

From Knowledge Management to Ecosystems of Innovation: A Scoping Review

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The ways in which organizations construct, process and justify knowledge differ, with persisting effects upon their relative performance. The field of knowledge management has expanded into different, although intertwined, strands of research, demonstrating the power of knowledge in the success of organizational performance. However, a meta-theory consolidating these approaches, as well as explaining and allowing for predictions of organizational performance with respect to the modes of dealing with knowledge within an organization, still seems to be lacking. This scoping review investigates the regularities by which *ecosystems of innovation* construct, process and justify their knowledge. The aim is to screen the landscape of research in support of the value of the idea that combining knowledge management with research into commons can lead to the construction of a meta-theory, allowing effective approaches to the original task of knowledge management, i.e. supporting the success of organizational performance in the long term.

Key words: knowledge management, organizational epistemology, commons, ecosystems of innovation, scoping review

Introduction

Much of human development has centred on attempts to cope with the future, either by acquiring knowledge about the world to adapt or

adjust oneself to the environment, or by changing the environment to bring it into line with one's interests and possibilities. Where does knowledge management lie between these extremes? It appears to fit somewhere between them or, to take up a suggestion by Hess and Ostrom (2007) with respect to the management of commons, somewhere between decentralized and centralized forms of organization. However, this indicates that the plainly cognitive approach to knowledge management so currently prevalent must be reconsidered either, as Senge et al. (2008) suggests, through investigation of the interplay between individuals and organizations via an ecological path or, as Hess and Ostrom (2007) maintain, via the study of knowledge as a commons.

Investigations into knowledge as a primary source of sustainable economic success in business organizations are now commonplace, together with analyses of the obvious drive towards knowledge that provides competitive advantage (Vogel 2012). The first of these that may be classified as *scientific* date to the 1990s (Nonaka and Takeuchi 1995; Davenport and Prusak 1998; Wiig 1997), but they are not without parallels and predecessors. These may be found in approaches addressing the management of commons, as per Ostrom (1990; 2010), i.e. approaches attempting to bridge the gap between market and state. The bulk of research results suggest that these approaches may support creativity, innovation and flexibility (Hess and Ostrom 2007) as the original targets of knowledge management.

This contribution seeks answers to the following research questions:

- What can we learn from contemporary *knowledge management* literature about ways of constructing, processing and justifying knowledge within organizations? How, and why, do these influence organizational performance in the long run?
- How do organizations sustainably managing commons construct process and justify their knowledge? What is it about the design of these organizations that supports knowledge sharing and knowledge creation?
- In what ways may the concept of *ecosystems of innovation* be used? How does it address the problems of knowledge sharing and knowledge creation?

Method

A scoping review approach (Jesson, Matheson, and Lacey 2011) appears best-suited the purposes of this inquiry, in this case: (1) to

carry out a time-efficient but comprehensive review of a highly diverse body of literature; (2) to determine lacunae in research and thus areas for future work; and (3) to establish potential areas for further deep investigation by means of systematic literature review.

The work started with a sample of keywords derived from previous studies. The starting set was considered incomplete from the outset (Arksey and O'Malley 2005), not subject to completion until the very end. Members of the research team conducted their own literature search in a domain defined by keywords. All were involved in source selection at mid-process. Inclusion criteria covered research question fit, author credibility, new perspective added and keyword match. The study prioritized theoretical concepts over empirical findings, although practical implications were far from ignored.

A variety of literature sources were examined, including research studies in peer-reviewed journals from electronic databases (EBSCO, JSTOR, WOS) and professional monographs as well as 'grey' information such as project reports, web pages, blogs, presentations, and professional network forums. The time frame encompassed mainly the years 1990 to 2014, primary language English. In total 88 references, 33 monographs, 34 research articles and 21 other sources were examined.

The Problem of Knowledge Sharing and Knowledge Creation in Organized Contexts

Organizations differ in their knowledge bases and these differences have persisting and significant effects on their relative performance. Why? How do organizations know what they know? How can their knowledge sharing and knowledge creation be managed?

THE POWER OF KNOWLEDGE IN ORGANIZATIONAL PERFORMANCE

While manual work, according to Mládková (2005), is characterized by the direct assignment of tasks from a designated superior and brings immediate, visible and measurable results (cf. Ford production), knowledge work is characterized by low visibility, an indirect link with the result, requirements for individual decisions and the ever-present possibility of misguided calculation through measurement of performance in terms of input.

Much of the world may now be termed an *information society* in which, according to Vymětal, Diačiková, and Váchová (2005), the quality of life and economic development depend increasingly on information and knowledge and how they are employed. Raw ma-

terials and economic resources, traditional grist to the mill of global competitiveness, now take second place to knowledge and information. Directly associated with this trend is the need for changes from strictly hierarchical structures to more flexible ones.

Nag and Gioia (2012), Drucker (1993), and Reich (1991) identify knowledge within an organization as its main strategic resource, the basis for the long-term sustainability of competitive advantage, not only for individual companies but also for states and nations. Knowledge unique to a given company accumulates, and continues to do so over the course of its development, in the context of its interaction with the surroundings and historical background from which its – largely tacit – form is implied. The competition is unable legitimately to copy such intrinsic knowledge, as might be possible for knowledge that is more explicit. Petříková (2010) further adds that if we consider company knowledge as a key competitive advantage and seek to use it as such through knowledge management, such knowledge management must be integrated into all managerial activities across all levels, redirecting interest away from structural capital towards the intellectual.

Barták (2008) notes that markets remaining uninfluenced by the competitive struggle are becoming increasingly rare. It is therefore essential to act proactively, to take advantage of new opportunities before others in order to maintain market position. The main prerequisite for the effective use of new waves of innovation is improvement of innovative company strategy through recognition of the creative ideas of employees. However, creativity does not necessarily equal innovation; the latter is the result of transforming ideas into new products of high added value.

HOW DO ORGANIZATIONS KNOW WHAT THEY KNOW?

Thanks to the high expectations put on knowledge management, the need for a more developed definition of the concept of emergent knowledge is becoming quite pressing. According to Veber (2009), knowledge is a dynamic, involving interaction between experience, skills, social relations, values, and thought processes. Částoral (2010) connects knowledge with information transformed into usable form, either through human agents or by technical means (information held in information systems). This concept parallels the division of knowledge into tacit and explicit, mentioned, for example, by Collison (2005).

Mládková (2005) draws attention to access to knowledge from the ecological and the technical perspective, which corresponds to the

enactivist (Varela, Thompson, and Rosch 1992) and the representational approach to organizational epistemology, i.e. studies of how organizations construct, process and justify their knowledge (Tsoukas 2005). A technical or representational view perceives knowledge only in explicit terms, separating it strictly from people's thinking and tracking the methods or procedures through which innovative solutions emerge. This approach is widely perceived as American (e.g. Davenport and Prusak 1998). An ecological or enactivist approach tackles knowledge dynamically, as a process, constantly developing, integrating with the knowledge of the surroundings and context, which allows the system to respond to changes. In practice, this means awareness of the organization as an ever-changing system in constant interaction with its surroundings – for example, competitors, customers, and employees. Efforts should be made to create space for maximum interaction that can subsequently increase transfer and sharing of knowledge, allowing exposure of that which is obsolete and making space for the new (Barták 2008). The enactivist approach is more typical of Japanese and European firms.

Zhu (2004) develops the idea of the perception of knowledge through culture (cf. also Andriessen 2008). He differentiates between four main styles: the American, European, Japanese and Chinese.

The American style adheres to the technical approach, building databases (through IT technologies) containing knowledge derived from all the individuals in a company. The position of *Chief Knowledge Officer* (CKO) has been brought into being, a person tasked with managing existing knowledge and selecting a few individuals to execute knowledge management initiatives (Takeuchi 1998).

The Japanese style uses an ecological approach, in which emphasis is laid upon tacit knowledge considered as part of the human character and experience. The knowledge network is created by everyone, not only the manager or CKO; it arises out of interaction between all levels – company-individual, group and organisational (Takeuchi 2001).

The European style lies between. Knowledge is perceived not only as a static and human mental skill, but also as a work in progress, its final shape subject to historical, sociological and cultural environments. Swan and Scarbrough (2001) attribute a suggestive, controversial, and collective nature to knowledge; it is not enough to establish a database, implement a supporting culture or order employees to act in a given way. Knowledge workers have to combine their own knowledge and experience with superiors' requirements,

at the same time as being limited by rules, company procedures and available equipment.

The Chinese style owes much to the national religious and historical background. In the footsteps of Confucian thought, a framework they term *Wuli-Shili-Renli* (wsr) has emerged. In rough translation, *Wuli* is regularities in objective existence, *Shili* is ways of seeing and doing and *Renli* encompasses the patterns underlying human relations (Gu and Zhu 2000).

A methodical approach to identification and description of the enactment of organizational knowledge in successful organizational performance requires a holistic approach to knowledge, involving enquiries into organizational *practice and thinking* (Toulmin 1990; Tsoukas 2005). Among such approaches, the following concepts, centring on flexible practice and innovative thinking, are worthy of note.

Weick's concept of *sense-making* (Weick 1969; 1995; Weick, Sutcliffe, and Obstfeld 2005) draws attention to the *collective mind* (Weick and Roberts 1993), which may be defined as the pattern of interrelations of actions taking place in a social system. Members of the system in a company are employees, their actions regulated by their own decisions, the actions of their colleagues and system reaction. With increasing harmony between these three components, mistakes made in a decision-making process become more valued. Compared with other authors (Hutchins 1991; Sandelands and Stablein 1987), Weick favours the form of mind connection and mind activity over connection strength or mind as entity.

Tsoukas (2009) introduces a dialogical approach. Dialogue enables at least two speech partners to exchange a verbal message. If partners respond to each other (double interacting), each partner thinks while considering the restrictions of his/her utterance, and a productive dialogue ensues, using self-detachment (*self-distanciation* is the term used by Tsoukas) to establish the distinctions through which new knowledge can be created. Such self-detachment can lead to creating new knowledge, through making new distinctions by the processes of *conceptual combination*, *conceptual expansion* and *conceptual reframing*. Conceptual combination uses already-known concepts and combines them to create a new category or change our current cognition. Conceptual expansion develops present concept signification, at best by using conventional forms such as analogies. Conceptual reframing, in which a new view of the concept arises out of object reclassification, means that emphasis is shifted between different classes.

Hess and Ostrom (2005) identify knowledge as a shared resource, including factors from the fields of technology, politics, psychology, economics, sociology and intellectual function to explore various subjects, where human behaviour and decision-making are regulated by rules and norms. They introduce what they term the *Institutional Analysis and Development* framework (IAD), which has the advantage of its adaptability to dynamic states of affairs, in which individuals have to cope with novel restrictions, norms and technologies. Because, as Gibson, McKean, and Ostrom (2000) point out, it is impossible to focus on just one part of system complexity, e.g. storing knowledge, the users of the physical form of knowledge, the specific conditions and relationships within the knowledge community and the unwritten rules in use must be known. The IAD framework specifies three groups of variables that influence required outputs. In the context of knowledge commons, biophysical characteristics (facilities, artefacts, ideas), attributes of the community (Who are the users/providers? Are values shared between participants?), and using rules as a first group of variables, must all be considered. The second group of variables takes in the decision-makers, who make use of the first group elements to set the rules or pinpoint directions for action.

Table 1 (p. 86) summarizes the approaches discussed so far.

LIMITS AND IMPLICATIONS FOR FURTHER RESEARCH

Research related to knowledge management has expanded in recent years (Vogel 2012), making room in the representational approach to accommodate the enactivist (or process-oriented). Weick's concept of sense-making is perhaps the best-known enactivist approach in this field.

However, although much is known of *how* particular knowledge is created within an organization, significantly less is established of *how*, and why, certain regularities of processing, constructing and justification of knowledge within an organization affect organizational performance (Danneels 2010; Sandberg and Targama 2007; Tsoukas and Vladimirou 2001).

Emerging lines of research have begun to address this shortcoming by conceptualizing knowledge not as an entity but as a performative realization. Such a reconceptualization has opened up several new discussions and inquiry spaces about *how* e.g. expertise (Collins and Evans 2007; Dreyfus 2005; Dreyfus and Dreyfus 1986), competence (Fauré and Rouleau 2011; Rouleau and Balogun 2011; Sandberg and Pinnington 2009) and dynamic capabilities (Danneels

TABLE 1 Comparison of Selected Approaches to the Creation of Organizational Knowledge

Item	Approach			
	Enactivist			Representational
Author	Weick	Ostrom	Tsoukas	Vymětal et al.
Aim of approach	People who act as if they are a group.	To create an adaptable environment for sharing and thinking up new knowledge within an entire community.	To create new knowledge by reframing existing experience(s).	To collect and store all knowledge into a database and find an automatic algorithm for the creation new knowledge.
Form of knowledge	Tacit	Tacit/explicit	Tacit/explicit	Explicit
Creators of knowledge	People's minds	Community	Individual	Knowledge worker
Process	Connecting	Creation	Reframing	Collecting
Year of publication	1993	2005	2009	2005
Knowledge definition	Knowledge is based on connections of symbols not on separated symbols; uniqueness.	Shared-resource, including various factors.	Individual ability to draw distinctions, within a domain of action, based on an appreciation of context or theory, or both.	Information widened by previous knowledge, skills, experiences, mental models.

2010) are realized in the performance of individuals, groups, and organizations. These new discussions are also enhanced by a renewed attention to skills (Attewell 1990; Ingold 2000; Sennett 2008) and the modes of handling knowledge within organizations (Brown and Duguid 1991; Gherardi 2006; Nicolini et al. 2003; Tsoukas 2005).

Much research remains to be done. Process perspective is likely to be beneficial in several important ways. For example, it has the potential to identify and describe activities through which knowledge is enacted in organizational performance. However, also needed is a theoretical (representational) explanation for, and justification of, the reasons *why* these processes in social and individual experience, as well as activities within an organization, are successful – espe-

cially in the long run. Such a theoretical extension and explanation would facilitate understanding and controlled reproducibility of those events that are considered and accepted as examples of organizational success.

Sharing and Creation of Knowledge as a Commons: The Missing Link to Organizational Performance?

COMMONS

The term *commons* is intrinsic to much that follows and it is therefore relevant to expand briefly upon its origins, use and analysis. The word finds its roots in meanings that centre upon that which is shared – *held in common* – rather than owned. For hundreds of years (even thousands if one accepts certain translations from ancient Rome), *commons* has referred to shared, non-owned land and goods, or to a stratum of society or community that possesses nothing or very little. Hence, in the English language, *short commons* means a lack of communally supplied food; a *common* is (or rather was) land available for community use with no particular owner; the House of Commons is Britain's third estate, the lower level of parliament intended to represent those people *not enabled*. In modern socio-economic terms, commons is expanded to include the natural environment, the air, the habitable land, and the waters of the earth. For the digital world, Fuster Morell (2010, 5) defines the digital commons as 'information and knowledge resources that are collectively owned or shared between or among a community and that tend to be non-exclusive, that is be [freely, generally] available to third parties.'

Some of the terminology and assumptions commonly associated with commons have picked up a certain bias from the political history of the British Isles. A revolution took place in British agricultural production from the mid-seventeenth to the nineteenth centuries. Although domestic production increased enormously, such success came at the expense of the loss of common land, as old manorial holdings fell into complete private ownership, robbing communities of their shared allotments of ground. This gave wide currency to *the tragedy of the commons*, a term made famous by an eponymous article by Garrett Hardin (1968), but first used by the British economist William F. Lloyd in 1833. It posited various disadvantages of commonly-held land, largely arising out of irresponsible and self-interested over-use. However, on Continental Europe, especially in Germany, Austria and Switzerland, such pessimism was far from justified in small-scale agriculture. A couple of centuries later, the dis-

interested observer may well consider many of the British objections to commons as pseudo-scientific justification for simple commercial greed, although some of the points made remain worthy of consideration. There can be no doubt that, as Hardin pointed out, in the absence of appropriate managerial leadership of the creation and consumption of commons, focusing on their development or at least maintenance or non-overuse, disaster may result.

Managing the commons

Problems of commons may be addressed by measures that prevent waste and overuse of such resources. The Austrian school of economics, represented mainly by Friedrich Hayek and Ludwig von Mises, offers a solution that is here referred to as the *privatization of resources*. This is the transfer of ownership into private hands on the basis that a private owner has an interest in the long-term conservation of the resource. Furthermore, it is possible to take advantage of *state regulation*, which, in the form of quotas or other restrictions, specifies maximum consumption so that the source is preserved. There is a need to take care of commons in the long term and use their collective stewardship (that no one has the right of ownership; there are only administrators) (O’Riordan 2014). Elinor Ostrom, the first woman to be awarded the Nobel Prize for Economics, proposes that the intervention of state power or privatization is not necessary, assuming that people can manage the goods together and that their solutions may work well over time. Ostrom’s work emphasises that direct communication between the entities that have an influence on the goods is the most important factor, and further claims that people can cooperate in their negotiations, which leads to optimization of administration. She also proposed eight widely accepted principles for the management of the commons that should help with their use (Ostrom 1990; Ostrom 2010).

FROM KNOWLEDGE MANAGEMENT TO MANAGING KNOWLEDGE AS A COMMONS?

Commons may be, under certain circumstances, accessible and available to all. This may be both their blessing and their curse, and is the reason proper management of them is essential. When, for example, information commons and protected intellectual property (copyright, industrial design, patents, utility models, etc.) are placed into contrast, it becomes clear that information commons will be (in this case through price) available for subsequent research or more favourable use.

TABLE 2 Comparison of Approaches to the Management of Commons

Item	Models		
	Centralized	Decentralized	Polycentric
Schools/ examples	Hardin (1968)	Austrian school (1940s)	Ostrom (1990), Hess and Ostrom (2007), Pisano and Shih (2009), Frischmann, Madison, and Strandburg (2014)
Characteristics	Historically, the first approach to managing commons	Emphasis on private property, and justifi- cation for it	State-of-the-art ap- proach to managing commons
Focus	Overharvesting of commons leading to the <i>tragedy of the commons</i>	Problems arising from unclear owner- ship	Empirical analysis of the management of long-lasting and ro- bust commons
Solution	Regulation	Privatization	Design principles for managing commons
Result	Prevention of the overuse of commons; prone to failure	Tragedy of the <i>an- ticommons</i> (Heller 1998)	Growth and robust- ness of commons

Michael Heller (1998) introduced the concept of *the tragedy of the anticommons*, which describes the kind of market failure that occurs when ownership is so fragmented that its use becomes problematic. Typically, this takes the form of a blockage of innovation, a kind of gridlock arising out of excessive patent protection, which in turn leads to a phenomenon that may be termed underuse of resources. James McGill Buchanan, Nobel Laureate in Economics, also sees a useful metaphor in the term *anticommons*, in that it draws attention to the problem of under-use, directly comparable with overuse, of resources.

Business organizations cannot expect to use the protected intellectual property of others in the near future. They therefore have to dig deeper into their own structures, right to the level of departments and employees. Such entities are ineluctably faced with the realities and problems of daily function. Every day, new, sophisticated or improvisational solutions to existing problems must be assessed. These solutions may be considered as new and available information or knowledge commons. Business organizations can sustainably benefit from these solutions, no doubt, but there is no escape from a re-instantiation of the principles of their appropriate management within the organization (Ostrom 1990; Hess and Ostrom 2007; Ostrom 2010; Frischmann, Madison, and Strandburg 2014).

Sharing and Creation of Knowledge as a Commons: The Core of Ecosystems of Innovation

ECOSYSTEM AND INNOVATION: SOME DEFINITIONS

The term *ecosystem* originally came from the natural sciences (Tansley 1935) and there are some differences in its interpretation between the natural and socio-economic sciences; however, there is also a great deal in common (Vermeij and Leigh 2011), definitely enough to justify its use in the latter context.

The natural sciences view an ecosystem as a network of all the organisms within a defined unit of space, which interact with, and affect, each other and their surroundings, having all the components necessary for survival. From another point of view, it is a dynamic, unpredictable *ad hoc* open-system analysable by scientists (Arms 1990; Chiras 1990; Odum and Barrett 2005; Warren and Robbins 2007; Wright and Nebel 2002).

For the purposes of this contribution, a definition of innovation coined by Baregheh, Rowley, and Sambrook (2009, 12) was selected for its robust meaning: 'Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace.'

ECOSYSTEMS OF INNOVATION: APPROACHES

Increasing globalization leading to increasing competition, shortening life cycles of products, excess of supply in many industries and/or rapidly changing conditions are just some of the environmental factors putting pressure on the *ecosystems of organizations*. Adaptation to ever-changing environments is essential to long-term survival, in human and societal networks as in the natural world. *Innovation* is viewed as a key to success and prosperity (Kotzier and Alon 2013). As conditions change, so must organizations – and innovation is the key.

Synthesizing various other definitions of innovation ecosystems, Gobbles' (2014, 1) definition is used in this work: 'Innovation ecosystems are dynamic, purposive communities with complex, interlocking relationships built on collaboration, trust, and co-creation of value and specializing in exploitation of a shared set of complementary technologies or competencies.'

This work classifies Ecosystems of Innovation from an organization-environment perspective. Three major approaches to Ecosystems of Innovation are identified:

- A Single-organization ecosystem – an ecosystem within an organization
- B Networks of organizations – inter-organizational relationships
- C Regional innovation networks – a whole region as an ecosystem

It is worth noting that, while sub-approaches in category B are somewhat self-contained, lone theories A and C are used as a blend of different sub-approaches with only the underlying aspect of common perspective.

Single-Organization Ecosystem

Approach A is probably the least developed in the current contribution, despite a great deal of interest from the academic and non-academic worlds (e.g. Trifilova and von Stamm 2009; Koetzier and Alon 2013).

In this field, there is little consensus about what constitutes a single-company ecosystem of innovation, i.e. an innovative ecosystem within a company's boundaries. Yet, only partial aspects of this perspective have attracted research attention. Actual case studies of companies trying to establish an ecosystem of innovation for their own purposes (e.g. Thompson et al. 2012) are of especial interest. However, these organizations employ a somewhat *ad hoc* approach to a number of innovation concepts, rather than a single structured technique, to establish their innovation ecosystems.

Some identified sub-approaches:

1. Stanford's Innovation Ecosystem Network (Russell et al. 2011; Still et al. 2012) – data-driven study of relations within the network as a source of sustained value co-creation.
2. Chinese schools of Innovation Ecosystems – Emerging interest among Chinese academics in this field has led to the creation of several approaches toward Ecosystems of Innovation, of which probably the most promising is Total Innovation Management (Xu et al. 2007; Xu 2012), which has been put forward as a paradigm for management of an innovation value network.
3. High Reliability Organizations (e.g. Weick and Roberts 1993) – studies of systems within organizations that have avoided failures in high-risk environments.
4. Naïve simplification (e.g. Tidd and Bessant 2009) – usually in the form of guidelines for the establishment of better innovation climates; however, without proposal of any system for understanding underlying factors.

Networks of Organizations

Theories of inter-organizational ecosystems of innovation have received far more attention than those outlined as approach A. Two in particular are worthy of mention – Open Innovation and Clusters – together with some less-developed sub-approaches:

1. Open Innovation – introduced by Chesbrough (2003), as the opposite of old-fashioned closed innovation and defined as ‘a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology’ (Chesbrough 2006, xxiv). According to Remneland Wikhamn and Wikhamn (2013), open innovation theory may be divided into *firm perspective* and *ecosystem perspective*. The former is represented by initial work on the part of Chesbrough (2003), who co-developed it, into (open) business strategy (Chesbrough and Appleyard 2007). The latter is more concerned with the entire ecosystem beyond the boundaries of the given firm. Von Hippel’s work (1986) on user innovation preceded the establishment of this theory.
2. Clusters – based on Porter, who defined them as groups of physically close and inter-supporting industries creating ‘competitive advantage in a range of interconnected industries that are all internationally competitive’ (Porter 1990, 86). A cluster is the natural result of vertical and horizontal relationships between a nation’s regional, successful industries. They support each other’s development in a mutually reinforcing process (Porter 2011). According to Matei (2013), general cluster theory can now be divided into two themes: clusters and competitive poles.

Other important sub-approaches:

3. Innovation Interdependence (Adner 2006; Adner and Kapoor 2010) – a view of Ecosystems of Innovation as a source that may collectively offer of a network of organizations to a customer. The contribution of each network member is essential to the final result.
4. Ecosystem Lifecycle (Moore 1993) – proposes different kinds of organizational innovation behaviour depending on the maturity of an ecosystem (viewed as a parallel to natural ecosystems).

Regional Innovation Networks

Concepts of Regional Innovation Networks constitute an *ad hoc* category comprising countless theories together with, most importantly,

their practical deployment by regional governments. These concepts differ from the previous approaches in two dimensions – overall goal (i.e., the economic success of a region) and extent (mostly, all the organizations in a region).

Approach C is more concerned with supporting the competitive advantage of a whole region rather than a single industry (or group of closely related industries). This definition tends to confine matters to local governments, since the grasp of other organizations rarely extends so widely.

The theoretical basics of this approach are very loose. The configuration of these networks is subject to very fundamental differences in economic, political and other theory, from libertarianism to centralism.

Promoting economic success, which is an overall goal of this approach, in a region is actually the subject of works of traditional economic authors from Antiquity and recent history (e.g. Aristotle, mercantilism, Adam Smith) and remains important in modern times (e.g., Paul Krugman and his economic geography 1991, or competitive advantage, Michael Porter 2011).

LIMITS AND IMPLICATIONS FOR FURTHER RESEARCH

Some more general concepts have been excluded from this review, although they touch this field partially or could be used for better understanding of some of its aspects (e.g. theories about strategic alliances or Supply Chain Management).

The results of this review pinpoint important differences in the development of theories arising out of individual approaches. Although there are dominant and self-sufficient concepts for networks of organizations (Approach B) and Regional Innovation Networks (Approach C), such coverage is absent from a single-organization perspective, despite an undeniable need for such concepts among organizational leaders. In Accenture's 2012 Innovation Survey, only 28% of 519 executives expressed belief that their organizations were achieving consistent innovation performance (Koetzier and Alon 2013).

Conclusion and Some Research Imperatives

The general intention of this contribution is to assist understanding of, and improve, the evolutionary processes that efficiently influence organizational performance.

Starting with the central task of organizations, i.e. to simplify and systematize production processes, it emerges that the knowledge of

TABLE 3 Comparison of Approaches to Ecosystems of Innovation

Scope	Single-organization Ecosystem		Networks of Organizations (in general)		Open Innovation		Clusters		Regional Innovation Networks	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
Source of innovation	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
Primary goals	Promoting success of an organization (through better innovation)	Promoting success of individual members	Promoting success of individual members	Contact with innovation talent beyond a given organization; promoting progress in a selected field	Promoting success of individual members and their region	Promoting development of a region (employment, taxes, business success)	Promoting success of individual members and their region	Promoting development of a region (employment, taxes, business success)	Promoting success of individual members and their region	Promoting development of a region (employment, taxes, business success)
Major stakeholders	Shareholders, management, employees	Organizations	Organizations	Stakeholders in general	Organizations	Government, organizations, inhabitants	Organizations	Government, organizations, inhabitants	Organizations	Government, organizations, inhabitants
Approach to intellectual property	Closed	Mixed	Mixed	Open	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed
Relations among members	Medium-tight	Loose-medium	Loose-medium	Loose	Loose	Loose	Loose	Loose	Loose	Loose
General preconditions	Suitable organizational culture; management and employee support	Mixed	Mixed	Openness, fair behaviour and meritocracy	Concentration of organizations in a similar industry	Government support	Concentration of organizations in a similar industry	Government support	Government support	Government support
Duplicability and imitability	Difficult	Easy-medium	Easy-medium	Medium	Easy	Easy	Easy	Easy	Easy	Easy

the members of an organization has an important function. This depends on either individual knowledge or organizational knowledge (an organization can produce knowledge by itself, which is more than the sum of the individual knowledge contributions).

The topic of *organizational epistemology* arises out of this, concentrating on the emergence of knowledge in both the individual and the organizational realms in order to explain success in organizational performance and find out how one can influence the other in a positive way. Thus, knowledge is understood as a causal factor for both the functioning and the success of organizations.

In attempts to analyse the causal influence of knowledge upon decisions and creation within organizations, the beginning of research in the field of *knowledge management* was strongly influenced by cognitivist or representational analysis of knowledge, primarily orientated towards explanation of success in organizational performance. In the context of application, presuppositions of local operationalisation – put differently, enactment of knowledge – were not taken into account.

In parallel, research addressing the sustainable management of *commons* was in process to address the problem of their overexploitation (Rose 1986; Ostrom 1990), finally leading to the idea of considering knowledge itself as a commons as well (Hess and Ostrom 2007; Frischmann, Madison, and Strandburg 2014). Von Krogh (2003) condensed the point of research into commons to *communal knowledge* in association with the *enactment* of knowledge as investigated from the very outset by Weick, Tsoukas and others.

Returning to the first research question, these two lines of development, the representational and the enactivist approaches, develop an understanding of how knowledge can be constructed, processed and justified within an organization. In summary, it could be said that the cognitivist approach concentrates primarily on sharing knowledge, whereas the enactivist approach addresses the sharing of resources, in which knowledge itself is considered a resource to be handled as a commons.

A constructive combination of the two approaches, establishing a bridge between the cognitivist trend on the one hand and considering knowledge a resource on the other, will lead to model-theoretic ideas that allow for the emergence, promotion and support of knowledge-intensive environments built around communal knowledge as per von Krogh (2003) and the core of research on commons as per Ostrom (1990; 2010) and Hess and Ostrom (2007). Such knowledge-intensive environments are the backbone of sustainable



FIGURE 1 Organizational Epistemology of Ecosystems of Innovation

management of commons and, furthermore, establish the ecosystems essential to innovative adaptation to changes in the world.

The third research question leads to the conclusion that innovation ecosystems are not sufficiently analysed in the literature; the term has more currency as a *buzzword* than as a concrete cognitive tool. The existence of Ecosystems of Innovation needs to be supported by knowledge-intensive environments resting upon what appears above. At the same time, this supplies answers to the second research question concerning the design of organizations that support knowledge sharing and knowledge creation.

This scoping review was intended to uncover the innovative status of our own research (Born and Gatarik 2013; Gatarik, Born, and Kulhavý, forthcoming) by revealing the solid line of development that leads through both knowledge management and research into commons with respect to organizational epistemology.

It is worth reiterating that, in the commons research of Ostrom, it is suggested that factors influencing knowledge sharing in communities be involved, insofar as they support innovations, as well as into

knowledge management. There is a strong assumption that the combination of classical knowledge management and commons can lead to the construction of a new kind of meta-theory with ecosystems of innovation as core element. This meta-theory is expected to lead to new and effective ways of addressing the original task of knowledge management discussed at the beginning of this contribution. Such a theory could contribute greatly to a deeper understanding of the field of ecosystems of innovation in its intention to support organizational epistemology, and thus organizational performance.

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