The infrastructure of knowledge

A research outline

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PETER DE SOUZA

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1 Background and introduction

The role of knowledge in society and its development has through the centuries been, more or less, taken for granted. Although in modern times, research and education has been institutionalized and systematically treated in History of Science and Ideas and more recently in the approach called Knowledge Management. Today, knowledge has entered the main 'stage', it is defined as THE main contributor to human development and most (?) often progress.

"…we cannot imagine the functioning of economies without the acquisition, application, distribution and new production of knowledge."(Franz, 2008, p. 3)

To see the tendency towards a knowledge society through the prism of relevant processes and phenomena and to see the tendency as a product of fundamental changes in primarily the transformation of social and economic categories is clearly evident. The issues are not new – it is the volume of knowledge, the number of people employed in, what is called, science, the level of emphasis on relevant issues and finally the processes that produce, distribute or diffuse and use or exploit knowledge, that changes the recognition of the processes going on and the complexity of the issues at stake.

"So what are the central features from which we can recognize that certain forms of knowledge and certain ways of handling knowledge are becoming more important in our society?... the intensification of information and communication flows…the economy's strong orientation to innovation…institutionalizing high-quality learning and life-long learning within the educational system… the growing importance of knowledge-based activities and sectors."(Franz, 2008, pp. 2-3)

The framework of emphasized policy priorities toward improving the knowledge society in general, where the regional level seems to be recognized as instrumental or, should one say, seems to have grown in importance, in ways and means that has been analytically covered in quite detail but in many ways, still remains to be fully understood in its essence.

Today, there are a number of development processes that form important backgrounds to any knowledge-directed or related effort in the field of regional policy/ies and towards regional development. The general impact of globalization and internationalization, a reorientation in economic policies towards growth rather than redistribution, a general focus towards promotion of innovation and entrepreneurship are marked items on the agenda of today. A key document when it comes to the preconditions and prioritization of the knowledge-based economy is the Lisbon strategy (2000). But a framework discussion is not limited to the preconditions of the present and we have a complexity in the issues at stake, which by far, surpasses any systematized knowledge that research have provided. In the case of knowledge, it is 'the' object of study and if our understanding increases we will ourselves become more knowledgeable, at the same time. We have a complex heritage of varying policies and priorities to look back on as well as to find the consequences of.

It is quite clear that processes focusing knowledge as a central, or even the central factor is a basis for all relevant development strategies and policies of modern societies. Mainline regional development buzzwords and scientific models like Triple Helix, Regional Innovation Systems and Learning Regions plays an important role in the conceptual development and the further emphasis of it. The key played by, but not exclusively, the institutions of higher education in this process are given special attention. Their defined purposes are duly noted, to develop, also for specific regional circumstances relevant research, to stimulate the development of the education level and competence in general. The roles of creating, enriching and transferring knowledge are, in this context, the state-of-the-art. They act as a basis for economic development, bringing increased quality to the products and services that are produced, but also for the eventual degree of adaptation and innovation capacity of the economic sector. It is, however, important, as noted before, that the issues at stake has become and are more complicated than that. Regional development as an objective could be reached, sought through different channels and instruments using sometimes wide-reaching/general and sometimes more focused orientation/priority, **but the first step is to**

identify the wider scope of knowledge infrastructure. As a final commitment it is also possible to identify a more general role, direct and indirect, where knowledge, in one of its appearances is a basis for other indirect development processes like, for example, settlement objectives. A dimension that will be returned to in future contributions.

The knowledge infrastructure and the impact of its institutions in regional development, is a theme quite extensively covered in the scientific literature, but **often on a too generalized level (in spite of its focus on Higher Education) and missing important ingredients.**

2 An outline of the basic problem to be approached and some indications of methodology.

What I want to do here is to elaborate on an extended framework for analysis which takes as its starting-point and objective to discuss long-term visionary ambitions of improving the prerequisites for regional development. This should be defined by sharpening the tool of 'production' processes. There has to be a basic discussion on the framework and preconditions for methodologies chosen and used. One of the first exemplifying steps taken in this direction is to question the limited focus on and within the impact of the Higher Education and Academia (HEA) in this context. Taking this step backwards implies also a need for qualifying these frameworks. The first step in this direction is the general ambition, one could say ideology, stating that the idea of knowledge as a productive force means an in-depth study and presentation of knowledge in all its appearances (information, knowledge, competence, education/culture[1]) in all its phases (production and gathering, transfer, hoarding and consumption) and techniques (learning…) actors (from individuals to organizations, in positions and roles), systems…. and, finally, in light of the products (from knowledge to actual production).

I see here an important analytical mission to systematize studies already made in the field when it comes to different prominent actors in these constellations, i.e., a mapping. I do believe that an important question to be formulated is related to the actors themselves have sought cooperation and the questionable end results of this efforts creates a remaining picture

[1] Swedish word *'bildning'* which is somewhat unique in its interpretation.

with negative tendencies. Where is the essence of the lack of communication? Is it different languages, different interpretation of roles…?

We do need to make the abstractions of learning and knowledge development that is cultivated more real. One of the ways to do this is to make the concept of knowledge in itself, i.e, that we talk of something more than we get from books or in the lecturing hall. For instance, the concept of competence should include aspects like social competence and excellence. The need for this concretization can eventually lead to a statement like the classical 'the emperor has no cloths'. When registering the educational and research indicators real potential, it is not enough to register the throughput of students with exams, or numbers of peer reviewed articles etc. The framework, infrastructure in the form of frequency of qualified teachers, researchers in different strata and speciality, information experts, schools with qualifying definitions, technical educations, popular educational and training organizations, libraries, archives, mentors, coaches….. All these actors, and more, should be treated in the way of finding good qualitative dimensions as substance, quality, knowledge frontier, uniqueness, availability, matching the labor market. The list could eventually become endless. The basic issue however, is the demand for a more qualified and dynamic analytical approach.

The focus is, as noted, primarily directed to the institutions of the HE, which is not doubted in the present approach. The focus, however, lacks some basic dimensions in order to fulfill its ultimate purpose of improving the functioning of the knowledge infrastructure in general. The points made below are tentative and far from complete and should be elaborated in future discussions.

1) The preconditions in the culture of education, learning and relation to knowledge of different kind. The concept of culture extends to other issues of linkages between the individual and knowledge, where literature, art, theater and film extends the horizons and hopefully also a widening accessibility to knowledge in more general terms.
2) Not all relevant structures and functions relating to knowledge, in its different appearances, are present and accounted for. What will be considered is the whole range of educational programs, courses and their institutions, but also a framework of

institutions like general and specialized R&D institutes, libraries,[2] archives, consultants and all the way out into the diffuse world of individual and institutional carriers of tacit knowledge.

3) The reality of the functioning of society's provision of the individual knowledge producers, transferers and consumers within, primarily, the school system.
4) The differences between the Universities and University Colleges and aspects of dynamic processes in the progression of the latter to the former.
5) The prerequisites of the internal dynamics of the HE system, i.e, we see the HEI as an entity, but the rest is a black hole. Do we, in a scientific way, really know what happens behind the walls.
6) The interconnections between specific institutions are far from penetratingly discussed
7) There is also a policy demand related to this. To replace primarily one-dimensional efforts for knowledge creation with more complex, multifaceted approaches. In research about innovation there has been a consistent demand and substantiation of a need to turn from linear to complex or from Mode 1 to Mode 2 knowledge process analysis.
8) The argument is quite simple; the knowledge dimension of the regional development process is a function of the totality, i.e., the dynamics of interaction in the field. A dynamic, holistic approach is the main entrance to the program in its totality.

Noting, at this stage, the huge challenge to be approached, It is already here, necessary to define some general, inhibiting, roads to travel.

1) We have (I have) not defined the scope of the effort as I am still using both project and program. This is also natural as I seek cooperation and international comparisons, within the framework of a network.
2) There will be an effort to outline the full picture, but not guaranteeing the full presentation of all details and connections.

[2] To elaborate with a small example: To the libraries (different character) there is an inflow of diverse information material and good reading. This is refined by a catalogue system and presented in a a number of ways. It is transferred through instant consumption or by reading (extensive alternatives exist). Inbuilt functions in information seeking (by categories), reference materials, computers etc. All in the name of serving society with information on different levels of refining process and at the same time improving the ability to consume it.

3) When outlining the full picture, some of the aspects like the ones described above, will stand out in the material.
4) A case-based approach outlined in time and function will indicate the road to travel.
5) There is also something nice about contributing your efforts where they are needed. Whose needs and in what terms, will be a relevant question to answer at an early stage in the process of development.
6) In some parts the necessary choice of methods will define the possibilities, in some other the availability of the information will play that role.

Another instrument for sorting out could be distinguished in some kind of system/network cartographic outline. Could it be possible to use words like nodes, links and flows to generalize? Words yes! But will they be flexible enough as analytical tools? A somewhat playful effort in this direction was developed by the present author together with a professor of informatics using the metaphor of the brain discussing the regional learning concept.[3]

Among the parameters and variables could be defined:

- Different types of knowledge: information → to learning, maybe even further;
- Different types of knowledge (tacit/codified, Mode 1 and 2…)
- Different institutions and actors (casting the net wide, including, as exemplified, libraries etc):
    - Producers: Ex. differentiating for types and levels of education. Ex. Differentiating for different types of produceras.
    - Transferers: Ex. Lecturers.
    - Consumption: Ex. Reading, listening, viewing….
- Different functions:
    - Gathering, processing, transferring, consuming, hoarding.
    - Alternative forms of learning
    - Production – transfer – consumption

[3] Peter de Souza & Sule Yildirim (2007) Artificial intelligence and 'learning regions' -– an outline to a research adventure. 2007.

We will be able to distinguish a time perspective where the change of the entities, policy change and relation between societal aspects of knowledge takes on different strata and numbers in the population. As will also, hopefully, long-term consequences.

Functions to be studies

- Economy: general and labour market
- R&D
- Mobility and settlement
- Networking
- Special expertise
- Systemrelated factors
- Special impact

Subdivided into

- Ambitions
- Means/resources
- Results

Quantifiable structure and process analysis – a small example.

Only as an example we will here in some paragraphs approach the issue of an older regional policy where the university colleges were located to stimulate regional development and try to hinder possible negative development tendencies.

For regional structural and development purposes, this orientation was introduced[4] as a conscious step in maintaining and developing the regions outside the scope of market-defined growth areas, with a focus on what was, and still is, called a 'district' policy, a special priority has been promoted within higher education and research from the 1960s, as it was defined as an instrument for regional development through boosting regional educational capacities. At first it was the creation of universities and university colleges in Bergen, Trondhiem and

[4] These fragmentary remarks refer to Norwegian and Swedish experiences.

Tromsö and after that the, so called, district university colleges in the 1970 and 1980s. In Sweden a similar experience took place and mentionable examples are the university colleges of Karlstad, Växjö and Örebro, later turning into Universities.

Strong competence centers were simultaneously established to promote the innovation policies in the 70s and 80s. The basic idea was founded on ideas of knowledge, competence and innovation diffusion and transfer. An extended scientific focus on growth center theory and technological hubs came to the forefront. It included the establishment of new regional research and development milieus; like e.g. regional colleges, and contained specialized and practically orientated courses in economics and engineering, regional research institutions, technical and mercantile competence centers, etc.

In the 1990s the appearance of state university colleges.

"In Norway, state university colleges were institutionalized as a new higher education institution category following the 1994 reform of tertiary education. By this, 98 specialised public colleges and independent higher education institutions were merged into 26 new larger units – mostly with regional uptake areas." (Hedin, 2009, p. 16)

As noted below, these efforts could be described as visionary (forward-looking), but somewhere on the line they seems to got stuck in inter- and intra-academic budgetary haggling, cloaked in terms of quality, critical mass and frontline focus for research.

"What is considered as regionally important, could be rather different from what is deemed as nationally important, and that debates that reflect one on the other, are not linked together."(Karlsen, 2008, p. 92) (my translation)

"These efforts are noted as quite forward looking, …and the challenge today is to guarantee that these institutions can compete for the state budgets allocation for research purposes in order for them to uphold and develop their knowledge capital." (Berg, 2004, p. 80)

The present process of mergers and discussion related to geographical priorities could be an introduction of a long-term centralization policy, although the purpose is cloaked in terms

mentioned. The outcome will eventually have an substantial impact on the presence of HEI in several regions, i.e., the geographical spread.

"In Norway, the University College of Tromsö and the University of Tromsö merged in 2008. Parallell to this, several of the state university college are set to restructure their activities in order to reduce their total number of campuses." (Hedin, 2009, p. 16)

Still exemplifying, in order to study the impact, a classical choice has to be made as to the **level**, **size** and **characterizing** variables of the analytical entities chosen. Among the number of penetrating analytical filters of importance is the distinction between **nominal and relative growth.** The starting-point is crucial and as we are talking about quite substantial differences in regional structures and relevant levels, impressive relative growth figures could indicate not so large nominal effects. In the rich and proficient regions the impact is marginal although nominally as big as in a region where the impact is large due to other factors being sparse. For example, the net growth of people getting hired in relevant occupations is clearly most substantial in the region's where the universities and university colleges are located, while the relative growth has been quite substantial outside of these regions, although quantitatively small. (Sæther, Mönnesland, Onsager, Sörlie, & Arbo, 2000, p. 64)

Another aspect of evaluation in regard to growth and development indicators is **distinguishing the causality**. Despite some fragmentary evidence searching for the causal link between UC and regional/local growth should be an analytical *cul de sac* as external impacts and a dynamic actor makes any empirical results highly doubtful. Finally, but not excluding new candidates for the future elaborations we can raise the **distance variable.** The influence of the educational and research facilities could be discussed in terms of influence zones and the structure of the influence. For example, the form of HE-regions is necessary for different reasons – economic repercussions, impact on population development and the supply of labour med higher education. (Sæther, et al., 2000) A vicinity gets a special effect from the phenomena that the HE where it is (Sæther, et al., 2000) and is consequently defined by which type of effects that one studies. When the vicinity, in relation to place to live, has an impact on the choice of education, there appear regional patterns of schools. The establishment of district UC compared with Universities, has a more limited impact both geographically and also functionally, based on the total supply of courses and the policy defined in elaboration of

the educational program (for instance shorter courses).[5] Relative and actual distance to other education providers is also a case in point. Commuting potentials also and behind that as a basic variable stands technical development. (Sæther, et al., 2000, p. 18) In general we have a classic definition of distance decay. Looking into different aspects there is, of course, a variation that appears different and sometimes atypical. Quantities, however, are so low that results will probably not be significant. The effects could possibly have been better if there would have been a more far-reaching, organization of work between different UC:s or with a higher concentration of these has not been measured.

[5] Another distinction that will be returned to, and which I find quite important, is that between the Universities and the University Colleges, in terms of academic culture and what it entails.