³ Weber 1947.

3. How the different actors are relating to the system of innovation perspective?

The third question is addressed in what represents the empirical backdrop of the dissertation. The Swedish system of innovation is analysed in terms of how innovation policy discourse and practice have developed over time. The territorial based system of innovation is analysed through three instances: Vinnova, the Swedish Innovation Strategy and the Innovation Council, all considered to be relevant in understanding the embeddedness of ideas on innovation within Swedish politics and practice. The functional based system of innovation is addressed through the role of the large firm Ericsson in the systems of innovation. Ericsson has been chosen as an actor in a system of innovation, and therefore attention is paid to its interplay with the territorial actors, such as the state and universities. Several conflicts of interests characterize the relation between Ericsson on the one hand and the university and government on the other. The interplay between the two types of systems of innovation is further concretized in the analysis of the Mobile Heights case, an innovation cluster programme. Three key conclusions were derived from the empirical research that will guide the discussion in the following.

(a) The policy level.

Three instances are invoked to address the role of policy making: the case of Vinnova, the Swedish Innovation Strategy and the newly established Innovation Council.

The innovation policy is legitimated through and by the activity of the other actors in the system of innovation. From this perspective, broad goals are formulated and innovation policy becomes an outline of the administrative system. Hence, changes have been mainly in terms of instruments, of add-ons to what already existed, and not substantive changes; new layers are added to the already existing structure, incremental changes, thus no radical ones. Considering the Swedish Innovation Strategy and the Innovation Council in particular, the policy level consists in a process of finding a legitimate terminology and discourse, where the aim is to embed innovation in a broader discourse with societal relevance. In Vinnova's evaluation report of the strategy it is mentioned that the target for 2020 the Swedish Innovation Strategy is formulating "will be a target for initiatives in many policy areas". Furthermore, the innovation policy is evaluated in relation to the responsible organizations for the implementation of the strategy's goals. Considering the organizations that are enumerated, the innovation policy is meant to infiltrate the work and mission of all areas of policy making. Innovation is not the goal

in itself, but an instrument for the other policies to reach the target for 2020. Thus, innovation is not the goal but the mean and a discursive signifier of modernization in its most wide sense. Going back to the discussion on the theoretical status, the question is if the systems of innovation perspective may be the victim of its own success, as its openness invokes a wide range of uses.

In the theoretical framework, the role of policy making in a system of innovation has been compared to the role played by a pacer in a bicycle race, thus its main role being that of optimizer of the innovation activity. Nevertheless, the empirical inquiry showed that the role of the state or of policy making has a higher level of complexity than only as an optimizer. Policy making is steered by competing and sometimes contradicting rationalities. To only see the state as an optimizer is to address the state as a homogenous actor, which is not. Change of government has been showed to have implications for how the systems of innovation thinking is formulated and formalized. Change of government has also been discussed as a rupture with the previous one – hence a case of disruptive politics where the systemic nature of the systems of innovation is not reflected in how policies are shaped and developed. This makes it evident that the system performance needs to consider the actors in the system. The heterogeneity of the state/policy making as an actor is also mirrored in the debate between, for example, the Ministry of Education and the Ministry of Enterprise and Innovation.

(b) The administrative level

This is the level of the implementers of the innovation policy, in the context of this dissertation is the case of Vinnova - an actor of the territorial systems of innovation and the direct organ for the state to implement the innovation policy.

These two analytical conclusions pinpoint two facets of the state as an actor in a system of innovation. On one hand, the state as policy maker and driver of the innovation policy, and on the other with the state as policy implementer, through its organizations. The state as policy maker is the institutional level, while the state as policy implementer is the organizational level. Following the institutional theory of North (see chapter four), both institutions and organizations need to be considered for an institutional analysis, because there is a relation of mutual causality between institutions and organizations. The analysis here corroborates this. This mutual causality is observable in the relation between the state (policy formulator) and

Vinnova (policy implementer). It should be noted that Vinnova has as one of its main activities to produce reports and evaluations commissioned by the government. For example, Vinnova is the organ in charge of evaluating the Swedish Innovation Strategy. Hence, the agency needs to reconcile its own interests and the interests of the government. Agencies like Vinnova are steered by law and their decisions should be based on law. However autonomous, Vinnova is under the auspices of the government, and the government, through ministries, can steer the activity of the agency through different mechanisms, for example the budget. The consequence is that the activity of Vinnova appears to follow the political will and hence be segmented and opportunistic. But Vinnova is the expert authority within its area of innovation and technology, and has from this perspective an advantage compared to the ministries. Through the production of reports, analysis and expert documents, Vinnova has a great deal of influence on the government.

The consequences for the theoretical framework proposed by this dissertation are that a further problematizing of the non-economic actor, the state as actor, is probably needed for a higher level of accuracy. This is in line with the discussion of the state proposed by Van de Donk and Snellen as situated between four types of rationalities: political rationality, legal rationality, scientific rationality and economic rationality. The manifestation of the territorial system of innovation at the two levels identified from the empirical research is a manifestation of the different rationalities a state is situated between.

Dobbin is arguing that “it is socially constructed logics of state action, more than organizational resources of states that persist to produce policy continuity”⁴⁶⁴. In chapter six the emergence and development of the innovation thinking and consequently the emergence and development of the systems of innovation perspective in Sweden is discussed in terms of how relations between ministerial departments, relations between policy making and academics, relations between policy making and industry are shaping what Dobbin is referring to as the socially constructed logic of the state. These relations are embedded in a social and cultural context that is specific to the territory of Sweden. It is in the same way as the working methods and relations of MITI with its context are considered by Freeman to be nationally specific and therefore talking about the Japanese system of innovation. Policy making chooses from time to time to emphasise various aspects of innovation while the innovation agency accumulates experience and adjust its working methods over time, which causes recurrent debates regarding the meaning

⁴⁶⁴ Dobbin 1994.

and practice of innovation policy. The discussion of the case of Vinnova witnesses for what could be considered a reflective attitude. Over the years, the organization and the working methods of Vinnova have been restructured and modified. The agency is formulating this as driven by the quest for improvement. By introducing an actor perspective, it also implies considering how other actors in the system are perceiving these changes. For instance, stakeholders such as Ericsson consider the activity of Vinnova as lacking continuity and a clear direction.

The policy and administrative levels are discussed as two separated levels, but they could also be analysed as a continuum and an illustration of the heterogeneity of the state as an actor. Moreover, they are also not in alignment with the systemic expectations or rationality that are implied by the systems of innovation perspective. The question that is raised is if there is not an incompatibility between the rationality of policy making and the rationality of the systems of innovation perspective.

(c) The practice level

From an evolutionary perspective, firms develop and evolve on the basis of a combination of various factors, such as technological, market, ownership, governance, recruitment etc. This is a logic that it is quite different from the territorial one. Firms have been established as the locus of innovation by the systems of innovation literature. Thus, the innovativeness of the firm is analytically connected to the system - how the system contributes and creates a supportive milieu for firms to innovate. The firm's innovative capacity is linked to the capacity of the system to support innovation in terms of institutional arrangements and resources (i.e. financial support, labour market, institutions). This implies that the territorial system of innovation is made relevant to the functional one. This is one way the territorial and functional systems of innovation intersect. The analysis of the standardization process addressed in the previous chapter is an example of the other way; the standardization process is looked upon as a way for the functional system of innovation to make the territorial one fit its interests.

In the interviews with Ericsson it has several times been pinpointed the company's view on the role of the state, on what the company's expectation on the territorial are. This is one type of embeddedness, and it is an expression as actor of the Swedish system of innovation. If applying the taxonomy of Zukin and DiMaggio, the behaviour of Ericsson in the Swedish system of innovation is to be understood as a case of political embeddedness – how the behaviour of economic actors are shaped by non-market

institutions, particularly the state. But Ericsson is also raising critique towards the embeddedness of its activities in the Swedish system, especially in terms of education and research (i.e. financing of research). It is this critique that motivates Ericsson's presence in the Innovation Council, for instance.

The discussion on the three key findings aimed at highlighting the interplay between the two rationalities, how actors are embedded in their context. The interplay between the two actors is argued to be determined by their degree of embeddedness, and the internalization of the context. Ericsson is a multinational company - it exists all over the world and even in Sweden a large number of its employees are recruited from abroad. Nevertheless, the company shows a strong embeddedness in the Swedish context – a cultural embeddedness but also a political one if considering Ericsson's presence in the Innovation Council.

Addressing the state as an actor, understanding its behaviour goes beyond the mere analysis of the institutional arrangement and the formal level. The discussion carried out in chapter six showed in particular how the action of the state needs to be understood as embedded in particular historical contexts, ideologies and beliefs. In Zukin and DiMaggio's taxonomy this relates to the category of cultural embeddedness – how ideologies and beliefs are determining the behaviour, and how this is also a generator of conflicts of interests, especially if considering such a heterogeneous actor as the state. Just as an illustration, and going back to the empirical discussion in chapter six, a conflict of interest became obvious with the presentation and reception (and aftermath of) Research 2000. The state appears not as one but as two rationalities – the rationality of the Ministry of Education which was influenced by the interests of Swedish universities and academics, and the rationality of the Ministry of Enterprise and Innovation who was on the side of the industry and agencies which operated with industry as a primary audience such as NUTEK (Vinnova's predecessor). And this has different expressions in politics – a first expression was formulated as strategic research. With the change of the government a new direction was taken, and focus was placed on innovations. The clearest result is the establishment of the Innovation Council, which serves as the formulation of macro-narratives about innovation and the integration of macro interests in society around that. In line with the theoretical framework proposed by this doctoral dissertation, the establishment of the Innovation Council is discussed as a 'tool' for the territorial system of innovation to capture the functional one and make it a part of it in terms of taxes, work opportunities, economic growth and not the least to gain or improve its legitimacy. On the other side, the functional rationality perceives this as an opportunity to imprint the territorial one by

putting forward its own needs; the need for a knowledgeable and qualified labour force, the development of the market etc.

Discussing the key findings of the empirical inquiry on three levels the aim is emphasizing the complexity implied by applying an actor perspective to the analysis of the systems of innovation. The policy level is rather disruptive in its formulation of the meaning of a system of innovation, changing according to governmental shifts. However, a stable characteristic appears to be the aim of embedding it in a broader discourse with societal relevance, a process of finding a legitimate terminology and discourse. The administrative level can also be looked upon as the practice of policy and it emphasis conflicts and power relations within one category of actors (the non-economic actor). The relation between Vinnova and the ministerial departments is a complex one with important implications for the formulation of the national innovation strategy or policy. The functional rationality is that of the economic actor and in our empirical inquiry appears to have a higher level of homogeneity.

The interplay between different actors of a system of innovation or between the functional and the territorial rationalities appear to be dominated by several conflict of interests, showing that that actors are very much driven by own motives and goals. But it is also interesting what the case of Mobile Heights highlights - despite the different motives, interests and goals, actors are able to come together and pursue a common goal.

The most important conclusion of this dissertation is that the analysis of a system of innovation is a complex undertake and that the current theoretical framework requires to be rethought and to accommodate for the analysis of dynamics of the system. The analysis of the Swedish system of innovation showed that there is not one conceptualization of what could be called the Swedish system of innovation. But that the Swedish system of innovation is the product of different ideologies, industrial or innovation policy goals, but also a consequence of a bureaucratic structure and different constellations of power relations. The institutional arrangement that is often referred to as a national system of innovation is much less homogenous than is often presented and it is only a snap-shot.

8.2 Contributions and further research

I believe that this thesis makes several contributions to the field of systems of innovation.

The premise of this dissertation is that there is a need to establish a theoretical framework to analyse the role of the actors in a system of innovation in order to understand the dynamics. As a consequence, the state is analysed as an actor in the system and the analysis showed how the behaviour of the state is significantly changing due to different factors.

The emergence and development of the systems of innovation perspective opens up for discussion concerning the relation between academia and policy making, and the industry.

How should the academia position itself in relation to policy making? The relevance of research has nowadays become to be evaluated in terms of its societal contribution and its capacity of being absorbed by policy making or/and the industry. But what are the consequences if these rationalities steer academic research/interests/ education? The autonomy or independence of the university/academia is to be reconsidered when it becomes dependent (especially financially) on collaboration with the industry.

How should policy makers make use of academic knowledge/concepts? The relation academia – policy making as discussed above implies more dense and intense relations between researchers and policy makers, and policy makers becoming more aware or more open to academic concepts and theories. What are the consequences of the politicization of theories and concepts? Some concepts, such as the systems of innovation, had a high appeal to policy makers, but it was also “owned” by researchers with a foot in policy making or commissioned by policy making for different investigations. They played hence an important role in the politicization of the perspective.

From a theoretical perspective, it introduces an actor perspective and with the introduction of the embeddedness theory and the notion of interest, tools are given to address dynamics in the system. The systemic perspective is perhaps one of the main contributions of the systems of innovation to the field of innovation studies, but it is also one of its weaknesses. According to the theoretical underpinnings, innovation is a social process, embedded in an institutional context, dependent on feedback loops, learning and knowledge.

Considering the way institutions are employed by the perspectives, the role of actors – how actors are responding to the rules of the game – is central.

Most often a territorial or sectoral/technological adjective is added to the systems of innovation perspective. This is not done in this thesis because of the actor perspective that it is employed. The starting point of the thesis is in what I call the original formulation of the perspective, the one initiated by Freeman and Lundvall and the definition of systems of innovation as networks of institutions in the public and private sector whose activities and interactions initiate, import, modify and diffuse new technology. According to this definition, not the level of analysis becomes central, but rather the actors and the constellation of actors that are important for the production and diffusion of innovation.

From an empirical perspective, the thesis is also emphasising the politicization of innovation. The relation between research and industry is problematized and conflictual relations are emphasised. Policy makers make use and implement the perspective – this implies that other actors are expected to behave in a certain way, and are influenced by the government's actions. For instance, the Swedish state implements the systems of innovation perspective and Vinnova is established, along with other institutional and organizational changes. How, for instance, is an actor such as Ericsson relating to these changes, how are the two understanding and using the perspective and how does this affects their interplay?

The issue of further research is connected to the discussion if the system of innovation perspective is still a promising line of research. If one answers no, than there is no place for further discussion. Using or not the system of innovation terminology, I believe that the theoretical and analytical underpinnings of the systems of innovation perspective are more than a viable line of research, especially for its historical-friendly analysis.

By introducing an actor perspective, the role of the state as an actor in a system of innovation is emphasised – an aspect that is scarcely addressed in the literature. Even in a globalized world, the role of the state is not to be marginalized. The literature talks about global systems of innovation as a further development of the systems of innovation framework. But this is only a complementary discussion. The role of the state and policy making at the national state are not to be replaced. The legislation regarding the intellectual property rights is a state matter. And this does not reject the existence of a global legislation, but the discussion is to be carried out between national governments. The education and research systems are state issues. In this institutional context, the role of policy and interventions are important to be understood for the persistence and change of institutions.

From the empirical findings of this thesis, it emerges that the role of firms and perhaps multinationals/large international companies for their local context and for the global systems of innovation is an issue for further research. One should nevertheless keep in mind that the case of Sweden presented here presents certain particularities – small country with an economy dominated by large international companies. A further topic of research could thus be to compare the case of Sweden with other similar cases, for instance the case of the Netherlands, also a small country with large international companies.

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ABSTRACT

In 1987 a book by Chris Freeman with the title “Technology policy and economic performance. Lessons from Japan” was published. This book turned out to be the birth certificate of the systems of innovation perspective which came to enjoy a tremendous popularity the next three decades. The topic of this thesis is within the field of systems of innovation. This approach is extensively used today and the systems of innovation is an extensive field of studies; there is a growing interest and a well-established group of researchers deal with the concept and set the research agenda. Despite the great interest and the extensive work so far, the concept is challenged by noteworthy conceptual and methodological ambiguities and limitations.

The aim of this thesis is to advance a theoretical framework of the systems of innovation perspective by adopting an actor-based perspective. From a theoretical perspective, the dissertation pinpoints the system of innovation at the interplay between two rationales: a territorial rationale and a functional rationale. The intention of this theoretical framework is to shed light upon the variety of actors operating within a system of innovation. Based on different logics or rationalities, actors understand and behave differently which has an impact on the behaviour and performance of the system. The assumption is that the different rationalities influence the innovation process, and how activi-

ties are organized and carried out. In the empirical backdrop of the thesis, the Swedish system of innovation is analysed in terms of how innovation policy discourse and practice have developed over time. The territorial based system of innovation is analysed through three instances: VINNOVA, the Swedish National Innovation Strategy and the Innovation Council, all considered to be relevant in understanding the embeddedness of ideas on innovation within Swedish politics and practice. The functional based system of innovation is addressed through the role of the large firm Ericsson in the systems of innovation. Ericsson has been chosen as an actor in a system of innovation, and therefore attention is paid to the interplay with the territorial actors, such as the state and universities. Several conflicts of interests characterize the relation between Ericsson on the one hand and the university and government on the other. The interplay between the two types of systems of innovation is further concretized in the analysis of the Mobile Heights case, an innovation cluster programme. Three main analytical conclusions have been emerged from the empirical research, discussed in terms of policy makers, policy implementers and practitioners pinpointing to a fairly loose system where different interests, networks and practices can only be partially and temporarily aligned.

