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Innovation – actors, systems and cooperation

The relation between different theoretical and policy approaches

*Tom Johnstad,
Eastern Norway Research Institute and Gjøevik University College*

Abstract

Schumpeter pioneered modern innovation theory. He combined a behavioural and systemic understanding of innovation. At times has the behavioural approach dominated the scene as in the 80's with a strong emphasis on entrepreneurship and psychological aspects of innovation like creativity. Today is economic geography the dominant discipline in innovation research, with a strong emphasis on the systemic aspect of innovation with innovation systems as the core concept. Innovation is seen as an interactive process, but as such it contains both systemic, actor and relational aspects. The paper will elaborate on the need to integrate both behavioural and systemic approaches to better understand innovation processes and also develop better policies.

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1. Introduction

Schumpeter pioneered modern innovation theory. He had a behavioural understanding of innovation. At times has the behavioural approach dominated the scene as in the 80's with a strong emphasis on entrepreneurship and psychological aspects of innovation like creativity. Today is economic geography a prominent discipline in innovation research, with a strong emphasis on the systemic aspect of innovation with innovation systems as the core concept (Clark et al 2000, Fagerberg et al 2005). Innovation is seen as an interactive process, but as such it contains both systemic, actor and relational aspects. The paper will elaborate on the need to integrate both behavioural and systemic approaches to better understand innovation processes and also develop better policies.

Innovation can be seen from different perspectives. They have shifted over times, but represent complementary and partly overlapping approaches. These different perspectives see innovation as an

- entrepreneurial process,
- managerial process,
- internal collaborative process,
- open and interactive process,
- systemic process.

The last perspective, which overlaps with the next last, has got much attention the last decades within the social sciences and among policy makers. The last perspective often has the intention to include all the others through its holistic view, but it is a big danger that the systemic approach misses out the actors and the behavioural aspect of innovation (Johnstad 2009).

Lundvall (2007) emphasise that the "national system of innovation" (NSI) concept partly has been misused and partly has to be further developed. It has to be studied closer at the network- and company level, and at the local and regional level. He express that "... it is necessary both to understand micro-behaviour in the core and

understand "*the wider setting*" within which the core operates" (:95). – "The core of the innovation system is thus firms in interaction with other firms and with the knowledge infrastructure" (:102). Here the perspective has moved from the institutional and interplay in macro to also to include companies and their network and interplay with other companies and the knowledge institutions.

Giddens in his theory on "structuration" discusses the relation between actor and structure to overcome the traditional dualism and divide between voluntaristic and deterministic theories (Giddens 1984). The core in his reasoning is "the duality of structure". This relates to the idea that social structure both are the medium and result, the product of and condition for every day's life. Accordingly the theory tries to incorporate, on the one side knowledgeable and acting subjects as integrated parts of the social structure as long as it is the product or result of their actions. On the other side are elements, such as socialisation and institutions, power, ideology, time and space and social change, all function as conditions or media for social action or as structure for possibilities and limitations. Briefly then, all actors behave within the frame of given structures, but are through their actions forming the same structure.

In this relation Giddens (1984) separate and define the different concepts in his "structuration theory". He define *structure* as rules and resources, *system(s)* as enduring social practice, and *structuration* as conditions that govern the continuity or change of the structures , and through the reproduction of the system. Actors are an integrated part of this, but as acting and driving units.

According to Bocatti (2003) was also Marshall interested in the dualism or dialectics between actors and structures, or between conscious individual choices and more routine actions on the one side and inherited institutions on the other side. Human actions create a set of ties, according to Marshall, that could function as hindrances, but also as capacities to progress.

2. Innovation as an Entrepreneurial Process

A pioneer in the development of innovation theory was the early Schumpeter through the publication of his book "The Theory of Economic Development" (1934/1980). It was first published in German in 1911 when Schumpeter was professor at the

university of Cernowitz (today's Chernivtsi in Ukraine) (McCraw 2007). He argues her that *entrepreneurship* is the driving force for innovation and economic growth. Through a row of different new combinations put into life may the entrepreneur create different types of innovations as new products, processes, markets, sources of supply, and organisation. In this phase of his career Schumpeter had the focus on the entrepreneur as the driver of innovation and also profit – innovation as an entrepreneurial process. The new combinations often came from entrepreneurs and not established firms, but the entrepreneurial role is time limited and disappears with the routinisation of the activity.

The entrepreneur is characterized with the ability to break the rules that cement the activity within a field and through that see new possibilities of combinations. This ability has many aspects. It is a question of intellectual capacity and orientation to see new possibilities – a capacity called creativity. This is closely linked to psychological emotions and motivation to realise the possibilities, but also the social capacity to go alone and break conventions and accepted truth. It is not profit motives that drive an entrepreneur, according to Schumpeter, but the dream of independence and creation.

When the entrepreneur was able to create profit out of his new combination/venture the copyists would come in the next round to try to take their part of the profit. The effect often was that the entrepreneur and his copyists outcompetes the established and traditional companies through what he calls “creative destruction”. In this way are resources transferred from less to more productive companies and growth is created. An important part of Schumpeter's theory was the access to risk capital to realise the new combinations and make it an innovation. This need created investment banking as a new speciality in banking, which much later was supplemented with venture capitalists. This makes up the necessary institutional support and links for the entrepreneur.

Schumpeter changes his focus during the 1930's on the driving force in innovation, shifting from entrepreneurs to corporations, in line with the dominating view at that time. The interest in entrepreneurship drowned in this process, but was reborn 40-50 years later. The stagflation period of the late 70's with its overproduction crises destroyed the belief in large corporations, at least as job creators. New and smaller

companies were seen as the salvation (Birch 1979). The early Schumpeter was back on the scene and inspired the development of evolutionary economics (Nelson & Winter 1983). It also strengthened the interest in diffusion of innovation to smaller companies (Rogers 1983). This also influenced strongly the policy development with focus on technology transfer, incubators, venture capital, etc (Johnstad 1987).

“Schumpeter, like Marshall, viewed the innovative firm as the result of the entrepreneurial work of an extraordinary individual” (Lazonick 2005: 32). The interest and belief in entrepreneurship and the entrepreneurial process is still alive. Landes et al (2010) have explored entrepreneurship from ancient to modern times and their influence on the growth and prosperity of nations. They underline that entrepreneurial activities not always are productive and may even sabotage prosperity. Different institutions and restrictions have up through time enabled and impeded innovations and so have the incentives for the adoption and dissemination of inventions.

3. Innovation as a Managerial Process

With the growth of larger firms and organisations at the end of the 1800's and through the 1900's we saw the rise of innovation as a managerial and internal process. Both early Schumpeter (1934/1980) and Marshall (1919) though did not believe in the growth of large firms because of inherent problems. They “...located the limits to the growth of the firm in the problem of succeeding the original owner-entrepreneur” (Lazonick 2005: 38). Through three generations the wealth is often created and ruined. Even though the integration of ownership and control was a necessary condition for entrepreneurship, the solution of the innovation succession problem was at this time found in the separation of ownership and control. The later Schumpeter (1943/1976) recognised this (Lazonick 2005), and it became the essence of “the managerial revolution” and growth of “the managerial capitalism” in US businesses, where salaried and well educated managers became a powerful resource (Chandler 1977). A “three-pronged” investment in production, distribution, and management was the necessary condition for the growth of the industrial enterprise

and the new system (Chandler 1990). The role of R&D was an important an integrated part of this.

In the early phase of “managerial capitalism” there was a strong belief in science and research and the linear model of innovation. The experience during the Second World War strengthened this belief. The public policy response to this was the development of an applied research system to bridge the relation between basic and university research and development in the industry.

Tidd et al (2005) tries to generalise the characteristics of innovation as a management process. Within organisations focusing on renewal innovation has to be a core process according to them – it is “... a generic activity associated with survival and growth” (Tidd et al 2005: 67). This process involves certain steps common to all types of firms – *searching* for signals about threats and opportunities for change; *selecting* which of these signals to respond to; *implementing* new ideas on the base of the potentials and launching it in the internal or external market; and *learning* from processing through this cycle and build their knowledge base and improve the management of the process.

To manage this process successfully is a challenge for any organisation. Different circumstances lead to different solutions. A large science-based firm will tend to create solutions depending on formal R&D, patent searching, etc. Smaller engineering firms will focus on building capability to rapid implement new knowledge. In managing the process of innovation organisations develop behavioural patterns or routines based on learning. Tidd et al (2005) categorise these patterns into five clusters of enabling routines:

- Providing a strategic context for innovation
- Building effective linkages outside the organisation
- Creating effective enabling mechanisms for the innovation process to operate
- Building an innovative organisational context
- Learning and capability development for innovation management

The consequence of this modern view of innovation as a managerial process is the need to develop a learning organisation and good systems for knowledge management (Dierkes et al 2003).

4. Innovation as an internal collaborative process

Learning and innovation is most often a collective process that requires the collaboration of different people with different capabilities (Lazonick 2005). Within the learning organisation perspective we can see innovation as an internal collaborative process, especially in relation to incremental innovation. But it does not need to be so.

A central part of the massive investment in US companies in the rise of managerial capitalism was investment in skill-displacing technologies making it possible to establish the mass production of standardised, precision-engineered parts that could be used interchangeably in a product. A skilled worker to make parts fit together was not needed any longer (Womack et al 1990). Technical specialists were integrated into the managerial organisation sharply separated from “hourly” workers, which “...were not in general integrated with managerial personnel into the company’s organizational learning process” (Lazonick 2005: 40). This should later become a great weakness confronted with the Japanese challenges.

The Japanese firms succeeded through implementing high-quality, low-cost mass-production methods and created a big challenge for Western companies from the 70’s and on. “The Japanese... demonstrate[d] the innovative capability... created by not only building highly integrated managerial organizations, as the Americans had done, but also, as a complement, developing the skills of shop-floor workers and integrating their efforts into the firm’s collective learning processes” (Lazonick 2005: 40). An important part of their learning system is the role of “cross-functional” management and learning, compared to functional segmentation in US and Western companies.

Toyota was one of the leading Japanese companies in developing a learning company. Their form of internal collaborative organisation focusing on waste

reduction, continuous improvements (Kaizen) and close cooperation with their customers, suppliers and partners through “just in time”, was called “Lean production” and “Lean enterprise” by Womack and Jones (Womack et al 1990, Womack & Jones 1993). Toyota themselves call it Toyota Production System (TPS) or the more general “The Toyota Way” (Liker 2004, Liker & Hoseus 2008).

The approach in US industry was linked to the development of Taylor’s “scientific management”, a systematic study of human behaviour and management of organisations, going on parallel to the early Schumpeter and Marshall. The focus was on development of more efficient organisations from a rather mechanistic point of view which fitted the new mass production regime. This “taylorism” was challenged by “The Human Relation School” developed by Chester Bernard and Elton Mayo in the 30’s. They had a clearer social view on humans and underlined the importance of informal networks and social relations and the job needs and satisfaction of employees (Rogers & Rogers 1976).

The Norwegian psychologist Einar Thorsrud became a Scandinavian pioneer in work research within the human relation tradition in the 60’s. Being HR-responsible at the food company Freia he caught interest in the work research done at the Tavistock Institute in London in the 50’s. He gradually became a researcher and strategic driver of work research in Norway with the establishment of the two institutes – IFIM in Trondheim and AFI in Oslo. The democracy experiments in Norwegian companies in cooperation with the social partners were an important part in the research efforts. Within a socio-technical tradition, with strong focus on the need for autonomy and team work in working organisation, they brook strongly with the “taylorist” and US mass production logic (Skorstad 2002, Gustavsen et al 2010)

There is at the moment a big national and international interest in “the Norwegian Model” which is based on a national welfare state regime and cooperation between the social partners at the national level and in the companies. At the national level there is a three party relation where the government also participate and where working life issues are discussed. A well established national agreement between the social partners regulates the relation between them concerning wage negotiations, conflict regulation and cooperation on development issues. This is also in operation at the company level. This creates trust, low conflict level, predictability and dialog

which are pretty unique (Hernes et al 2006). It also is an important element in understanding OECDs Norwegian Paradox – the possibility of having high GDP and productivity without high level of R&D investment high-tech production. – This also illustrates the relation between institutional and structural factors in macro and action/behaviour in micro.

5. Innovation as an open and interactive process

Innovation as an open and interactive process was a core component in the innovation system writings of Lundvall in 1992 and the Kline & Rosenberg article from 1986. But this was also integral in the industrial districts literature starting with Marshall, through the contributions from the Uppsala school, to Porters view on value chain based competition and competitiveness to Chesbrough's open innovation focus. The innovation process is though much less a single enterprise activity today than it might have been earlier. On the other side organisations are still primary actors in the process even though an increasing amount is done in cooperation with others.

Through transformation of production from the late eighteenth century Britain managed to emerge as the world's first and leading industrial nation. Much of this productive power resided in industrial districts that accumulated capabilities which were based on craft organisation and on-the-job apprenticeship skill formation. It was skilled craft workers that maintained critical roles in keeping imperfect machinery running and the throughput of work-in-progress made from imperfect materials. A lot of "turning" and "fitting" was necessary (Bruland & Mowery 2005, Lazonick 2005, Marshall 1919).

Economies of scale and learning were not internal to the firms but external and part of the industrial district. Through the local press and mobility of workers new technological and organisational improvements was diffused among firms in the district. According to Marshall (1919) were the industrial arts "in the air", it did not

need strategic direction through organisational integration. Development of managerial capitalism though demonstrated the power in this kind of integration.

In the 80's the notion of "Marshallian industrial district" got renewed attention in relation to the change and growth in "the Third Italy". This was based on the growth in many highly specialised and localised districts during the 60's and 70's (Brusco 1982). On the basis of this experience the model of "flexible specialisation" was proposed as an alternative to the mass production regime and the US corporate model (Piore & Sabel 1984). Between the British and Italian industrial districts two differences appeared. "The first difference was the extent to which in Italy collective institutions supported the innovative activities of small firms... related to business administration, marketing, and training... The second difference, which became more evident in the 1990s... [that] "leading" firms could emerge, drawing on the resources of the industrial districts while, through their own internal growth, transforming the innovative capability of the districts" (Lazonick 2005: 37).

A third form of industrial district is the one we have seen in new high-tech milieus like Silicon Valley. Here the agglomeration effects and externalities are substantial, but with organisational learning occurring within firms, in addition play venture capital an important role in the early phase of firm formation, and the importance of state funding in the development of new technology and of universities for education of personnel going to the firms, are substantial (Larsen & Rogers 1984, Lazonick 2005)

The Uppsala School of researchers represented by Hägg and Johansson (1982) pioneered the research on customer and supplier relations and cooperation in learning and innovation processes. Powell & Grodal (2005) focus on networks of innovators, Miles et al (2005) on collaborative entrepreneurship and how communities of networked firms use continuous innovation to create economic wealth. Chesbrough have been missioning the concept "open innovation" to describe a model of innovation in which firms draw on research and development that may lie outside their own boundaries (Chesbrough 2003, Chesbrough et al 2006). All these theories have in common that they have the focus fixed on the firm and how they interact and use the resources in their environment.

They have this last point in common with Michael Porter in his study of competitiveness (1980, 1990, 1998) where the company is at the core located in the value chain, but in his cluster studies he is bridging towards a more systemic view. His cluster perspective has inspired a lot of policy activities all over the World. The OECD report on “Competitive Regional Clusters – National Policy Approaches” clearly shows this (OECD 2007).

6. The systemic nature of innovation

Fagerberg (2005) emphasizes the systemic nature of the innovation processes. Firms do not normally innovate in isolation, but in interaction or collaboration with other organizations as discussed in the previous section. At the end of the 80's was the innovation system concept introduced by Freeman (1988) in connection with his studies of Japan's competitiveness. Lundvall (1992) broadened this into a theory of national system of innovation (NSI) linked to an interactive innovation model where knowledge is the most important resource in the economy and learning the most important process that nourish innovation. The most central activity in an innovation system is production and diffusion of knowledge as basis for economic activity and growth (Lundvall 1992). The original idea with the system concept, according to Lundvall (2007), was that the whole is more than the parts, and that interaction between the parts is important for the process and the outcome.

Different related concepts have grown over the years like regional innovation systems which emphasize that innovation processes and knowledge are regionally anchored (Asheim & Isaksen 1997, Cooke 1998). In addition we have the “triple helix model” which focuses on the interplay between research, industry and government in innovation processes (Etzkowitz & Leydesdorff 2000). These different approaches have helped in diffusing the concept of innovation system. Huge international interest in the concept has emerged with broad applications in policy development by regional and national governments and international organisations like OECD and EU. The Swedish Agency for Innovation Systems

(VINNOVA) is named after the approach. Innovation Norway (Innovasjon Norge) also uses the innovation system thinking in many of their programs.

Edquist (2005) try to relate the system of innovation (SI) to "general systems theory" used in natural science. Here a system consists of two kinds of constituents – components and relations among them, and together they should form a coherent whole. Further the system has a function – performing or achieving something, and it should be possible to identify the boundaries of the system. In a SI organisations and institutions are the main components, according to Edquist. Organisations are the actors or players in SI while institutions are the rules of the game. Activities in SIs are the same as the determinants of the main function – to pursue innovation processes or to develop, diffuse and use innovations. "Innovations emerge in such "systems of innovation"" (: 182).

Even though this approach have actors or players (organisations and in a note also individuals) they easily slip into the background and the system itself becomes active. Then we are close to a structur-functional view where the actors "have disappeared". In theory and practical studies this is not only a threat but a reality. This also has important implications for the policy development and its realism.

7. Integrating perspectives

We have in this paper presented different views and perspectives on the innovation process going from one focusing on exceptional individuals and there psychological and social abilities, through the focus on management and leadership in larger corporations, to the role of interaction and collaboration with others internal or external to an organisation – the relational perspective. All this perspectives have the actor(s) and behavioural aspects as core focus, but often in relation to the environment or structure. The last group of theories take another stand. The system of innovation perspective has a more "holistic" and boards towards structural-functional view where the actors and behavioural aspects often disappear or play a second role.

The original view on systems of innovation, according to Lundvall (2007), built on a few simple ideas. “First that the whole is more than the sum of its parts, second that the interrelationships and interaction between the elements were as important for processes and outcome as were the elements and that therefore we might expect each national system to develop its own unique dynamics” (:100-101). But he adds to this an important comment. “Today I would emphasize another argument in favour of the “system” concept. The innovation process may be seen as an intricate interplay between micro and macro phenomena, where macro-structures condition micro-dynamics and visa versa new macro-structures are shaped by micro-processes” (:101). This is a view in line with the social science position reflected by Giddens (1984) referred to earlier. This is though a position that implies the overriding of a singular or narrow systemic position and more active take into account the more behavioural perspectives in studying innovation and create a more integrated and plural position.

We have seen that Lundvall (2007) recognise the shortcomings of the traditional national system of innovation (NSI) concept. He then tries to “...sketch the outlines of a method to study national systems of innovation that moves from micro to macro – and back again to micro” (:102). He starts with the following facts:

- Firms are the units that play the most important role and their organisation matters.
- Firms innovate in an interaction with other firms and the knowledge infrastructure.
- Firms’ innovative activities are dependent on the set-up of elements in the national innovation system.
- Firms belong to different sectors that differ in how they innovate and interact.

Further, Lundvall (2007) advice which steps could be taken to fulfill the challenge implicit in his new micro-macro perspective (:102):

- “to analyse what takes place inside firms in term of innovation and competence building” (the managerial process and the internal collaborative process)
- “to analyse the interaction among firms including competition, cooperation and networking, and how firms interact with knowledge infrastructure” (the interactive process)

- “to explain international differences in these respect with a reference to the specificities of national [elements/institutions in the innovation system]” (the systemic nature)
- “firm organization and network positioning may be used to “explain” the specialization, competitiveness and growth performance of the innovation system” (the systemic nature)

In addition Lundvall (2007) puts forward some extra ideas for “the future theoretical work on NSI”. I just mention one important idea here. “An interesting challenge is to link entrepreneurship, seen as the classical driver of innovation, to the concept of innovation system. There is an inherent risk that “system” brings with it a structuralist mode of explanation that neglects the critical role of agency” (:110). This is entrepreneurial process described earlier.

Lundvall here hits my point, and hopefully this might bring us closer to a more plural but also more integrated study of innovation. It would perhaps be better to call this “dynamics of innovation” instead of “systems of innovation” where the systemic perspective is more on line with the other perspectives and not that they are contained within the systemic view in a way that they disappears.

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