

Bateira, Jorge

**Conference Paper**

## Innovation Systems - Do they exist? Exploring Luhmanns thinking

45th Congress of the European Regional Science Association: "Land Use and Water Management in a Sustainable Network Society", 23-27 August 2005, Amsterdam, The Netherlands

**Provided in Cooperation with:**

European Regional Science Association (ERSA)

*Suggested Citation:* Bateira, Jorge (2005) : Innovation Systems - Do they exist? Exploring Luhmanns thinking, 45th Congress of the European Regional Science Association: "Land Use and Water Management in a Sustainable Network Society", 23-27 August 2005, Amsterdam, The Netherlands, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at:

<http://hdl.handle.net/10419/117611>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# **45th Congress of the European Regional Science Association**

***23-27 August 2005, Vrije Universiteit Amsterdam***

## **Innovation Systems: Do they exist? Exploring Luhmann's thinking**

**Jorge Bateira**

ESRC Centre for Research on Innovation and Competition (CRIC)  
The University of Manchester  
Harold Hankins Building, Booth Street West  
Manchester M13 9QH, England, UK  
[Jorge.Bateira@postgrad.manchester.ac.uk](mailto:Jorge.Bateira@postgrad.manchester.ac.uk)

### **Abstract**

Following Nelson and Winter's (1982) evolutionary critique of neoclassical view of technical change and economic growth, there appeared an abundant literature on National Innovation Systems (NIS) putting an emphasis on learning processes and institutions as important factors that shape the dynamics of growth in each country. Some scholars extended the discussion to sub-national territories, thereby giving origin to a new approach to regional development based on the concept of Regional Innovation Systems (RIS). Production and transfer of knowledge, and the role of institutions, are two major research domains in those strands of economics literature. However, the first one is largely dominated by H. Simon' cognitivism, which is under serious critique from a naturalist perspective; the second is mostly descriptive, lacking an ontological understanding of institutions. Drawing on cognitive sciences research and on Niklas Luhmann sociology, the paper critically discusses the assumptions used in the above-mentioned literature, and argues for a bridge between evolutionary economics and natural sciences that could accommodate the specifics of social phenomena.

### **Keywords**

Innovation systems, evolutionary economics, knowledge, institutions, regions, policy-making

## 1. Introduction<sup>1</sup>

We are contemporaries of a dramatic change in the way our societies organise interactions across space, which is being called 'globalisation'.<sup>2</sup> Territorial societies, be they national or sub-national, are more and more affected by globalisation processes on the economic, decisional and structural dimensions of their life.<sup>3</sup> This should not be seen as a mechanistic relationship, because national and local actors always mediate (by resisting or managing) the impact of globalisation on territories and, on the other hand, they take initiatives that interfere in its course. This interactive multi-level process is giving origin to a global system increasingly complex and unpredictable that presents emergent features of a new kind. Moreover, the fact that the emergent global system lacks regulatory institutions that could enhance its self-organisation makes some authors say that "the great national movements for democracy, liberty and social justice that took place in the eighteenth and early nineteenth centuries within nation-states now have to be reproduced globally. No less will do." (Giddens and Hutton, 2000: 223).

Taking the above-presented background, this paper acknowledges the explanatory potential of an evolutionary approach in economics, which provides a fruitful ontological and epistemological framework for a research focused on current processes of global competition. In fact, similarly to the emergence of natural systems, globalisation may be seen as the on-going production of a new (social) system with specific characteristics that are not found in its components, and although it arises from the interaction of lower-level actors, it feeds-back over them exerting what is usually called 'downward

---

<sup>1</sup> A previous version of this paper has been presented at the conference 'Inovação Tecnológica e Globalização – Implicações para os Países de Desenvolvimento Intermédio', ISCTE, Lisbon, 23-24 Oct. 2003.

<sup>2</sup> I take from Held *et al.* (2000: 55) the following definition of globalisation: "a process (or set of processes) which embodies a transformation in the spatial organization of social relations and transactions – assessed in terms of their extensity, intensity, velocity and impact – generating transcontinental or interregional flows and networks of activity, interaction, and exercise of power."

<sup>3</sup> In this paper the word 'territories' means spatial communities built on intense economic and social interaction, either at national or sub-national level, while 'region' refers to sub-national territories that may comprise different 'local productive systems' and have demographic and economic scale for policy decentralisation.

causation' (Emmeche et al., 1997; Bhaskar, 1979). In fact, the emerging global economic system and the economic (sub)systems that it comprises (e.g. economic agglomerations, nations, regions, global firms, MNE) are mutually constitutive and thus co-evolve in the broader social and natural environment.

This evolutionary approach is an adequate frame for the understanding of relations between Local Productive Systems (LPS) and Multi-national enterprises (MNE). In the last decades of twentieth century appeared a new type of actor, the 'global firm' or the 'integrated MNE', which adopts a holistic management of its operations by organising its chain-value as a global network of activities. This global firm takes advantage of the geographical distribution of resources and capabilities across the world by means of an efficiency-seeking foreign direct investment (FDI) policy that may target three kinds of cross-border specialisation: horizontal, vertical and asset augmenting (Dunning, 2000). The first one addresses the geographical allocation of each product; the second allocates different stages of a given production; the third is a mixed policy of FDI aiming to explore local R&D and other wealth-creating competencies mainly located in developed countries. In the cases of horizontal and vertical policies, the MNE tend to locate their affiliates in the proximity of clusters of related firms in order to benefit from what Storper (1995) has called 'untraded interdependencies'.

This new geography of production expanded through the nineties and began to destabilise a large number of LPS in countries of different levels of development. Before the nineties, LPS originated external economies and, in some cases, an innovative environment that enabled their small and medium-sized firms (SME) to countervail the economies of scale exploited by MNE. Henceforth, conditions for competition in the globalising economy have changed, as much for successful 'industrial districts' in Italy as for other LPS across the world (Markusen, 1996; Whitford, 2001).

So far, the empirical analysis of the above-mentioned changes does not support the idea that MNE are becoming placeless networks for which factors of production are highly mobile and all locations are easily substitutable

(Storper, 2000). For instance, even in developing areas of the world where an important part of local production is integrated in global commodity chains, local entrepreneurship plays an important role in the geographical allocation of MNE's production orders. Besides costs, MNE also take account of other factors related to time responsiveness and quality standards, which are important for the organisation of flexibility. Those qualitative dimensions of global competition are largely cluster specific because subcontracted SME usually rely on a common pool of labour competencies and a network of locally supplied services. At least so far, the phenomenon of 'deterritorialised' networks of production still accounts for a limited share of MNE economic activity despite the importance given by media to cases of delocalisation. However, the recent integration of China in World Trade Organisation will certainly increase price competition and accelerate some of the above-mentioned disruptive trends in LPS of developed countries.

Therefore, from the standpoint of a developing territory, the crux for a successful strategy in the current 'globalising learning economy' is to become specific (Maskell and Malmberg, 1999) and manage the integration of MNE in the local economy up to the creation of important switching costs (Schmitz, 2004).<sup>4</sup> Lündvall and the school of Aalborg have emphasised the circular process between globalisation and the need for learning, which produces a 'transformation pressure' to adjust and innovate. In this changing context, more dynamic LPS of developed countries (but also of intermediate levels of development) are seeking to build innovative environments based on systematic private-public co-operation, which "helps to safeguard existing jobs, embed existing foreign plants, promote more robust linkages between these plants and indigenous firms, and helps to disseminate 'best practice' throughout the regional economy" (Morgan, 1997: 501). However, these processes of social change seem to be beyond the training economists have been receiving, which is mostly focused on efficient resource allocation and

---

<sup>4</sup> For a definition of 'learning economy' see Lündvall and Archibugi (2001: 1): "Individuals and institutions need to renew their competencies more often than before, because the problems they face change more rapidly. (...) The key to success is, rather, rapid learning and forgetting (when old ways of doing things get in the way of learning new ways)".

equilibrium conditions. Yet, competition by innovation is about creation of new resources, it is about dynamics (Metcalfe, 1998).

In fact, globalisation also challenges economic science, which is (very slowly) changing in order to understand the complex and interdependent processes at work in different dimensions and geographical scales. For instance, the new-institutionalist school (Williamson, 1985) revised some assumptions of neoclassical economics and produced extensive research based on the concept of transaction costs. However, new institutionalism still remains an economics of allocation of resources, which is not adequate to deal with a learning economy. Further, his understanding of human behaviour in terms of rational choice theory, and its failure to see institutions as an emergent level that moulds the preferences of individuals make new institutionalism inadequate for research about socio-economic processes of change (Hodgson, 2000).

In the beginning of the nineties different strands of non-mainstream economists converged into a new approach to capitalism dynamics by placing institutions at the core of innovation processes and economic growth. Inspired by the seminal work of Nelson and Winter (1982), a growing literature began to study national innovation systems (NIS) (Lundvall, 1992; Nelson, 1993) and assumed an evolutionary orientation although the concept remained rather vague. Taking account that this new conceptual background inspires much of current research on territorial strategies of change (Gottardi, 1996), in the next section I will look closer to this 'systems of innovation' literature.

## **2. Systems of innovation: problematic underpinnings**

The NIS literature argues that there are national specificities regarding structure and functioning of markets, firms' technological capabilities, institutions, and mechanisms for selecting and diffusing innovations. According to Gregerson and Johnson (1997: 482)

The idea that lies at the centre of the concept of innovation systems is that the overall innovation performance of an economy depends not only on how specific organizations like firms and research institutes perform,

but also on how they interact with each other and with the government sector in knowledge production and distribution.

In this definition there are two issues that I will discuss briefly: the systemic nature of innovation processes, and their cognitive dimension.

The idea that interactions between firms, research organisations, and the state, are at the basis of learning processes is a crucial one and admittedly points to the existence of a 'system of innovation' (henceforth SI). The specification of this system is supposed to include the most important determinants of innovation, or its explanatory factors. But Edquist (1997:15) admits that "we simply do not know in detail what all the determinants of innovation are", and finally recognises that the 'system' concept is ambiguous as far as "none of the major authors provide a sharp guide to what exactly should be included in a '[national] system of innovation'; they do not define the limits of the systems in an operational way" (p. 27).<sup>5</sup>

The SI literature began with an emphasis on the national level, and proceeded with an exploration of a 'technological systems' concept addressing specific 'technology fields' (not necessarily within an industrial sector), which may crisscross national innovation systems (NIS) and regional innovation systems (RIS). On the issue of geographical scale, Howells (1999: 67) recalls Metcalfe's (1995) observation that "the national unit may be too broad a category to allow a clear understanding of the complete dynamics of a technological system". Other authors stress the role of sub-national interactions, and Cooke and Morgan (1998: 203) argue for a multi-level approach: "The point is that all three levels – global, national, and regional – have their relative importance and the research challenge is to tease out how and in what ways".

It is acknowledged that the SI approach to innovation draws on evolutionary economics (McKelvey, 1997; Saviotti, 1997). This stream differs from neo-classical economics at least in the following issues: heterogeneity of agents in cognitive and behavioural terms; endogenous dynamic nature of

---

<sup>5</sup> Cooke (1998: 11) also recognises that "in the literature on innovation, the term 'system' is not analysed in great detail."

complex economic systems, thus involving open-ended processes, uncertainty and path dependency; at least for some authors, adoption of the broad Darwinian scheme of evolution (variation, selection, and retention of characters). In the latter sense, the term 'evolution' goes largely beyond the idea of change along time to assume analogies between economic mechanisms and those of natural selection in biology.<sup>6</sup>

A crucial point in the SI literature is the generalised absence of an ontological statement about these 'systems'. What is their ultimate reality? McKelvey (1997: 201) states: "systems of innovation are constituted by innovative activities. (...) Innovative activities are therefore here defined as knowledge-seeking activities to develop novelty of economic value." In fact, the definition begs the question about the ontology of these 'knowledge-seeking activities'. In that literature most authors do not address this methodological issue. An exception is Cooke (1998: 11; italics mine) who gives an explicit ontological answer albeit ignoring its implications: "Clearly, an innovation system is a *social system*, and innovations are the result of *social* interaction between economic actors. Furthermore, it is an open system in interaction with its environment."

Thus, the ontological question remains: is there a *social system* able to define its borders and maintain itself along time like natural systems? In the case of a living system this implies a definition of borders that *include* the components belonging to it and *exclude* those who belong to the environment. Living systems are more sophisticated than physical-chemical systems; in the former the processes through which the system creates and maintains its borders are part of its nature and functioning. Contradicting the stated biological inspiration, most evolutionary economists do not discuss in these terms the 'systemness' of the SI they study. Researchers define a set of organisations and institutions according to pragmatic (operational) criteria, instead of building on existing sociological research about social structures, be

---

<sup>6</sup> For a thorough discussion on this point see Hodgson (1993). In the next section I attempt to argue that we should go further and accept a common ontology of human beings and natural systems that preserves the specifics of each level of emergence.



they systems or not. In fact, SI literature most frequently adopts a mechanistic (first-order) cybernetics that is radically inadequate for the study of social systems.<sup>7</sup>

Within the SI literature it is common to invoke analogies with natural systems and Darwinism as a source of inspiration, and at the same time stress that there is no mechanical transfer of concepts into economic analysis.<sup>8</sup> In doing so evolutionary economics builds on problematic underpinnings. On the one hand, evolutionary authors separate human behaviour from the rest of nature following the idea that human nature is radically different. But this is a misstated argument taking account of current interdisciplinary research (Archer, 2000).<sup>9</sup> On the other hand, they create an inadequate divide between their epistemic approach (economic theories) and the ontology of social systems, which frequently display properties similar to those of natural systems.

The attempt to take an excessively cautious distance from natural sciences research also has important implications in the concepts of knowledge and information adopted by evolutionary SI literature. See for instance Saviotti (1997: 192):

Innovation systems are very knowledge intensive. (...) These different types of knowledge are often created and transmitted by different types of institutions, but they have to be combined into the production of final outputs. In order to study these flows of knowledge a number of generalizations which are applicable to the different types of knowledge have emerged.

It is important to observe that expressions like ‘types of knowledge’, ‘to be combined’, and ‘flows of knowledge’ reveal an implicit assumption: knowledge

---

<sup>7</sup> First-order cybernetics applies to input-output systems that mechanically adapt to changes in the environment. Second-order cybernetics adopts the point of view of a living system, which *organises exchanges with the environment in order to preserve its autonomy*. See Heylighen and Joslyn (2001) for the history of cybernetics and its concepts.

<sup>8</sup> See Saviotti (1997: 183): “Biology can be a very powerful source of inspiration for evolutionary economics, but in the sense of allowing us to formulate new questions and problems and not in providing biological answers to economic problems.”

<sup>9</sup> See also Hodgson (2002a) for a detailed critique of these arguments. For a complementary view of a biologist see Corning (1996: 8): “the claim that ‘humans alone’ can invent new adaptive strategies is totally at odds with the extensive evidence that other organisms are able to do so as well, although humans obviously excel in this respect.”

is a 'thing' (a commodity) that can be accumulated and transferred. In the same vein, McKelvey (1997: 203) states: "In order to avoid confusion, we can distinguish between 'information' which exists independent of receiver/transmitter and 'knowledge', that is, information which has been translated so that humans understand it." In brief, it is accepted that knowledge is subjective ('an interpretive structure') but may be converted into information by using codes ('codified knowledge'). In this case, communication transmits information, which is understood as codified knowledge. Besides the distinction between information and knowledge, it is usual to refer to 'tacit knowledge' that is associated to personal skills, a 'type of knowledge' that cannot be codified.<sup>10</sup>

In fact, this understanding of knowledge and information is deeply inspired by the cognitivism of Herbert Simon, which is challenged by contemporary neurobiological research (Núñez and Freeman, 2000). In fact, most evolutionary economics accepts uncritically the cognitivist explanation of mind-brain relations according to the computer metaphor, and therefore frequently use terms like 'knowledge accumulation' or 'retrieval of knowledge' in memory, the latter viewed as a container in the brain ('hard-disk'). The crucial point is that SI authors maintain with natural sciences a rather timid dialogue that is not favourable to the acknowledgement and adoption of results coming from modern interdisciplinary study of knowledge and information.

At the outset, it is necessary to stress that human beings are deeply rooted in nature, not only by their biology but also by their minds (Capra, 1996; Donald, 2001). Taking account of this basic unity, we should see human cognition as an evolved capability of mind that operates in intimate relation with the overall dimensions of the person (Christensen and Hooker, 2000; Damasio, 1994; Donald, 2001). Humans are not born with 'predetermined structures' in higher cerebral centres that put labels ('encode') neural signals

---

<sup>10</sup> These authors accept the misreading of Michael Polanyi (1966) made by Nelson and Winter (1982). Denying this duality (tacit versus codified), Polanyi actually presented a *unitary process of knowing* that always needs, in more or less extent, a 'tacit dimension'. About this point see Chia (2002) and Bateira (2005).

coming from the periphery. Each human being is constituted through social interaction, and the meanings he acquires along life come from a complex process involving neural networking, hormones, imagination and emotions. In brief, knowledge belongs to the *continuous flow of a personal (embodied and embedded) experience* (Lakoff and Johnson, 1999). Thus, when we refer to knowledge we must bear in mind that it is indeed a personal sense-making process; our words are of a different nature as part of an institution we call *language*, which we learn and use to manage our social relations in the environment we live.

Certainly, we engage in communication and this is the way we learn. But, through an act of communication I do not send 'codified knowledge'. I send signals (words of a language) that are understood by anyone who has lived personal experiences similar to mine while learning that same language, therefore attributing to those signals identical meanings.<sup>11</sup> Indeed, in communications there is no objective information. Meanings are not attached to the words; they are constructed in our minds through social interaction that also uses words (Bickhard, 1987; Deacon, 1997). This naturalist understanding led Brier (2002/2003) to argue that human communications always involve an articulation of three types of autopoietic systems<sup>12</sup>: *biological* (brain and the rest of the body), *psychological* (ultimate interpretant of signs), and *communicational* (in the sense given by Niklas Luhmann).

To sum up, I suggest that the concept of SI (national, regional, or technological) is not supported by any theory of social systems. Further, although most of the literature acknowledges the inspiration of biological analogies, it does not use even in a metaphorical sense the concept of a living system as accepted in biology, which is based on second-order cybernetics.

---

<sup>11</sup> Lakoff and Johnson (1999) argue that personal knowledge is deeply moulded by metaphorical thought. Primary metaphors used in communication are stable for long time as they come out of relationships between *the same body's structure and the same natural environment human beings share*. There are also (not so stable) complex metaphors that are built out of the primary ones and of multiple forms of cultural manifestations as widely accepted beliefs, folk theories, etc. In this sense there are some *objective conditions* for the relative stability of concepts we need in order to communicate and live.

<sup>12</sup> Autopoiesis is a particular mode of systems' self-organisation. According to Whitaker (1995), "autopoiesis involves both organization preservation and componential (re-)production".

Finally, knowledge and information are commonly understood and discussed in the SI literature according to concepts taken from the cognitivist paradigm much diffused by Simon, which lacks support from modern interdisciplinary research coming from biology, neurosciences, developmental psychology, and embodied semantics.

### **3. Luhmann's social systems and innovation**

The German sociologist Niklas Luhmann gave important contributions to the understanding of social systems (Arnoldi, 2001), which so far have not been recognised within evolutionary economics. Luhmann draw on the research of biologists Maturana and Varela, dating back from the sixties, and used their concept of autopoietic systems to theorise social systems. He argued that *social systems are systems of communication that make sense of their environment*:

Hence, Luhmann's work is neither on how actions are coordinated into action systems, nor an attempt to describe social order through actors' experiences of others. Instead, it concerns meaning-processing social systems, excluding the actors point of view but including sense-making. (Arnoldi, 2001: 3-4).

Those systems 'observe' their environment and make the crucial distinction between 'inside' and 'outside'. Or, using the words of Arnoldi (2001: 5), "the distinction is meaning-constituting because it contains its *own* (self-reference) outside. (...) That is, *the observation constitutes the observer*."

For Luhmann (1995/1984), 'societies' are comprehensive social systems that developed the property of internal differentiation, which is the repetition inside the system-society of distinctions between *particular types of communications* and their environment thereby self-constituting various 'functional systems'; for instance, political system, economic system, law system, education system, and so on.<sup>13</sup> Vanderstraeten (2001: 305) synthesises this view of modern societies in the following:

Each of these subsystems accentuates, for its own communicative processes, the primacy of its own function. Each establishes a specific, highly selective set of system/environment relations and *privileges its own*

---

<sup>13</sup> Luhmann (1995/1984) considered three broad types of social systems: societies, organisations, and interactions.

*directive distinction* (e.g. true/false, have/have-not, legal/illegal, rulers/opposition). Function systems are not differentiated as regions of being, but by means of their *modes of operating and observing*.

According to Luhmann's understanding there is no functional system that could steer the whole society because, being autopoietic systems, each functional system conducts its operations on its own terms. Although the political system aims at regulating all the other functional systems, in fact it only succeeds in influencing them in indirect ways *as far as it changes their environment*. In complex societies there is no centre of command, and each functional system belongs to the environment of each other.<sup>14</sup>

Looking at social systems in these terms has important implications for the discussion of SI. So far there is no *specific type of communication arising from innovation processes* that could be able to make distinctions so as to self-constitute an identity, to emerge as a system that could play the particular function of generating innovation in modern societies. In fact, from a Luhmannian point of view, communications *within* and *between* firms, science organisations, or state agencies actually are of a different nature. Each of these social systems has its established meanings, and makes specific distinctions that preserve its own identity. Therefore, what the SI literature fails to see with its mechanistic metaphor is a crucial aspect of social systems: those different ways of making sense of the environment are at the root of the widely acknowledged difficulties of public programmes in addressing the so-called 'transfer of knowledge' from universities into firms.

Following the above-mentioned theoretical framework, it is useful to critically analyse the SI concept at the light of a distinction between 'system integration' and 'social integration'. Luhmann (1996: 344) himself recalled these concepts:

Using David Lockwood's (1976) famous distinction between social integration and systems integration we can understand social integration as the integration of different autopoietic systems (e.g. minds and social

---

<sup>14</sup> This has important implications for the quality of modern democracies. For instance, to improve the influence of the political system on the whole society politicians need to integrate in their rationality the way their communicative acts are perceived and understood by other functional systems. They need a reflexive way of observing their environment.

systems, but this would include also brains and minds and cells and brains) and system integration as the integration of subsystems based on the same type of autopoietic operations.

The above-mentioned distinction has important implications for our analysis. Within society, firms belong to a particular functional system ('economic system') as far as they are created through a specific type of communications and accomplish an economic function. Improving coordination of different firms *within this system* corresponds to a higher degree of integration of the economic system. The same holds within the science system in the research activities of universities and other scientific bodies, and within the state in its multiple administrative forms and geographical levels. On the other hand, when we consider "the reciprocal restriction of the degrees of freedom" *between different functional systems* (economic, science, state) through changes in the environment of each other, we should refer to social integration.<sup>15</sup>

Those distinctions lead to a radical implication in our discussion of the SI concept: there is no such 'System of Innovation' that could self-organise according to specific communicative acts centred on innovation, or reproduce its structures according to a specific mode of making distinctions. From a Luhmannian perspective, we do not find in our societies a SI; however, we do find *societies that are more or less integrated, and the characteristics of this integration certainly bear on their degree of innovativeness*. This makes an important difference, theoretically and in terms of policy-making, as I will discuss later.

Arguing the ontological inexistence of a SI does not mean the automatic rejection of everything that so far has been proposed by evolutionary economics literature about innovation processes. However, adopting the point of view of Luhmann for social systems, we gain a new (and hopefully useful) analytical insight that is inspired by natural sciences research, thereby filling

---

<sup>15</sup> In fact, when Lündvall (1992) and Nelson (1993) discuss national systems of innovation they are addressing the specificities of highly integrated *national societies*. At a sub-national level society's integration is lower, even in politically autonomous regions such as Catalonia (Riba and Leydesdorff, 2001)

the interdisciplinary gap mentioned in the previous section. Further, building bridges between evolutionary economics and natural sciences illuminates the need of a shift from policies centred on financial incentives in line with the neo-classical view of human nature (Davis, 2003), towards policies centred on learning processes in different types of organisations (Brown and Duguid, 2001), on creating cross-border organisations that enable communications between different functional systems (Kaufmann and Tödting, 2000), and on reflexive policy-making that introduces learning processes within the state (Jessop, 1997).

Policy implications of a naturalist understanding of knowledge merit a closer look. As far as knowledge is an embodied and embedded experience, there is no such transfer of ‘codified knowledge’ that could be appropriated by a receiver. Only those who have acquired similar experiences, attended similar education and training, and/or have interacted intensely with each other (thus belonging to an ‘epistemic community’), are in condition of giving similar meanings to a communicative act. This implies that the ‘appropriability’ argument about R&D activities only holds within the borders of circumscribed communities.

For those actors who have not a similar background there is a case for innovation policy aiming to foster learning processes. Taking a non-Cartesian understanding of knowledge, and in basic accordance with Lündvall’s initial intuition, I argue that learning needs interaction not only within networks of firms but also between firms and real services suppliers in order to take off the initial knowledge burden that impede the adoption of new technologies.<sup>16</sup> As argued by Attewell (1996: 213):

provision of these services by mediating institutions does enable user organizations to adopt a complex technology without (initially) having to acquire a full range of technical knowledge in-house, and hence is functional for diffusion.

---

<sup>16</sup> The importance of real services to SME becomes more evident if we take account of two concepts related to learning: ‘absorptive capacity’ is needed to cross a cognitive distance between two persons, and ‘communicative capacity’ is needed to help others understand what we do or say. About these concepts see Nooteboom (2000).

Continued interaction with go-between organisations, combined with adequate market incentives, should create conditions for a shift from service to self-service. SME of low-tech industries in developing regions are good candidates to this capability-building policy, which in the last years has been object of some experimentation and evaluation in different European regions (Asheim *et al.*, 2003).

#### **4. Innovation policy in developing societies**

Although SME networking appears to be the adequate policy direction to promote learning processes, there remains the problem of how to make it work in developing regions. LPS of these regions face huge difficulties to achieve differentiated input-output relations and locally specific technological knowledge. At the same time, those developing societies fail to produce the 'institutional thickness' that could sustain the new forms of local association that feed learning processes (Amin and Thrift, 1995).<sup>17</sup>

After Putnam (1993) a vast literature on local institutions has been produced, with a particular emphasis on the importance of trust for actors' co-operation. Connecting with the work of Luhmann, Bachmann (2001: 342) presents 'trust' as a foundational mechanism of social co-ordination:

at the origin of the social world lies the constitution of successful generalised forms of social practices induced by individuals' repeated decisions to co-operate with each other rather than remaining in isolation. In any case, such mechanisms are essential in regard to the constitution of differentiated social systems.

This basic mechanism involves someone's assumption that a trustee will not behave opportunistically without guarantees or enforceable promises of exchange. It is a necessary but risky engagement that calls for continued *search of good reasons* to be judged acceptable. In this perspective, trust is neither a kind of strategy that rational actors use to maximise their interests, as Coleman puts it, nor it comes out of the need to reduce costs of opportunistic

---

<sup>17</sup> I use the term 'institutions' in the sense of old institutionalists. For firms, universities, and other social actors, I use the term 'organisations' in the sense of Luhmann as presented in the previous section.



behaviour, as viewed by Transaction Cost Economics. Although both Coleman and Luhmann argue that *institutions* help social actors to assess the risk of trust investments, there are important differences between both authors:

Luhmann, who rejects the concept of solipsistic and solely calculation-oriented actors, suggests that institutions are to be understood as reducing risk by providing patterns of social behaviour which in a *non-deterministic* manner orient social actors' expectations and decisions (Bachmann, 2001: 345).

This means that the interplay between institutions and individual behaviour is of a recursive nature, which preserves individual's freedom to break the rules; both formal and informal institutions "do their job in a latent manner". Hodgson (2002b: 173, emphasis mine) argues for a similar understanding of the macro-micro process:

In general, the causal processes of reconstitution [of individuals' preferences] discussed here are not mysterious 'social forces' but well-known psychological mechanisms of imitation, conformism, conditioning and cognition. (...) *Recognition of the ideational facets of institutions is a partial safeguard against the mistake of reification.* This error is to regard institutions or social structures as if they were just things, independent of social agency.

Therefore, the main problem of less developed regions is to build 'systemic trust', which emerges as an institution from the complex interplay of informal agreements between organisations, legal norms and their enforcement, the way the financial system works, behaviours of trade associations and public administration, the credibility of political authorities, the nature of policy-making processes, etc. Institutionalised trust emerges by a widely spread variety of trust-based behaviours, and in turn reinforces social actors' willingness to co-operate.

The importance of institutions is acknowledged in SI literature. However, it is considered in a rather limited way, as a kind of parameter to take account in economic decisions through cost-benefit rationality.<sup>18</sup> However, if instead of the new institutionalism we call back the old, Veblen-inspired institutionalist view, we are able to establish the cognitive link between institutions and

actors' behaviour, and we gain a deeper understanding of the obstacles to social change. Two important dimensions derive from this (old institutionalist) approach to institutions: the first is the importance of a *sense of community* made up of common norms and values or, as put by Storper (1997: 286), "the conventions that define collective identities of the actors in the production system by giving them access to a common context of coordination"; the second is the need of an *infrastructure of discourse and communication*, which enables cross-border interaction between different functional systems and the creation of instituted meanings, thus facilitating social dialogue and elaboration of compromises (Amin and Hausner, 1997).

Building on this institutionalist perspective about inertia and change, it becomes clear that innovation policy in developing regions is not simply a matter of decentralising policy-making to regional powers. Much more than that, innovation policy needs to address the processes of institution building, which is not a pre-condition for, but rather the process of social change itself (Amin, 1999). Thus, public policy must be based on a careful assessment of regional institutions and culture in order to prevent the temptation of taking successful regions as models for 'good practices' (Hospers and Beugelsdijk, 2002).

Following this line of thought, Storper (1997) argues for a policy strategy in developing regions based on 'talk' and 'confidence'-building as a first step.<sup>19</sup> Talk between regional actors is a means to achieve mutual understanding, and it needs patient efforts to overcome distrust and create weak precedents that could underpin a minimal basis for the next steps. In brief, it is a new kind of policy experimenting:

Small experiments build on the communicative understanding that comes from talk, asking parties to interact by suspending their fears and doubts. The likelihood of getting the parties to act *as if* confidence existed, as the first step toward establishing real precedents, should

---

<sup>18</sup> See McKelvey (1997: 206): "Institutions will influence the parameters of behavior that innovating agents perceive as acceptable and possible, such as which directions of search activities are likely to lead to results."

<sup>19</sup> In a similar vein, see Lündvall (2001: 281): "What is needed is to bring the right parties together in minor cooperative activities so that they can start to build trust".

logically rise with the degree of knowledge they have about each other (Storper, 1997: 274).

In this process, besides the depth of knowledge about specific issues, the breadth of knowledge that parties have about each other on different domains of their lives plays an important role. Information of this kind is likely to be more useful if it can be *obtained and validated in the local context*, which is an important argument for a regional level of innovation policy-making.

The policy implications above-mentioned are seldom discussed in the SI literature, which mostly concentrates on the architecture of organisational links, R&D infrastructure, information flows, coordination functions, and strategic steering (Cooke, 1998; Acs, de la Mothe and Paquet, 2000). Although some of this is certainly necessary, in focusing on a planning approach the SI literature misses the crucial point: learning processes and social systems dynamics. After all, this is not so strange if we remember that knowledge is treated in that literature as something that can be transferred, and (more or less easily) 'captured and accumulated'.

The perspective argued in this paper should be viewed as a first step in the attempt to overcome the above-mentioned contradiction between claims of SI literature for an evolutionary label, and its adoption both of Herbert Simon's cognitivist understanding of knowledge and of the new institutionalist approach.<sup>20</sup> Grounding human nature on a naturalist paradigm, and exploring the sociological thinking of Niklas Luhmann, not only supplies a link between knowledge, innovation processes and social change that is consistent with natural sciences research but also shows the kind of new theoretical approaches that could give more consistency to contemporary evolutionary economics.<sup>21</sup>

---

<sup>20</sup> See Viskovatoff (2001) for a view on rationality that is consistent with the perspective argued in this paper.

<sup>21</sup> More specifically, my perspective of evolutionary economics is based on critical realist ontology (Lawson, 2003), and on an enlarged Darwinism that accommodates the specific nature of socio-cultural evolution (Depew and Weber, 2001).

## 5. Conclusion

Modern societies have differentiated into multiple functional systems thus becoming highly complex systems that cannot be guided by a hierarchical command-and-control mode. Under the pressure of globalisation, regional policies have been redirected to systematic promotion of partnership as an alternative to failing top-down policies and to blind short-run market mechanisms. This “complex art of steering multiple agencies, institutions and systems” (Jessop, 1997: 95) in local societies has been called ‘governance’, and became a new buzzword that should be handled cautiously.

On the analytical level, current emphasis on formal mechanisms of governance usually underscores informal institutions, and ignores that an organisation is an element of a functional (social) system, which has a specific boundary, language, interests, and self-reproduction mechanisms. In this context, learning processes across organisations are at least problematic. On the policy level, that emphasis on governance corresponds to a certain fascination with the ‘associational economy’ and tends to be optimistic about the power of local initiatives. It is frequently forgotten that, as an outcome of (highly complex) non-controllable social interactions, governance is also prone to failure taking account of (unfavourable) national and global ‘downward causation’ mechanisms.

In showing that the state and its agencies are part of a specific (nation-wide) functional system, albeit one that produces normative orientations for the whole society, we also put forward that public policy needs to be reflexive in order to acknowledge reactions of other sub-systems. In developing regions, this reflexivity is even more important for innovation policy must deal with institutional change. Therefore, an evolutionary agenda for innovation policy calls for setting aside the neo-classical framework and the adoption of an experimental approach to policy-making, both at the national and the regional level, in order to foster learning processes (Metcalf, 2003).<sup>22</sup> Like natural

---

<sup>22</sup> According to Metcalfe (2003: 179): “The initial step is to recognise the adaptive nature of the policy process and to contrast that with the optimal policy framework which is the corollary of the market failure approach.”

systems, social systems form a multi-layered reality and their development also calls for reflexive and multi-layered innovation policy within the framework of an evolutionary paradigm.

## References

- Acs, Z. J., de la Mothe, J. and Paquet, G. (2000) 'Regional Innovation: In Search of an Enabling Strategy', in Z. J. Acs (ed) *Regional Innovation, Knowledge and Global Change*. London and New York: Pinter.
- Amin, A. (1999) 'An Institutional Perspective on Regional Economic Development', *International Journal of Urban and Regional Research* 23(2): 365-378.
- Amin, A. and Hausner, J. (1997) 'Interactive governance and social complexity', in A. Amin and J. Hausner (eds) *Beyond Market and Hierarchy – Interactive Governance and Social Complexity*. Cheltenham, UK: Edward Elgar.
- Amin, A. and Thrift, N. (1995) 'Institutional Issues for the European Regions: From Markets and Plans to Socioeconomics and Powers of Association', *Economy and Society* 24(1): 41-66.
- Archer, M. S. (2000) *Being Human – The problem of agency*. Cambridge: Cambridge University Press.
- Arnoldi, J. (2001) 'Niklas Luhmann – An Introduction', *Theory, Culture & Society* 18(1): 1-13.
- Asheim, B., Isaksen, I., Nauwelaers, C. and Tödting, F. (2003) *Regional Innovation Policy for Small-Medium Enterprises*. Cheltenham, UK: Edward Elgar.
- Attewell, P. (1996) 'Technology Diffusion and Organizational Learning', in M. D. Cohen and L. S. Sproull (eds) *Organizational Learning*. Thousand Oaks, London, and New Delhi: Sage.
- Bachmann, R. (2001) 'Trust, Power and Control in Trans-Organizational Relations', *Organization Studies* 22(2): 337-365.
- Bateira, J. (2005) 'A Naturalist View of Knowledge', CRIC Working Paper n° 14, ESRC Centre for Research on Innovation and Competition, The University of Manchester.
- Bhaskar, R. (1979) *The Possibility of Naturalism: A philosophical critique of the contemporary human sciences*. Hemel Hempstead: Harvester Press.
- Bickhard, M. H. (1987) 'The Social Nature of the Functional Nature of Language', in M. Hickman (ed) *Social and Functional Approaches to Language and Thought*. London: Academic Press.
- Brier, S. (2002/2003) 'Luhmann Semioticized', *Journal of Sociocybernetics* 3(2): 13-22.
- Brown, J. S. and P. Duguid (2001), 'Knowledge and Organization: a Social-Practice Perspective', *Organization Science*, 12(2): 198-213.
- Capra, F. (1996) *The Web of Life*. New York: Doubleday.

- Chia, R. (2002) 'Entrepreneurial Strategising: The Tacit Mode'. Working Paper, School of Business Economics, University of Exeter.
- Christensen, W. D. and Hooker, C. A. (2000) 'An interactivist-constructivist approach to intelligence: self-directed anticipative learning', *Philosophical Psychology* 13(1): 5-45.
- Cooke, P. (1998) 'Introduction – Origins of the Concept', in H.-J. Braczyk, P. Cooke and M. Heidenreich (eds) *Regional Innovation Systems*. London and New York: Routledge.
- Cooke, P. and Morgan, K. (1998) *The Associational Economy: Firms, Regions and Innovation*. Oxford: University Press of Oxford.
- Corning, P. A. (1996) 'Evolutionary Economics – Metaphor or Unifying Paradigm?', *Journal of Social and Evolutionary Systems* 18(4): 421-435.  
At: <<http://www.complexsystems.org/essays/evolecon.html>>
- Damasio, A. (1994) *Descartes' Error – Emotion, Reason and the Human Brain*. New York: Putnam's Sons.
- Davis, J. B. (2003) *The Theory of the Individual in Economics*. London and New York: Routledge.
- Deacon, T. (1997) *The Symbolic Mind: The Co-evolution of Language and Brain*. New York: Norton.
- Donald, M. (2001) *A mind so rare: the evolution of human consciousness*. New York: Norton.
- Dunning, J. H. (2000) 'Regions, Globalization, and the Knowledge Economy: The Issues Stated', in J. H. Dunning (ed) *Regions, Globalization, and the Knowledge Economy*. Oxford: Oxford University Press.
- Edquist, Ch. (1997) 'Systems of Innovation Approaches – Their Emergence and Characteristics', in Ch. Edquist (ed) *Systems of Innovation*. London and Washington: Pinter.
- Emmeche, C., Koppe, S. and Stjernfelt, F. (1997) 'Explaining Emergence: Toward an Ontology of Levels', *Journal of General Philosophy of Science* 28: 83-119.
- Giddens, A. and Hutton, W. (2000) 'Fighting Back', in W. Hutton and A. Giddens (eds) *On the Edge – Living with Global Capitalism*. London: Vintage.
- Gottardi, G. (1996) 'Technology Strategies, Innovation Without R&D and the Creation of Knowledge Within Industrial Districts', *Journal of Industry Studies* 3(2): 119-134.
- Gregerson, B. and Johnson, B. (1997) 'Learning Economies, Innovation Systems and European Integration', *Regional Studies* 31(5): 479-490.
- Held, D., McGrew, A., Goldblatt, D. and Perraton, J. (2000) 'Rethinking Globalization', in D. Held and A. McGrew (eds) *The Global Transformations Reader – An Introduction to the Globalization Debate*. Cambridge: Polity Press.
- Heylighen, F. and Joslyn, C. (2001) 'Cybernetics and Second-Order Cybernetics', in R. A. Meyers (ed.) *Encyclopedia of Physical Science and Technology*. New York: Academic Press.  
At: <<http://pespmc1.vub.ac.be/Papers/Cybernetics-EPST.pdf>>

- Hodgson, G. M. (1993) *Economics and evolution: bringing life back into economics*. Cambridge, UK and Ann Arbor, MI: Polity Press and University of Michigan Press.
- Hodgson, G. M. (2000) 'From micro to macro: the concept of emergence and the role of institutions', in L. Burlamaqui, A. C. Castro and H.-J. Chang (eds) *Institutions and the Role of the State*. Cheltenham, UK: Edward Elgar.
- Hodgson, G. M. (2002a) 'Darwinism in economics: from analogy to ontology', *Journal of Evolutionary Economics* 12: 259-281.
- Hodgson, G. M. (2002b) 'Reconstitutive Downward Causation', in E. Fullbrook (ed) *Intersubjectivity in Economics – Agents and Structures*. London and New York: Routledge.
- Hospers, G.-J. and Beugelsdijk, S. (2002) 'Regional Cluster Policies: Learning by Comparing?', *KYKLOS* 55(3): 381-402.
- Howells, J. (1999) 'Regional systems of innovation?', in D. Archibugi, J. Howells and J. Michie (eds) *Innovation Policy in a Global Economy*. Cambridge: Cambridge University Press.
- Jessop, B. (1997) 'The governance of complexity and the complexity of governance: preliminary remarks on some problems and limits of economic guidance', in A. Amin and J. Hausner (eds) *Beyond Market and Hierarchy – Interactive Governance and Social Complexity*. Cheltenham, UK: Edward Elgar.
- Kaufmann, A. and Tödtling, F. (2000) 'Science-Industry Interaction in the Process of Innovation: the importance of boundary-crossing between systems', paper presented at the 40<sup>th</sup> Congress of the European Regional Science Association, Aug-Sept., Barcelona.
- Lakoff, G. and Johnson, M. (1999) *Philosophy in the flesh – The embodied mind and its challenge to western thought*. New York: Basic Books.
- Lawson, T. (2003) *Reorienting Economics*. London and New York: Routledge.
- Luhmann, N. (1995/1984) *Social Systems*. Stanford, CA: Stanford University Press.
- Luhmann, N. (1996) 'Membership and Motives in Social Systems', *Systems Research* 13(3): 341-348.
- Lündvall, B.-A. (ed) (1992) *National Systems of Innovation – Towards a Theory of Innovation and Interactive Learning*. London: Pinter.
- Lündvall, B.-A. (2001) 'Innovation Policy in the Globalizing Learning Economy', in D. Archibugi and B.-A. Lündvall (eds) *The Globalizing Learning Economy*. Oxford: Oxford University Press.
- Lündvall, B.-A. and Archibugi, D. (2001) 'Introduction: Europe and the Learning Economy', in D. Archibugi and B.-A. Lündvall (eds) *The Globalizing Learning Economy*. Oxford: Oxford University Press.
- Markusen, A. (1996) 'Sticky Places in Slippery Space: A Typology of Industrial Districts', *Economic Geography* 72(3): 293-311.
- Maskell, P. and Malmberg, A. (1999) 'Localised learning and industrial competitiveness', *Cambridge Journal of Economics* 23: 167-185.

- Metcalfe, J. S. (1995) 'Technology systems and technology policy in an evolutionary framework', *Cambridge Journal of Economics* 19: 25-46.
- Metcalfe, J. S. (1998) *Evolutionary Economics and Creative Destruction*. London: Routledge.
- Metcalfe, J. S. (2003) 'Equilibrium and evolutionary foundations of competition and technology policy: new perspectives on the division of labour and the innovation process', in P. Pelikan and G. Wegner (eds) *The Evolutionary Analysis of Economic Policy*. Cheltenham, UK, Northampton, USA: Edward Elgar.
- McKelvey, M. (1997) 'Using Evolutionary Theory to Define Systems of Innovation', in Ch. Edquist (ed) *Systems of Innovation – technologies, institutions, and organizations*. London and Washington: Pinter.
- Morgan, K. (1997) 'The Learning Region: Institutions, Innovation and Regional Renewal', *Regional Studies* 31(5): 491-503.
- Nelson, R. R. (ed) (1993) *National Innovation Systems: A Comparative Analysis*. New York and Oxford: Oxford University Press.
- Nelson, R. R. and Winter, S. (1982) *An Evolutionary Theory of Economic Change*. Cambridge, MA: The Belknap Press.
- Nooteboom, B. (2000) 'Learning by interaction, absorptive capacity, cognitive distance and governance', *Journal of Management and Governance* 4: 69-92.
- Núñez, R. and Freeman, W. (eds) (2000) *Reclaiming cognition: the primacy of action, intention and emotion*. Bowling Green, OH: Imprint Academic.
- Polanyi, M. (1966) *The Tacit Dimension*. Gloucester, MA.: Peter Smith.
- Putnam, R. D. (with Leonardi, R., Nanetti, R. Y.) (1993) *Making Democracy Work. Civic Traditions in Modern Italy*. Princeton: Princeton University Press.
- Riba, M. and Leydesdorff, L. (2001) 'Why Catalonia cannot be considered as a regional innovation system', *Scientometrics* 50(2): 215-240.
- Saviotti, P. (1997) 'Innovation Systems and Evolutionary Theories', in Ch. Edquist (ed) *Systems of Innovation – technologies, institutions, and organizations*. London and Washington: Pinter.
- Schmitz, H. (2004) 'Local Upgrading in Global Chains', paper presented at the DRUID Summer Conference, June 14-16, Elsinore, Denmark.
- Storper, M. (1995) 'The Resurgence of Regional Economies, Ten Years Later: The Region as a Nexus of Untraded Interdependencies', *European Urban and Regional Studies* 2(3): 191-221.
- Storper, M. (1997) *The Regional World*. New York: The Guilford Press.
- Storper, M. (2000) 'Globalization and Knowledge Flows: An Industrial Geographer's Perspective', in J. H. Dunning (ed) *Regions, Globalization, and the Knowledge Economy*. Oxford: Oxford University Press.
- Vanderstraeten, R. (2001) 'Observing Systems: a Cybernetic Perspective on System/Environment Relations', *Journal for the Theory of Social Behaviour* 31(3): 297-311.
- Viskovatoff, A. (2001) 'Rationality as optimal choice versus rationality as valid inference', *Journal of Economic Methodology* 8: 313-337.



- Weber, B. H. and Depew, D. J. (2001) 'Developmental Systems, Darwinian Evolution, and the Unity of Science', in S. Oyama, P. E. Griffiths, and R. D. Gray (eds) *Cycles of Contingency: Developmental Systems and Evolution*. Cambridge, MA, London: The MIT Press.
- Whitford, J. (2001) 'The decline of a model? Challenge and response in the Italian industrial districts', *Economy and Society* 30(1): 38-65.
- Williamson, O. E. (1985) *The economic institutions of capitalism*. New York: Free Press.
- Whitaker, R. (1995) 'Observer Web'.  
At: <<http://www.enolagaia.com/Tutorial2.html>>