

Quadruple Helix and Knowledge Management: Partnerships, Data Management and Regional Development

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Abstract. This paper summarises aspects from the doctoral thesis “Regional Development in Romania and Finland. Examples from Remote and Sparsely Populated Areas”. It refers to regional and rural development processes within cross-sectoral partnerships quadruple helixes. Knowledge management is a component of regional and rural development, generally and of local development processes and project management particularly. It is insufficiently acknowledged and accounted for. There are numerous cases when *involuntary knowledge management* occurs while carrying on regional or rural development, therefore the specific processes related to knowledge creation and management are conducted without awareness, harnessing less a more efficient functioning of the activity. At a very general level, social structure consists of the uneven puzzles of social subsystems facilitating or hindering different kinds of interactions (Giddens 1984). The conceptual model takes over Giddens’ consideration about sub-systems, therefore it also assumes that each of them has different degrees of structuration and there are different kinds of interactions to be considered (Aldea-Partanen 2007). The theoretical framework employed accounts for concepts associated with regional development such as knowledge creation and management, innovation, sustainability, social networks and social capital, quadruple helix, and place-based development. Other terms, related to the policy framework, are considered in a critical manner: main available policies are briefly examined, at different levels, connecting them to elements from the theoretical framework. Policy implementation and evaluation tools, such as project cycle management are summarised and critically reviewed. This paper focuses on the way knowledge management may be used for knowledge based regional and local development. This paper provides a review of concepts related to knowledge management in regional development processes.

Keywords: Knowledge management, Regional development, Sustainable innovation, Quadruple helix, Involuntary knowledge management, Knowledge transfer

1. Introduction

“Locales are not just places but settings of interaction” (Giddens 1984, p. 118) The settings of interactions are determined by the locations being them physical or virtual. Regional development is understood in a broader sense, as the sum of the intentional or unintentional results of various policies implemented at EU, national or regional level, amended by the cultural, historical and organisational backgrounds’ influences and accounting local policy context and international processes. Knowledge has a definitive role in formulation and implementation of regional and rural development policies.

In the context of Manuel Castells’ information society (Castells 2004, Castells 2000), social networks play a crucial role in defining the significant differences between, and advantages of, regions.

This paper considers both the intentional knowledge management processes as well as the involuntary ones. Knowledge management is always a component of regional and rural development, generally, and of local development processes and project management, particularly. It is insufficiently acknowledged and especially accounted for in the interactions between local and regional level. There are numerous cases when involuntary knowledge management occur while carrying on regional or rural development. Therefore, the specific processes related to knowledge creation and management are conducted without proper awareness of the fact and functioning principles, hindering a more efficient functioning of the activity. From a policy point of view, special attention is paid to place-based development and research, as well as to learning regions.

The paper adopts Anthony Giddens’ theory, according to which society is a combination of subsystems having different degrees of structuration and interactions. (Giddens 1984). The above model is used to analyse the changes occurring in particular regions. At a very general level, social structure consists of the uneven puzzles of social subsystems facilitating or hindering different kinds of interactions. The conceptual model takes over Giddens’ consideration about sub-systems, therefore it also assumes that at regional level each of them has different degrees of structuration and there are different kinds of interactions to be considered (Aldea-Partanen 2007).

This perspective applies both on the fact that there are different subsystems to be considered while describing regional development, as well as on the various connections between policy makers and implementers, and

between various social groups within the society. This paper provides a summary of some key concepts used in the doctoral thesis as well as brief illustrations related to knowledge management.

2. Definitions of Innovation, Sustainability, and Knowledge Management

These definitions of innovation, sustainability and knowledge management are interconnected in the field of regional development. This section presents a selection of definitions to be accounted for and some of the implications considered important for regional development, generally, and for the one of sparsely and remote populated areas, particularly. This selection of definitions may be of use to regional developers or regional development researchers interested in adopting and adapting their tools.

2.1 Innovation – Selected Definitions

The novelty element is always a precondition while defining innovation. Nuances are set, reflecting upon economic, social or technological aspects. Some definitions are considered below, followed by focus on two innovation models. The successful exploitation of any new ideas may occur in the cases of local communities or regional or central government. (Aldea-Partanen, A, Keränen, H and Nevalainen 2003, p. 3) – “Social innovation is distinct from economic innovation because it is not about introducing new types of production or exploiting new markets in itself but is about satisfying new needs not provided by the market (even if markets intervene later) or creating new, more satisfactory ways of insertion in terms of giving people a place and a role in production” (OECD, LEED forum on social Innovation 2006).

Alternative foci of innovation are presented. While economic innovation has been seen as the main motor for development, more attention is paid to social innovation, as it brings a larger perspective to the solving of the problems. “‘Social innovation’ seeks new answers to social problems by: – Identifying and delivering new services that improve the quality of life of individuals and communities. – Identifying and implementing new labour market integration processes, new competencies, new jobs, and new forms of participation, as diverse elements that each contribute to improving the position of individuals in the workforce. – Social innovations can therefore be seen as dealing with the welfare of individuals and communities, both as consumers and producers. The elements of this welfare are linked with their quality of life and activity. Wherever social innovations appear, they always bring about new references or processes.” (OECD, LEED forum on social Innovation 2006)

While the definition may still seem too related to the economic dimension, the long-lasting effects are possible just when social, cultural and environmental aspects are accounted for in economic development. “Social innovation is one key element of prosperity and a crucial aspect of sustainable development. ... There is social innovation wherever new mechanisms and norms consolidate and improve the well-being of individuals, communities and territories in terms of social inclusion, creation of employment, quality of life. Social enterprises and the non-profit sector in general, have demonstrated to be means to achieve social and economic goals.” (OECD, Social Innovations at Local Level) This definition of social innovation is very rich, referring to many aspects to be accounted for. The novelty element is contextualised and related to mechanisms and norms with a clear finality; enhancing and refining well-being as the purpose of the social innovative processes has multiple target groups: individuals, communities and territories. The definition also specifies the directions for well-being operationalisation, which is seen in relation to social inclusion, employment and quality of life. Therefore, social innovations at the local level are seen as crucial whenever they provide, with new mechanisms or norms positively affecting social inclusion, employment and quality of life in a manner serving not only some individuals but also communities and territories. Furthermore, this definition underlines the important roles of social enterprises and non-profit sector in achieving social and economic goals.

The concurrent innovation paradigm proposes a more complex approach of social innovation taking into consideration the type of actors involved in the interaction. Furthermore, it proposes a cycle perspective on innovation. Central to the Concurrent Innovation paradigm is “the human centric KBS virtual professional communities, which are intended to interplay in entanglement with traditional business entities, as well as with collaborative networked organizations such as companies’ clusters and Virtual Enterprises” (Santoro, Bifulco, 2006, p. 2). *Knowledge Business Social* (KBS) Community consists of researchers, individual professionals, authorities, and other key persons aiming at addressing agreed business activities and sharing a common vision. The concrete activity is carried on by virtual teams, which combine the achievement of the jointly set results and the self-fulfilment of the members. The mechanisms through which they generate value are interaction, sharing and collaboration. There is certain communality between communities of practice, formed around knowledge sharing and the KBS communities. Whereas the communities of practice especially part the knowledge and social dimensions, the KBS community adopts an outcome-oriented approach. Santoro and Bifulco bring in two types

of such communities, “Incipient discipline KBS communities”, potential creators of new knowledge disciplines and “Challenge-oriented KBS communities”, where the knowledge purpose is less specified, but the activity is decided upon (Santoro, Bifulso, 2006, p. 4). The core elements of the concurrent innovation paradigm are co-creation, shared intent and the problem identification. Co-creation refers to the joint efforts of producing set results, such as products, services or whatever the members agree upon.

The shared intent is the actual starting point and the precondition for starting the activity, together with the problem recognition. As scope, the concurrent innovation paradigm must feed in the social innovation lifecycle. From a strategic perspective, it has human focus, and the strategic objectives are to increase creativity through full realization of individuals’ human potential, to foster innovation driven business competitiveness and to enhance the capability of determining systemic innovations (same source, p. 7). Social innovation lifecycle is placing the knowledge creation and the activity of the KBS community in the centre of the cycle, in this manner a larger probability to achieve systemic innovations occurs.

Another form of generating innovation and of participation is witnessed in a Quadruple Helix partnership, a citizen extended version of Triple Helix (TH). As Leydesdorff and Etzkowiz mentioned (2001), university-private-governance partnership allows for the creation of innovation systems and generates a knowledge-based system. However, it is important to note that the degree of understanding how such systems function may enhance or limit the access to and performances of such a system (Leydesdorff, Etzkowiz 2001).

All aforementioned, certain preconditions are needed to allow and stimulate the formation of “business clusters that tap niche markets for products and services” (OECD, 2005, p. 12). Service provision has particular relevance in the countryside as urban areas are better endowed with such facilities while, quite often, rural areas struggle to maintain or build such services. Critically considering the initial linear patterns of the innovation, Etzkowitz’ and Leydesdorff’s Triple Helix model proposes a different approach modelled as a spiral for the innovation capturing multiple reciprocal interactions among institutional settings (public, private and academic) “at different stages in the capitalization of knowledge” (Etzkowitz’ and Leydesdorff 1995; Viale, Ghiglione 2006). Etzkowitz’ and Leydesdorff’s Triple Helix model refers to the European Regional Innovation Systems and various examples of Industry-University cooperation (Aldea-Partanen 2007). The helixes’ number of dimensions is not fixed at three or four. And any type of helix with a larger number of dimensions than three builds upon the original triple helix. The n-tuple helixes may as well contribute to regional development and a functioning of a quadruple helix having local-global as fourth dimension is just one of the possible extensions of the traditional Triple Helix (Leydesdorff 2012).

This paper reflects upon the relationships between knowledge management and project management for rural and regional development of sparsely and remote areas. The sustainability of innovations created in such development processes is facilitated by quadruple helix partnerships.

The Quadruple Helix concept has been used in various projects and programmes, being expanded as a co-operation forging tool in regional policies in European Union. It is nowadays taken into consideration in the current regional projects and programmes. “In addition to the three strains of the triple helix, knowledge regions pay an increasing attention to the participation of citizens, of engaging the public in the processes of knowledge creation, creating quadruple helix interactions” (Reichert 2006, p. 41). The current EU regional development policy aiming at creating knowledge regions accounts for the necessity of pooling together various knowledge resources, including the ones of the local inhabitants. However, the formulation of this preferable choice indicated a top-down approach, in which policymakers involved with knowledge regions see participation as a form to engage the public, usually a less involved part. The participation of citizens is a crucial part of the Quadruple Helix (QH), allowing for a better mobilisation of local capacity in local development. The innovation emerges and is consolidated or spread in the quadruple helix partnerships (Aldea-Partanen 2011). The role of QH in innovative processes is accounted for in many policies and projects, such as the **Creating Local Innovations through Quadruple Helix CLIQ** project co-financed by European Regional development Fund and made possible by Interreg IVC Programme. The “Quadruple Helix, with its emphasis on broad cooperation in innovation, represents a shift towards systemic, open and user-centric innovation policy” (Arnkil et al. 2010, p. 2). In their scientific reports CLIQ researchers identify four different types of QH models: 1) the “TH + users model”, 2) the “Firm-centred living lab model”, 3) the “Public-sector-centred living lab model”, and 4) the “Citizen-centred model” (Arnkil et al. 2010, p. 7). In their analyses, they noticed that QH has the capacity of narrowing downs and sometimes even bridging innovation gaps. Their reflections illustrate in a practical manner how quadruple helix networks may contribute to building trust and how it may be reinforced by participation. The participants contributing to the cooperation for the concrete purpose of supplying certain services or products are sharing a

concrete common purpose and they may be aware of each other's capacities and they may be willing and able to actively allow the others to contribute to the process trusting that this will serve the innovation process. Furthermore, the public and regional authorities have an active role in renewing the local-regional "innovation ecosystem" (Arnkil et al. 2010, p. 11 /131). "This new innovation policy approach includes also a general shift ... towards a more flexible, enterprise-oriented policies focusing on market developments. This has meant a transition from policy models looking for general 'best practices' towards more customized policies and policies supporting the development of in-house competencies, in both private enterprises and public organizations" (Arnkil et al. 2010, p. 12 /131). Pragmatically, the cooperation process allows for competencies development, therefore facilitating knowledge creation and transfers.

2.2 Knowledge Creation, Types and Management and Their Implications on Policy

Usually, knowledge is associated with the cognitive processes of individuals and organisations. Rarely all the implications of the analysis are noticed or considered. At a philosophical level, there is a tendency to search too much in the abstractions and to ignore concrete forms of knowledge. Andrew Sayer considers that "we reduce practice to knowledge, knowledge to science, and science to observation and contemplation". He considers it necessary to observe the context of knowledge and attempts to combat "the following (interrelated) misconceptions:

1. that knowledge is gained purely through contemplation or observation of the world;
2. that what we know can be reduced to what we can say;
3. that knowledge can be safely regarded as a thing or product, which can be evaluated independently of any consideration of its production and use in social activity;
4. that science can simply be assumed to be the highest form of knowledge and that other types are dispensable or displaceable by science." (Sayer 1992, p. 13)

Relating to the first misconceptions, Sayer reminds us that the formation of knowledge simultaneously depends on two contexts: the one of work, in which it occurs, and the one of language, which mediates its emergence. He combats the contemplative stance of knowledge, pointing out how different social scientists are an active part of the knowledge creation and change. Different languages, as culturally embedded, have slightly different ways in shaping processes. Speaking and writing are as important as making and doing, proposing the scientists to be more aware of these last aspects, as well as of what he calls "the unexamined practical consciousness". He also refers to academics' blind spot that is practical and tacit skills. (Sayer 1992, p. 15) Therefore, it is worth it to have a more careful look to tacit and local knowledge concepts, as well as to the involuntary knowledge management, for better understanding the social reality in regional and rural development processes.

Concluding he argues: "Knowledge – whether adequate or not – never develops in a vacuum but is always embedded in social practices and we can more fully understand the former if we know the latter" (Sayer 1992, p. 43). His view is adopted and adapted here. Consequently, examining knowledge in regional development of the sparsely populated areas can and should be done by both examining different theoretical concepts used by scientists in describing the processes, and by accounting how the social practices are shaped around them or ignoring them. For instance, being aware that social innovation is born even when the 'producers' have not the slightest clue of innovation concepts they apply. In the case of investigating mechanisms allowing for long-lasting cooperation, the researcher should be aware of the need to acknowledge the social practices, the local context as well while portraying regional development processes. This is why place-based development is a suitable approach in general and especially in the case of sparsely populated areas. Here the definition used is of knowledge management as the process of managing the knowledge in its various forms, occurred both at individual, organisational or network level. In European and North American contexts, it usually refers to dissemination of explicit knowledge, mainly through IT-mechanism and in some happy cases, also to management of tacit knowledge. The relevance of knowledge management in the context of regional and local development relates to the capacity of the regions to mobilise and attract resources, as well as to better use their own capacity, in an innovative way allowing for lasting development. Knowledge is one resource available in various forms at individual and organisational level.

Nowadays, there are some forms of *involuntary knowledge management* in regional development processes *whenever, in an ad-hoc manner, some of the available knowledge is mapped and managed for the use of development*. It may be the case of a certain development project or a regional body who has such an initiative. More profitable for the development processes is communication on the on-going processes of knowledge creation, as well as sharing information on the existing or past projects, programmes and processes. Ideally, each local or regional development body should have their own knowledge management operational plan,

allowing for knowledge creation and sharing. This builds as well upon Einstein's view, who appreciated that “the only source of knowledge is experience” (Kazi et al. 2006, NET source).

Knowledge management is also seen as discovery learning. In the context of knowledge society, which is set ahead, “a firm understanding of the interplay between the management of knowledge and learning is of strategic importance to create and maintain effective learning processes in a large variety of non-traditional learning situations” (Naeve et al. 2008, p. 2). Practically, the views proposed here analyse the dominance in the definitions of knowledge between Western societies and Japan, illustrated with pertinent models, proposing concepts and approaches which can be used in the traditional learning environments and in the regional and local development processes, dominated nowadays of necessity of transferring best practices. Furthermore, according to the authors, managers should be ‘drivers of learning’ (Naeve et al. 2008 p. 2). Regional managers or regional development managers of dominantly rural areas need to be drivers of learning, stimulating knowledge sharing and creation, leading to better use of local resources. The next table presents the forms of knowledge and the correspondent investigation research methodology.

Table 1: Types of knowledge and corresponding methods of exploration

Type of knowledge	Consists of	Method of exploration
Explicit knowledge	Statements easy to recall	Quantitative method: standardised surveys
Implicit knowledge	Statements needing reflection and introspection	Qualitative methods: deep interviews and ethnographic methods
Silent knowledge	Practical actions	Qualitative methods: deep interviews and ethnographic methods
Subconscious knowledge	Feelings	Psychological methods
<i>Tacit knowledge</i>	<i>Practical actions and Statements needing introspection</i>	<i>Qualitative methods: deep interviews and ethnographic methods</i>
<i>Local knowledge</i>	<i>Statements easy to recall or practical actions or statements needing reflection and introspection</i>	<i>Quantitative qualitative standardised and methods: surveys, deep interviews and ethnographic methods</i>

Note: Table is based on the Göranson typology, as presented by Naeve et al, for the first 4 forms of knowledge (Naeve et al. 2008, p. 4), with two additions (by author) taking account of the forms of knowledge existent in regional development processes, whether accounted or not.

There is a need for acknowledgment of tacit knowledge in development processes. While previous authors consider in a distinct manner knowledge creation and knowledge management, there is also a complementary view: knowledge management supposes the creation of knowledge, together with the skills and communication based on a desired and shared vision of the future. Knowledge management builds upon jointly defined values. “Knowledge management requires innovative responsible leadership” (Suurla et al. 2002, p.V, Aldea-Partanen 2003)

Is knowledge power per se, as Bacon proposed? The management of knowledge and especially its transfer is seen as power (Piepkorn 2010). Transferring knowledge suits the regional development processes, generally and the sparsely populated areas, in particular. Being aware of existing individual and organisational capacities, mobilising them in a targeted manner, as well as improving them by sharing acquired complex knowledge, as a part of the local development processes will positively impact the well-being and the development of the region. Cooperation is done more fruitfully when partners are knowledgeable about their organisational and region's capacities; therefore a well-conducted knowledge management serves the development process. If the resources are not yet enough for a proper in-house management, perhaps action-researchers may be used to

contribute to proper knowledge management. A particular situation of transfers occurs in the case of so called “knowledge triangle” (Myklebust 2009, Tenhunen 2009, Serra 2009, Flodström et al. 2009, Gordon 2010, Vilalta et al. 2010, Melin et al. 2011, Saublens et al. 2011). *The interactions between education, research and innovation are seen as key drivers of knowledge-based society* (Flodström et al. 2009, p. 7). While the hope is to convert university acquired knowledge into innovation stimulating development and generating revenues, the real challenge is done by the changing role of universities, which should remodel their functioning in a manner relying less on state aid and generating more profit. (Myklebust 2009) The ideal situation is that the knowledge acquired in the research to be transferred both through education and innovation processes in a manner benefiting citizens and businesses, therefore stimulating or preserving at least economic development. How do we administrate knowledge? One reply to this question is proposed by the following definition. “Knowledge management (KM) is the process of capturing, documenting, storing, retrieving, reusing, creating, and sharing the knowledge to increase company productivity and efficiency” (Piepkorn 2010). Similar operations are needed also in regional development processes in general and especially for the sparsely populated areas with low access to other pools of knowledge. As place-based development perspective proposes, the local resources must be known and put to use, and knowledge is essential for that. In the case of such region, it is less the case of increasing its productivity; sometimes it may just mean maintaining its productivity or re-inventing ways to be productive. Designing and conducting knowledge management combined with a place-based approach, it will certainly increase the efficiency of the region. Piepkorn also presents certain steps to be followed in the knowledge management process, to be also applied in the regional development of sparsely populated areas. The next table illustrates how each step proposed by Piepkorn is adapted for regional development.

Table 2: Steps to be followed in the Knowledge Management Process

Steps as proposed by Piepkorn (2010)	Implications for regional development processes (Aldea Partanen 2011)
Knowledge capture which involves content management and lessons learned	Capturing knowledge in regional development means being aware of local knowledge and the various settings around it. It is also a solution-oriented process by accounting conclusions of relevance for further development. Best practices are not the only way to move forward; learning from ‘failures’ is of crucial importance as well.
Knowledge document, store and retrieval for reuse which involves entering the captured knowledge in a retrievable repository (such as a database or competence center).	Knowledge document, store and retrieval for reuse which involves entering the captured knowledge in a retrievable repository (such as a database or competence center).
Knowledge creation, which involves activities such as project knowledge and experience or knowledge from innovation.	Creating knowledge is based on past experiences seen in a new manner; being aware of past projects and knowing while trusting innovation concepts may allow for a speedier and more robust knowledge creation. A “translation” in lay terms is recommended while working with innovations at local level, so common understanding may be assured.
Knowledge sharing which involves making the knowledge available to those who may benefit from it such as use of intranet, documenting good practices, and communities of practice.	While using of intranet and documenting good practices are already accepted as ways of knowledge sharing in most of the efficient regional development processes, creating and maintaining <i>communities of practice</i> still needs oriented efforts in development work. Communities of practice are a good way to share tacit knowledge. Working together and sharing what we individually worked on allows for joint learning and potentially stimulates knowledge creation as well.

3. Conclusions

The mentioned steps propose a linear approach of the corresponding processes. However, in reality many of such processes related to each step may overlap and so partially may also the steps themselves. The practitioners need to be aware of the complexity and non-linear nature of the reality. Innovation, knowledge and sustainability should be considered in their larger sense for a lasting effect in regional development processes. Cooperation and multi-disciplinary approach are necessary while investigating regional development

processes in general and for reshaping it in particular. "Transparent processes that facilitate effective two-way transfers of knowledge between public organizations and stakeholders are fundamental for establishing successful partnerships." (Riege et al. 2006, p. 37)

Involuntary knowledge management could be converted in a form of open-system knowledge management. Knowledge management in public organisations and in participative processes of partnerships creation needs further attention both in terms of research and development processes.

Ethics declaration: The conceptual paper presented here is part of my doctoral thesis and no permission was needed.

AI declaration: I did not use any AI tool in the development of the paper

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