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Osborne, M., Laitinen, L., and Stenvall, J. (2016) Complex regional innovation networks and HEI engagement the case of Chicago. *International Journal of Knowledge-Based Development*.

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Deposited on: 27 April 2016

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Complex regional innovation networks and HEI engagement – the case of Chicago

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Abstract: This article considers how HEIs engage within local complex development networks in order to develop the urban metropolis, using the case of Chicago as a specific example. The data utilised in the study are based on document analysis and interviews with some 40 representatives of organisations within the Chicago metropolitan area, including regional HEIs. Qualitative content analysis was undertaken in order to determine core themes and discourses, and to build a logical chain of evidence to formulate our conclusions, which offer new thinking about the regional engagement role of HEIs within complex innovation systems. Our focus of analysis was the extent to which an adaptive and creative co-operation network of local triple helix actors had been created. Our study shows that creativity, the sharing of information, and acting and learning together are critical success factors in city development, and in particular in capitalising in the knowledge held by HEIs.

Keywords: higher education institutions; HEIs; regional engagement; complex networks; open systems; co-creation of knowledge.

Reference to this paper should be made as follows: Laitinen, I., Osborne, M. and Stenvall, J. (xxxx) 'Complex regional innovation networks and HEI engagement – the case of Chicago', *Int. J. Knowledge-Based Development*, Vol. X, No. Y, pp.000–000.

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1 Introduction

Increasingly regional development is carried out within various kinds of open systems and complex networks. The open system's approach employs concepts such as co-production and co-creation; co-production implies services being implemented and their content being defined together with the customer (Pestoff and Brandsen, 2007) whilst co-creation, refers to planning together with customers (Chathoth et al., 2013). Dominant thinking both theoretically and in practice is to synergise the powers of various actors and it is regional competitiveness that has been the main driver to develop new networked approaches. The generally held precept is that accomplishment of this goal of competitiveness requires new, innovative models for collaboration. This is often seen as requiring cooperation between public, private, third sector actors and service users, and higher education institutions (HEIs). This challenge leads to new kinds of complexities.

Higher education engagement occurs through formal and informal networks, and via a variety of forms of collaborative activities between HEIs and communities (see Jacob et al., 2015). The complexity of these relationships implies the need for a multi-disciplinary approach in which comprehensive, holistic thinking replaces a world-view where simplifying causal relations, reductionism, a linear time concept, control and predictability are emphasised (e. g. Stacey, 2010).

At a regional level there is an increasing need to develop cooperation skills in decision-making with the aim to develop, instead of partial optimisation, long-term visions and resolutions. In particular, regional innovation has been contextualised within of the concept of an ecosystem. In the ecosystem of innovations, there has been a focus upon establishing highly communicative and creative cooperation networks of local actors. We define innovation as an interactive learning process as it is understood in the context of the learning economy and it is socially and territorially embedded and culturally and institutionally contextualised (Asheim and Coenen, 2005). An innovation

ecosystem in turn is formed around various actors, material resources and human capital in order to enable technology or service development, and innovation; these ecosystems of course include typically HEIs and their sub-units (Adner, 2006; Carayannis and Campbell, 2009; Jackson, 2011). Characteristic of an ecosystemic approach is that innovations are carried out through learning exchange and collaboration between those actors (see Jackson, 2011; Mars et al., 2012; Asheim and Coenen, 2005).

As befitting its Latin origin, 'region' refers to a geographical area of governance and in regional development research it has been mainly used in this precise sense (Cooke and Leydesdorff, 2006). In practice for the purpose of analysis the effective 'region' may be an entity that is the sum of a number of administrative districts, most notably described as the 'city-region'. We follow Cooke and Leydesdorff and define a region within a regional innovation ecosystem as one with collaborative and learning partnerships that cross municipalities, but with the common aim of pursuing aims of competitiveness.

In regional innovation activity within metropolitan areas, confluence is particularly found in cooperation models implementing 'triple helix' thinking (Etzkowitz, 1993). Triple helix networks refer to research and development cooperation, information sharing, exchange of knowledge as well as operational cultures focused on creating something new between HEIs and other research providers, government and the private sector. The background for such development has been influenced by the fact that the expectations and needs for the knowledge generated by research institutions has developed, from simply the absolute value of scientific knowledge towards the additional benefit and usefulness of that knowledge as determined by the cooperation of the different parties involved.

That development challenges roles and functions of HEIs. This article considers which elements and components affect how HEIs engage within local complex development networks in order to develop the urban metropolis, using the case of Chicago as a specific example. It focuses on three main issues, which are guiding themes for our analysis and for our concluding remarks:

- how collaboration occurs
- how goals are set and how shared goals have been created
- the extent to which there exist conflicting views amongst stakeholders, and their capability to create solutions where there are disagreements and clashing purposes.

2 Complexity, innovation and networks

Networks have been increasingly used to create innovation capacity in city areas. In networks, an innovation should not be seen as the product of one actor, but as the result of interplay between several actors (Håkansson, 1982). However, it is HEIs who most often have been seen as the key players in local innovation networks (see for instance Leydesdorff and Etzkowitz, 2001; Etzkowitz and Klofsten, 2005) and it is these actors who are our focal point.

Complexity challenges in networks have been identified by a number of researchers (see for instance Klijn, 2008; Aasen and Johannessen, 2007). As Hermans et al. (2012) have pointed out, to deal with complex problems, flexible and dynamic innovation

networks are formed and are variously termed as ‘innovation coalitions’ or ‘innovation configurations’. In dynamic networks, joint or social learning and negotiation are very often vital in shaping an innovation. It is also reported that it is extremely important that the actors of networks have ‘eyes and ears’ in complex environments. That has been discussed in previous research, through concepts such as knowledge acquisition, attention and distribution. Innovation is dependent on connections and without cross-pollination of ideas, constant information flow and multichannel communication, the ecosystem cannot thrive (Luoma-aho and Halonen, 2010). Within an open approach, innovation has been interpreted as a socially constructed process in which social groups continuously negotiate different meanings. Open innovation links organisational learning, knowledge management and collaborative practices. It is defined as knowledge exploration, retention and exploitation outside and inside an organisation’s boundaries (Vardaxoglou and Baralou, 2012).

Knowledge sharing has been at the core of the current open innovation research. Carrillo (2015) has proposed that the shift from closed to open innovation as the major cultural evolution underlying the transition from industrial to knowledge societies. West and Bogers (2014) consider that there is a tendency to ignore the importance of business models in open innovation models, which were previously perceived to be at the core of research on interorganisational collaboration in innovation, and they also argue that universities were seen earlier as a special source of external innovations. Further Kodama and Shibata (2015) argue that ‘the creation of a new business model’ moving beyond ‘demand articulation’ is crucial to the ‘second innovation cycle’ and in particular the process of innovation. Universities are considered by a number of researchers to have new roles outside their historic formal norms to educate their students to collaborate in an open innovation environment (see for example Oganisjana, 2015). In an inter-organisational sense this links to challenge of developing mobile knowledge workers, and how to attract and retain them. The application of urban design principles to creating and sustaining innovation spaces has seen as one to achieve this goal method (see Pancholi et al., 2015).

Another knowledge sharing research question in open innovation has been how an urban entity evolves from an *industrial city* to a *knowledge city*. Current research suggests that as knowledge-based urbanisation proceeds, the size of a knowledge city increases (Yun et al., 2015). Carrillo (2015) has concluded that the ‘knowledge’ dimension of knowledge cities is also much about the capacity to balance all societal values into an equitable and sustainable dynamic equilibrium..

Open innovation is a strategy of value creation that acts as an alternative to vertical integration. Organisation types can be differentiated by reference to their mutual ‘binding ties’ through differentiating these ties as being ‘deep and wide’ and ‘formal and informal’. Organisations that beneficially exploit their own know-how and promote innovation form ties that are both wide and deep with network partners. At the same time, they would endeavour to ensure that the value of information flowing out via the network is not greater than that of information flowing in. Individuals and organisations that are committed to these networks would ensure that information flows both between organisations and between individuals are conveyed through both official and less visible, unofficial relationships (see Hansen, 1999).

Raising interaction has been at the root of many studies whose common denominator is the understanding that innovation is the implementation of new ideas whose inception and distribution are resolved at the interfaces between various actors (Chesbrough, 2003;

Johansson, 2004). Particularly where the public sector is concerned, innovation is emphasised as something that occurs in an open environment and in collaboration with various actors (Moore and Hartley, 2008). Because of the need for openness and accountability to taxpayers, and the role of multiple agencies in the public sector, innovation also cannot be controlled in the traditional sense. For this reason, the conception of innovation as a nonlinear and emergent development, in which there is also room for unanticipated and unplanned development, is a fundamental distinguishing feature in public service.

Innovation most likely occurs under circumstances in which the actors accept uncertainty, and learn to live with and even derive benefit from it. In environments of change and uncertainty, complexity theory values polyphony, interaction and participation extending beyond field boundaries, as well as the alternation of the global and local, which together establishes the basis for development and new, unforeseen solutions. van der Heijden (2005, pp.30–33), for example, has noted that in order to survive, organisational systems need a degree of complexity to reflect the environment with which they react. Interaction of many participants also generates novel outcomes and behaviour – that is unpredicted and incalculable, and cannot be derived from knowledge of a single component of the system.

3 HEI engagement

The engagement role of universities has been explored in some depth in a number of recent publications, including within the work of Benneworth (2013b), Duke et al. (2013), Escrigas et al. (2014), Inman and Schuetze (2010), OECD (2007) and Hamilton et al. (2013). Benneworth and Osborne (2014), writing within a European context, provide a historical context for this engagement, arguing that since the 11th century,

“the scope and scale of engagement has subsequently increased from producing elites to working closely with firms and citizens, as universities have developed relationships and duties to religious powers, temporal authorities, cultural communities, industry and latterly civic society.”

In contemporary times, the work of the OECD’s Centre for Educational Research and Innovation (CERI) (1982) provides further nuance on the forms that university engagement with communities can take. The CERI report suggests that universities tend to focus their engagement work on ‘nearby’ communities in three senses. Firstly this might be simply a question of geographical proximity. Less obviously it might be for ethical reasons based on commonality of societal purpose with specific communities, an example being with groups advocating equality of opportunity for those that are systemically disadvantaged in entering universities based on issues such as race, ethnicity or class as exemplified by Brennan et al. (2006). Thirdly there might be mission proximity, for example with businesses and/or government as in the Triple Helix model of innovation systems that was introduced earlier in this article. The concept of the Triple Helix of relationships between university, industry and government has been attributed to Etzkowitz (1993) and essentially gave a more significant role to universities to developing the knowledge society than in previous decades of the 20th century. A major concept within this model of innovation is the idea of the ‘entrepreneurial university’, which actively seeks to put knowledge to use and to create new knowledge. It thus

operates interactively within innovation systems rather than within the parameters of traditional linear models.

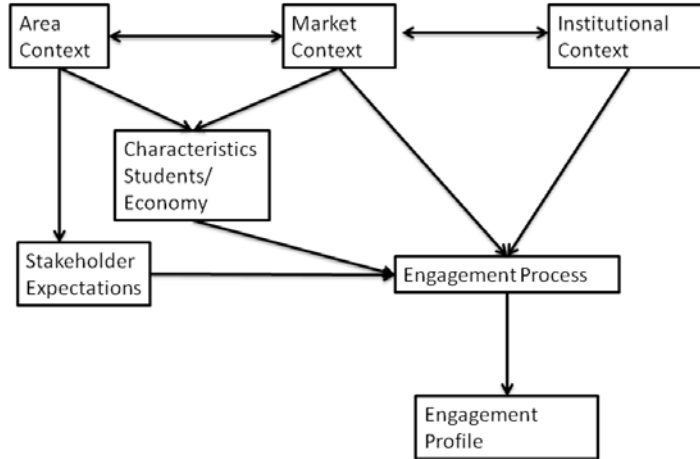
CERI in 1982 presented a number of best practices of university engagement and many examples of institutional arrangements for promoting university-business engagement, urban regeneration and community development. Benneworth (2013a) has adapted CERI's characterisation of the potential engagement activities of universities their common characteristic being that engagement is viewed as an extra activity in addition to the core activity of universities: teaching and research. It lies within the domain for which the term 'third mission' was coined, and despite many advocates who have suggested that engagement is not an optional add on, for many universities it is such a status that it still occupies. Growing pressure to create new income streams, as the support of the state has gradually been removed in many societies, has meant that universities have increasingly looked towards internationalisation rather than localisation as their priority. For most universities this means a focus on recruitment of high fee paying overseas students. If there is any local engagement it tends to be that which generates a significant income stream, namely working with the corporate and public sectors in areas such as technology transfer and high-income professional development programmes.

Even in contributing to local regional innovation systems through entrepreneurial activity, this too is more often than not subsidiary to core teaching and research. Benneworth (2013b) suggests that whilst the majority of universities may engage in this way, it is a consequence of these core missions rather than a mission in itself.

The actual profile of engagement for individual universities is influenced by a number of factors, as have been outlined by Schuetze (2010, p.13). These include its historical mandate, its role, tradition and culture, and geographical location. All universities have relationships with a complex array of other organisations within its area of influence, and engagement with numerous these regional networks of stakeholders presents many challenges. Hamilton et al. (2013) suggest this profile is dependent on three important contexts, which they refer to as *area*, *market* and *institutional* as illustrated in Figure 1.

"The Area Context refers to the social, economic, cultural and geographical characteristics of the region in which an HEI is located... The Market Context refers to HE providers being a part of a market regionally, nationally and internationally... The Institutional Context is important because having taken a strategic position, HEIs have to establish arrangements to support this through institutional allocation of resources, management practices and incentives for staff to deliver programmes consistent with the desired direction." [Hamilton et al., (2013), pp.439–1440].

In understanding the effectiveness of these relationships, social network analysis is a potentially important tool. Three groups of characteristics are fundamental to such networks: relational, functional and structural characteristics [Bienzle et al., (2007), pp.9–10]. Relational characteristics refer to the qualities of ties and commitments, the content of ties are the functional characteristics and structure relates to the morphology or design of the network.

Figure 1 Diagrammatic model of regional engagement

4 Case Chicago

4.1 Chicago – nurturing the culture of the innovation ecosystem

The city of Chicago has been promoting innovativeness in its policies. It has undergone major changes in its economic and service settings, but is still facing many challenges, to which policies and new innovation networks are targeted to respond proactively.

If the USA is compared separately to other nations by using indicators of skills and qualifications, research, corporate R&D, broadband, venture capital, GDP (or gross state product) per worker and productivity, many US states individually would be more innovative than any other nation in the world bar one. Only Finland would break into top ten, with nine US states, Massachusetts, California, Connecticut, New Jersey, Washington, Delaware, Maryland, Colorado and New Hampshire alongside it. The state of Illinois would be 19th on that same ranking, but it would still get higher scores than even high-performing nations such as Finland in some areas, including education, GDP and productivity, although it lags behind in every other category (Atkinson and Andes, 2011).

“Like the railroads of yesteryear, the internet is the infrastructure of today’s global society and economy.” (The City That Networks, 2007)

Broadband and internet are a vital part of Chicago’s current development. Chicago has one of the world’s highest capacities in network access points. And its economy and global competitiveness are positioned to benefit from technology and ICT use with the Chicago metropolitan area having moved upwards in the Global Cities Index [Mossberger et al., (2012), p.126].

However there is uneven access to these technologies. Many studies have shown that neighbourhoods influence the quality of life for individuals across a range of dimensions. For example Osborne (2014, p.1070) argues that “Good places contain healthy people,

who are more likely to enter learning, gain qualifications and become employed. Furthermore they will then become more civically-minded engaged citizens”.

Certainly those living in poorer neighbourhoods in the Chicago suffer many educational advantages including relatively high drop-out rates at all levels of schooling, and low achievement. Whilst improved ICT could bridge local educational disparities, in the Chicago metropolitan area there still are clear differences in accessibility and usage. By illustration, the City of Chicago website is most likely to be accessed by the residents with higher income, better education and those who are younger, parents and women [Mossberger et al., (2012), pp.127–129, 135–141, 143]. Glaser (2012, p.242) has noted that the city’s long-time mayor, Richard M. Daley, knew that the city would be competitive and successful only by providing a business-friendly environment and a decent quality of life. Chicago has been defined as a global city with a post-industrial economy with an industrial heritage. It is thus a city with a ‘Janus-face’ looking to the past and to the future [Mossberger et al., (2012), pp.125–126]. This is not a surprise since the dominant discourse is promoting the *New Chicago School of Urbanism*. The old Chicago School’s paradigms of knowledge in urban economics established in the early 20th century no longer seem fit for the twenty-first century. In the New School’s model of the city the concentric rings of growth growing from the very centre of the Centre Business Area, *The Loop*, as conceptualised by the Old School no longer applies as Chicago is now not a compact urban area (Simpson and Kelly, 2011).

Whilst in many ways Chicago is once again a ‘city on the make’, and the Loop is still one of its economic centres, as a diverse area and complicated system Chicago may be seen metaphorically to be more like a human body with the heart and brain in the Loop and numerous networks and novel ways to collaborate stretching all over the region [Sampson, (2012), pp.7, 12–20, 192, 412; Simpson and Kelly, 2011].

4.2 *The perspective from Chicago*

The study consisted of two phases. Firstly secondary analysis of literature identified the key stakeholders (using a peer-nomination reputational technique as advocated in this context by Farquharson, 2005) and the main challenges of the local innovation network. The second phase consisted of interviews with representatives of organisations within this network including regional HEIs. Interviews were conducted during March–April 2011 and June–July 2013; these were semi-structured and face-to-face interviews undertaken in Chicago and Northern Illinois¹ with academics, senior specialists, administrators and policymakers of knowledge intensive organisations, totalling 40 in number both individually and in teams. The interviewees included a range of employees from top executives through to frontline workers and represented three different sectors: private ICT companies, public municipal organisations and HEIs². Each personal interview lasted an hour, while the group interviews took 90 minutes each. As part of the methodological triangulation, documentary evidence was utilised alongside interviews and observations. The documentation gathered included plans, reports, reviews, evaluations, and other relevant studies. We subjected this data to qualitative content analysis in order to determine core themes and discourses, and to build a logical chain of evidence to formulate our conclusions (see Kvale, 1996; Miles and Huberman, 1994; Silverman, 1993).

From an ecosystemic perspective, many interviewees shared an understanding of the importance, that the three contexts – *area*, *market* and *institutional* – should be better linked in order to achieve the regional competitiveness.

“To promote innovation, we need new ways to collaborate and act together, to understand the essence of networking... So, I consider that networks are different. In a world of open networks, strategy is more like the art of guiding purposeful conversations between different actors. I see it as a creative collaboration to integrate education, workforce development, and economic development.” (Interviewee, professor, HEI)

“We (HEI) support and promote the concept of the living learning community... Even the greater universities are changing their policies to be more interactive with companies and local authorities.” (Interviewee, director, HEI)

According to interviewees there are growing numbers and a variety of tightened collaborations within the area, across markets and HEIs. A very significant development is the ongoing process of various HEIs or networks of HEIs coming into the community as ‘outside experts’. This role includes programs whereby HEIs collaborate as solution brokers in co-production of knowledge. One notable example is *1871*, a novel innovation concept promoting collaboration between community, education and entrepreneurs. Its name derived from the Great Chicago Fire of 1871, after which engineers, architects and inventors came together to build a new city. HEI partners in 1871 are the University of Illinois, the University of Chicago, Northwestern University and the Illinois Institute of Technology with other partners including Illinois Science and Technology Coalition, and Chicago Venture. The hub defines itself as follows:

“1871 is Chicago’s entrepreneurial hub for digital startups. Located in the famed Merchandise Mart, the 50,000 square-foot facility provides Chicago startups with programming, access to mentors, educational resources, potential investors and a community of like-minded entrepreneurs that help them on their path to building successful businesses.” (1871.com)

One respondent summarised a common perception of 1871 as follows:

“It is bit too early to say how successful the 1871 will be or is, but on the other hand it has been successful in many cases even so far. When I graduated from Northwestern there was no place like that. And now very many of our students are interested and committed to that concept and it is very active physical place. It is very important and significant to have different people with different backgrounds in the same place to collaborate. And part of the puzzle is the entrepreneurship. – (Mayor) Rahm Emanuel is there pretty often and he takes that very seriously and wants that be successful; the 1871 profile is very high.” (Interviewee, professor, innovation management, HEI)

There have been a number of other simultaneous processes to develop collaboration between the triple helix actors. These have challenged the roles of HEIs from having only scientific roles or outcomes to co-create multidisciplinary processes and pragmatic approaches to better use of resources, and to invest in future possibilities. For example, the Illinois Workforce Investment Board (IWIB) has established the Entrepreneurship Task Force, a cooperation between state agencies, business and corporate leaders, non-profit organisations, educators and entrepreneurs. According to Harris and Stern Grach (2012, p.2), this has sought to “provide a deeper analysis into the role that entrepreneurship and entrepreneurial learning can and should play in our education and

workforce systems in Illinois... Among the group there was much discussion about an *entrepreneurial mindset* that is inherent in critical thinking, problem solving, creativity and taking action”.

Interviewees referred to an ongoing paradigmatic change with a need to focus on future possibilities.

“What is significant is the plurality and diversity of different collaborators. The city is divided economically, but we share that understanding that schooling and education is the way out of poverty. Big companies and the Mayor’s office are trying to cross these boundaries. The game changer is openly shared information.” (Interviewee, director, private ICT-company)

“Yes, it can be said that there is that ecosystemic approach. The prime movers are committed to make city of Chicago more competitive, new ventures are committed and that is very transparent. And people from academia, wide range of people. They are part of the system, ecosystems and they are implementers of that ecosystem. – So, there is a real change – nobody knew some years ago what digital entrepreneurship together with innovation is. It has been developing and now there is a platform for it and it is growing very fast. And this new approach means that applications are tested and go to those who are not ICT people and during this process the developers use different iterations with citizens.” (Interviewee, professor, innovation management, HEI)

From the perspective of HEI engagement, the demand as expressed by a range of stakeholders was to fulfil future needs and participate in multifaceted collaborative networks in order to support cooperation between various actors. Interviews with these stakeholders expressed a range of desired changes to be actioned by the HE sector including that they adopt the following roles:

- 1 to co-develop and deepen learning exchange and meta-cognitive skills with regional players
- 2 to develop HEI professionals and teachers who have networking competencies and who can engage in multi-disciplinary and multi-professional collaboration
- 3 to operate a partners for the city and private enterprises in developing solutions.

The first role is rooted in the constant growth of information flows and Big Data, which was mentioned by several interviewees with there being a challenge in developing skills to analyse and interpret information. It was also seen as an important part of the various ‘edutainment’ programs in Chicago.

The second role is linked to new skills development and new organisational models. The latter was defined in various ways, and in particular how HEIs should

- advocate entrepreneurship and innovation
- be part of the targeted STEM areas within networks
- collaborate closely with high schools, private and public R&D groups, and ICT companies
- support students’ developmental pathways from high schools across P-20 and adult education cultivated by learning that takes place across and beyond the curriculum.

“We all share the interest to develop education. All of us – Mayor’s office, public schools and companies. And how? We have focused STEM programs, we focus on getting girls more into technology, in the high schools we collaborate within technology, mentoring, career support and curriculum development.” (Interviewee, director, private ICT-company)

The importance of STEM has been demonstrated also in political decision-making. Governor Quinn launched *Illinois Pathways*, a public-private STEM-based education initiative to prepare students for assumed future needs, in 2012. The main goal was to deepen and strengthen collaboration from across education, industry, government, non-profits and the entrepreneurial community to leverage resources to advance hard STEM-based fields of study [Harris and Stern Grach, (2012), p.6].

The third role refers to those many events and programs in which either the City and/or private enterprises are seeking solutions for diverse needs including those of the general public. For example the city of Chicago organises an *Open Gov Hack Night* through the 1871 hub, organised by civic tech group Open City. The goal is to

- get work done on civic projects
- start a new project, or find one to join
- bounce ideas and get help from technology and government experts
- learn about open data, smart cities, and open government
(see <http://opengovhacknight.org/>).

The main driver has been the paradigmatic shift from closed to open systems. Economies are not just metaphorically *like* open systems, they literally and physically are *part of* open systems.

“In our policies data is open, and there are lots of policies in general which support openness, but on the other hand there are some guarded protocols, for some of the decision making is still in the hands of gatekeepers.” (Interviewee, 1871)

The local economy and shared understanding to develop local or regional competitiveness were identified among the interviewees as a driver for HEIs to engage and deepen collaboration with the other actors. Stakeholders’ expectations were very explicit and defined not only by the interviewees, but also in several reports and regional evaluations.

“Shared programs and projects are important tools for that (learning). These bring together different actors and develop the process as a learning process. And those are very local level settings and not some grade-programs. – In Chicago there still are silos and that mentality and also in HEIs, but in our coalition that is not the big problem – we all understand that we are dealing with new approaches. There is some competition for the funding and that causes some tensions. There are also some problems about how people with different backgrounds are trying to secure their own identities and some companies are quite sensitive with identity issues, but in our coalition we are aware of those challenges. We have had some forums where we have discussed these; what should be done in Chicago to achieve the great goals and visions.” (Interviewee, 1871)

“We are now very transactional. We do make confidentiality agreements, plan how we engage partners and PPP agreements. We have lot of networking not only on economic development but regional innovation networking. There was

very little collaboration with other sectors and offices. There was collaboration only when it was mutually beneficial or at least shared opportunity. And on many occasions when people didn't know each other there had to be more money on the table, money was a substitute for trust. ... But now that has changed. Now technology transfer offices and research centers report directly to my office and we direct allowances for these. ... What has been surprising is the risk averse students!" (Interviewee, director, HEI)

4.3 *Challenges in managing ecosystemic development*

"This is though pretty true. There are gate keepers, people you must know in order to get things done." (Interviewee, manager, municipal organisation)

"We do think in long term perspective and consider whether Chicago will stay competitive. Some key people are bit too risk averse. We need to encourage each other more... The network organisation is simply bit too loosely formed. Or it serves mainly those people in the core." (Interviewee, public organisation, regional authority)

In particular, interviewees in the outskirts of Chicago seemed to be reserved or even critical of the quality of collaboration within the network. While they supported the shared areas of focus (e.g. STEM, and open ICT policies) they were skeptical of benefits that would accrue to themselves. They felt themselves and their organisations at best to be 'loyal outsiders'. It seems that some of the main actors in this adaptive situation seemed to mistrust each other. According to a number of interviewees at the beginning of the process there was much resistance to change. Further many reported that the participation of the potential beneficiaries of open innovation stifled opposing comments. So whilst it was evident that the open system bridged various stakeholders, many reported that they had experienced changes in the rules of the game and in ways in which results were presented. This phenomenon accords with the work of Stacey (2010) who has analysed the power games related to social interaction. In interactive relationships different actors try to influence one another in ways that tend to create complexity. This can take a variety of forms, such as invalidation of the perspectives of other actors or forming alliances with other parties (Stacey 2010; see also Gentilcore, 1999; May, 2004; Powell, 2010). Power games seem to explain most of the complexity related to reforms in the Chicago metropolitan area.

5 **Conclusions**

Our study had three principle objectives concerned with new thinking about the regional engagement of HEIs within complex innovation systems where the focus of analysis was the extent to which an adaptive and creative cooperation network of local triple helix actors, including the service users, had been created: the process of collaboration; the setting and sharing of goals; conflict and their resolution.

5.1 *The process of collaboration*

The first objective of our study concerned understanding how collaboration in regional engagement plays out in Chicago in the context of the complex interactions that are embedded in an open system. The study shows how an open system in which customers

are seen as co-designers and co-producers shifts the role of knowledge sharing and learning. We found that Chicago is in the middle of making a paradigm shift. At the core of that change is the open system approach. That includes a variety of ways to engage citizen-users as co-creators, including through user-driven innovation and digitalised services. The use of technology enables, for example, the production and transfer of interactive information and the involvement of customers within services. The open system's logic is both bottom up and top down. And the new context is set to support both of these approaches.

From different institutions' perspectives the paradigm shift to an open system has been both a challenge and an opportunity. In Chicago there are various platforms for collaboration with end users, to engage people and to interpret information with them. Many of these practices are based on ICT, but novel and interesting hybrid organisations (such as 1871), and professions have also been created. We have also observed that HEIs have very special and particular roles in the process. In Chicago there are simultaneously centralising and de-centralising processes. Collaboration has occurred via new nodes, for example 1871, which in turn promotes openness, and cooperation with wider audiences and end users. Open data policies have developed the ecosystem. The easy accessibility of data, stakeholders' commitment to make that data available and to promote it in various ways, and to create civic applications of open data have had impacts on the triple helix. The intention to engage developers and a public audience have made various projects, programs and platforms of learning viable for local HEIs. HEIs have also been active in developing their own staff to become more entrepreneurial. As one interviewee noted:

“There is now a real need of PhDs with eMBAs – with the academic and business background. And there are these, and it goes with the policy of the HEIs in this new collaboration and it is a way to develop their mindset and attitudes.” (Interviewee, 1871)

5.2 The setting and sharing of goals

Our second objective was to establish how goals are set and how shared goals have been created. We have identified that in the case of Chicago there exists a widely shared goal to develop and improve novel approaches for regional engagement to enhance innovativeness and competitiveness. The need to collaborate was recognised by all stakeholders, including HEIs. And the open system approach has forced the various organisational silos to become more adaptive. That has led to versatile solutions being demanded and drawn down by service users in a close collaboration with the public and private sectors, and HEIs. An open system favours management that sets the context, encourages and coaches change, and engages local people. The clear majority of the interviewees in Chicago nominated these three aspects as a necessity for ecosystemic development.

5.3 Conflicts and their resolution

Our third objective was to determine what conflicts existed in the setting of goals and the ways in which such differences were solved. We established that whilst there are rhetorically shared goals in Chicago, some stakeholders do not view themselves as being at the core of developments, and are more critical and skeptical. Nonetheless the

collaboration of service providers including HEIs with local people and service users has narrowed the gap between aspirations and reality, demanding responses outside the normal repertoire. This signals a readiness from service providers to cope with uncertainty, which in turn has led to a requirement for atypical working practices, setting demanding challenges. This leads to a need for new kinds of managerial skills. In an open system managers are defined as professionals who have both expert thinking skills and communication skills to interact with a wide range of disciplines and specialists especially within a complex context, and unclear single answers or solutions. Core questions of changing management roles involve considering perspectives that include how to produce services with the customer, how other service providers can be supported, and how services can be co-produced. This requires a change in the role of the management, a shift of the focal point from only being about the manager's wishes to one that emphasises a relationship. In other words, management becomes depicted not simply as 'a position', but as a relationship an interaction co-creating and sharing knowledge. Interpreting the role and its meaning is a constant ongoing process.

Regional development has been seen typically as a challenge to construct regional advantage and build clusters. The favoured approach to achieve this goal has been by enhancing industry – university interaction through building an innovation system around these players, calling upon theories of network management with their various recommended approaches (see for example Sotarauta, 2010). A major paradigm shift has changed to that of 'organisational betweenness' and 'open systemic thinking'. From this perspective, regional development is a constantly developing interactive process, where reformation and learning are based on broad information flows, experience, and in-process learning. From the perspective of the logic of an open system it is possible to apply the methods of learning by experience and learning by doing (Argyris, 1977; Kolb, 1984). Ultimately to develop such models of regional engagement, new forms of leadership are needed because this is a process during which individuals and organisations must confront contradictions, and adjust to new realities. In a response of the shift of paradigm, the key resource is a learning-oriented interaction structure, not top-down administrative solutions, and a broader, even 'unofficial' fabric of cooperation between all actors, including customers and local people. The case of Chicago presents some insights on how this might be achieved.

This article has dealt with regional innovation management in an open environment. The study shows that creativity, the sharing of information, and acting and learning together are seen as and are becoming critical success factors in city development, and in particular in capitalising in the knowledge held by HEIs. Of particular significance here is the endeavour to create an 'ecosystem'. Exchanging information and ideas between the ecosystem's stakeholders creates a social learning process in which cognition is situated, distributed and enculturated, and finally embedded. These are not simply technical processes, and they demand new managerial, learning and collaborative understandings within the private and public organisations as well as HEIs.

Chicago has strategically put much effort into becoming a digitised environment for collaboration. In an open system, knowledge and knowledge sharing is more and more digitised. That in turn means new demands and challenges for HEIs as they have roles not only to curate credible, relevant, and specific information but also to align skills development and capacity building. The required expertise and professional skills to meet these demands and challenges include innovativeness, and interactional and social skills.

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Notes

- 1 We used a geography that covered the city of Chicago and surrounding municipalities in order to cover a range of institutions within the umbrella of America's Urban Campus (see <http://www.americasurbancampus.org>) and their sponsors, as well as institutions that feed from the Chicago population and their stakeholders.
- 2 The universities were: Northern Illinois University, Northwestern University, Purdue University (although not in Illinois it is involved in collaboration in the state and has been actively supporting innovation policy development), University of Illinois, University of Chicago and Illinois Institute of Technology. The networks were: Illinois Science and Technology Coalition, 1871, Kellogg Innovation Network and World Business Chicago. The City/Regional Municipalities were: Chicago, Rockford, DeKalb, Aurora and Hoffmann Estates. The City of Chicago's R&D programs covered were: Chicago Center for Green Technology, Chicago Community Trust, CMAP Chicago Metropolitan Agency for Planning, Metropolis Strategies and Department of Business and Information Services). Private Sector Representatives, including Incubator hybrids for startups and the Chicagoland Chamber of Commerce were also consulted.