Two rebelling approaches but only one embraced by policy – on the different embedding patterns of NIS and IMP

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Abstract

Two rebelling schools directed in the late 70s and early 80s a heavy critique towards neoclassic economic theory and its omnipresence in models available for understanding change in the economic landscape. 40 years later one of the rebels, the National Innovation System approach (NIS) has turned into the perhaps most utilised models in OECD and EU policy circles. The other is 40 years later still a rare exception in OECD and EU policy circles. The IMP network approach has even lost the position it once had in at least one national policy context. From 1980 and until the mid-1990s IMP researchers were recurrently engaged by The Swedish National Board for Technological Development; among others for analysis of specific industrial areas and for evaluations of policy measures.

The aim of this paper is to sketch a first draft at an explanation of the difference in policy success between IMP and NIS, by discussing the compatibility between the two schools and the needs and preferences of the international policy context, as well as the domestic Swedish setting. First, we study *a selection of the seminal texts of the two approaches* in order to identify their basic theoretical assumptions, giving us one part of the raw material needed to discuss on the variety of policy success. Second, we present an empirical illustration of how the IMP and the NIS approach have been embedded in the Swedish national policy setting; with STU/NUTEK and Vinnova as focal policy actors, based on two published historical studies; presented in History of Technology respectively Economic History. In the concluding discussion, we discuss if IMP; using its theoretical framework, could predict its own relative policy failure.

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Introduction: The neoclassic model does not fit!

In the late 1970s and early 1980s the theoretical perception of technological development, innovation and industrial renewal was in a state of crisis. Low economic growth, high unemployment and industrial structures perceived as obsolete and vulnerable to international competition demanded theoretical perspectives that could explain the state of affairs and point towards hope at the end of the tunnel. Neoclassical economics was not much help. The field of growth accounting had empirically demonstrated that the vast majority of economic growth was explained by "the residual", by factors external to the economist's models assumed to mainly consist of technological change. At the same time empirical studies of innovation processes had shown how messy they were, not at all conforming to the linear model where investments in basic research were assumed to spill over into applied research and at a later stage product innovation (see Mytelka & Smith 2002, Sharif 2006, Eklund 2007, Miettinen 2012). With old conventional wisdoms overturned, the door was open for new alternative viewpoints to make their mark on the world. This paper will take a deeper look at two of these new candidates and how they influenced the policy discourse.

Both of them emerged during this time of crisis and at first glance they appear very similar. They both sported a self-image as "rebels", presenting a heavy critique towards the linear model as well as neoclassic economic theory and their perceived omnipresence in models available for understanding change in the economic landscape. The message was clear-cut: the deductive, highly abstract neoclassical market model cannot shed light on the empirically observed complex interaction processes behind technological development, innovation and industrial renewal. Both rebels presented systemic perspectives meant to incorporate the complexities left out by established market views. The common denominator of the schools was that both acknowledged the role of producer-user interaction for technological development, innovation and industrial renewal – and stressed that the analytical models used by policy could not catch this phenomenon. Moreover, while assembling an international network of scholars, a disproportionate amount of those involved had Scandinavian backgrounds. For both schools, their development has taken place in close interaction with policy circles. Both have grown significantly over the last decades in terms of researchers engaged and in publications presented.[2]

Still, in terms of policy success there are large differences between them. Forty years later one of the rebels has turned into the most utilised approach in OECD and EU policy circles. Since the mid-1990s the National Innovation System approach, with Lundvall (1988) as one of the pioneers, has been embedded into a number of policy strategies and programs, on local, national and transnational levels. The adoption of the NIS approach has been made with a particular purpose: to build and reinforce national and/or regional innovation systems. This have given rise to a number of policy measures; such as investments in organisational over to development of steering documents and quantitative indicators for analysis what's assumed to be important system components. (Eklund, 2007, 2013; Elzinga, 2004)

The other rebel is forty years later still a rare exception in OECD and EU policy circles.[3] The IMP network approach, presented in a first joint publication by the IMP Group/Håkansson ed. (1982) has even lost the position it once had – at last in one national policy context. From

[2] In Håkansson et al (2009) more than 120 PhD studies resting on this framework was identified, and at about the same time more than 2000 papers presented at the annual IMP conferences was listed on website, where also more than 25 book publications were listed. (www.impgroup.org) The NIS

[3] One of the few examples is the EU financed Gloval project (Waluszewski, 2011), where the IMP framework was utilised in an analysis of the relation among national policy/transnational networks.

1980 and until the mid-1990s IMP researchers were recurrently engaged by The Swedish National Board for Technological Development (STU), from 1991 The Swedish National Board for Industrial and Technological Development, (NUTEK)[4], among others for analysis of specific industrial areas and for evaluations of policy measures. (See e.g. Hammarkvist, Håkansson and Mattsson, 1982; Håkansson, 1987; Laage-Hellman and Axelsson, 1986; Laage-Hellman and Waluszewski, 1992). However, the main ambition of STU's was to get critical perspectives of what role a policy agency could play in relation to specific industrial challenges.

When the Swedish policy system was reorganised in 2001 and STU/NUTEK was replaced by the new innovation agency Vinnova, the interaction among policy representatives and IMP researchers already had faded away. Despite that IMP had emerged into one of the main theoretical schools in the B2B research field in a broad sense, covering issues such as technological development, innovation and industrial renewal; consequences for policy included, from the mid-1990s it lost its role as being engaged by policy. Instead, the National Innovation system concept was adopted by OECD and EU – and since the design of Vinnova followed closely the policy regimes of these two units, NIS became the role model for the Swedish policy organisation and its way of working.

Research design

The aim of this paper is to sketch a first draft at an explanation of the difference in policy success between IMP and NIS, by discussing the compatibility between the two schools and the needs and preferences of the international policy context, as well as the domestic Swedish setting.

While we mainly focus on IMP and NIS, it should be noted that many other schools of thought have sought to provide answers to the challenge presented in the first paragraph. IMP and NIS date back to the 1980s, but a later wave of concepts from the 1990s and onwards involve Clusters (Porter 1990), Mode 1/Mode 2 (Gibbons et al 1994) and Triple Helix (Etzkowitz & Leidesdorff (1998). These latecomers share with NIS a successful penetration of the international policy discourse. On the other hand, Bo Carlsson and the Sweden's Technological System project show more similarities with IMP, being embedded in a national policy context and fading away after the mid-1990s (see Carlsson et al 2010).

We will proceed in two steps. First, we will study *a selection of the seminal texts of the two approaches* in order to identify their basic theoretical assumptions, giving us one part of the raw material needed to discuss on the variety of policy success. The emphasis here lies on I) how the schools view the importance of relations between companies, II) how they perceive the innovation process, III) their attitude towards the neoclassical market model and IV) the explicit and implicit implications of their theoretical assumptions for policy. For the research network IMP three main 'IMP Group' publications is the obvious choice of representative, while the heterogeneous and widely diffused NIS is more of a problem. We have chosen to focus on texts by Bengt-Åke Lundvall, one of the "grand old men" of NIS (together with Richard Nelson, Christopher Freeman and Charles Edquist). We are well aware that Lundvall may not be entirely representative for the whole NIS community, in some instances he has in fact expressed dissatisfaction with how the concept has developed (see Lundvall 2006). Still, he is a founding father of the concept and is often automatically cited when it is mentioned. By serving as the deputy director of the Directorate for Science, Technology and Industry at

[4] STU was merged with NUTEK in 1991.

the OECD between 1992 and 1995, his career also interestingly spans both the academic and policy worlds. Three texts have been selected from each school, with the ambition of incorporating the 1980s, the 1990s and the 2000s. IMP is represented by IMP Group/Håkansson ed 1982; Håkansson and Snehota eds 1995 and Håkansson, Ford, Gadde, Snehota and Waluszewski, 2009. The NIS studies consist of Lundvall 1988, Lundvall 1992 and Lundvall 2010.

The second step of our analysis consists of an empirical illustration of how the IMP and the NIS approach have been used in the Swedish national policy setting; with STU/NUTEK and Vinnova as focal policy actors. The choice of the Swedish policy context can on one hand be claimed to not be representative at all. To the best of our knowledge, this is the only national policy context where the IMP approach has played any significant role in terms of being adopted as an analytical approach. On the other hand, an investigation of IMP and NIS embedding in this context can give detailed insights into the different embedding patterns, and especially which of their features that have been embraced by policy. The empirical illustration is based on two historical studies, published in History of Technology respectively Economic History; by scholars which neither are engaged in the IMP nor the NIS setting. One is Hans Weinberger's (1997) study *Nätverksentreprenören (The Network Entrepreneur)* which focus on the emergence of technical development, innovation and industrial renewal policy in Sweden from the 1930s to 1991. The other is Magnus Eklund's (2007) study on the how the innovation system concept was adopted in Sweden from the 1990s and onwards. Both studies gives detailed insights into which theoretical sources that was embedded into the Swedish policy context with what aim. The actual use in the policy practice is however less covered. On the latter topic we can only make the traditional claim that "more research is needed".

IMP vs NIS – theoretical assumptions

In order to shed light over the similarities and dissimilarities of IMP and NIS, we will take a closer look at four aspects presented above: I) The importance of relations between companies, II) the perception of the innovation process, III) the view on the neoclassical market model and IV) the explicit and implicit implications of their theoretical assumptions for policy.

The importance of company relations

It can easily be said that the main focus of IMP lies with how companies and other organizations interact and form lasting relationships with each other. Besides empirical observations, the theoretical foundation is the assumption of resource heterogeneity; i.e. the understanding that resources are unknowable in any total sense and that the economic value of a resources is not given but created in interaction with other resources. This notion, inspired by Penrose (1959) and Alchian and Demsetz (1972) have had some important implication for how the value of economic resources is understood. [5] Given that it is not the quality of a resource in itself that determines its economic value, but what it can contribute with in interface with direct and indirect related resources when embedded into a context of customers and suppliers, any analysis of such processes has be context specific. Or, as expressed in Håkansson et al, (2009, p. 66):

[5] For other early inspiring theoretical sources on the content and effect of interaction, see Håkansson et al, 2009, p. 16 and p. 68.

> *"Thus, the characteristics, usefulness and value of a company's resources depend on how they are combined with the resources of particular counterparts and how that combinations interact with other related resources elsewhere in the network."*

The impact investments in place; in terms of direct and indirect related material and social resources have for technological development and industrial renewal is present in all of the main IMP analytical models; that is the interaction model (IMP Group/Håkansson ed 1982) the ARA model (Håkansson and Snehota, eds, 1995) and the 4R model (Håkansson and Waluszewski, 2002, Håkansson et al, 2009). While all models opens up for investigations of interaction and relationships, the latter allows investigations of interdependencies regardless if this phenomenon is represented by direct interactions or not.

For NIS, the focus lies with a specific kind of relationship, namely that between producers and users. Similar to IMP, these relationships are durable, but the glue holding them together is shared cultural norms and code rather than complementarities in resources. These norms combine with a rational cost-benefit analysis:

> *Inertia – a general resistance to change and risk aversion – combines with rational motives in reinforcing existing user-producer relationship. Ceteris paribus, the user will prefer to trust producers, known from his/her own experience, rather than getting involved with a new producer. The investment in information channels and codes will be lost if the old relationships are severed and new investments in the creation of new relationships will be required. Therefore user-producer relationships will tend to become enduring and resistant to change.* (Lundvall 1988, p 354)

Lundvall also emphasises the importance of contextual knowledge in analysing these user-producer relationships, but it is largely knowledge of the nationally specific context (Lundvall 1992, p 5). To understand the national context is of course less demanding than to know the resources of a multitude of different companies and organizations, and to assess the consequences of their potential combination.

The perception of the innovation process

An implication of the interdependency-based view in IMP is that any novelty introduced needs to be successfully combined with the existing resources already in place; in a producer as well as in a user setting. This creates a conservative bias in favour of incremental innovation, allowing the main part of existing structures and trajectories to continue unthreatened.

For NIS, the innovation process is the main focus. Its success depends on the ability to create functioning channels of communication between users and producers. This is helped by the existence of shared cultural and social norms. Thus, the potential bottlenecks blocking innovation lies not in existing resources, but rather in cultural and social contexts that does not facilitate communication. Lundvall does assume a conservative bias in innovation as well, for him based on the nature of learning processes. Since learning arises from routine activities, innovations tend to be conservative and incremental from start (Lundvall 1992, p 9f). While IMP sees conservatism in the adoption of innovation, NIS rather sees it already in the emergence of innovation.

The view on neoclassical market model

Already the first joint IMP publication; *'Industrial Marketing and Purchasing of Industrial Goods'* (IMP Group/Håkansson, ed. 1982,) based on the investigation of the content and effect of 1000 buyer-seller interactions in an European context, directed a critique towards policy's trust in unrealistic analytical approaches which relied heavily on the market model and the assumptions of free and independent units on both the supplier and customer side. The market assumptions was accused to colour both how policy identified problems/opportunities and the identification of means to affect technical development, innovation and industrial renewal. The main critique concerned that policy analysis of technological development and industrial renewal approached companies *and* research & development units as individual, context independent units. Alternative models, resting on other assumptions about the basic foundations about the business landscape, and consequently producing other suggestions for change, was claimed to be neglected. What was assumed away in the neoclassical model was the interdependencies among companies and organisations – and the heavy impact these had on both change and stability in the business landscape.

The IMP market critique was based on empirical findings underlining the connectedness among companies and organisations, deliberately increased through "mutual adaptations in technical, organisational and knowledge dimensions". (IMP Group/Håkansson, ed, 1982, p. 394). The analytical approach was presented as "a challenge" and was questioning three main assumptions about the "market": Firstly, the idea that buying takes place in "single, discrete purchase". Instead industrial buying was claimed to take place in a "complex pattern of interaction". Secondly, the idea of a "generalized and by implication passive market". Instead, "either firm may be taking more active part" in the buying and selling. Thirdly, the assumption of an "atomistic structure in industrial markets", including the idea of "ease and speed of change between suppliers" and "ease of market entry or exit". Instead "stability" was stressed, in terms of buyers and sellers "who know each other well and are aware any movements". (IMP Group/Håkansson, ed, 1982, p. 1) [6]

Although the focus of the first IMP study was "single pairs of companies" the systemic consequences of technological and organisational interdependencies was taken into consideration. Historical, direct and indirect connected interactions were seen as influencing – although not determining – the content and direct of contemporary ones. (IMP Group/Håkansson, ed, 1982, p. 394) The content and effect of interdependencies became the point of departure of the second joint IMP study, and was based empirical studies on connected business relationships in the European and the US setting, presented in Håkansson and Snehota, eds, 1995.[7] A conceptual model for analysing across-company interactions was presented, which included three 'layers': a) how activities are linked and performed, b) how resources are utilised and developed, and c) how capabilities of actors are affected.[8] As summarised in Håkansson et al, 2009, p 263[9]:

[6] The first presented analytical framework, the so called *interaction model* (IMP Group/Håkansson ed, 1982, p. 32), allowed the investigation of how dyadic short- and long term interaction; the contextual influence included, affects the human and technological resources involved.

[7] The second joint IMP Group research project was based on 14 empirical studies on connected business relationships in the European and the US setting and included theoretical and methodological discussions on how to analyse the content and effect of these.

[8] The so called *ARA model* presented in Håkansson and Johanson (1992) and further elaborated in Håkansson and Snehota (1995) suggests that the outcome of across company interaction can be analysed in three different but related dimensions; the actor layer, the resource layer and the activity layer.

[9] The thirdly presented so called *4R model* (Håkansson and Waluszewski, 2002, Håkansson et al, 2009) opens up for investigations of direct and indirectly connected resources, regardless if these interdependencies are represented by business interactions or not. The model distinguish between four types of resource (productions

> *"An interactive view of the business landscape suggests that the form, the use and development of each resource and activity is not determined by a single actor or by the characteristics of the activity or resource in itself, but by its interactions with others."*

What the IMP models have in common is that none is compatible with the assumption of a general market characterised by an atomistic behaviour and structure. The methodological implication is inevitable: it requires the identification and analysis of specific, direct and indirect interactions *including* the contextual forces these are exposed to in time and space.

Even if it is "unrealistic" that a coherent picture of the business landscape ever can be acquired, the notion if interdependency requires that the researcher's interest is directed to the interplay between specific actors, to the wider structure of interdependencies within which the interaction takes place and to the process of interaction in itself. (Håkansson et al, 2009, p. 186-187). Hence, the methodology has to be guided by the research approach; it is considered as an integrated part of the research question and the research approach, regardless if a particular study is based in a qualitative or quantitative investigations. (IMP Group/Håkansson, ed, 1982, p. 28)[10] In practice, this implies that the dyad is the smallest unit of analysis and that both the focal interaction and its relation to the context in which it takes place has to be taken into consideration.

The critique that NIS directed towards market thinking and why it was insufficient for policy analysis was that it assumed away social and institutional factors and therefore could not be catch the observed messy, complex and interactive aspects of technological development, innovation and industrial renewal. The lack of its ability to investigate the non-linear processes was behind the engagement in the development of an alternative framework, although it in contrast to IMP mainly was focused on innovation issues and not on the basic features of business exchange. In contrast to the neoclassical thinking, innovation was characterised by a "systemic interdependency" concerning the production and diffusion of "user values with new characteristics'. (Lundvall, 1988, p. 362) Hence, innovation was understood as taking place in user-producer interaction, where the role of the producer was to monitor the development process and the user to relate it to specific user needs.

The characteristics of the user and producer was argued to be critical for the outcome of the innovation process: The more competent users and producers, the higher degree of innovativeness. The more complex technology, the more important of a close spatial proximity among user and producer. Hence, innovative user-producer interactions were understood as processes "defined in an economic space", characterized by close spatial and cultural proximity. (Lundvall, 1988, 354-355)

It is important to note that the objections mainly concern the microeconomic theory's restricted usefulness in the analysis of innovation processes. When it comes to analyses of

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facilities; products; organisational units; organisational relationships) and allows the investigation of how resources are shaped by current and historical interactions giving them specific features.

[10] The imprints of the research approach became visible in both the qualitative and quantitative investigations of the content and consequences of specific buyer-seller relationships. Both the quantitative investigation of 900 buyer-seller relationships and qualitative investigations of business relationships involving different types of industrial goods were focused on aspects identified through the research approach: buyer-seller relationships in varying *environments*, characterized by varying *technologies*, and in varying exchange of *elements*, taking place in varying *atmosphere*. (Håkansson, ed, pp. 28-56)

'business-as-usual'; i.e. user-producer interaction concerning established products and processes, "the microeconomics theory presented in textbooks will do", argues Lundvall: "The standard approach will be most relevant when technological opportunities and user needs remain constant." In accordance with the microeconomic theory, the resources exchanged in such processes are treated as knowable for both the user and the producer: "The flow of goods and services between subsystems can – if use-value remains constant – easily be quantified in terms of value and volume." (Lundvall, 1988, p. 362). Hence, an important characteristic of NIS is that the departure from traditional market theory is restricted to the innovation processes – while the exchange of established products is assumed to be more or less in accordance with a neoclassical viewpoint.

Policy implications

The main implication for policy; addressed already in the first joint IMP project, is not a particular guideline, but a message similar to what's addressed in the methodology discussion: the need for model awareness. The theoretical framework on which policy analysis is based has a great impact on how problems and opportunities are understood. The choice of analytical framework colours all aspects of how innovation is framed by policy: from what's considered its main sources over to the design of investigations, collecting of data, and engagement in implementations of innovation support. (IMP Group/Håkansson, ed, 1982, p. 6) Hence, the most important policy advice is to choose analytical models which can catch the basic features of the landscape where innovation is going to be created, industrialised and taken into use:

> *"The actions taken by politicians in order to control the economic development in a country are often aimed at influencing the behaviour of firms. These actions must be based on realistic models of the behaviour of firms."* (IMP Group/Håkansson ed 1982, p. 6)

The second joint IMP study did not include any direct advices explicitly directed to policy, but had The Swedish National Board for Technical Development as one of its financing sources. The publication was however concluded by a discussion of what consequences the observed phenomenon of an interdependent business landscape had for a macro respectively a micro perspective (Håkansson and Snehota, eds. 1995, pp. 383-397).[11] On the macro level, the observation of resource utilisation which "is not confined to exploitation of given resources to given purposes" (ibid, p. 383) were claimed to challenge both the traditional view of efficiency and change. It was argued to call for "a somewhat unorthodox view of what economy is about", based on the understanding that producing value for others is more than achieving efficiency in resource transformation and that "what is valued by others is subject to continuous change and always specific for the parties in a relationship" (Håkansson and Snehota, eds., p. 384). On the micro level; i.e. in relation to specific connected relationships, the double face of interdependencies were stressed: One on hand a potential "utility" for reaching efficiency and renewal through across company combinations of resources and activities, on the other hand a potential "black hole", when internal and external efficiency/renewal ambitions clash. The implication for innovation is that every change will cause a "reaction pattern" which is more or less favourable to the initial change. Hence, the

[11] The so called IMP 2 project was supported by grants by the policy actors which we will take a closer look at in next section: The Swedish National Board for Technological Development, STU.

reaction patterns from direct and indirect related actors are central for the dynamics of a network – and what directions it take. (ibid, p, 388-390)

The latter observation implies that innovation processes are problematic from a democratic point of view, something that is stressed in the third text in focus of this paper. A business landscape characterised by interdependences will direct innovation forces to take advantage of the main investments in place – and consequently have dark and bright sides. An important task outlined for policy; besides supporting what's identified as desirable routes of new combinations of social and material resources across business and organisational borders; is to "counteract the non-transparent, non-democratic and economically conservative forces of business networks". (Håkansson et al, 2009, p. 259)

The policy implication addressed in this text explicitly underlines again the need for awareness of what principles policy rest upon. The critique is directed to a policy making which; through adoption of approaches like cluster, triple helix and national innovation system still assumes that the 'normality' of the business landscape has the characteristics presented in the market model. (Håkansson et al, 2009, p. 259) What the approaches utilised by policy have in common is that they are based on an idea similar to what's addressed in new institutionalism; i.e. when information is hard to overcome, formal and informal networks structures can facilitate knowledge transfer to the market. Hence, the organising of formal and informal network-like structures such as innovation systems and clusters are always an exception to the general economic pattern – which is exchange as depicted in the market model (ibid, p, 237). One particular legacy from traditional economic theory is claimed to be more or less consciously been embedded into contemporary policy thinking; the assumption that both 'markets' and 'networks' include some kind of basic self-regulating mechanism. In the same way as the market is assumed to be tending towards equilibrium, this understanding implicitly colour approaches such as national innovation system, cluster and triple helix approaches.

> *"With these assumptions, it is easy to understand the high expectations that policy-makers and others have of networks as creators of 'economic goodness and prosperity'.* (Håkansson et al, (2009, p. 239)

Hence, the policy message is that if transnational network structures are both creative and forceful but also manipulating and transparent, and above all, are not equipped with any self-regulating mechanism, there is a need for policy analytical frameworks which are not burdened with the presupposition of a self-regulating economic domain.

For NIS, the role for policy lies mainly in facilitating communication between users and producers, and in strengthening the relative power of users, who often tend to be at a disadvantage. Lundvall also argues in favour of public policy analysing the social effects of innovation processes rather than blindly accepting market outcomes (Lundvall 1988, p 358f, 365ff; Lundvall 1992, p 4f). As noted, for both IMP and NIS contextual knowledge matters for policy making, but for IMP that knowledge goes deep inside companies and their unique resources, while NIS focuses on national specificity.

Figure 1: IMP and NIS understanding of the business landscape

	IMP	**NIS (Lundvall)**

Views on company relations	Companies exchange heterogeneous resources, the value of the resources depends on how they are combined with other resources. Tendency to form lasting relationships.	Specific focus on users and producers. Stable relationships due to shared communication norms and economic rationality. Focus on national context.
Views on innovation	Success of innovation depends on existing resources and relationships and how they are combined with the novelty. Contextual knowledge needed for analysis. Conservative bias in favor of existing structures and trajectories.	User-producer communication crucial for the innovation process, requires cultural and spatial proximity. Conservatism based on learning from routine activities.
Views on markets/neoclassical economics	Highly critical of the atomistic market view where companies are perceived as independent of each other. No dualism, neoclassical market view never useful.	Dualism: neoclassical market view sufficient to understand established products, while the innovation of new products requires social and institutional analysis.
Views on policy	Selection of the right anlytical model crucial for policy. Facilitate fruitful combinations of resources. Counter the conservative bias.	Facilitate communication between users and producers. Strengthen users. Be wary of social effects of innovation.

The embedding of the IMP respectively NIS approach in the Swedish policy setting

In this section we will take a closer look at the embedding of the IMP respectively NIS thinking in the Swedish policy context. When the IMP respectively NIS approach was first presented; in the early and mid-1980s, the intellectual foundation of the main policy body; The Swedish National Board for Technological Development, STU, was already changing. The understanding that the linear model did not reflect the innovation process had evoked interest in research that could articulate STU's governmental commission: to increase the investments in "technical-industrial development". (Weinberger, 1997, p. 398)

STU/Nutek and the utilisation of IMP research

In the early 1980s the so called "network approach"; as presented in a publication by Hammarqvist, Håkansson and Mattsson (1982), became one of the main inspiring sources for STU, The Swedish National Board for Technological Development, in its ambition to gain an "increased self-reflection" and understanding how it could act given the task to influence the technical and industrial development in Sweden. (Weinberger, 1997, p. 2007)

STU was established in 1968 with the governmental task to perform an industry oriented technical development and was attempt to realize the Social Democrat idea of an "active industry policy". The main task of its progenitor, TFR, The Swedish Council for Technical Research, which together with four other units was merged into STU, had been to initiate

research areas of assumed future importance. In practice, this had meant a strong basic research focus; on areas which might form the basis of new technologies of international interest and research which might be of relevance for Swedish industry. (Weinberger, 1997, pp. 377, 434; 513-515)

After some years of conflict among STU and the Ministry of Industry, and after protests from among others The Swedish Natural Science Research Council, STU did during from the second half of the 1970s increase its focus on how to facilitate the renewal of the existing industry and how to support emerging areas. The intellectual foundation was the understanding that the linear model did not reflect the interactive aspects of innovation and industrial renewal, something that opened the door for a new, long term engagement in specific industrial areas and changed STU's relation to both industry and the research community and industry.

Firstly, STU offered the industry opportunities to increase the knowledge about established technologies and products/product systems. Secondly, this main task was complemented with knowledge development support to "new technology based firms". This was realised in terms of *framework programmes*, established in collaboration with researchers and aimed to strengthen important knowledge areas and through *initiative areas*, focusing on specific industrial areas. (Weinberger, 1997, pp. 377-434) In total, STU's activities was characterised by a balancing among established industries need for strengthen its technological competence and support to what could be innovatory industrial areas. (Weinberger, 1999, p. 438-441)

> *"The STU approach was cross-disciplinary and STU mobilized different resources to achieve cooperation as well as control, thus acting as a network entrepreneur.* (Weinberger, 1997, pp. 514)

One of the inspiring sources on how affect an industrial network was, as mentioned above, the network approach as presented by Hammarqvist, Håkansson and Mattsson (1982). The publication *Marknadsföring för konkurrenskraft/Marketing for competitiveness* was the outcome of a research project initiated by IVA, The Royal Swedish Academy of Engineering Sciences, and co-financed by IVA and STU.[12] The theoretical point of departure of the study was in line with STU's distrust in the linear model and was based on an approach recognising interdependencies in terms of technological, social and economic "bonds" among firms; in time and space. (Hammarqvist et al, 1982, pp. 1-37) The project was carried out by a group of researchers more or less involved in the IMP project: Håkan Håkansson, Uppsala University, was one of the initiators, MTC was under the management of Karl-Olof Hammarqvist one of its financiers and Lars-Gunnar Mattsson, Stockholm School of Economic was through his research on 'system interdependence one of its theoretical inspiring sources. Two representatives from IVA did also took part in the project, of which one became important for the utilisation of the network approach within STU; Gunnar Blockmar, economist, and Lennart Elg, psychologist, who was recruited to work with innovation studies within STU from January 1981.[13]

At STU Lennart Elg became responsible for a small part of the budget devoted to innovation studies. However, this was extensive enough to establish an innovation research program, which in total financed about 80 studies, carried out industrial development oriented researcher at universities and institutes – utilising different theoretical approaches. The program was, argues Weinberg (1997, p. 470) the policy actor's possibility to engage in "self-

[12] Marknadsföring för konkurrenskraft. The study was a follow up of a governmental financed IVA study published in 1977, named 'Knowledge for Competitiveness'.
[13] Hammarqvist et al, 1982, p. 3, Weinberger, 1997, p. 420.

reflection" and to increase the understanding of what role it could play in order to facilitate for technological development and industrial renewal.

One of the inspiring sources that initially was utilised was the network approach and researchers engaged in the IMP research project was involved in a number of analysis of STU's working areas. "The results and the concepts developed helped, according to Lennart Elg, to articulate another view: STU as a network builder, rather than a gadget fixer". (Weinberger, 1997, p. 475)

STU's changing view on its role and function triggered the establishment of a new research program in 1987, informally labelled "Small Country Squeeze", later on "Sweden's technological system and future competitive ability". This program was managed by Bo Carlsson, professor at Case Western Reserve University, Cleveland, USA and involved researchers from three Swedish research institutes; The Research Institute of Industrial Economics (Industrins utredningsinstitut) Stockholm, Institute for Management of Innovation and Technology (IMIT), Gothenburg, Research Policy Institute, Lund. Although the program brought together schools with somewhat different theoretical foundation, it opened up the door for the interesting in what Dahmén labelled 'development blocks', where the key feature was the industrial activities. [14] In practice, STU's utilisation of the IMP network respectively development block thinking was rather pragmatic: the network approach was used to analyse industrial complexities in terms of relationships in time and space, while the development block thinking was used to analyse why industrial networks sometimes takes this developing shape. (Weinberger, 470-472)

By the mid-to late 1990s the influence of IMP and Bo Carlsson's technological system project on Swedish policy had already waned.[15] Charles Edquist had made some attempts to launch the innovation system concept into the Swedish policy debates during this period, mostly through his connection with the social Democratic Party and through editorial articles in Swedish newspapers. His success was limited though, and it appeared as if Sweden's technology and innovation policy was about to enter a paradigm-less state, with no theoretical model or perspective boosting a dominant position. The Swedish membership in the European Union in 1994 also placed some new limits on what could be done to facilitate technological development, innovation and industrial renewal through the policy apparatus.

While technology policy appeared to enter a sleepy phase in Sweden, things were heating up in the area of research policy. Since the late 1970s, the practice where Swedish government agencies fund research within their policy areas (so-called sectoral research) had become increasingly questioned. This funding, where government bureaucrats rather than researchers allocated the resources, had increased into an ever larger share of total research funding. Critics argued that this promoted shortsightedness and opportunist behavior at universities and that researchers should control the funding in order to safeguard the scientific quality of sectoral research. In November 1998 a government investigation named Research 2000 argued that the control of research funding should be transferred from the government agencies to the resercher-controlled research councils. This caused an outrage among the funding government agencies, who mobilized to protect their influence over research funding, aided by trade unions, industry organizations and parts of the political system.

[14] The Research Institute of Industrial Economics (Industrins utredningsinstitut) Stockholm, Institute for Management of Innovation and Technology (IMIT), Gothenburg, Research Policy Institute, Lund.
[15] This section is based on Eklund 2007.

It was in this context that the innovation system approach, which up until now had struggled to gain a foothold, suddenly was thrusted into the Swedish policy debate. It played a prominent role in the comments that various organizations wrote to criticize Research 2000, and in just a few years it had been used to name the government agency of Vinnova. It appeared that the innovation system approach had some qualities that made it very useful in the project of saving government influence over sectoral research funding. First, it made it possible to reconstitute scientific research as part of a system whose main function was to facilitate innovation. The problem was not the lack of researcher influence over funding, but rather the lack of interaction between scientific research and other system components. Second, the innovation system approach was associated with the OECD and the legitimacy the organization provided (see Albert & Laberge 2007). This made it possible to argue that through implementing the recommendations of Research 2000, Sweden would embark on a path that was separate from the rest of the OECD, where innovation and research policies were increasingly integrated. Third, using the innovation system approach lent scientific legitimacy to those wanting to protect sectoral research. These rhetorical uses of the innovation system approach were very frequent in the immediate reactions to the investigation Research 2000. Interestingly, the appropriation of the concept in the research policy debate happened even though Lundvall himself had been a vocal supporter of university autonomy:

> *If the academic mode of production is undermined and replaced by a profit-oriented mode of production, where pecuniary incentives become more important and where secrecy regarding the output becomes more frequent, the academic mode of behaviour may lose one of its principal merits – the tradition for world-wide diffusion of knowledge.… National systems of innovation may temporarily become strengthened when universities become subordinated to industry. In the long run, the production and world-wide distribution of knowledge may become weakened.* (Lundvall 1988, 364f)

It is doubtful that the IMP approach could have served a similar function due to its lack of association with the OECD, and its more contextually bounded system perspective, which implies the notion that research advances, developed outside the business contexts, represents a particular challenging and resource demanding source of innovation.

Concluding discussion

When it comes to technologies, IMP would predict that the successful prospects for any novelty would depend on how well it can be combined with the existing resources already in place among the main potential users and related producers. If we view IMP and NIS as if they were new technologies hoping to be adopted and diffused, could IMP using its theoretical framework predict its own relative policy failure? Any such analysis would of course depend on the resources offered by the two approaches, the resources already established in both international and national policy settings at various points in time, and how well all these resources are likely to combine. While both IMP and NIS like to present themselves as rebels radically departing from neoclassical economics and the linear model, the IMP framework itself would suggest that the less of a rebel you actually are, the better your chances of being adopted.

It can be discussed to what extent Lundvall is representative of the whole heterogeneous NIS approach, but from our perspective he may have been the best possible choice. It may be that Lundvall is more similar to IMP than the average NIS thinker, which raises the question of if we even there may find crucial differences? At a first glance the similarities abound. Both approaches expect durable relations between organizations to develop over time, both emphasis the role of contextual knowledge for policy analysis and both perceive a

conservative bias in the innovation process. But after a deeper look we find some significant differences. For IMP the heterogeneity of resources and the unpredictable complexity of their combinations explain the durability of relations, the importance of context and the conservative bias. Lundvall places these phenomena in a different theoretical setting. The durability of relations is due to shared communication codes, the context is mainly the national context and the conservatism is due to innovations arising out of learning from routine activities. While IMP is uniformly critical of the neoclassical market model, Lundvall limits his criticism to the special case of how new products emerge through innovation. To understand established products the neoclassical market model works fine.

From this comparison it appears that IMP is much more grounded in context than Lundvall's brand of NIS. This follows from the heterogeneity of resources, which forces any analyst to acquire deep contextual knowledge of individual companies, industries and national and international settings to understand the value of these resources. To grasp the role of national contexts and how they influence user-producer communication is far less taxing in comparison. IMP is "tied to the ground" and radically critical of the neoclassical market view. It places high demands on any policy maker that would adopt it, in terms of acquiring deep contextual knowledge and giving up established views on how the economy works. NIS, on the other hand, requires contextual knowledge on a more superficial level and can co-exist with neoclassical economics. We find that just looking at the theoretical assumptions of the two approaches, NIS appears to have a head start in the policy race.

Still, for a while IMP combined well with at least the domestic Swedish policy arena, a process described in Weinberger (1997). This was helped by geographical proximity to the policymakers, together with curiosity from their part. There was also a lack of alternative paradigms, with the exception of the complementary Sweden's Technological System project led by Bo Carlsson. In the mid 1990s, the influence of both those approaches on Swedish policy had waned. Starting from the early 1990s Swedish technology policy went through a number of institutional changes. STU transformed into Nutek, and at a later stage into Vinnova. New generations started their careers as policy makers. With the EU membership in 1994 the tools available for national technology policy became more limited. Meanwhile the NIS concept increasingly influenced the OECD and EU. Nevertheless, as shown in Eklund (2007), the NIS approach ended up being abruptly thrusted into the Swedish policy discourse as part of a heated debate on the control over research funding. This is particularly interesting, as Lundvall has been a staunch supporter of university autonomy. But the relative abstractness of both the NIS concept and the context in analyses means that it can be applied in a wide variety of policy situations. With the increased OECD legitimacy of the approach, the incentive for different groups to appropriate it had increased significantly.

While the concrete and grounded need for contextual knowledge has made it more difficult to combine IMP with a wide variety of policy needs, a complementary explanation for the lack of policy influence is the lack of effort from IMP. NIS has actively worked to influence the policy world, but IMP has been content to build a research network and empirically study business interaction. When IMP interacted with the policy arena in Sweden during the 1980s, the policy actors were the ones taking the initiative.

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