Submission # 67:

Smart City as innovation arena for a business cluster

PhD Synnøve Rubach, sr@ostfoldforskning.no ,
Ostfold Research (Østfoldforskning), phone: + 47 97742057
PhD Gunnar Andersson, gunnar.andersson@hiof.no
Østfold University College (Høgskolen i Østfold), phone: + 47 92858976
PhD-candidate Frode Ramstad Johansen, frode.r.johansen@hiof.no ,
Østfold University College (Høgskolen i Østfold), phone: + 47 93030885

Paper for the IMP 2014 Conference in Bordeaux.

Category special track: CORPORATE SOCIAL RESPONSIBILITY, ETHICS, AND SUSTAINABILITY IN BUSINESS NETWORKS

Work-in-Progress paper

NOTE: This paper is not yet fully developed. The case study needs elaboration, and the analysis is very incomplete. We still hope the paper may form the basis for some discussion of smart cities as innovation arena, and our sketch for an analytic framework to study translation of such phenomena. Moreover, the global aspect is so far mostly implicit in the case study: we intend to develop connections to how the regional translations and practices are closely connected to the global ideas and interpretations. Inputs to such developments are appreciated.

Keywords:

- Smart Cities
- Sustainable innovation
- Business cluster
- Innovation
- Regional development

ABSTRACT [AS SUBMITTED TO IMP IN JANUARY 2014]

The purpose of this paper is to explore how a constructed business cluster[1] (Håkansson et al., 2009, p 259) in a Norwegian region utilizes the Smart City concept establishing common projects for business development. In this region, a regional development project has been running since 2011. This project is focusing on a greener and smarter urban and social development, where the Smart City may be seen as a common goal for the network initiatives and activities (within health technology and services, sustainable rehabilitation of buildings, smart energy markets and the creative industry). The Smart City is a popular but fuzzy concept in the governance and policy arena(s) (Caragliu, Del Bo, & Nijkamp, 2009). Aspects of the Smart City concept includes: Smart Economy, Smart Environment, Smart Governance, Smart Living, Smart Mobility and Smart people (http://www.smart-cities.eu/model.html). Caragliu, Del Bo and Nijkamp (2009) operational definition[2] of Smart City suggests a loose web of literature including, as we translate it, open innovation (West, Chesbrough, & Vanhaverbeke, 2006), sustainable innovation (Allen & Shonnard, 2002), actor-network theory (Latour, 2005) and systems innovation (Elzen, Geels & Green, 2004). This web of literature combined with empirical data from a longitudinal case study (participatory observations, interviews and document analysis) of the business cluster (2007-ongoing) will contribute to the understanding of local translations of global ideas for innovation and business development - and hopefully, a more sustainable development (Brekke, 2009; Håkansson & Waluszewski, 2002).

[1] Part of the Norwegian Centres of Expertise (NCE) system http://www.nce.no/no/Om-NCE/About-NCE/

[2] Caragliu, Del Bo and Nijkamp introduce an operational definition as an illustration of this richer understanding of Smart Cities: "*We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance*". (Caragliu et al., 2009, p. 6)

INTRODUCTION

Different types of regional collaboration are promoted by policy makes in order to out-weigh the effects of global competition (add reference). In Norway there are several R&D-programmes aiming at developing or strengthening regional innovation systems through facilitated initiatives. In these initiatives, the triple helix actors[3] (Etzkowitz & Leydesdorff, 2000) are often encouraged to act together in regional innovation projects with an aim to construct innovation systems as this is said to be beneficial for innovation and value creation (e.g. Edquist, 2005). The hypothesis behind the regional focus is that geographical proximity between actors promotes interaction and hence innovation.

In addition to construction and strengthening regional innovation systems, new concepts and initiatives focusing on developing regions are constantly emerging. One of these concepts is smart cities. Smart cities, simply said, focus on a greener and smarter urban development. It is a popular, but fuzzy concept with a broad variety of interpretations related to what it is and what it contains (Huber & Mayer, 2012?). In order to find sustainable solutions there are no doubt that there is a strong need for taking responsibility for the upstream and downstream impacts of any activity that consumes resources. This calls for collaboration, and to include the relevant actors in the process of finding solutions (add reference; Ballard, 2005). However, to transform a city into a smarter and greener one requires ways of solving societal tasks in an integrated and trans-organisational way which is not common in most areas as of today. Hence, it calls for systems innovation (Meadows, 2009), i.e. as interconnected set of innovations achieved through a series of small incremental steps or through more radical, disruptive transformations.

What then happens when a regional innovation system (a cluster organisation) embarks on the challenge of initiating and facilitating a smart city initiative? Questions which are raised in this paper are: How did it at all come about? What is it interpreted to encompass by different actors? How is it translated into local innovations and actions? A focus on a smarter and greener urban development could create different and new opportunity for interactions. How can the actors involved enhance their own and the collective innovation potential through planned learning processes both in interorganizational and intraorganizational settings? Different practices represent different mind-sets - a shared arena such as a regional innovation project (i.e. smart city), offers opportunities to exchange knowledge, learn and teach. The learning opportunities are considerable. Such activities and learning opportunities can subsequently be transformed into innovations as they form bridges to worlds (and ideas) one does not daily walk within. In order for the transformation into innovations to happen, some structured/ planned learning processes need to be present both in the regional innovation project and in the single participating organization (Klev & Levin, c2009; Rubach, 2011). The learning has to be made relevant or internalized into the organization before it will be put in active use (Klev & Levin, c2009, p. 187). It is therefore the actual *arranging* of these processes that is important. Whilst results can't be planned, planning the process of making this transfer can be (increasing the likelihood that it will happen). Just bringing something new back to one's own organization doesn't mean it will be used, since it may often remain decoupled from the value-creating, daily activities in the organization (Klev & Levin, c2009, p. 187; Rubach, 2011, p. 171). Without intraorganizational learning processes, learning will not be utilized as a potential for change and development for the

[3] Triple helix actors: academia – industry - state

organisation (Lipshitz, Popper, & Friedman, 2002; Rubach, 2011). In addition, it is the exploited intraorganizational experiences that fuel interorganizational exploration (Holmqvist, 2004; Klein, 2004; Rubach, 2011). Thus, intraorganizational learning processes stands out as a prerequisite for interorganizational innovation initiatives.

Brekke's (2009) *translations vehicle* model is in this paper used to analyse how sustainability[4] is mediated in a cluster network translating smart cities from global ideas and discourses to local discourses and innovations. The translation vehicle model is further combines with a dual organization-development (OD) conceptualization of network participation (Rubach, 2011) to promote co-operation and networking (interaction which can also lead to the creation of new/and or joint knowledge).

INNOVATION SYSTEMS AND SMART CITY

INNOVATION SYSTEMS VS SYSTEMS INNOVATION

In EU, and also in Norway, policy makers are promoting and supporting innovation systems initiatives[5] such as clusters and networks as means for national and regional innovation, transformation and prosperity. In Norway, the Norwegian Centres of Expertise (NCE) programme is such an example. This initiative is inspired by, among others, Porter's cluster theories on competiveness (1998) and Florida's concept of learning regions (1995). The NCE programme is jointly owned and implemented by the three main Norwegian innovation agencies: Innovation Norway, the Research Council of Norway and SIVA. This programme encourages the triple helix actors (academia-industry-state) (Etzkowitz & Leydesdorff, 2000) to collaborate in (already existing) regional clusters, in addition to being internationally oriented. The goal of the NCE programme is "…*to enhance sustainable innovation and internationalization processes in the most dynamic and growth-oriented Norwegian clusters*". The financing of the NCE projects covers: Network construction within the cluster and with external operators, analysis and strategy processes, development of ideas and project proposals, and marketing of the cluster. In addition the financing covers the employment of people who can direct these processes in the NCE project. As such, the financing should act as positive input into the already existing regional innovation system, supporting it as a total to further development and growth.

As such, a funded NCE cluster-organisation could be looked upon like a tool for support and further development of the cluster's existing relevant business life, but also as a vehicle for transformation and systems innovation, i.e. the innovation system should impose system

[4] The concept of sustainability is quite vague and more than 300 definitions have come out since Brundtland report in 1987 (Johnston et al., 2007 ref. in Basurko & Mesbahi, 2012). Often the concepts of sustainable development, sustainability and sustainability assessment are confused (Glavič & Lukman, 2007), and clarification is necessary. The conventional definition of sustainable development is "to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs"(WCED, 1987). Sustainability is the property of a thing such as policy, product, process or technology to be sustainable, i.e. the thing can be maintained in a specific state for indefinite or very long time" (Heijungs, Huppes, & Guinée, 2010).

[5] An innovation system consists of important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations (Edquist, 2005, p. 182). Innovation systems are thus a network of organizations, people, and rules which is directly connected to how efficiently new knowledge is created and used.

innovation. A system can be defined as an interconnected set of elements that is coherently organized in a way that achieves something (Meadows, 2009, p. 11). Further, a system consists of three kinds of things: elements, interconnections, and a function or purpose (ibid). System innovation could be looked at as interconnected set of innovations achieved through a series of small incremental steps or through more radical, disruptive transformations.

Geels, Elzen & Green (in Elzen, Geels & Green, 2004, p. 6) points to three important gaps in the existing literature of system innovation. Firstly the ”systems of innovation” approach. This approach investigates at different analytical levels how innovations emerge from the coevolution of a range of elements. This means that the main focus in the system of innovation approach is on the functioning of systems rather on the change of systems. Another gap is pointed out in the literature on “path dependence” and “lock-in” (add reference). It provides many explanations of stability, but how can we understand “lock-out? What make transitions occur? It is these transitions we will be tracing, since the focus here is on the bigger changes (systems innovation). Thirdly, Geels et al. point out that existing systems seems to be “locked-in” on many dimensions even though many new technologies (and ways of doing thing; our comment) do exist. Implementation of promising new environmental technologies (and organizational practices; our comment) may require other changes in user practices, regulation or infrastructure (Håkansson?). Although the importance of systems innovations is increasingly emphasized in public debates there is not yet much known about how system innovation occur and how policy makers may influence them. As we see it, Smart City is one of the public initiatives embarking on this challenge.

SMART CITY AS SYSTEMS INNOVATION

The Smart City is a popular but fuzzy concept in the governance and policy arena(s) (Caragliu, Del Bo, & Nijkamp, 2009). There is currently no accepted standard definition of Smart Cities (Huber & Mayer, 2012?). Initially there was a strong bias on the role of networked infrastructure and then the concept was further developed as a strategy for creating a competitive environment and enhancing the competitive profile of a city. The high tech and creative industries have an important role in these conceptualizations. Still these interpretations of Smart City is well alive, but today the concept is growing beyond this limited and structural (geographical) point of departure to include practices, sustainability, environmentally and democratic issues making it more relevant but also more complex to research. Caragliu, Del Bo and Nijkamp introduce an operational definition as an illustration of this richer understanding of Smart Cities:

> *We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance.* (Caragliu et al., 2009, p. 6)

However, what is the actual overall vision of a Smart City? Some focus on the huge possibilities for increased efficiency made possible by using “Big Data”[6] for development of integrated

[6] Definition from http://www.yourdictionary.com/big-data: Big Data refers to the massive amounts of data that collect over time that are difficult to analyze and handle using common database management tools. Big Data includes business transactions, e-mail messages, photos, surveillance videos and activity. Scientific data from sensors

solutions in fields like energy use, transportation and health care. The focus on sustainability is in most cases limited, and it is often seen mainly as a tool for city development (Huber & Mayer, 2012?). For instance fighting climate change and securing sustainability is only indirectly mentioned in Caragliu et al.'s definition, hidden in *"a wise management of natural resources"*.

The European Commission, Directorate General, defines their goal with smart cities as follows (http://ec.europa.eu/dgs/connect/en/content/smart-cities):

> *Our vision is to help EU cities to develop into "smart cities" that provide public services to their citizens in a more convenient way, that are more responsive and citizens-centred, that provide the right information in real-time to allow for better everyday and business decision-making, and that achieve all this in an economically viable way so as to improve environmental sustainability.*

Smart City is thus embarking on the enormous challenge it is to transform city infrastructure and city systems. This calls for systemic innovation, which calls for an interconnected set of innovations in many different areas.

This is mirrored in other interpretations of Smart City, as the one suggested in the European Smart cities project in 2007 (http://www.smart-cities.eu/) and further developed by, among others, Boyd Cohen[7]. Here aspects of the Smart City concept includes: Smart Economy, Smart Environment, Smart Governance, Smart Living, Smart Mobility and Smart people. This is shown in Figure 1, illustrating the Smart City Wheel. Each "Smart" focus area has some suggested areas of concern and a set of related indicators. These are further described in Table 1 in Appendix 1.

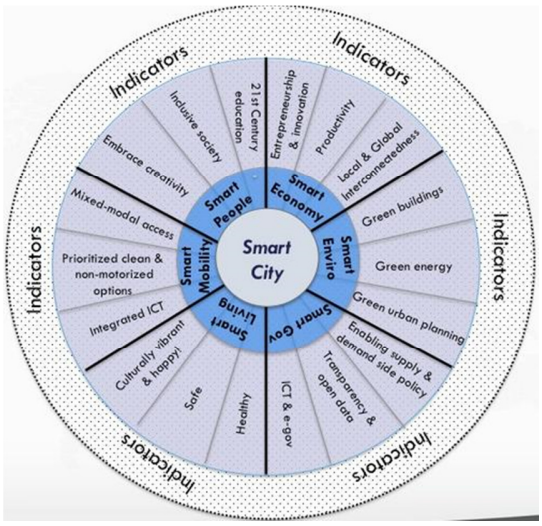

Figure 1 Smart City Wheel[8]

These indicators are used to perform smart city assessments, and through these cities are ranked, and/or they could be used/are used as a help for further development. As Huber and Mayer

---

can reach mammoth proportions over time, and Big Data also includes unstructured text posted on the Web, such as blogs and social media.

[7] http://www.boydcohen.com/

[8] http://www.ubmfuturecities.com/author.asp?section_id=219&doc_id=524053

(2012?) points out: The concept of Smart Cities does not suggest one exclusive normative idea of what a "good city" is but rather *how* a good city might be achieved.

The Smart city concept could thus first and foremost be seen a tool perspective. Huber and Mayer (2012?) claim that the innovative aspect of the Smart City concept is its alternative perspective on organizing change processes. To make citizens' life better needs to be co-created with citizens and all relevant stakeholders. Further, Hhe Smart City concept implies the rise of a "community era", where people seek common and new, more sustainable, ways of commuting, living, consuming or spending their leisure time. The wider concept definition provided by Caragliu, Del Bo and Nijkamp seems to correlate quite good with the key challenges in transforming a city into a "Smart City".

According to Caragliu, Del Bo, & Nijkamp (2011) the characteristics proper to a smart city are:

1. The utilization of networks infrastructure to improve economic and political efficiency and enable social, cultural and urban development.
2. An underlying emphasis on business-led urban development
3. A strong focus on the aim of achieving the social inclusion of various urban residents in public services
4. A stress on the crucial role of high tech and creative industries in long-run urban growth
5. Profound attention to the role of social and relational capital in urban development
6. Social and environmental sustainability as a major strategic component of smart cities.

However, these characteristics are still rather wage and could be interpreted and implemented in a broad variety of ways. Campbell (2012) criticizes the smart city concept, stating that the real promise lay in creating conditions of continuous learning and innovation.

> "*Building up a knowledge economy of highly educated talent, high-tech industries and pervasive electronic connections are only the trappings of smartness and cannot guarantee the outcomes that policy makers hope to achieve. Though global talent and seamless connections are important, they can also amount only to the dressing of a pauper in prince's clothing.*" (Campbell, 2012, p. 5).

In this, cities are interpreted as open institutions, with different levels of learning. The way Smart City is interpreted and acted on locally seems crucial.

LEARNING AS KEY ISSUE IN SMART CITIES

To be developed based on Campbell (2012), Rubach (2011) and other sources. (Draft to be found in Appendix 2).

TRANSLATIONS OF THE SMART CITY

Local discourses and innovations could be interpreted as particular actor-networks, which mean

that its reality, and the understandings and practices of it, are effects of the web of people, structures, technologies and others who relate to it. To explore the networks of relations, how these relations assemble or not, and the effects of these networks could tell something about how innovation occur or not (Andersson, 2011, p. v).

It is not a metaphor of network in the meaning of a digital network like the Internet where the message is sent as a perfect copy and transported instantaneous. It is the opposite, a network as a series of transformations and translations where the message sent is altered from its origin (Latour, 1997, p. 47).

> *"...the spread in time and space of anything - claims, orders, artifacts, goods - is in the hands of people; each of these people may act in many different ways, letting the token drop, or modifying it, or deflecting it, or betraying it, or adding to it, or appropriating it."* (Latour, 1986, p. 267)

It is these translations (Latour, 2005, p. 108) that enable the ideas to circulate (Latour, 1999a, p. 71), loose some properties and gain others. Translations act as glue (Harman, 2009, p. 15) holding the project together and at the same time introduce tensions (Andersson, 2011, p. 125) that may break it.

Actors may constitute obligatory passage points (OPP) (Callon, 1986, pp. 203–206) aligning the identities of other actors in the network. These are of special interest for us because they translate other actors' contributions. Literature suggests a range of different mediators also referred to as transporters or vehicles for translation (Brekke, 2009, p. 231). Vehicles for translations hold the network together, aligning, or more precisely translating, other actors' interests, problems and goals. Vehicles for translation include routines, reports, organizations, human beings and other actors that transport an element from one domain to the other or vice-versa (Brekke, 2009, p. 231).

METHODOLOGY

The case study (Stake, 2000) is concerned with the regional interpretations of the concept Smart City. The focus is on how a cluster facilitating organization (a publicly funded regional centre of expertise, NCE) aiming to enhance innovation and business related to energy and ICT, translate this global concept into local initiatives and activities.

The empirical data used in this article are preliminary, as the Smart City initiative is in a very early phase in the region. This study is therefore mainly based on a literature review and limited research data.

The unit of analysis in this paper is the Smart City initiative launched by the cluster facilitating organization. The research design could be classified as an instrumental, single case (Stake, 2000) and as a longitudinal process study (Van de Ven, 2007, p. 194).

The existing data has emerged from documents analyses and from taking part in workshops and meetings. Since 2007 the researchers has followed the development of the cluster organization mainly from taking part by attending seminars and workshops, but also from taking part in some administrative and reporting meetings in a regional development project where Smart City has been one of the focus areas. The researchers' role has in some activities been as engaged researchers or actors (Levin & Ravn, 2007; Van de Ven, 2007) and in others activities the role has been more as onlookers (Van de Ven, 2007). The data material consists of field notes from meetings and workshops, minutes of meetings, and project documents.

In the analyses we will use a modified version of Brekke's model (2009, Chapter 5.4) which describes the role of vehicles for translation enabling ideas to circulate. The model is presented in Figure 2. This model will thus be used to analyse and explore how sustainability is mediated in the cluster network translating smart cities from global ideas and discourses to local discourses and innovations.

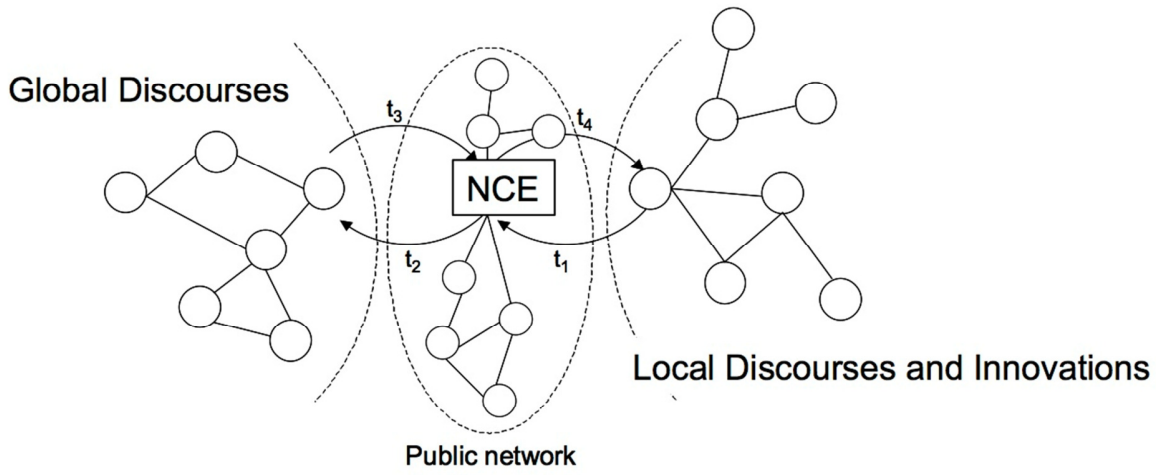

Figure 2 Model for how an NCE works as a vehicle for translations transferring elements between global discourses and local discourses and innovations

We will follow the idea smart city from global discourses and literature through entangling initiatives and translations. We treat the local discourses and innovations as an effect of specific historical events. As already mentioned, we base the analysis on minutes of meetings, presentations and public documents part of the cluster network over a period of more than 4 years.

THE CASE STUDY

The case is played out in one of Norway's counties[9]. The county has a rather high population growth, indicating high attractiveness as a place of resident. However, this is not mirrored in the labour market and the economic life. Related to educational standards the situation is below average. A large number of people, especially those with higher education, are commuting out of the county (most to the capital Oslo) to work. As such, the county is still based on the labor-intensive economies (traditional industry) and the agricultural-intensive economies, lagging behind the trend in the global economy in its transition to a "knowledge economy". This is made visible by the deficiency of knowledge based working places.

THE NCE PROJECT

The NCE project has been running 14 (one and a half day) workshops since mid 2009. The first five was part of a foresight process and the following has been run as management workshops. The number of participants has gone from a twenty people in 2009 to just above one hundred in 2013, and likewise from nine private/public actors in 2009 to more than twenty in the last workshop in 2013. In addition to firms, other participating groups are public sector and academia. The main objectives have been knowledge and business development focusing on smart grids and ICT solutions for the energy sector. All of these workshops are documented through published invitations and summaries, produced by the cluster facilitating organisation. Whereas concepts as smart grid and smart energy are mentioned repeatedly in the documentation, the mention of the concept of smart cities is sparse from the beginning.

Smart cities in project development of 2010

During the first quarter of 2010 the cluster, together with two other regional partners, developed an application for the regional R&D program VRI[10] (VRI 2 hovedsøknad, 2010). The application was granted for three years. The application consisted of a common framework and three projects where the building industry and the health care sector were focused in other two parts. The cluster facilitation organisation's part of the application was named *Technology and energy – green solutions in Smart Cities*. They defined the project as a strategic "expansion of the scope of cluster towards Smart Houses and Smart Health, as a first step towards Smart Cities". Further the application includes explicitly an ambition to expand the perspectives to Smart Cities and it is stated that the expansion will happen through actively connecting to the other two projects (building industry and health care sector). This is further clarified in the common activities where two out of three milestones deal with the development from Smart Energy to respectively Smart Houses and Smart Health. The building industry project mentions Smart Cities once in their part, whereas the health care project does not mention Smart Cities at all. Some of the companies in the cluster later participated in workshops run by the building industry project. Especially one company contributed with their technological expertise and products, and used the building project as a test ground.

[9] The county had 284.493 inhabitants in 2013.

[10] VRI is the Norwegian Research Council's primary support mechanism for regional research and innovation. The primary goal of VRI is to encourage innovation, knowledge development, and added value through regional cooperation and a strengthened research and development effort within and for the regions. Fundamental components of the VRI programme include research activity, exchange of experience, learning, and cooperation across scientific, professional, and administrative boundaries.

At the conference Innovation Exchange in Copenhagen October 2010, representatives from the cluster presented “The NCE Halden approach to the SmartGrid. Smart City: What’s involved and where does the business case lie” (Bremdal & Gustavsen, 2010). In the presentation they stated their general targets for a smart city program; lower CO_2 emissions, reduced energy consumption, smart energy management and easier living. They defined focus areas to be: residential homes, office buildings, industry, street lights, local grid and traffic/transport. The solution presented was the development and use of grid and brokering (market) technologies, and with the slogan “It´s time for a smarter grid”.

Smart Cities in a workshop 2010

Late in 2010 Smart Cities is on the agenda at a cluster workshop the first time. In the invitation, called “Smart, smarter, smartest”, there is issued a challenge to expand the Smart Grid towards a Smart Cities concept. The smart cities concept is explained as “transportation, buildings, infrastructure, and energy trading”. At the workshop, a group produced a project idea named Smart Green Micro Society, with an aim “to show efficient use of air, water, sewer, produced energy etc” (Workshop summary, 2010). Key elements in their proposal were technological solutions for buildings, grid, management systems, and internal trading systems (management of a collective car pool etc). The cluster where proposed the roles of contributing to the development of services, optimization of energy use, prosumer (producer-consumer) testing and research on social processes. Possible partners where proposed to be property developers, house building firms and power companies. The outcome of the workshop was a decision that the cluster should take a leading position in smart energy markets and adjacent areas, i.e. smart cities. At this point in time the cluster also changed its name from NCE Energy and Emission Trading Halden to Smart Energy Markets Thus, the invitation to the workshop was in the first name and the summary in the latter.

Smart cities in the workshops of 2013 and in a conference of 2014

During 2013 and winter 2014 the cluster management promoted the concept of Smart Cities to the cluster members, the local municipalities and selected companies. A result of this work was Smart Cities being issued as a theme for a workshop in 2013 and in the Future Conference in 2014 (VRI 2 TES 2014).

The next time Smart Cities is mentioned in the summaries from the two workshops in mid and late 2013. The first workshop focused on “how the cluster can take positions on the topic of Smart Cities”. The summary (Workshop 2013a) states that “Smart Cities” is an important priority of the cluster as it builds on the smart grid competence and the core competence of the cluster. It further declares four perspectives on Smart Cities; as solving major societal challenges, it calls for a holistic and interdisciplinary approach, approaches must rest solely on the cluster competence and lastly the need to establish an understanding of the cluster’s contribution regarding Smart Cities. “Major societal challenges” is related to “energy, logistics/infrastructure, efficient transport, sustainable technology, life and living environments, upbringing and education etc”. Further it is claimed that: "Smart Cities will, in other words, solve the good life for citizens”.

In the second workshop in 2013 “Smart Cities” was the main focus. Several representatives from the public sector was main speakers (Invitation workshop, 2013). According to the summaries

(Workshop 2013b) the workshop had a twofold purpose; highlight the cluster's ambition and collective expertise in "Smart Cities", and highlight the municipalities as an innovation arena for the development of new services and products for "Smart Cities". This was done by working up ideas and proposals for developing a specific municipality in the county as a Smart City. Later this was further used in a process to provide input to a strategic regional plan for Smart Cities.

Smart Cities in the NCE Smart Energy Markets

As already mentioned, the first mentioning of smart cities date back to the joint project application for a regional project. This application was written by the cluster management. In the cluster workshop in late 2010 the participants were invited to discuss new business opportunities in "developing the smart grid commitment further towards a wider smart-concept". The subsequent summary put smart cities as one of four priorities resulting from the workshop, together with smart energy production, smart transportation and smart energy infrastructure. Figure 3 shows the interrelatedness between smart cities and the other priorities (NCE press release 17.12.2010).

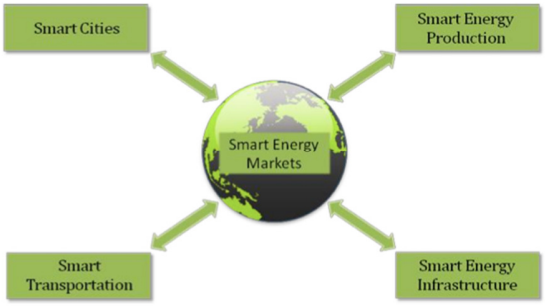

Figure 3 NCE Smart Energy Markets concept

In the workshop smart cities was defined as "communities, factories, offices and houses", with a clear emphasis on energy and ICT based solutions as drivers for smart cities. In the documentation it is stated, "Our approach is the Smart Energy Markets perspective on all the other areas/boxes. Flow of both energy and information makes it smart, as basis for smarter use of Energy" (Workshop summary, 2010).

This understanding or definition is further elaborated in the annual two-day Future Conference of 2014, where the cluster invites to the conference as follows: "We examine the global trends in fusion energy and IT. National and international speakers are focusing on energy and ICT's impact on the future of smart cities" and "We look at how energy and ICT will influence the development of smart cities and regions and cities as a starting point. We present projects from the region".

ANALYSIS & DISCUSSION

NB! This part is not written out.

What is Smart City in the county (criteria, translations, local preconditions)?

Do the county at all have the possibility to be a Smart City/County?
Where is the focus on sustainability? Can it be traced?

We explore, look for connections and events and actions, confront and discuss and gradually build an analysis on a detailed account of actors, actions and events taking place. The analysis is thus about identifying and telling the stories that define actors and contributions and the translations that hold the actors together.

In a workshop summary from late 2010 the NCE defined Smart Cities as "communities, factories, offices and houses", with a clear emphasis on energy and ICT based solutions as drivers. In the documentation it states, "Our edge is the Smart Energy Markets perspective on all the other areas/boxes. Flow of both energy and information makes it smart, as basis for smarter use of Energy". Is the statement true? Is it an argument to try to influence public opinion and local and regional decision makers? Is the statement a correct description of reality? These and similar questions are not relevant for us. We are not interested in the intensions or the "truth" behind the contributions. What is relevant is how the actions translate the smart cities discourse.

The concept of Smart Cities was to be fulfilled through the clusters technology and competence.
Finding: joint application development + joint project, but run mostly independently (VRI project) + coupling of energy and building projects + cluster technology and competence as drivers for the other areas

Finding: presentation + an understanding of smart cities as tech + cluster technology and competence as drivers for smart cities

Findings: cluster technology and competence as drivers for smart cities + project proposition + change of market focus

Findings: focus of cluster technology and competence as core for smart cities initiatives + binding of the municipalities to the cluster version of Smart Cities (?)

As shown in Figure 3 the cluster puts Smart Energy Markets in the centre, and smart cities at the same level as for instance smart transportation. Others (literature) might argue that smart transportation is part of a smart cities concept. From this it is possible to conclude that the cluster is looking for business models and market opportunities in smart cities, which is based on the clusters existing competence and technology. They then introduce to the regional actors the concept of smart Cities as a technological concept. As the only major actor in the region promoting smart cities at the moment and as they have been able to get the municipalities aboard, the clusters version of smart cities is the current status of the concept.

Smart grid/energy use is a very narrow part of the complex smart city concept; hence NCE reduces smart city to a very narrow "path". If NCE are "allowed" to define the resulting local focus a lot of opportunities could be missed out on.

Another perspective is given in Huber & Mayer (2012?): "*Based on our data, we claim that Smart City does not provide any specific new orientation in terms of content that would allow distinguishing it clearly from other city labels such as Green Cities, Sustainable Cities or Low-Carbon Cities. Yet, the term might be useful for framing the transitioning process, as most interview partners stressed the need to organize the ways of collecting, processing and connecting available information for an efficient resource management (instrumental-economic dimension), the rules and processes of defining objectives and actions for future pathways of the city development (administrative-procedural dimension) and to reorganize the patterns of interaction between city stakeholders (governance dimension).*"

CONCLUSION

NB! This part is not written out.

To sum up, this paper has explored theoretically how the Smart City concept could be understood, and how a constructed business cluster in a Norwegian region utilizes the Smart City concept establishing common projects for business development.

The paper is drawing on insights from a case study and theorizing the translation of the global idea of Smart City to local initiatives. The main contribution to the IMP discourse is to ccontribute to the understanding of local translations of global ideas for innovation and business development - and hopefully, a more sustainable development (Brekke, 2009; Håkansson & Waluszewski, 2002).

Bibliography list

Allen, D. T., & Shonnard, D. R. (2002). *Green engineering: environmentally conscious design of chemical processes*. Upper Saddle River, N.J.: Prentice Hall PTR.

Andersson, G. (2011). *The assembly of lean production: an analysis of doing production improvements* (Vol. 2011:173). Trondheim: Norwegian University of Science and Technology.

Ballard, D., 2005. Using learning processes to promote change for sustainable development. *Action Research*, vol. 3(2), 135-156.

Basurko, O.C. & Mesbahi, E., 2012. Methodology for the sustainability assessment of marine technologies. Journal of Cleaner Production (2012), doi:10.1016/j.jclepro.2012.01.022

Brekke, A., 2009. *A Bumper!? An Empirical Investigation of the Relationship between the Economy and the Environment (PhD thesis)*. Oslo: BI. 2009:03. http://web.bi.no/forskning/papers.nsf/wSeriesDissertation/0AE7EB8E4407004FC12575B00049A353

Bremdal B. & Gustavsen, K., 2010.

Callon, M. (1986). Some elements of a sociology of translation domestication of the scallops and the fishermen of St Brieux Bay. In J. Law (Ed.), *Power, Action and Belief. A new Sociology of Knowledge?* (pp. 196–233). London: Routledge & Kegan Paul.

Campbell, T. (2012). *Beyond smart cities: how cities network, learn and innovate*. Abingdon, Oxon ; New York, NY: Earthscan

Caragliu, A., Del Bo, C., & Nijkamp, P. (2009). *Smart cities in Europe*. VU University Amsterdam, Faculty of Economics, Business Administration and Econometrics. Retrieved from http://ideas.repec.org/p/dgr/vuarem/2009-48.html

Cohen, B. (2014). Smart City indicators. Retrieved from http://www.boydcohen.com/smartcities.html 09.05.2014

Edquist, C. (2005). Systems of innovation. perspectives and challenges. In J. Fagerberg, D. C. Mowery & R. R. Nelson (Eds.), *The oxford handbook of innovation* (pp. 181-208). Oxford: Oxford University Press.

Elzen,B., Geels F. W., & Green, K. (2004). *System Innovation and the Transition to Sustainability.* Cheltenham; Edward Elgar Publishing Limited.

Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and "mode 2" to a triple helix of university-industry-government relations. *Research Policy, 29*, 109-123.

Florida, R. (1995). Toward the learning region. *Futures*, 27(5), 527-536.

Giffinger, Rudolf; Christian Fertner, Hans Kramar, Robert Kalasek, Nataša Pichler-Milanovic, Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". http://www.smart-cities.eu/. Vienna: Centre of Regional Science. Retrieved 2009-11-11.

Glavič P. & Lukman, R., 2007. Review of sustainability terms and their definitions. Journal of Cleaner Production, 15 (2007), 1875-1885.

Harman, G. (2009). *Prince of Networks*. Melbourne: re.press.

Heijungs, Huppes, and Guinée 2010. Life cycle assessment and sustainability analysis of products, materials and technologies. Toward a scientific framework for sustainability life cycle analysis. *Polymer Degradation and Stability*, 95 (2010), 422-428.

Holmqvist, M., 2004. Experiential Learning Processes of Exploitation and Exploration within and between Organizations: An Empirical Study of Product Development. *Organization science*, 15 (1), 70-81. Stable URL: http://www.jstor.org/stable/30034711.

Huber, A. & Mayer, I. (2012). Smart Cities: an emerging city concept to frame sustainable transitions? Paper presented at the *International Conference on Sustainability Transitions*. Retrieved from http://dev.eifer.uni-karlsruhe.de/spip.php?article133 09.05.14.

Håkansson, H., Ford, D., Gadde, L.-E., Snehota, I & Waluszewski, A. (2009) *Business in Networks.* Glasgow: John Wiley & Sons Ltd.

Håkansson, H. and Waluszewski, A. (2002). Managing Technological Development. IKEA, the environment and technology. London: Routledge.

Klein, J. A. (c2004). *True change: How outsiders on the inside get things done in organisations*. San Francisco, CA: Jossey-Bass.

Klev, R., & Levin, M. (c2009). *Forandring som praksis: Læring og utvikling i organisasjoner*. Bergen: Fagbokforl.

Latour, B. (1986). The powers of association. In *Power, Action and Belief. A new Sociology of Knowledge?* (pp.

264–280). London: Routledge & Kegan Paul.

Latour, B. (1997). The trouble with Actor-Network Theory. *Philsophia*, *25*(3-4), 47–64.

Latour, B. (1999). On Recalling ANT. In J. Law & J. Hassard (Eds.), *Actor Network Theory and After*. Blackwell Publishers.

Latour, B. (2005). *Reassembling the social : an introduction to actor-network-theory*. Oxford: Oxford University Press.

Levin, M. & Ravn, J. (2007). Involved in Praxis and Analytical at a Distance. *Systemtic Practice and Action Research*. 20 (1), 1-13. DOI 10.1007/s11213-006-9045-1

Lipshitz, R., Popper, M., & Friedman, V. J., 2002. A multifacet model of organizational learning. *The Journal of Applied Behavioral Science, 38*(1), 78-98.

Lovins, L. H. and Cohen, B. (2011) Climate Capitalism: Capitalism in the Age of Climate Change. New York: Hill and Wang.

Meadows, D. H. 2009. *Thinking in Systems. A Primer.* Oxon, UK: Earthscan (imprint of the Taylor & Francis Group, an Informa business).

Porter, M. E. (1990). *The competitive advantage of nations*. London: Macmillan.

Rubach, S., 2011. *A Dual Organization-Development (OD) Process. Bridging the learning processes in a network and the local learning processes in the participating company* (PhD thesis). Trondheim: Norges teknisk-naturvitenskapelige universitet. 2011:131. Stable URL: http://ntnu.diva-portal.org/smash/record.jsf?pid=diva2:435477

Stake, R. E. (2000). Case studies. In N. K. Denzin, & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 435- 454). Thousand Oaks, CA: Sage Publications.

Van de Ven, A. H. (2007). *Engaged Scholarship. A guide for Organisational and Social Research.* New York: Oxford University Press Inc.

West, J., Chesbrough, H., & Vanhaverbeke, W. (2006). *Open innovation: researching a new paradigm*. Oxford: Oxford University Press.

Appendix 1

Table 1 Smart City indicators (Cohen, B., 2014)

Dimension	Working Area	Indicator	Description
Environment	Smart Buildings	Sustainability-certified Buildings	Number of LEED or BREAM sustainability certified buildings in the city
	Resources Management	Total Energy Consumption	Annual Total Electrical Energy Consumption per capita (in mWh)
			Annual electricity consumption per capita (mWh)
		Carbon Footprint	Annual CO2 emissions per capita (in tonnes)
		Waste Generation	Annual total waste volume generated by the city per capita (in kg)
			Annual household waste per capita (in kg)
	Sustainable Urban Planning	Green Space per Capita	Urban green open areas per capita (in m2)
Mobility	Efficient Transport	Clean-energy Transport	Percentage of Clean-energy Transport use (electric train, subway/metro, tram, cable railway, electric taxis, bicycling)
	Multi-modal Access	Public Transport Use	% of Public transit trips / Total trips
	Technologic Infrastructure	Access to real-time information	# of public transit services that offer real time information to the public: 1 point for each transit category up to 5 total points (bus, regional train, metro, rapid transit system (e.g. BRT, tram), and sharing modes (e.g. bikesharing, carsharing)
Government	Online services	Online Procedures	Number of online procedures performed / total procedures
	Infraestructure	WiFi Coverage	Number of WiFi hotspots per km2
		Diviersity of Sensors	Diversity of installed sensors for monitoring the following categories (1 to 5 points): air & noise contamination; waste, transit, emergency, other
		Municipal human resources	% of administrative employees with university degree
	Open Government	Data sets	Total # of open data sets (excluding regulations/laws) with information for the last 3 years
		Open data	# publicly available applications utilizing open
Economy	Oportunity	New startups	Number of new opportunity-based startups
		R + D	% GDP invested in R&D in private sector
	Productivity	GRP per capita	Gross Regional Product per capita (in US$)
	Local and Global Conexion	ICT Cluster	% of ICT companies based in local clusters
		International Events Hold	Number of international congresses and fairs atendees.
Society	Integration	Internet-connected Households	Percentage of Internet-connected households
		Gini Index	Gini coefficient of inequality
	Education	University Graduates	Number of University Graduated per 1000 inhabitants
	Creativity	Creative Industry Jobs	Percentage of labor force (LF) engaged in creative industries
Quality of Life	Culture and Well-being	Life Conditions	Percentage of inhabitants with housing deficiency in any of the following 5 aereas (potable water, sanitation, overcrowding, deficient material quality, or lacking electricity)
		Investment in Culture	Percentage of municipal budget allocated culture
	Safety	Crime	Number of crimes per 100,000 inhabitants
	Health	Life Expectancy	Life Expectancy at birth
			Smart City Index

Appendix 2

Håkansson and Ingemansson (2011) conclude that to transfer more substantial knowledge, or to transfer knowledge that is more complex and more embedded (sticky), there is a need for both cooperation and networking. Such interaction can lead to creation of new and/or joint knowledge. Håkansson and Ingemansson further state that the kind of interaction which they have called networking happens when there are three or more knowledge bodies confronting each other. The number of interfaces increases and the situation becomes more complex, but this also gives more opportunities for change and development. The actors are then involved in continual learning situations on a more long-term basis. They must be motivated to learn from specific suppliers and customers; the overall goal is to establish a more efficient and knowledgeable organization through interaction with other companies and organizations.

This is mirrored in the dual organization-development (OD) model for network participation (Rubach, 2011), see Figure 1. The model is based on the co-generative learning model initially developed by Elden and Levin (1991), and further developed by Greenwood & Levin (2007) and Klev and Levin (c2009). Here communicative processes at different arenas are integrated in the same learning process (Klev & Levin, c2009, p. 73). The model captures that insiders and outsiders use different frameworks, i.e. ways of understanding, language, or cognitive maps. These need to be combined to develop "local theory," which is a newly shared framework. Knowledge development through concrete problem solving (actions) is what actually moves the OD process forward. The sociotechnical systems perspective here becomes evident because it is through changing praxis development and readjustments in organizations are created. The results of an OD process should be both an increased ability to accomplish the right tasks and to handle future challenges in a smarter and more effective way. The proof of this is simply improved abilities in action (Klev & Levin, c2009). This model can be used to understand what happens both in the cooperating or networking arena and back in the single company/organization. The common engagement in concrete problem solving will help in the process of revealing tacit and explicit knowledge and knowing how (e.g. Lundvall & Johnson, 1994; Polanyi, 1967; Ryle, 1949).

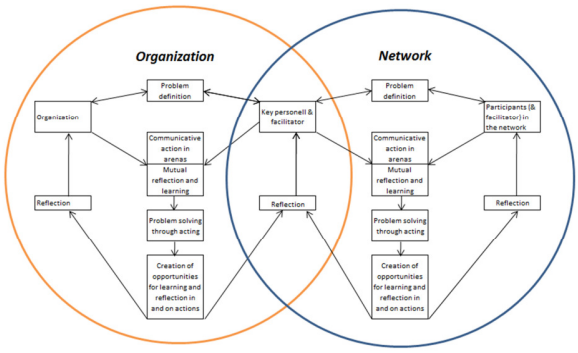

Figure 4 The dual organization-development (OD) model (Rubach, 2011)

To base the view of OD as a learning process (Klev & Levin, c2009) put emphasis on the role of those who are the actual problem owners and the emphasis on a continuous change process (long-

term process) rather than a limited-time one. If the problem owners are invited into and are allowed to participate in the process, then a coreflective learning process is initiated from the very beginning. This invites to a dialogue where different viewpoints are brought to the table, and the learning opportunities expand.

However, the participants in regional innovation initiatives (network) must be motivated by the opportunity to work together and explore opportunities with others. In addition to collaboration, time, training, and trust are the key elements which one must be willing to invest or develop. In return they will gain access to a web of knowledge of new ideas, learn a new structural way to work based on collaboration (Miles, Miles & Snow, 2005). Obstacles can include the lack of willingness to invest time in the collective process, hence failing to establish and develop the common more efficient and knowledgeable organization (the network in the dual OD model) (Miles, Miles & Snow, 2005; Rubach, 2011). In order to succeed in this the actors have to become *learning organizations* (Miles, Miles & Snow, 2005; Senge, c2006).