

Paper presented at the RSA conference in Lisboa, April 2007
(draft, not to be quoted)



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ARTIFICIAL INTELLIGENCE AND ‘LEARNING REGIONS’ – an outline to a research adventure.

Can we usefully improve the understanding of a ‘learning (knowledge) region’ by using an Artificial Intelligence (AI) metaphor?

Could one capture the dynamics of a learning, intelligent, society in a geographical or a functional form with an analytical approach like the Artificial Intelligence (AI)? Specifically, could this approach, as a metaphorical example, contribute to the understanding of the functioning of the *learning (LR) or knowledge regions*¹. Simultaneously, with the focus on the issues raised, this is also an experiment in lateral thinking where two academic fields through two researchers meet for the first time and this process could in itself be of value for further elaboration.²

One of the first questions that follows the one of whether is how we identify or recognise this, and then turn to the where and when. Quite a challenge! If the answer is a (still hesitant) yes – an accompanying question, in that line of thought, is if the exercise is worthwhile³? If this also results in a positive answer, the next step will be to define or, at least discuss, how far we can take the process and what the limits are to our efforts. Our hypothesis is that the comparison and mirror image between the two entrances is worthwhile as a new way of looking, scrutinizing an important societal development factor and process and, at the same time, trying out a scientific toolbox called AI in a new environment.

The hypothetical starting-point is that cooperation between the fields of cognitive science, artificial intelligence, and the social sciences can contribute to a better understanding of both

¹ Both terms are used, usually, without definition as to their contents or applicability. We will refrain to burden the essay with exercises in splitting straws when not needed.

² This selfreflective approach will not be returned to in this paper.

³ To measure the value is not really feasible. If such an exercise should have taken place anyhow, it would have been in the way of a summary of contributions to development processes within the two subjects or scientific fields as well as the impact on the understanding and eventual contributions to any real-world development. The latter, is eventually possible to dissect in a much more thorough and empirical manner.

the cognition and social processes than they can independently of each other.⁴ Some efforts in social sciences are and have already been taking place, especially in the form of social simulations. These have, so far, evolved an understanding of social processes in societies independently from the two fields described above. However, Sun⁵ among others have shown that there is a clear relation between individual cognition and social processes. This is a way of thinking worth exploring further.

The rationale for the ambition here is that knowledge and therefore learning is defined, or should be defined, as a kind of infrastructure for processes that functions as a primary cause for a 'positive' development on a regional (and others) level.

*"In the framework of the contemporary transformation from an industrial to a knowledgebased economy, the learning economy (Lundvall, 1996) and recently also learning regions have been propagated as future concepts for successful economic development in many countries of Europe."*⁶

The close relations between terms and concepts like the cluster, innovation system and Triple Helix are at issue here as well, but through the lenses of the LR as an example. If we can find forms or entrances to improve the understanding of this 'infrastructure' in real terms, and through this, in the end, improve, strengthen growth and development processes in general, based on the recognised link between knowledge and creativity, innovation and entrepreneurship, this would definitely be a worthwhile effort.

What is of interest on this level, are the simplified, more or less too simple, pictures that compares the above mentioned collective phenomena/processes with the human brain, in order to understand aspects of both the individual and collective cognition that are being involved. As far as we know, this specific relation has not been explored earlier.

Ideas about collective learning or learning collectives (organisations, enterprises, regions) has, by natural reasons, only partly the same starting-point. But only partly – as what is not emphasised enough in ongoing discussions and analytical processes is that the production and product is the sum of individual human/intellectual processes. Complexity and interdependence are defined factors also for a society and these characteristics creates a common, general framework for a system-theoretical approach. Today, noticing the degree of complexity seems to have refrained us (sic) from making the effort of qualitatively understanding important terms and concepts, while still using them in a generalised manner as policy and planning tools with far-reaching and sometimes unforeseen consequences. This seems, from a hypothetical outside observer, to be like placing the wagon in front of the horse.

We take it as a starting-point that fundamental characteristics as complexity and high degrees of interdependence are shared in both systems (AI and regional structures) and this at least makes it theoretically possible to model, which is, of course, running a bit ahead of our first

⁴ This proposition is probably valid for other combined efforts as well and we welcome a discussion on any such possibilities. Our proposition is, however, more fundamentally based on already achieved and similar experiences in other fields.

⁵ SUN, RON (2006) (Ed) *Cognition and multi-agent interaction – from cognitive modelling to social simulation*. Cambridge University Press.

⁶ HASSINK, ROBERT (2005) *How to unlock regional economies from path dependency? From learning region to learning cluster*. European Planning Studies, vol 13, no 4, p 523-4.

already ambitious level. What has been achieved in applied AI, and where the results has gone from the scientific AI to become general knowledge, indicates that applications within the field of regional development, that catches dimensions of creative and innovative processes, should be possible to identify and apply in a new sector.

Leaving the stage of the metaphorical example, gives us grounds to define our research problem's next development stage, which is actually subdivided in 2 directions:

Is there, within the AI toolbox, methods and instruments directly applicable to a defined description of a 'learning region' and, is it possible to map or give a functional description of the 'learning' aspects of a region, opening up for an applied AI analysis of some kind.

Can the connection be understood by social simulations and multi-agent simulations of AI and by exploring the relationship between computational cognitive modelling and social simulations? How is the cognition of a society different from individual cognition? Can AI methodology function as a way to analyse the status and processes and develop as a source for experimental, laborative instruments for later application as a promising analytical instrument in the understanding of an, not only, important but crucial aspect of modern society. The line of thinking brings us not only to the toolbox in itself, but opens up, as noticed, for the idea of computational comprehensive modelling, where future progression will be orientated to refining modelling with a consideration of increasing complexity. Analytically we are standing on a threshold of providing the last stage 3 problem formulation, which also indirectly returns our gaze to the actual final⁷ value of the exercise. Included in this is also the search for minor and major simulations of different societal functions like, for instance, decisionmaking, conflict management and organisational optimization. We are at this stage discussing an approach from two directions (top-down and bottom-up). The former in order not to lose sight of the totality and complexity and approached by a successive disaggregation. The latter through a piecemeal construction of limited applications with a later ambition on linking these together. There is a natural logic in such duality as the constituting elements are legitimized based on their contribution in substantiating the whole.

If the process of research and exploration above is possible and plausible will the introduction of a 'real' region create a possibility for wider policy implications? Will such possibilities be realised in the process of methodological development or only as an end result?

We suggest that the elaboration on all levels and stages of progression will contribute indirectly to an improved understanding of the applied concept of LR and through this will have possible policy implications. The direct possibilities are not a necessary result and there are some interesting ethical considerations and debates connected with this issue as well, which we will return to in the future.

The scope of this endeavour could evidently be summarized in three complementary directions or levels:

⁷ What will be argued in the ongoing discussion directly below is that values in different denominations and results will be a continuous contribution.

- As far as possible use AI as a metaphor – as a picture – and with this as a mirror discuss, with a startingpoint in modern AI-research, the scope of explanatory power. How far this general entrance could be used in order to understand the functioning of a learning region, or the possible malfunctioning in regional realities, is to be seen.
- To extend the understanding and analysis of AI methodologies and techniques in light of new ways and subjects of application.

This takes us to a final stage 3:

With AI-methodology and techniques, translate the LR into an AI model (models) and discuss possible ways to analyse the societal system called a learning region with this tool. Improving and understanding of cognition and socio-cultural processes in a learning region with a main focus on the learning process.

With the end result of :

providing an insight into the intricacies of exploring the special substance of learning on a collective level and through this improving techniques for that learning process that can contribute positively to the development process on a regional level.

Let us approach and develop the general discussion first from the AI side

The starting point of the project is that the AI is defined on an idea or a picture of the biological representation/reflection of intellectualism – i.e. different reflections of artificial representations of the processes that governs/regulates the human brain, i.e., thought processes and value creation. AI is a science that tries to understand intelligence and build intelligent systems.

The concept of cognition is related to the abstract concepts of mind, reasoning, perception, intelligence, learning, and many others that describe numerous capabilities of human mind and expected properties of artificial or synthetic intelligence (Wikipedia)⁸. These concepts have been under study within the fields of Artificial Intelligence, Machine Learning, Psychology, Cognitive Science. Computational models of human and animal cognition have been proposed and used to understand the underpinnings of natural intelligence. These models range from the ones that closely integrate the actual workings of the human brain⁹ to the ones that view cognition as a physical symbol system where a physical symbol system is posited to have the necessary and sufficient means for general intelligent action¹⁰. On the way from one to the other, connectionism has been proposed as an alternative approach to the physical symbol systems for studying intelligence. Connectionism approach uses artificial neural networks where an artificial neural network is composed of nodes which are approximations of neurons in living organisms and the links between them. Different types of artificial neural networks have been employed to model numerous capabilities of natural intelligence such as short term memory, navigation behavior, natural language, obstacle avoidance, learning etc.

⁸ Wikipedia: <http://en.wikipedia.org/wiki/Cognition>

⁹ Houk J.C. (2005). Agents of the Mind. Biological Cybernetics, vol. 92, no.6, 427-437.

Yildirim S., Dam, G., Houk, J. C. (2007). The Mind Agents In Netlogo 3.1. *Proceedings of Agent Directed Simulation (ADS'07)*, March 25-29 2007, Norfolk, VA, USA.

¹⁰ Newell, A. and Simon, H. A. (1976) Computer Science as Empirical Inquiry: Symbols and Search. Communications of the ACM, vol. 19, 113-126.

In this project, one of our research questions is whether any of the existing approaches mentioned above or any other on the spectrum from physical symbol systems to the studies that integrate brain based knowledge can help in understanding the workings of a human society since most of the approaches mentioned above have concentrated on understanding individual cognition rather than collective cognition. If so, what analogies can be made between the existing cognitive modeling approaches and the human societies? Could these approaches help us understand how and why learning occurs in a human society? If so, could this help us impact societies in terms of making learning more efficient in learning regions and hence increase creativity, productivity and innovative thinking?

Many different disciplines contribute to AI. Philosophy with theories of reasoning and learning; mathematics with formal theories of logic, probability, decision-making and accountability; psychology with tools to investigate the intricacies of the human mind; linguistics with theories of the structure and meaning of language; computer science with hard and soft tools. AI says there is a need to understand how 'ordinary' intelligence functions. If that is so, there is a similar starting-point for theorizing on if and how a constructive learning and knowledge process can be translated in terms of a 'learning region'. Research to solve the complexity of human behaviour could be used to understand /solve aspects of the complexity of a society.

Examples chosen from the AI methodological arsenal that first comes into mind could be:

- Multiagent systems
- Creation of evidence
- Production of games
- Pattern recognition
- Picture analysis
- Understanding of language and speech

In order to somewhat limit the challenge we have decided to begin with discussions of the first three examples (a challenge as good as any).

Multiagent Systems: An agent can be defined as an entity which is situated in an environment, which perceives that environment and performs autonomous action. A set of agents can perform actions towards a common goal or goals given that the agents are capable of carrying out assigned tasks and the goals are defined clearly. Multi agent systems have been used for modelling various issues relevant to systems and structures in businesses, organizations, economics, military, education, transportation, etc. Multiagent systems approach helps to evaluate how systems and structures behave under different circumstances and can point to the changes required to obtain optimized behaviour from these systems and structures.

This characteristic of multiagent systems is especially suitable for modelling and understanding the components and knowledge flow of a learning society / region. There are numerous multiagent systems and an investigation is needed to figure out which of them that are best suitable for the modelling of a learning region.

Creation of Evidence: Robust bodies of knowledge might be necessary to obtain in order to understand the characteristics of a learning region. There can be many ways to access that knowledge, i.e, paper based surveys surveys presented on the web, observations. One

problem with collecting knowledge is that the motivation of the parties, who has the knowledge, to share this knowledge might be too low. The motivation can be obtained by informing the parties of the benefits of the research that is being carried out.

Production of games: The use of games is gaining an increasingly important role in education. As a result, games is always a candidate for adding to the knowledge and creativity of a learning society and making the learning process efficient. Depending on the regional goals, production of games to obtain efficiency in learning and to create learning regions is an important aspect of our research in addition to the aspect of understanding the underlying mechanisms of a learning society.

The other fields of AI, namely Pattern recognition, Picture analysis and Understanding of language and speech could add to the quality of research efforts in the future or during the carrying out of research as it progresses, however, they are not the critical aspects to begin with.

The first approach has so far been used in studying the following capacities:

- the bases of leadership
- the functions of norms
- the implications of environmental change on organizations
- the effects of land-use planning constraints on populations
- the evolution of language
- and other topics.

Known AI-program where application could exist could also be:

- Expert system – large databases with specific information;
- Genetic algorithms – with simulation as a nucleus adopted to fit specific circumstances;
- Neuronic nets (with linkages to network theory) and a potential process through that.

And now let us return to the Learning Region (LR)

The focus on economic development (or growth) that involves the decisionmaking elite of the present society, defines knowledge society (the intellectual capital and its development) as the nexus for the competitive power of enterprises and of the economic arena defined (locally, regionally, nationally and globally). Knowledge is earmarked as the most important input factor/resource and learning is defined as the process where knowledge is absorbed, digested and transformed. In this statement the conclusion is that the learning capacity of an economy/society and in our case a regional economy, is of accentuated strategic importance for its potential and future innovative capacity and therefore also a crucial element in the interregional competitive processes.

Before we enter into the intricacies of this theme, we will temporarily stop and engage ourselves in some fundamental definitional gymnastics. From the starting point there is a clear case of ambivalence as to the term or concept of a *learning region* and the intellectual situation around it.

*"Although there are several definitions and perspectives, most scholars consider learning regions as regional development concepts in which the main actors (politicians, policy-makers, chambers of commerce, trade unions, higher education institutes, public research establishments and companies) are strongly, but flexibly connected with each other and are open both to intraregional and interregional learning processes."*¹¹

Engaging oneself into a definitional exercise is therefore not only made for the scholastic pleasure of it, but based on the fact that such an exercise will, to a certain degree, disclose the lack and existence of substance, debate and potential of the term simultaneously.

*"The definition of learning regions are quite vague and diverse, since seldom concrete examples can be shown and since policy-makers, who have been eager to use the concept as a label for their development plans, have not made efforts to define what they mean by learning regions."*¹²

We find, in the exploitation, two complementary general definitions. The first is an abstraction, a theoretical construction of the general preconditions of the economy. Of special interest here is the proposition that the concept of LR is a model in itself. "... a **model** towards which actual regions need to progress in order to respond most effectively to the challenges posed by the ongoing transition to a 'learning economy'".¹³ Another one, in a more applied form, is linked to the fact that knowledge and learning has, as indicated above, appeared as the most important productive factors in the general economic development and with a central impact on the economic and societal development and therefore, in its turn, a central issue for policy development.

Another distinction, originally defined by Boekema et al¹⁴, distinguishes between regional learning (where cooperation starts up a learning process among the participants) and learning region (which defines the institutional framework and a conscious, maybe planned, development effort). It is the general viewpoint of the authors of the present paper, that the exploitation of the term in present-day societal circumstances does not catch the complexity of the theme itself and the challenge of the terminological practice that the term/concept does have or ought to encompass.

To exemplify further with some definitions used by other colleagues:

LR are "*collectors and repositories of knowledge and ideas,...(which) ... provide an underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning.*" **Richard Florida**

LR are "*regional development concepts in which both interregional and intraregional learning is emphasised.*" **Robert Hassink**

LR is a method to ... "*initiate and provide the basis for cooperation between enterprises in regions, local public bodies, organisations and other interest groups.*" **National Institute for Working Life** (Sweden)

Asheim himself (2001) from whom these quotations are borrowed, uses a much broader understanding:

¹¹ HASSINK (2005) 522.

¹² HASSINK (2005) 524.

¹³ OECD (2001) *Cities and regions in the new learning economy* (Paris: OECD) 23-24

¹⁴ HASSINK (2005) 522.

“...representing the territorial and institutional embeddedness of learning organizations and interactive learning.”¹⁵

If we just, as an example, focus on the exploitation of the term ‘learning region’ we will find that for the **academic (researcher) in different subjects...**- participating in a frontline development within primarily economic geography and economics a focus that confirms the existence of a productive factor called knowledge and learning and also evaluating that factor to be the primary one in modern economic structures forwards his/her position in the scientific and general community. The emphasis and differences appears in important dimensions.¹⁶ A central ingredient behind all this – is selfevident – at least to the geographer - that knowledge and learning to a certain degree is place or regionally defined. The point taken exemplified here is that the position in the scientific field makes for different interpretations and emphasises. For **policy makers** – the learning region is an instrument to transmit a roughly outlined idea about economic-political priorities. The ambition has been important in burdening the ideological development on a regional level with ingredients not necessarily of frontline importance in the conceptual, methodological and applied dimensions and will become clearer the further we walk along in this labyrinth. One of the possible explanations is that what is said and done should be visible and easy to communicate. For the formally acknowledged **knowledge brokers – the consultants** – this is a motorway to fame and riches – i.e., if the Cornucopia is leaning in the right direction, usually through quite simple concepts/slogans. Is is also an important part of the rhetoric needed in order to be noted and not demoted from different financial sources or employers. For the **project leader** – it is usually a very diffuse frame for applications and a frame-of-reference for the rhetoric that is the communicative language with authorities and fellow actors. A kind of ritual dance.

Summarized categories of where definitions of a *learning region* is found in different places in the literature could also be exemplified as below:

- 1) It is like an attribute linked to a regional classification for historical-analytical purposes. Learning has through all ages been a continuing process. During some periods it has had very defined geographical delimitations and been connected with place-names and/or regions.¹⁷
- 2) From the perspective of what kind of role that collective learning and cooperation plays in regional clusters and networks, with the ambition to develop the potential of innovation and through this the competitive capacity on a regional level. Partly exemplified by the definition of the Third Italy.
- 3) As new dimensions of evolutionary and institutional economy, where regional production systems, industrial and technological districts appear as increasingly

¹⁵ ASHEIM, BJÖRN T. (2001) *Learning regions as development coalitions: partnership as governance in European workfare states?* I: Zimmerman, F.M. & Janschitz, S. (red) *Regional policies in Europe – key opportunities for regions in the 21st century*. Leykam.

Which for our purposes brings the need for the definitional exercise one step further. We will eventually return to that.

¹⁶ Nilsson & Uhlin (2002, 34-5) states that economists are concerned with learning as a generalised phenomena in the economy, while, for instance economic geographers or researchers involved with cluster theory finds the variable of place and proximity-related knowledge an interesting complementary variable in the discussion.

¹⁷ At least when looking back from our present positions.

prominent – i.e. that the importance of geographical proximity is in focus for knowledge and learning.

- 4) Learning regions has also been defined by aspects of their organisation. For instance in connection with the EU-inspired focus on regional Partnerships, most clearly promoted in the German policy development process.

These are only some examples indicating, not covering, the extent of the exploitation of the term. What is not, so far, indicated is a general lack in defining the working body, its functions, its elements, i.e. its dynamics actually producing learning processes and eventually resulting in developing *increased knowledge*.

“A dynamic, processual understanding of competitiveness clearly indicates that enterprises in order to keep their position in the global market, must focus on developing their own core competencies through transforming themselves into learning organisations.”¹⁸

During recent years there has been an orientation among the OECD countries that interactive learning and the production of knowledge is central to all kinds of development mechanisms and supports cluster¹⁹ orientated or similarly inspired ambitions.²⁰

As one, of many, consequences of this, there is an increasing demand for the conceptualisation and eventually also for the definition of operationable methods to promote an improvement of the qualitative status of this amorphous structure/process/functions. Another is the general demand for a dynamic and qualitative production of knowledge in contents, form and quantity. The number of knowledge-intensive enterprises is increasing and generates/produces an increasing demand for knowledge related services/businesses or functions both new and old. Other consumers, clients, customers is gathering and strengthening this trend.

It is of central interest also to state that learning in whatever capacity is a continuously ongoing process, on whatever level or subject you are discussing. Enterprises, in modern and historical times have always had the ambition to learn, or maybe more correct, to provide a framework for individual learning in a collective spirit - to become more competitive.

This makes room for an important diversion. The question is if there actually are any such phenomenon as learning regions or organisations. The deciding factors are the learning processes, but these takes place within the individual in interaction with other individuals, it

¹⁸ Asheim, B. T. (2005): Kluster, regionala innovationssystem och lärande regioner. En syntetiserande översikt, in Benner, M. (ed.), *Innovationer. Dynamik och förnyelse i ekonomi och samhällsliv. (Innovations. Dynamics and renovation in economy and society)*. Dahmen institutet, Studentlitteratur, Lund, 33-60. The idea is not only to replace the words enterprises or organisations by region, the analysis emphasises the interaction of these into societal development

¹⁹ The complexity and usefulness of the concept must in these preliminary paragraphs be severely questioned and the same time as the author/s makes the same cardinal mistake as everyone else in the branch. Use it on the basis of lacking something more suitable.

²⁰ These positions are, however, not new in any way. Economic history and geography recognizes the appearance of critical masses of knowledge and creativity in historical times in, for example, Venice, Vienna and Manchester. TÖRNQVIST, GUNNAR (2004) *Kreativitetens geografi. (The geography of creativity)* Pocketbiblioteket, SNS förlag.

is an individual's social process. It is not institutions and functions that learn. They are delimited as containers for a defined categories of individuals.²¹ The quoted source has the ambition to describe the preconditions for lifelong learning and how to go about creating learning organisations. This diversion is of course a crucial entrance into the intricacies of applying an AI approach to the analysis.

Evidently, a *learning region* is primarily an ongoing process, the geographical entity is a possible framework/context, but what is actually happening is that a functional mapping is placed or based in or on a geographical framework needing a similar conscious approach.²² From this 'simple' contexts, a definition of a learning region begins to appear. But only because the context is so easily described here, the description of the contents and any 'efficient' policy will soon get into real trouble.

Before we venture further it can be worthwhile with a little detour or *caveat* around the concept of *region*. As is well known, this is one of the mayor intellectual problems within the subject of geography – an obstacle and a challenge. But once the final word is said and done, we will find ourselves with a term that is delimited or delimits. The region is therefore both an instrument and somewhere where things happens and defines the subject when it itself is being defined. If we are not clear enough about in what capacity we are using the word, there will automatically appear some confusion.

Ideas on the operationalisation of the LR

A starting-point for a modern cluster/innovation system analysis or theory is often described in terms of the result of the interactive processes where the actors own or carries different types of knowledge or competencies and where they meet and exchange information in order to solve specific – technical, organisational, commercial or general intellectual problems. That efficiency and qualitative aspects of this process is crucial and usually noted as self-evident has, as far as we have noticed, not been studied to the extent of their importance.

Of connecting and central importance is also that the units, defined above as not being learning entities, instead should be identified in their capacity to create conditions for continued learning and development for the individuals encompassed as an example of finding efficient means to store and provide old and new information and for being containers for the individuals. This part of the definition is also crucial. They should take responsibility for the organisation of these processes but, emphatically, focus on those ingredients that are carrying the knowledge/teaching/learning capacity. The responsibility covers organisational and communication issues of both internal and external character.

It is, however, necessary, to formally accept the complexity of the subject/mission, already on a first, most abstract, level, recognising the interdependency and fundamental differences of the definitions in different positions and roles among the actors and institutions. With this we want to emphasise the challenge that lies in the complexity defined within and among the actors.

²¹ HAGLUND, THOMAS & ÖGÅRD, LEIF (1995) *Livslångt lärande- en arbetsmodell för kompetensutveckling för att skapa en lärande organisation. (Lifelong learning – a working modell for competence development in order to create a learning organisation)* Uppsala, Konsultförlaget.

²² To what degree the geographical variable/s are integrated will, of course, be defined by the focus of the research orientation.

In order to develop the investigatory process in itself, a discussion on different progression stages has been made and related to the impact/product improved knowledge processes and knowledge, that is sought.

Step 1

AI have been and can be used for application in societal analysis. This has already been tried out. As this is the case, there are some shortcuts to be made towards the systematisation within a new focus area. This preliminary step will elaborate an inventory of how and where. If we go this way we can increase knowledge into the field of AI and increase the analytical scope in regional analysis. Parallell with this the AI side of the first phase is the verbalisation of the metaphor – a kind of diagrammatic mapping of what aspects of the brain that will be used for the comparison on a general basis and at the same time an identification of relevant instruments/methods/techniques that should be tried out.

In order to develop this we will first need an operationable presentation of a hypothetical region. The concept of Learning Region demands, in order to be translated/transferred into a model structure a first system overview – a mapping. There is a value in this exercise in itself as it problematizes some aspects of the learning region, which are, more or less, taken for granted and not qualified in any developed dimension. It also begins to present pictures – a visuality of important functional and other relations. The value of it is also based on the close connection between the special cartographer (mapper) experience of a real world. Learning Region (in our case the Hedmark County) and its real-world knowledge and learning structures. Our approach is in the definition or recognition of a **knowledge and learning infrastructure (actors, institutions and functions), context (societal preconditions) – all discussed within a framework of continuous processes, flows and in the perspective of a sought for positive (progress) development.**

The mapping is, in itself, possible to take directly back to a, first phase, analysis of the County. It is possible that this version of the work has important implications in an evaluation of the functioning of the region from a LR point of view, it is useful for future comparative purposes and finally for policy formulation and evaluation purposes. The main focus in this paper is, however, its possible translation into a more developed AI orientation. The first step in this effort is to get a better understanding of the systems in themselves. Looking at them from a new angle is an opportunity.

Step 2:

Matching AI towards LR on a general level, means that analytical tools, which purposes and contents, should be clearly distinguished and defined. The tool/s should be developed on the basis of a elaborated number of fundamental deducted principles and finetuned in experimental situations in direct relation to the mirror approach.

Matching LR towards AI means a process of analytical mapping where real world description is complemented by discussions on relational dimensions, of bottlenecks etc, in order to translate these into workable assumptions about different behavioural characteristics. This process should also encompass a qualitative discussion and necessary exclusionary considerations, the latter in order to make any matching procedures workable.

Where to go to start out the mapping exercise? A first answer is found in the following quotation which also lists possible further references:

*“An environment that supports learning and accumulation of knowledge is based on local institutional settings as well as on the relationships and partnerships in and among different institutions. (Morgain, 1997: 493; Lundvall, 1992, 1996, 2002; Landabaso et al., Oinas and Malecki, 1999, Kautonen and Sotarauta, 1999; Sotarauta and Kosonen, 2003.) The technological infrastructure and the institutional and organizational structure of the locality have been of importance when a specific region has been capable of learning new ways of collecting, producing and using knowledge.”*²³

And from the same author:

*“Summarizing the idea, the key elements of institutional capacity are: institutions (technological infrastructure), knowledge resources, networks, and finally, the existence or creation of ‘public spaces as shared arenas’.”*²⁴

As will be shown in the tentative outline in appendix 1 the discussion above is still too generalized.

Step 2 (possible LR extra detour)

The mapping could also be extended to come closer to the real-world framework, giving names to ingredients and giving body to the analysis. A variant of this is of course taking certain parts of the mapping and by this exemplifying the endeavour as such. A methodological problem is to refrain from drowning in too much details of real-world applications or arguments around the validity in the special case. The return from this position to be able to generalize back to the mainline of the investigation is crucial for the main orientation of the project. Of interest on this level is the actual process of mapping in itself and the functional and cartographical representations used. A kind of special feedback into the communication process between the AI and the geographers/cartographers entrance is the Geographical Information Systems (GIS) approach where a lot of methodological and factual material is already handled and potentially useful.

Step 3:

For the AI approach, finding and evaluating different methods etc and discuss their potential usefulness in the exercise envisaged.

For the LR, approaching those systematic aspects of human and economic geography and other relevant theoretical concepts and subjects that could be of use for AI interpretative purposes and translateable into AI methodology and techniques.

Step 4

Developing a very simplified (first version) AI-model (probably segments or parts of a model) of a theoretical LR and putting those in working order and trying out, considering,

²³ KOSONEN, KATI-JASMIN (2005) *Linking less-favoured regions to the knowledge economy – Finnish experiences*. Aalborg 28-31, May. s 3-4.

²⁴ KOSONEN (2005) 5.

different basic/fundamental structural relations and variations in, for example, the following directions.

- Analysis of the value of variables and their results.
- Identification of basic causal relations.
- Identifying bottlenecks,..etc on a hypothetical basis. This should be a very pendular exercise.
- A further development of the model in a continuously more complex process.
- A discussion and identification of real consequences within the theoretical LR and by way of realworld data a feedback loop to the theoretical LR and its model.
- Somehow, as said before, there are some policy result looming continuously.

Step 5:

- Returning to the real world and defining and extracting empirical information on vital issues.
- Defining an applied and comprehensive research program on this basis and using the home region as a case.

Step 6:

Having something to say about policy issues on a more definitive level. This identifies our most complex research problem. **Can an AI-model identify an effectivisation of the knowledge society on a regional level so that certain systemic functions can be planned and regulated.**

Problems and reservations:

We will probably be asked to qualify important aspects of the learning region, in regard to, for instance what kind of knowledge and what kind of learning. Exemplified in the following quotation:

“The key questions whether it is possible to identify and understand the important knowledges that lie behind the competitiveness of a region, company, industrial sector or national economic. The danger is that current methodologies will identify the most visible forms of knowledge.”²⁵

The problem is quite evident as that kind of proof or definition has not been demanded from the terms being *a la mode* in modern regional development practice and at the same time crucial for the modelling approach in itself as well as for its outcomes. The question is valid and will be returned to in a more exploring paper in the future.

Another issue is that an LR is different things, or need to be, depending upon the general development of the theoretical region. The problem gets analytically even harder as we want to apply it to a real region. The value of outcome for general purposes is quite important and can in a first effort only be evaluated for its impact on the first real case. This issue also indicates the classical problem of reductionism, i.e. how far in the direction of simplifying modelbuilding can one go, before reduction turns into distortion.

²⁵ BRYSON, JOHN, R., DANIELS, PETER, W., HENRY, NICK & POLLARD, JANE (2000) *Epilogue*. Routledge. s 279.

Another problematic dimension is that the rules of the game change as we walk along:

“Therefore, a learning economy is a system which is pressured by rapid change and a need for new skills and knowledge creation in the form of networks.”²⁶

²⁶ KOSONEN (2005) 2.

APPENDIX I

Mapping and mapping principles

To be further elaborated

Actors

Technicians/facilitators
Producers
 Researchers/organisations
 Investigators/consultants - enterprises
 Commercial enterprises secondary results
 Experts
Cultivators/ Refiners
 as above under producers
Middlemen/ conveyors
 Informers
 Media
 Teachers/Schools
 Consultants/Consultancies
 Other enterprises
 Volunteer organisations/members
 Public organisations/civil servants
 Political organisations/ politicians
 You and I, ordinary people
Facilitators
 Programmers
 Statisticians
Consumers
 Experts
 Students
 General population
 Organisations
Institutions
 Schools (all kinds)
 Libraries

Products

Information
Knowledge
 Tacit knowledge/based on experience
 Scientifically coded knowledge
 Combination of tacit and coded
Service
Research
 Reports
 Articles
Projects

Reports
Planning
Implementation

Technology

Computers
Library systems
AI

Paths, links and flows

The spoken word
The written word
Internet and networks
The meetingplace
The unsaid and unwritten

Criteria

Quantity
Quality
/unit of time
People
Culture, norms and values
Critical mass
Geographical
 Delimitation
 Critical mass
Functional
 Disciplines
Level of development
 Idea
 Innovation
 Product
Primary/secondary
Mode1/Mode2
Tacit/codified
Radical or incremental

Processes

Information gathering
Information refinement
Research
Transfer, transmission
Programming
Consumption
Teaching/learning

Special structures or analytical approaches

Mode 1 and Mode 2
Akademgorodok

Technopolis
Projekt Manhattan