INNOVATION IN MULTIPLE CONTEXTs: SEARCHING IN THE JUNGLE OF INNOVATION CONCEPTUALISATIONS

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1. INTRODUCTION

In recent years, a growing interest in literature has been captured by studies depicting innovation and its evolution.
Innovation is becoming so complex that even large firms are unable to afford the innovation or development alone (Chesbrough, 2006). Collaboration with partners is so natural in today's business world that some of the leading scholars look at innovation as phenomenon which necessarily occurs in the context of systems, clusters, networks or industry (Chesbrough, 2003; Lundvall, 2007).
To depict this new dynamism new conceptualizations of innovation have started to emerge; in many cases these concepts simply add to the old labels integrating and expanding what they originally mean, in other cases they deliver new and more complex concept.
For example it is what happens with the ecosystem and ecosystem innovation. Both academic and business literatures make a large use of this new and appealing term to depict the complexity of the innovation at present.
An ecosystem is used to depict the more complex web of interdependent enterprises and relationships directed towards the creation and allocation of business value (Moore, 1996). Firms' functional specialization, international value chain fragmentation, and industry convergence have been stated to support the formation of ecosystems (Moore, 1996; Adner, 2006) or value nets (Möller and Rajala, 2007) for innovation. Ecosystems typically cut across multiple organizations, functions, and industries, providing a foundation for new and seamless innovation and asking for more social and technology complexity to manage and provide innovation.
However the interdependent and dynamic view of innovation ecosystem stretches much further. Move from the first domain of strategic and technological studies (Adner 2006; Chesbrough, 2006), the ecosystem metaphor has also captured the interest of some other scholars both from economics and regional studies (Carayannis and Campbell, 2009), entrepreneurship (Isenberg 2010; Nambisan and Baron, 2013) and recently marketing and service studies (Vargo *et al.*, 2014).
Particularly, the ecosystem conceptualization helps redirect the efforts of different innovation scholars towards a greater attention to understanding the fundamental drivers and dynamics of social, technological, and economic systems that influence the innovation processes.
This proliferation of new concepts and labels has led to an increasing conceptual ambiguity, with studies focusing differently on well established innovation terms such as systems and networks and new ones as value net, ecosystems, and so on, inhibiting scholars' ability to build a coherent body of knowledge.
At the very least, this may be detrimental to what could be useful studies by scholars inside the innovation community, who find it difficult to consider how innovation links into broader systemic and dynamic debate.
Starting from these considerations, the aim of this paper is to establish the conceptual territory within which the different labels addressing innovation phenomenon could be framed. Particularly our specific research interest is narrowed to the concepts taking the focus on the multiplicity of contexts as natural locus where innovation takes form. We considered three main concepts, namely 1) innovation system (Lundvall 1985; Freeman 1995), 2) innovation network (Powell *et al.*, 1994; Ahuja, 2000; Ritter and Gemünden, 2003), and 3), innovation ecosystem (Moore, 1993; Adner, 2006).

Our search moves from the ontological question (Uschold and Gruninger, 1996) of what are the various modes of being of the innovation codified under systems, and network ecosystem labels?
More specifically, we are interested in how the studies grouped under different labels interpret the contexts and processes enabling innovation to take form. By goes in depth in the literature review the paper attempts to examine theoretical foundations, outcomes, and patterns of contributions to which each innovation label is tied in a way that similarities and differences, consistencies and inconsistencies, and underlying controversies could be revealed.
By pinpointing different elements in the three literature contexts the paper provides a useful way to appreciate how the academic debate is different around the three concepts and how it is possible to move towards a more unified understanding of innovation complexity.
The remainder of this paper is organized as follows. First, the methodology used to review the literature is illustrated, then findings are presented to depict the results achieved and to lead towards discussion about the topics highlighted above. In the end, discussion and implications are provided.

2 RESEARCH PROCESS

To discern among differences in concepts and their meanings, authors conducted a literature review. It provides an appropriate way for organizing and assigning meaning and directly relate to the epistemological foundations held within a research community (Pittaway *et al.*, 2004).
The suggestion of Finfgeld (2003) led the literature analysis, which went in three steps. In the first step authors made clear the specific literature interest of qualitative study by deciding what were the relevant interests and inclusion criteria for the studies. The authors conducted a search on articles in which the topic mentioned was the keyword “innovation” conjoint with the keywords “System”, and “Network”, and “Ecosystem”. They found the combined keywords as the most useful in sourcing the relevant documents. The research databases we used were ISIWeb of Science and specifically the Science Citation Index Expanded (SCI-EXPANDED) and the Social Science Citation Index (SSCI) databases. The choice of ISIWeb of Science as data source was consistent with its reputation of being one of the most important bibliographic databases. According to the purpose of the analysis authors restricted the selection of the documents within five ISIWeb of Science categories, Management, Business, Economics, Operations and Business Finance. The data set, including results covering a period of about 30 years (data from 1985 up to now) consisted of a corpus containing articles, book and proceedings. The choice to avoid document as letters, editorials, reviews, etc. was due to the consideration that we directed our attention to documents which more reflect the production of the original research. This search yielded over 2.500 references that were then entered into a database using Excel. To each entry was given a label classification depending on what keywords combination had been used to identify the publication. Multiple entries of the same publication were eliminated, but only after noting all the appropriate classifications and discussing about them; in more detail, one author proposed the classifications and debated about them with the other two.
The cases in which an entry is found in more than one query were not hugely relevant; it happens more frequently in systems and networks labels (55 cases), and more than half among them were assigned to literature on “system innovation”. It happened 26 times as it concerns the queries on systems and ecosystems, with most of them being put in the literature on “ecosystem innovation”, while just 5 cases were linked to both ecosystems and network, and in one case a paper arose from all three queries.
In the second step, authors aimed to provide the first distinguishing elements of each classification. They decided to make a content analysis of abstracts to grasp meanings and connections among elements (Tesch, 1990) in literature contributions (Xiao and Smith, 2006; Herbst *et al.*, 2011). The choice of a content analysis is linked to the selection of software to perform it and they preferred NVivo, as it gives the opportunity to perform analysis on different levels (Bazeley and Jackson, 2013) and even because of its reliability (Krippendorff, 2012). Also, the choice of abstracts to

perform the analysis depends on their availability and on the opportunity to have first insights on the content of scholars' contributions, leading to the possibility to let categories emerge from each item shaping the whole dataset (Pittaway *et al.*, 2004). In order to give more reliability to investigation, authors split into four different collections the three datasets, to test if the results were different one another. Based on time measure, through this process authors identified four subsets (from 1996 to 2015, from 2001 to 2015, from 2011 to 2015, and from 2013 to 2015) that shown strongly similar results. In this way the stability of analysis was stated. As result of the second phase, a first synthesis of different innovation labels was provided. In this step authors moved further within the labels in clarifying and analysing key concepts. As a frame to analyse the key concepts, authors utilized nodes as they have been codified through the content analysis.

In the third step a critical reading of the selected documents from dataset was conducted separately by researchers. In this phase, having established the key concepts from content analysis, the researchers re-red the relevant concepts and interpretations on the basis of a common schema. The approach was the creation of common categories from the coding as emerging in the previous step, in line with what is known as "inductive coding" (Bazeley and Jackson, 2013). In this step authors aimed to provide the first distinguishing elements between labels. The documents to read were chosen on the basis of their maximum occurrence. The authors selected together the level of citations to be set and they considered in the analysis the scholars' contributions shaping the 80% of the total citation rate in the dataset. The analysis was not a one-off and stand-alone process, but it emerged more as an abductive, cyclical process of search and questioning on insights and the key topics (Magnani, 2001). This step facilitated navigation among the labels and helped to 1) make clearer what the "key categories" mean, 2) and highlight which is the influence they exert within the innovation debate. It proved a useful way to appreciate how the academic debate was different around the concepts and how it evolved.

3. FINDINGS

Authors discussed findings under three main contents. Firstly an overview of the results as they emerged from the investigation on the scholar's contributions is presented; the second paragraph presents the insights from content analysis and main categories we coded; the third paragraph provides evidence of difference in the labels and the main issues dealt with each one.

3.1 OVERVIEW

In the following table (Table 1) overall information about the set of publications are presented. The number of contributions took into account is really different in terms of quantity; while "system innovation" and "network innovation" are similar as it concerns the time span in which scholars published their research.

The trend in the production is different among the labels: both system and network after the peak respectively in 2011 and in the 2010 show a steady reduction; differently from ecosystem that have started catching an increasing interest in the scientific community only in the last years (2013 the peak with 47 contributions).

Moreover, as the analysis of the journals show, it has been possible to observe that the debate is mainly intense in technology areas, for all three subsets, together with some differences. In detail, scholars' contributions around "system" are published in journals dealing with policy and economic studies of science, technology, and innovation as it is evident by looking at Research policy, the top journal in this category; contributions around "network" are debated mostly on technological oriented journals; in the end, the debate around "ecosystem" is less concentrated.

Table 1 – Main publication features

	SYSTEM	NETWORK	ECOSYSTEM
N. of contributions	1833	444	227
Time span	1988-2015	1991-2015	1993-2015
Trends of production from 1994-2014	Positive trend until 2011 (year of the peak)	Positive trend until 2007 Variable trend after 2007 (2010 year of the peak)	Positive trend starts from 2008 Peak in 2013: 19% of overall production
First 3 Sources	Research policy (8,62%) Technological forecasting and social change (4,04%) Regional science (2,89%)	International Journal of Technology Management (5,18%) Research policy (4,73%) Technovation (3,60%)	Collaboration and competition in business ecosystems (3,96%) International Journal of Technology Management (3,52%) Technovation (3,08%)
3 top-cited authors	Freeman (1987) Cooke *et al.* (1997) Lundvall (1990)	Powell *et al.* (1996) Owen-Smith and Powell (2004) Dhanaraj and Parkhe (2006)	Adner (2006) Adner and Kapoor (2010) Chesbrough and Appleyard (2007)

Authors' elaboration

3.2 Content analysis

Authors performed a content analysis on the three subsets of papers, by analysing the abstracts through a word frequency. Authors erase all the useless words, like articles, prepositions, years, proper nouns, and so on, and they grouped the results in nodes in order to build up our coding. More in detail, authors defined 28 nodes (Table 2), shaped by some of the top 100 words emerging from the word frequency.

Table 2 – Word frequency and coding process

#	SYSTEM			NETWORK			ECOSYSTEM		
	Word	Count	Weighted Percentage	Word	Count	Weighted Percentage	Word	Count	Weighted Percentage
1	innovation (-s)	6370	3,84	innovation (-s)	1748	4,40	innovation	554	2,42
	innovative	508	0,31	innovative	120	0,30	innovative	52	0,23
2	system (-s)	3757	2,26	system (-s)	153	0,38	system (-s)	135	0,59
3	network (-s)	614	0,37	network (-s)	1478	3,72	network (-s)	98	0,42
				networking	66	0,17			
4							ecosystem (-s)	468	2,04
5	knowledge	1372	0,83	knowledge	471	1,19	knowledge	165	0,72
	learning	292	0,18	learning	82	0,21			
6	region (-s) (-al)	1922	1,16	regional	170	0,43	regional	65	0,28
	country (-ies)	769	0,47	countries	68	0,17			
	local	304	0,18						
	national	874	0,53						
7	technology (-ies) (-ical)	2372	1,42	technology (-ies) (-ical)	384	0,97	technology (-ies) (-ical)	306	1,34
8	policy (-ies)	1111	0,67	policy	86	0,22	policy	58	0,25
9	industry (-ies) (-ial)	1559	0,94	industry (-ial)	322	0,81	industry (-ial)	155	0,68
10	firm (-s)	1052	0,63	firm (-s)	396	1,00	firm (-s)	165	0,72
	companies	208	0,13	companies	85	0,21	companies	63	0,27
11	management	579	0,35	management	142	0,36	management	98	0,43
12	performance	428	0,26	performance	135	0,34	performance	57	0,25
13	government	412	0,25	government	64	0,16			
14	enterprise (-s)	706	0,42	enterprise (-s)	247	0,62	enterprise (-s)	70	0,30
15							entrepreneurship (-ial)	93	0,40
16	market	388	0,23	market	72	0,18	market (-s)	136	0,59
17	institutions (-al)	590	0,35						
18	university (-ies)	602	0,36						
19	information	305	0,18	information	78	0,20	information	56	0,24
20	service	290	0,17	service	54	0,14	service	83	0,36
21	resources	287	0,17	resources	85	0,21	resource (-s)	80	0,34
22	sector	269	0,16	sector	74	0,19			
23	cluster (-s)	464	0,27	cluster (-s)	211	0,53			
24	strategy (-ic)	442	0,27	strategy (-ic)	113	0,29	strategy (-ies) (-ic)	167	0,73
25				relationship (-s)	151	0,38			
26							platform (-s)	128	0,56
27				capability	66	0,17			
28				value* chain	58	0,15			

Author's elaboration through NVivo and Excel

As it is showed in the previous table, just 17 out of the 28 nodes are common to all subsets and only 7 out of the 17 are composed by the same words.

The first nodes are useful to make some first considerations, like the citations of each of the three labels of innovation in the whole dataset; "system" is cited by scholars investigating on networks and ecosystems, leading to consider system as something opening the paths in studying the contexts where innovation takes place, and network is cited by both scholars on system and ecosystem, so it is both the way system is linked to networks and the source to move towards a new context, namely ecosystem. The novelty expressed by the conceptualisation about ecosystem is confirmed since it is not cited in abstracts from systems and networks studies.

The nodes were investigated through a proximity analysis to understand how the most important issues are linked with other topics. The proximity analysis for each issue led us to achieve some interesting insights and even a support to favour the final step of the investigation. The first evidences to be considered stand on the crossed considerations of system, network, and ecosystem. System is considered in network innovation literature by focusing on the geographical context where innovation take place and by considering the most relevant features, like knowledge, technology, and the complexity. When looking at how system is meant in ecosystem innovation literature, some differences emerged, as system are framed into industry and business terms in

addition to geographical location; knowledge and technology kept their relevance in comparison with literature on network innovation. As it concerns network, it is seen in system literature with a strong focus on knowledge and actors shaping them; even the geographical aspect is relevant, together with a focus on both the technology and the structure of the relationships. Network is thought in ecosystem innovation literature in a different way, as it is linked to the value and the social aspects; knowledge kept a quite good relevance, while technology is hardly ever taken into account.
After these preliminary considerations authors moved towards an in-depth analysis to understand how the conceptualisations emerging in our coding are taken into account in the contributions offered by literature.

3.3 In-depth analysis

The analysis of the nodes cited above led authors to highlight the most relevant elements from the literature contributions on system, network, and ecosystem innovation; as the nodes contain similar issues, authors discussed about the opportunity to group them into five categories on the basis of common topics. In order to do this step, authors debated together about how to create categories to be aligned with a common idea; the result of the unification of nodes into five categories- named innovation, context, actors, factors and strategy- is presented in the following table (Table 3).
The creation of categories favours a better understanding when comparing the three contexts of innovation, especially when some specific topics are depicted in different ways when scholars investigated about innovation.

Table 3 – The Categories

		SYSTEM			NETWORK			ECOSYSTEM		
	#	Word	Count	Weighted Percentage	Word	Count	Weighted Percentage	Word	Count	Weighted Percentage
innovation	1	innovation (-s)	6370	3,84	innovation (-s)	1748	4,40	innovation	554	2,42
		innovative	508	0,31	innovative	120	0,30	innovative	52	0,23
General overview	2	system (-s)	3757	2,26	system (-s)	153	0,38	system (-s)	135	0,59
	3	network (-s)	614	0,37	network (-s)	1478	3,72	network (-s)	98	0,42
					networking	66	0,17			
	4							ecosystem (-s)	468	2,04
Context	6	region (-s) (-al)	1922	1,16	regional	170	0,43	regional	65	0,28
		country (-ies)	769	0,47	countries	68	0,17			
		local	304	0,18						
		national	874	0,53						
	9	industry (-ies) (-ial)	1559	0,94	industry (-ial)	322	0,81	industry (-ial)	155	0,68
	16	market	388	0,23	market	72	0,18	market (-s)	136	0,59
	22	sector	269	0,16	sector	74	0,19			
	23	cluster (-s)	464	0,27	cluster (-s)	211	0,53			
	26							platform (-s)	128	0,56
	28				value* chain	58	0,15			
Main actors	10	firm (-s)	1052	0,63	firm (-s)	396	1,00	firm (-s)	165	0,72
		companies	208	0,13	companies	85	0,21	companies	63	0,27
	13	government	412	0,25	government	64	0,16			
	14	enterprise (-s)	706	0,42	enterprise (-s)	247	0,62	enterprise (-s)	70	0,30
	15							entrepreneurship (-ial)	93	0,40
	18	university (-ies)	602	0,36						
Factors	5	knowledge	1372	0,83	knowledge	471	1,19	knowledge	165	0,72
		learning	292	0,18	learning	82	0,21			
	7	technology (-ies) (-ical)	2372	1,42	technology (-ies) (-ical)	384	0,97	technology (-ies) (-ical)	306	1,34
	17	institutions (-al)	590	0,35						
	19	information	305	0,18	information	78	0,20	information	56	0,24
	20	service	290	0,17	service	54	0,14	service	83	0,36
	21	resources	287	0,17	resources	85	0,21	resource (-s)	80	0,34
	25				relationship (-s)	151	0,38			
	27				capability	66	0,17			
Strategy	8	policy (-ies)	1111	0,67	policy	86	0,22	policy	58	0,25
	11	management	579	0,35	management	142	0,36	management	98	0,43
	12	performance	428	0,26	performance	135	0,34	performance	57	0,25
	24	strategy (-ic)	442	0,27	strategy (-ic)	113	0,29	strategy (-ies) (-ic)	167	0,73

Authors' elaboration through NVivo and Excel

3.3.1 Thinking innovation through system

Innovation

The idea about the innovation system has been firstly discussed in the 1985 by Lundvall and up to now this concept has become one of the most debated topic interesting researchers spanning across many different academic domains. Particularly the researches on innovation system group scholars interested in the process underlying national (Freeman 1987, 1988) and regional (Cooke et al., 1997) dynamics of innovation, sectoral and industrial transformation (Breschi and Malerba 1997), and economic growth (Edquist, 2001).

Even if the topics the literature addresses are different, the theoretical ground of the innovation system thinking is common. These studies drawn both on evolutionary theory of market (Nelson and Winter, 1982) with emphasis on process and dynamism and on theory of systems where the focus is on system seen as configuration of discrete element connected and joined together by a web of relationships (Freeman, 1988).

As consequence, innovation under this perspective is understood in wider sense going far beyond mere technical and stand alone process limited to the interpretation of single companies.

The complex processes related to innovation come into the focus in analyzing and explaining shifts in technological trajectory and economic growth and development, and some common features of innovation system are identified as in the following:

1) innovation is taken as systemic and evolutionary in nature.
    a. systemic because innovation as technology development is a result of a complex set of relationships among actors in the system, which includes enterprises, universities, and research institutes (Freeman 1995; Cooke *et al.*, 1997)
    b. evolutionary because even if innovation reflects human initiative and R&D efforts it also implies a continuous interplay of activities involving the diffusion, absorption, and use of innovation (Lundvall 1990, 2007). Innovation connects all the elements of the knowledge processes: the development, deployment, and diffusion activities.
2) Innovation is context-dependent in the sense that it is social, economic, political, and cultural embedded. Each context is specific in terms of experiences, competencies, and knowledge bases (Edquist 2001; Asheim and Coenen, 2005).
3) Innovation comprises not only elements of technological change but also implies changes in organizations and actors' behaviour, and the way in which different agents in a system are related to each other. In the same way innovation is also possible if it is accompanied by cultural and/or institutional changes (Edquist and Johnson, 1997).

Context

The literature provides different contexts under which a system innovation has been conceptualized. Since the seminal work of Lundvall (1985) who firstly introduced this concept without any added specification, many other contributions have started to affirm to identify specific contexts of innovation system.The National System of Innovation assuming the nation as unit of analysis diffused firstly through the work of Freeman (1987), Freeman and Lundvall (1988), Lundvall (1992), Nelson (1993), and Edquist (1996). The focus is upon the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify, and diffuse new technologies (Freeman, 1995), and that are either located within or rooted inside the borders of a nation state (Lundvall, 1992). The element of nationality stems not only from the domain of technology policy but also from elements of shared language and culture which hold the system together, and from the national focus of other policies, laws and regulations which condition the innovative environment (Metcalfe, 1997).

Other researches on innovation went into more detail by referring to specific clusters, regions and technologies rather than remain at an aggregate national system level. Carlsson and Stankiewitz (1991, 1993) developed the concept of 'technological innovation system to identify the more

specific networks of organizations and individual agents interacting in a specific technology area and supported by institutional infrastructure (Carlsson *et al.*, 2002; Berger *et al.*, 2006). Since the middle of the nineties in the literature the 'regional systems of innovation' has grown rapidly (Cooke, 1996; Maskell and Malmberg, 1997) to stress the relationship between technology, innovation, and industrial location. Spatial proximity becomes important in revealing differences in the skills, market, and financial institutions and learning mechanism taking place at interface of closer and co-located partners (Asheim and Coenen, 2005).
However great part of these studies presents a snapshot of a system in a particular time period and dealt less with the new system formation.
On different front, Malerba with colleagues developed the concept of 'sectoral systems of innovation' (Breschi and Malerba, 1997; Malerba, 2002) to better describe the dynamics and evolution of innovation system. The focus is more on set of products and a set of agents carrying out market and non-market interactions for their creation, production, and sales. Sectoral systems of innovation has a specific knowledge base, technologies, inputs, and demand with a set of agents connected through complex processes of communication, exchange, cooperation, competition on the bases of common institutions (rules and regulations).

Main Actors

Basing on different definitions of innovation systems, researchers have identified different groups of main actors according to their roles in the systems. Nelson (1993) and other NSI scholars stated that R&D system, government, and universities are main actors in the innovation system. Authors recognised the important role of firms but what emerged is mainly that firms are in interaction with knowledge and political infrastructures (Edquist and Johnson, 1997; Lundvall *et al.*, 2002). It is stressed the role of government as a guiding institution and that one of universities as the provider of basic scientific knowledge existing in the innovation system (Carlsson, 2006). The set of distinct institutions has been intended both in a narrow (R&D department, technological institutions, and universities - Nelson (1993) and broader sense including all institutions and relationships (social, financial, and educational) which interact in the production, diffusion, and use of new useful knowledge (Lundvall, 1992; Nelson and Nelson, 2002). These actors are stated to make a significant contribution to enhance regional and national technological competitiveness. All these actors are characterized by a specific knowledge, competence, organizational structure and behavior that can instigate a complex pattern of innovations, practices, structures, and strategies at different contexts.
In the studies of scholars analysing the innovation at regional (Cook, 2005; Bergek *et al.*, 2008) and sectoral contexts (Malerba, 2002) the focus is on a large number of actors including also entrepreneurs and knowledge agents such as knowledge-intensive business services seen both as sources of and bridges for innovation (Muller and Zenker, 2001). However even if the entrepreneurship has a specific role mainly related to its contribution to knowledge diffusion (Van Looy *et al.*, 2004), the features of individual entrepreneur have remained only relatively prominent in all innovation system literature.

Key Factors

When the innovation contexts have been specified, a crucial issue becomes to identify all the important factors influencing the development, diffusion and use of innovations.
The analysis of innovation system literature stands out by conceptualizing innovation as the outcome of ongoing learning activities involving a wide set of actors. Knowledge and learning processes emerge as the key factors within much of the literature in this area. Learning processes are seen as processes of joint production where one output is innovation and the others are change in the competences of the involved agents (Lundvall 1992). Also authors stress the role of learning processes as the key preconditions for innovation. It is also represented in its complex nature as the

results of different kinds of cooperative and competitive actions the firms taking in their interactions with other public and private organizations (Gregersen and Johnson, 1997; Furman et al., 2002).
The social nature of learning process is also into the focus as this process is stated to work best, when the actors involved are close enough to one another to allow for frequent knowledge exchange (Asheim and Coenen, 2005). The localised and context specific nature of knowledge are echoed mainly by regional systems authors. Important elements of knowledge are embodied in routines of firms and at actors to actors' interfaces and for this they cannot easily moved from one place to another. Lundvall *et al.* (2002) moved to terms 'systems of learning' rather than "systems of Innovation" to stress how learning process include both organisational learning (leading to creation innovations) and individual learning (leading to creation of human capital). The distinction between adaptive and innovative learning is also important in this context. In the adaptive learning the exploitation of the options of a specific techno-economic development path is possible, while innovative learning leads to fundamental changes caused by new techno- economic paradigm (Viotti, 2002).
Other point the literature addresses is the crucial question of how institutions may support learning and innovation. The "institution" is enough questioned factors in the system innovation literature. In the early studies of NIS the prevailing understanding of institutions encompassed different organizations including firms and their activities and strategies. A different perspective takes into account the institutions to depict the setting in which systems innovation is embedded and take place. Johnson (1988) understood institutions as the set of norms, habits and rules determining how people relate to each other and how they learning and use their knowledge. Similarly Edquist and Johnson defined institution as a set of "common habits, routines, established practices, rules, or laws that regulate the relations and interactions between individuals and groups" (Edquist and Johnson, 1997: 42). Many basic functions are attributed to institutions as reducing uncertainty, manage conflicts and cooperation, and provide incentives and human, financial and cultural resources as well (Nelson and Nelson, 2002).

Strategy
The literature analysis shows that the prevailing understanding of governance and performance are rather vague within innovation system literature and that these concepts remain often underdeveloped and unclear.
The governance is often debated by referring to National and Regional authorities and the role they play in influencing the learning process and component interactions in the system (Lundvall, 1990; Cooke, 2001). In some cases horizontal governance mechanisms such as those created within networks or cluster between particular types of firms and sectors are associated with increasing ability of system to learn with all actors working for the purpose of serving that function (Asheim and Coenen, 2005; Hellert *et al.*, 2007). Interaction and coordinator mechanisms between components of systems are also considered unplanned and unintentional rather than deliberate even in a more developed innovation system (Smits and Kuhlmann, 2001). In this sense the role of public authorities becomes that of moderator or enabler allowing different parts of the system to communicate more effectively.
Area that has also only partially addressed in the literature is the performance of various systems. These indicators approach the robustness of more conventional measures such as R&D expenditures, patents, ecc. (Acts *et al.*, 2002; Furman *et al.*, 2002). At the same time, specific analyses are directed to measuring of certain types of knowledge flows such as human resource flows (Ronde and Hussler, 2005) or the level of institutional and organisational linkages (Liu and White, 2001) as predictors of less or more innovative firm behaviour.

3.3.2 Thinking innovation through network

Innovation

Innovation network cannot be unified and grounded in a unique literature domain. Since the mid 90's the academic interest in innovation networks has been encouraged by the increasing complexity in technology and the need for firms of additional resources which enable them to take the lead of competitive pressure.

Scholars from fields of economics (Powell et al. 1996; Owen-Smith and Powell 2004, Noteboom 2000), as well as strategic Management (Gulati 1995; Ahuja 2000; Ritter and Gemünden, 2003) have engaged in continuous investigations, either theoretically and conceptually, to define what a "network" is in general, and what is an "innovation network" in particular.

This great part of researches can be united by the interest in analysing of the emergence, the structuring and the evolution of innovative activities undertaking by multiple actors collaborating to achieve common results. Resource dependence theory (Penrose 1959; Pfeffer and Salancik 1978) and organization learning studies (Levitt and March 1988) seam implicitly or explicitly exert influence on innovation network researches.

The emphasis is on innovation seen as linked to social activity of building relationships. Innovation is stated to take place in a context shaped by multiple actors through the leverage on knowledge, technology, and resources which are distributed either spatially in regional area (Powell et al. 1996; Owen-Smith and Powell 2004, Noteboom 2000) or in businesses relationships (Gulati 1995; Dhanaraj and Parkhe 2006; Moller and Rajala 2007).

Innovation network shows to be a promising alternative co-ordination mechanism which allows firm to have access to the complementary assets, which otherwise have to be build up alone. Network is seen as a bundle of resources (Penrose 1959; Kogut 1988; Gulati 1995) which are activated or mobilized through innovation activities by firms engaged in series of linkages, aiming at creating higher potential value.

Moreover, innovation can be considered as a step to be made in order to answer to technological novelties and even in this case network can be a useful way to collaborate towards innovation goals, for both small (Karlsson and Olsson, 1998) and big firms (Dittrich and Duysters, 2007), with potential effects of such a kind of collaboration even for organizations operating in more than one country (Zander, 1999).

Context

The emphasis on context of innovation (explicitly or implicitly) emerges in a different way within the two main group of researches.

The importance of regional networks was debated by economist where the emphasis is slight on geographical aspect, because the relationships became independent from firms location (Zander 1999).

Regional networks are thought as results of integration processes also supported by governments or universities - especially when there are spin-offs and start-ups - and benefiting from knowledge flows useful to favour knowledge transfers, even for firms different one another as it concerns dimensions, industry, and typologies of operations to be carried on in their core business (Powell 1990; 2006). Differently to the top down perspective focusing on stability of network, a bottom up perspective is assumed taking into account the actors motivations, capabilities, and constraints to act in a network context (Wissema and Euser 1991). It seems appropriate not to subsume all relations under a broad notion of network but to reserve this notion to a specific way firms coordinate their activities (cf. Menard, 2004) with intensity of the relationships between the actors involved: universities and research labs, firms, funding organisations and public/governmental institutions. The role of regional networks is considered as keeping relevance thanks to the advantages offered by tacit knowledge, institutional factors and face-to-face communication, due to trust among actors.

Apart from being located in space, innovation networks are framed in business, industries, sectors, clusters, and along the value chain; first of all markets host network innovation processes and

relationships because of the way actors cooperate among them, since the linkages are based on relationships in hierarchical ways arising from market-based relationships (Swan and Scarbrough, 2005); moreover markets are the places where motivations to collaborate emerge and this perspective is both directly and indirectly connected with the geographical aspects of market, as firms cooperate if they belong to the same local market and even if they decide to move towards other geographical areas (Ambos, 2005). Across market linkages have been mirrored in cross sector relationships when network innovation is depicted as crucial (Chang, 2003) to carry on innovation leading to innovative performance. Innovation processes are different from a sector to another, but they can be carried on together by firms belonging to different business areas, leading to global innovation networks (Sachwald, 2008), as they encompass the physical location of firms.
A similar perspective is adopted when considering innovation in networks for firms belonging to the same industry, as drawing upon external actors has been considered as the solution to achieve better innovative performance (Lechner and Dowling, 2003). This consideration is confirmed by Freel (2003) when investigating the necessity to benefit from external support when looking for novel innovations instead of incremental ones; this contribution is even useful to encompass once again the spatial logic of network innovation.
The higher level of complexity in innovation networks arises when framing them in clusters, because even if actors are similar, the great number of participant to this kind of aggregation makes harder to manage innovation capabilities and usually lead to the failure of specific policies (Ferrary and Granovetter, 2009). However, even if collaboration is harder, results are better, due to the high specialization of this kind of innovation context (Rutten and Boekema, 2007). Finally, an innovation network is even embedded in value chain, since performing collaborative activities in the value chain facilitates the innovative capability for SMEs (Tomlinson and Fai, 2013).

Main actors

Firms and companies are obviously the basic elements of innovation networks as they shape a set of relationships and often one of them act as orchestrator (Dhanaraj and Parkhe, 2006), due to the necessity of building linkages and define the ways in which value can be extrapolated from activities and thanks to them. The selection of actors is relevant as it changes the way innovation takes place in networks and linkages among more actors are considered as a chance to improve the workability of innovation processes (Ritter and Gemnunden, 2003; Heillinen et al. 2007). The effects of innovation networks create a virtuous cycle as both intra- and inter-firm relationships are necessary to the workability of the innovation processes to be performed together (Lechner and Dowling, 2003) and the impacts of innovation in networks can be considered as driven by relational capability and reconfiguration of stable networks. One more task to be performed by firms is the adaptation of the organizational forms as networks constantly modify (Robertson and Langlois, 1995). The role of government is considered relevant in favouring certain kinds of association within networks, especially for the exploration and exploitation phases in the innovation process. Complementarity among actors can be favoured by governments even in transnational cooperation (Frenken, 2000), in across sector processes (Chang, 2003), and by looking at the opportunities offered by collaboration between public and private sector (Inzelt, 2004), as it happens when universities are expected to support firms in their innovation processes.

Key Factors

Knowledge is doubtless the key factor in innovation network, as it is the main goal in interorganizational collaboration (Powell *et al.*, 1996), leading to rename innovation networks in "knowledge and innovation networks", due to the great significance of knowledge in innovation processes carried on by different actors together (Cowan *et al.*, 2007). Scholars mainly focused on how knowledge can be mixed by actors and on which are the most suitable methods to identify which are the actors to collaborate with.

Knowledge transfer is a central element, even when investigating technology in innovation networks, because it can be considered as:

- the object of relationships, when a technology has to be transferred among actors in a network, with strong relationships with knowledge as it regards both spin-offs and start-ups (Perez and Sanchez, 2003);
- one of the mechanisms favouring the workability of network relationships towards innovation (Swan and Scarbrough, 2005), as only a full understanding of the role of technology in the processes to be carried on together can favour the correct path towards the expected goals;
- the content of a relationships, especially if innovation activities are taking place among actors belonging to different industries (Gilsing and Nooteboom, 2005), creating new business models (Calia *et al.*, 2007), or exploring the potential opportunities to be deployed (van Aken and Weggeman, 2000).

The elements considered above - knowledge and technology - are both framed as objects shaping relationships that are one more key issue in innovation networks; relationships are both shaped by technology and knowledge and shaping them. Relationships are formal and informal (Rothschild and Darr, 2005) but all of them are addressed to extend the knowledge exchange, the creation of know-how (Rothschild and Darr, 2005), and the extension of the set of relationships itself (Perez and Sanchez, 2003);

Firms' capabilities have also a key role, first of all as it concerns relationships, as the relational-capability is one of the ways to improve network configuration towards innovation (Lechner and Dowling, 2003). In this way the authors highlighted how actors decide to choose their partners for innovation goals. Capabilities are mostly relevant in exploitation and exploration phases as they favour a better definition of the roles to be played by actors in a network innovation, giving even flexibility to the processes (Dittrich and Duysters, 2007). Capabilities are seen as the way to put together internal and external resources (Freel, 2003) and to understand how the ownership of a resource or of a process can affect the relational power into innovation network (Swan and Scarbrough, 2005).

Social capital as stated to be one of the most effective enablers to inter-firm knowledge and resources transfer because high trust decreases situational uncertainty and opportunism (Lubatkin et al., 2001) and encourages higher commitment to the relationship (Capaldo, 2007). In more detail firms usually prefer to select partners on the basis of their previous relationships in order to decrease the risk as they already trust one another and the network innovation is even affected by the contribution of upcoming actors, selected on the basis of the relational capability of the firms already shaping a network.

Strategy

The conceptualization of innovation network is considered as strategically relevant when based on technology (Dittrich and Duysters, 2007), especially when contexts are characterised by continuous changes; moreover the tie between innovation network and strategy stands on the possibility to give agility and flexibility to the ways relationships are managed and activities are carried on and even on selecting partners (Baum *et al.*, 2010). The relevance of strategy in innovation network literature is even stronger when taking into account the conceptualisation of strategic networks as one of the factors favouring positive outcomes from innovation processes.

The logics driving firms' actions in innovation networks are also stated depending on policies proposed at regional (Scott, 1992) and national level (Chang, 2003), and even in transnational collaborations (Frenken, 2000); a common approach convey policies towards the achievement of better condition for SMEs (Thorgren *et al.*, 2009) due to their harder conditions in the competitive arena. Policies are often compared to entrepreneurial initiatives to improve the ways decisions are taken on central levels and when defining a policy it should be addressed to actors by stimulating their willingness to compete, as contests favour learning effects (Eickelpasch and Fritsch, 2005).

The aim of the collaborative innovation in networks can be depicted through the performance, as innovation performance are a common issue in the contributions taken into consideration (Chang, 2003; Thorgren *et al.*, 2009) and they became an element to evaluate firms' position in a network (Baum *et al.*, 2010) and to orientate self-evaluation of innovation processes carried on in a network-based approach (Dilk *et al.*, 2008).
Finally value can be thought as something similar to performance, but scholars contributions favour a better focus on value as an aim more than as an outcome, as network innovation are orchestrated towards value creation (Dhanaraj and Parkhe, 2006) even for the whole communities around them, since value is embedded in networks (Perks and Jeffery, 2006).

3.3.3 Thinking innovation through ecosystem

Innovation

Ecosystem thinking it is a fairly new conceptualisation in the innovation literature. The application of ecosystem thinking emerges firstly in business literature and dates to the mid1990s (Moore, 1996), while the term "innovation ecosystem" starts to affirm in the early 2000s.
Accordingly, it is likely to assume that a research field on its own has been not developed yet and a unified perspective is not being stated as well.
Ecosystem as innovation concept combines a wide different perspectives spanning from technologies and open innovation literature (Chesbrough, 2006), strategic management (Iansiti and Levien, 2004), economics and regional development (Carayannis and Campbell, 2009; Carayannis and Korres, 2013) and entrepreneurship (Isenberg, 2010). Notwithstanding the differences in perspectives, a common ground can be drawn from the line of the studies using ecological metaphor seen ecosystem as an interactive system established between living creature and environment in which they live (Transley 1935; Moore, 1996). The ecosystem has an internal and hierarchical organization with interacting parts depend on each other for accessing to resources upon which all community depend on. The ecological perspective emphasizes resources provision and adaptation as fundamental driving forces of the ecosystem and the dynamic evolutionary processes upon which the diversity is sustained through the variation, selection, and retention process (Iansiti and Levien, 2002; 2004; Garnsey and Leong, 2008). The key properties of biological ecosystem, such as diversity of actors and their network ties, co-evolution, self-organization and disequilibrium are used for describing the innovation "ecosystems".
However while the biological metaphor depict the complex set of relationships, whose functional goal is to maintains an equilibrium sustaining state, the innovation ecosystem concept models the dynamics of the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation (Moore, 2006; Adner and Kapoor, 2010). The ecology analogy however comes in to the use to describe the analogies and differences from system thinking. In line with system tradition of thought (Freeman, 1987), innovation is understood as a results of relationships developed under the influence of interplay of economic, social and political actors. Moreover innovation ecosystem builds on, and enriches systems theory by articulating additional characteristics of complex systems (Luhmann 1997) and by emphasising the interrelationship and interdependence. Consequently, the diversity and interdependence go in the focus and emergent structures, patterns and propriety of ecosystems arise which characters distinguish also for contradictory and uneven relations of power (Moore, 1993; Adner, 2006; Kapoor and Lee, 2013).

Context

Innovation ecosystem has been described in multiple ways.
Firstly strategic management literature (Iansiti and Levien, 2004) provided their definition by drawing on previous business ecosystem conceptualisation of Moore (1993). According to Adner (2006) innovation ecosystems was "the collaborative arrangements through which firms combine

their individual offerings into a coherent, customer-facing solution" (p. 98) (Adner, 2006). The members of ecosystems work as interrelated system of interdependent collaborative and cooperative companies (Moore, 1996) to deliver value to end customers wherein each player contributes a specific component of an overarching solution (Levinen and Iansiti 2004; Adner and Kapoor 2010; Clarysse *et al.*, 2014). An innovation ecosystem is stated to provide entrepreneurial firms with knowledge resources and information to navigate in a constantly changing competitive environment (Zahra and Nambisan, 2012). The concept of open (technology) innovation is very relevant in this context because this "openness" is related to the need to capture knowledge everywhere in highly dynamic network structures to cope with fast technology evolution and to become more competitive (Chesbrough 2007, 2012).

The value creation nets of actors supporting the idea of interdependent actors complemented each other activities and competences, come close to the platform ecosystem of Gawer and Cusumano (2002, 2008) and digital ecosystems concepts introduced by Selander et al (2013). In such ecosystems the technology owners co-create business value with other firms in their platform ecosystems by encouraging complementary invention and exploiting indirect network effects.

Similarly Clarysse *et al.* (2014) identified ecosystems as value networks that provide mechanisms for goal-focused creation of new goods and services tailored to rapidly evolving market needs, with multiple institutions and dispersed individuals, for parallel innovation.

While some authors examine innovation ecosystems within the context of network markets, other scholars from economic thinking direct their effort to the understandings of complex interplay of business, economic and social perspectives that influence the innovation processes (Carayannis and Campbell, 2012; Yawson, 2009). Particularly Carayannis and Campbell (2009, 2012), debated of the competitiveness and superiority of innovation ecosystem determined by its creative capacity to combine and integrate different knowledge and innovation modes via co-evolution, co-specialisation and co-opetition. Van der Borgh *et al.* (2012) focused on concept of knowledge-based ecosystems and the mechanism at the basis of its development identified by the diversity of organizational forms; the presence of an anchor tenant, and cross fertilization. Mercan and Göktaş (2011) specified that an "innovation ecosystem consists of economic agents and economic relations as well as the non-economic parts such as technology, institutions, sociological interactions and the culture" (p. 102), suggesting that an innovation ecosystem is a hybrid of different networks or systems boost innovation and its creative power.

The engine role of ecosystems is in the main point of the entrepreneurship Ecosystems (Isenberg, 2010) concept defined as such environments that nurture and sustain entrepreneurship and innovation (Zahra and Nambisan, 2012). [They] consist of a set of elements – such as leadership, culture, capital markets, and open-minded customers – which are intertwined in a complex manner to innovate. (Isenberg, 2010). In many cases the nucleus of an entrepreneurship ecosystem is university or college where entrepreneurship is emphasized in a special way through a variety of initiatives related to teaching, research and outreach (Debackere and Veugelers, 2005; Cosh and Hughes, 2010).

More recently marketing literature framed the service ecosystem as constitutive elements of innovation in technology and markets (Vargo *et al.*, 2014) by looking at complex social technological and economic dynamics that influence innovation. This approach puts forward the idea of collaboration and cooperative approach at innovation and emphasizes the co-creation of value, the dynamic integration of resources, and the importance of institutions in interrelated systems of service-for-service exchange. Service ecosystems, as emergent A2A structures actors, are create and recreate through their effectual actions and offer an organizing logic for the actors to exchange service and co-create value and innovate (Lusch and Nambisan, 2015).

Main Actors

Innovation ecosystem deals with different perspectives that provide emphasis on different actors in innovation ecosystems.

Many investigations within the line of business ecosystems approaches concern the analysis of the innovation context dynamics and mobilization with the focus built on the perspective of focal and main actor (Gawer and Cusumano, 2002; Iansiti and Levien, 2004; Nambisan and Sawhney, 2007). By looking closer at the hub focal firms these studies provided a detailed analysis of the configurations and mechanisms needed to manage and leverage external contributions in innovation ecosystems. The business relationships related mainly to productive and commercial linked processes are privileged and in many cases the collaboration are mainly narrowed to those involved firms and complex market networks including user, complements, and producer-add value business actors, with other important organizations such as universities, research centres and intermediaries analysed mainly in terms of strategic partners supporting firms to accelerate and scaling up innovation (Iansiti and Levien, 2004; Adner and Kapoor, 2010).

Many scholars (Isenberg, 2010; Zahra and Nambisan, 2012; Nambisan and Baron 2013) also put forward entrepreneurs the role of peripheral actors (Zahra and Nambisan, 2012) and of high-tech SMEs (Mezzourh and Nakara, 2012) as amplified factors of ecosystem growth. Ecosystems is depicted as a new economic pattern which is based on the integration of multiple knowledge, technology, capital, and entrepreneurship both at local and global level (Nambisan and Baron, 2013)); entrepreneurships has seen as the important strategic significance for technological innovation, the changes of industrial structure and economic growth mode; it has emerged as the engine of ecosystems sustainable development (Isenberg, 2010).

The main feature of the ecosystem includes more that single entities in connections with other actors, the idea of networks interacting with other networks involving top-level universities and research institutions, large established companies and new startups, service companies, intermediary organizations and markets for new innovative products both at local and at global context (Kenney, 2000).

However the businesses still are considered the principal innovation actors in the ecosystem as it is they who leverage the resources within the ecosystem for growth and innovation (Adner and Kapoor, 2010; Gawer and Cusumano, 2014).

Key Factors

An important feature of an innovation ecosystem is that innovation is usually strategically developed around a specific technology (Iansiti and Levien, 2004, Adner 2006, Zahra and Nambisan, 2012). The fundamental science based research is recognised as the a necessary ingredient for the development of transformational innovations that have potential for impacting business and economic growth, but the R&D knowledge and are not enough alone (Adner and Kapoor, 2010). Given that the investment in fundamental research comes at the expense of profits, an innovation ecosystem is one that closes the feedback loop between R&D investments and market; this bridging role is assumed by technology. Technology as main factor is debated on double aspects. As component to span across different knowledge and research domains (Gawer and Cusumano, 2014) and as support and infrastructure that enables actors working in conjunction by adding value to the knowledge they support (Selander *et al.*, 2013). In this role the ICT technologies are mentioned.

The actor's innovation capacity also mentioned as strategic for the ecosystems (van der Borgh *et al.*, 2012) is debated more in terms of quality and intensity of interactions it allowed e.g. research and development alone are necessary but insufficient conditions to increase an economy's innovative activities (Makinen and Dedehayir, 2013).

The research on the dynamics of innovation ecosystems points towards the role of knowledge and the mechanisms enabling knowledge transfer both at local and at distant relationships. Knowledge in ecosystems spans through interactions promoting a double flows – a flow speeding knowledge in a local cluster and flow that favours the acquisition of more codified knowledge that firms obtain through wider networking activities also including the international context (Basole, 2009; Brusoni and Prencipe, 2013).

However what is commonly stressed is that innovation is the results of constant and balanced fertilisation of ideas, knowledge and technology between different communities and networks (Bahrami and Evans, 1995, Kanter, 2012). Each community must receive "nutrients" through different supportive structures, such as leadership, funding, policy, education, roles and culture (Rohrbeck et al 2009).
These institutional and regulatory factors are debated mainly in terms of support mechanism allowing the innovation ecosystems to emerge and stabilize. The focus is more on identification of institutional and policy lock-ins that prevents markets in ecosystems from working efficiently and equitably and suggestions for better balance among conflicting factors (i.e proprietary rights and open standards ecc), enabling to unpicking those lock-ins. (Dedehayir and Makinen, 2011).

Strategy

A successful ecosystem is stated to require governance and direction (Adner 2006). There is the need for integration to link innovation in ecosystem context to consider the need of participative strategic orientation and in some cased distributed management as important actions and the general framework for decisions about innovation and change (Williamson and Meyer, 2012). Keystone players are identified by Iansiti and Levien (2004) to depict the actors involved with the main role of creating value within the ecosystems as well as sharing the value with the other participants. Similarly Zahra and Wright (2011) pointed out as firms and actors need to make use of the wealth of all actors' expertise to multiply the value created. In particular, firms need to shepherd the creation and implementation of forward-facing business models that align with the interests of all actors (Gawer and Cusumano, 2002, 2013; Sharma *et al.*, 2010).
According to some other authors the governance mechanisms in innovation ecosystems means much more than simply ensuring that everyone is aligned with common objectives or when resolving conflicts. Some authors demonstrated as innovation ecosystem is well structured and concentrated around a number of multiple central and peripheral actors that collaboratively shaping the allocation and distribution of resources with the main aim to forging and expanding links among partners (Isenberg 2010; Carayannis and Korres, 2013, Rohrbeck *et al.*, 2013).
The complexity and nonlinearity of ecosystem interactions convey much more limitations when the issue of ecosystem performance is considered. Difficulties to address this topic is widely highlighted by scholars, a great part of them much more than to observing to the output of innovation ecosystem devoted their attention to the process dimension (Clarysse *et al.*, 2014). Value creation and value capturing processes are considered the main sources of ecosystems health (Adner 2006; Ritala and Hurmelinna-Laukkanen, 2009). However these topics remain at more general level and are predominantly considered at the individual focal firm-perspective looking at how firms pursue to reach their wealth and reap related profits.

4. CONCLUSION AND IMPLICATIONS

The paper summarizes and discusses the counterparts of innovation seen as dynamic and systemic phenomenon. The debate moves from three different innovation concepts – system innovation, network innovation and ecosystem innovation- and examines how these different labels interpret the contexts and the processes enabling innovation to take form. To address this aim the paper presents a review of literature conducted by the means of five features framework elaborated though coding analysis of the most frequent words within the highest cited studies. The five coding categories provide a vocabulary made up of key terms: innovation, actors, contexts, factors and strategy/performance. The paper opens up in depth these categories to provide indications of what they mean and how they are related. It allows framing a coherent understanding of innovation under the different systemic and dynamic conceptualisations. Moreover, the proposed framework proves

useful to scrutinize and compare the three innovation labels on the basis of the main categories they addressed.

Regarding *innovation*, it is thought as based on different contexts (economic, political and cultural) in systems perspective (like regional, national, and so on), but this statement has to be considered together with the evolutionary vision provided by scholars, as innovation is dynamic into the context where it takes place. The approach to innovation in network is relational and collaborative-based, so networks are the most suitable context where innovation can be framed and the reason why it starts is given by technological challenges. The evolutionary perspective is considered even in network, as more recently the open innovation approach has started to spread. Dynamic perspective is common even in ecosystem approach, but scholars contributions take into account the complexity as a way to create diversity to favour technological development; the diversity of agents is sustained by social economic and institutional relationships characterised by co-evolution and interdependence and driven by contradictory and power relationships. Thus, the innovation eco systems can be seen as complex systems (i.e. i.e. with diverse actors, but with multiple unpredictable interactions and potential for disequilibrium) rather than complicated systems (with diverse actors, yet predictable interactions and equilibrium state) which are closer to the innovation system concept.

As it concerns *context*, system innovation literature defines actors as shaped by contexts in which they cooperate to achieve innovation-based goals. The context is pivotal in understanding innovation and the way it takes place and the geographical and industrial location are the most relevant issues in defining the achievable aims. This perspective is totally different in network innovation, as the physical location is encompassed when "global innovation networks" emerged. Network studies are useful to highlight how innovation can start in contexts like regions or markets, but it is driven towards wider perspectives, leading to more complexity. Ecosystem innovation is thought as based on complexity as it starts in a context depending from relationships based on value nets, but due to the necessity to involve both economic and not-economic actors, the A2A perspective is the key to understand how innovation processes are performed by actors cooperating in an ecosystem innovation perspective.

The focus on *actors* in system innovation led to consider a wide set of subjects supporting the innovation processes, with relationships based on both knowledge and political infrastructures; the role of businesses is obviously considered but a focus on entrepreneurship is missing, as most of the attention is paid to the ways governments support the collection of contributions by different actors. Differently, network innovation are created through the involvement of several actors on the basis of the innovation aims, like universities or other research entities, even with the support offered by government, but basically due to the great efforts by firms, even to favour a continuous changement in the set of relationships to fill the perceived resources gap. Businesses are even more relevant in ecosystem innovation approach, as they are framed as hub in the innovation processes, with a great relevance devoted to entrepreneurs and to the possibilities offered by cooperation with new and peripheral partners. In addition, the role of non-market institutions is just slightly taken into account. However ecosystem thinking is characterized by stronger incorporation of business and market mechanism whereas the innovation system approach stresses more the role of non-market institutions and historically formed relationships

Within systems of innovation the role of *key factors* is presented in strictly relation with the setting in which they are embedded. The focus is on learning and institutions as broad spectrum of socially based inter-linked factors considered necessary for innovation. The viewpoint of network considered knowledge and technology as main objects shaping relationships addressed to extend the knowledge exchange, the creation of know-how and the extension of the set of relationships itself. From ecosystems perspective innovation is not only a question of more resources for research but

mainly involves technology and its power to cross different knowledge and research domains. Also innovation is boosted by the way of shaping and reshaping a broad set of open relationships supporting ongoing innovation and fertilisation in a wider context of different and dynamic innovation communities.

Finally *strategy and performance* have different prominence in the literature.
The understanding of strategy and performance are rather vague within innovation system. Here the interaction and coordinator mechanisms between components of systems are also considered unplanned and unintentional with the role of authorities seen as an enabler or moderator in interactions.
The tie between network innovation and strategy stands out when the possibility of main actors to manage relationships and activities of selecting partners is considered. The relevance of strategy in network innovation takes into account the networks orchestrating as one of the factors favouring positive outcomes for firms' innovation processes.
Strategy and leadership are viewed as critical aspects for innovation ecosystem. There is the need for theoretical integration to link innovation in ecosystem context to consider strategic orientation as an important action and the general framework for decisions about innovation and change. However the leadership is presented under the wider collaborative efforts to create value for all actors in the ecosystem.

The above differences show that each label provides a different mode of being of innovation. This implies the need to take a separate approach between the system, network and ecosystems innovation. More specifically innovation ecosystem cannot be considered a subset or synonym of 'innovation system. Innovation ecosystem comes close to business and dynamic vision of multiple innovation actors and also captures the value generating aspect (including not strictly technological aspects) of innovation. That's why ecosystem innovations frame a vision more tied to consideration of managerial and business issues differently from the economic-focused perspective of system literature.
The ecosystem perspective comes closer to idea of network innovation even if here the matter of knowledge manageability is framed within a narrowed hub- firm's interest into transferring or translating knowledge and collaboration into innovation.

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