**Urban big data as innovation platform in smart city context – Case Helsinki**

**Keywords:** big data, smart statistics, smart city, social interactions, learning, Helsinki

**Introduction**

We are in the midst of a new economic age, a complex competitive landscape defined largely by globalization and digitalization. That means that the utilization and production of knowledge and innovativeness have become critical to organizational survival. (Uhl-Bien – Marion - McKelvey, 2007). That development has had its impacts also to urban development. Urban development, performance and competitiveness are seen depending on the availability and quality of knowledge. (Caragliu - Del Bo – Nijkamp 2011.)

Smart city has been in discussions and became fashionable especially after year 2010, but is still somewhat fuzzy or not clearly defined. Smart city has been used even to refer cities which do not have clear strategies or processes supporting that. (Dameri - Cocchia, 2013.)

The smart city concept originated from that of the ‘information city’, but has now much broader and deeper scope. As in the case of City of Helsinki the term ‘ubiquitous’ was widely in the use in the early phase of the smart city concept. That term ubiquitous was derived from ‘ubiquitous computing’. And thus on that very early stage of smart city –concept development the dominant thinking was about defining services via integration of IT. (Lee - Phaal - Lee, 2013.)

What has changed is the exponential rise in the volume of raw data available to us. Big data phenomena within urban context is growing exponentially among public sector organisations. There is no precise and exact definition of big data. There is no numerical or quantified definition for big data and it has be seen more as massive and typically very complex sets of information. The concept has referred to massive, voluminous amount of data and secondly to the analysis of that data. Despite of the variations of the definitions they all have at least one of the following assertions common: the massive size of the dataset, the structural complexity of the data and the technologies are needed and used to analyze the datasets. The quantitative and computational techniques’ side of big data has over 40 years history, but what is now changing and creating the real revolution is how we are using big data. (Mayer-Schönberger & Cukier 2013, 6-9; Ward & Barker 2013; Barnes 2013.)

As Michael Batty noted what is needed is a new theory, since data without theory is not sufficient (Batty, 2013). The theory need asks forth understanding of how to use analytics to improve e.g. public services. And thus it will also have a significant impact on how we collect, use and interpret data and how professionals and experts work. In a highly connected information society, learning and the process of acquiring new skills and knowledge are of fundamental importance and define whether we are active participants or passive observers in the digitalisation process. Importantly, it is not just about learning new skills but unlearning old ones. The challenge for us is to develop new adaptive communities and working methods and to ensure that people embrace change while maintaining and gradually transitioning away from old practices. (Laitinen et al., 2017.)

**Methods**

The data is produced in one thematic interview and focus group interviews. People in the interviews represent different kind of experts and specialists. Some of them have, for instance, professional backgrounds in technological or ICT sectors. There are specialists from the technological sector, social and health care sector and from research and innovative oriented units in the focus groups. All interviewees work for the City of Helsinki and are involved in Smart City or digital Helsinki programs.

The topics of empirical research are generated according to earlier studies of adaptive leadership, learning, and smart city. The research focus on the following themes: the concept of

smart city, digitalization, big data, smart statistics and learning.

As to the methodological approach, the research is based on critical realism. The purpose is to combine various theoretical perspectives with the empirical case in order to explain the

phenomenon, and to discover new insights into theoretical development (Bhaskar, 2014; Tuurnas 2015). What makes critical realism critical is taking a step beyond falsification, applying the possibility that ‘indentification and retardation of those mechanisms that createfalse beliefs can contribute to emancipation’ (O ́Mahoney & Vincent, 2014). Critical realism emphasizes theory as a “tool” to generate knowledge into better explanations of social phenomena.

The cornerstone of the realist project is a distinctive viewpoint on how interventions bring about change. We apply realist evaluation which stresses four key linked concepts for explaining and understanding programmes: ‘mechanism’, ‘context’, ‘outcome pattern’, and ‘context-mechanism-outcome pattern configuration’ (Pawson and Tilly 1997). Context describes the features of the conditions in which programmes are introduced, and that are relevant to the operation of the programme mechanisms. Mechanisms describe what it is about programmes and interventions that bring about any effects. Outcome-patterns comprise the intended and unintended consequences of programmes, resulting from the activation of different mechanisms in different contexts. The themes gave the general frame and

the empirical material was produced on the basis of open interviews.

**Results**

City of Helsinki is globally recognized as one of the most prominent smart cities and big data urban platforms (Almirall et al., 2014). Helsinki is the capital and largest city in Finland in the region of Uusimaa, southern Finland. Helsinki has approximately 643.000 residents.

Helsinki scores high in the European digital city index, being 4th on 2015 and 2016 (EDCI, 2015; 2016). The CITIE 2015 index, City initiatives for technology, innovation and entrepreneurship, notes that Helsinki, which was 3rd on that index, has the most consistent profile of any of the top 5. CITIE describes that Helsinki has a highly collaborative approach to working with local entrepreneurs and has been developing high-quality digital solutions for citizens. (Citie, City Initiatives for Technology, Innovation and Entrepreneurship, A Resource for City Leadership, Citie.org, June 2015.)

City of Helsinki is a public sector ecosystem. In Helsinki new ecosystems and models are tested and developed in service pilots where everything is based on actual demand. The operating model of the City of Helsinki is based on openness and transparency. City of Helsinki has been one of the world leading cities in opening and utilizing public data. Due to aforementioned City of Helsinki is a testbed and platform of e.g. new smart mobility solutions.

Platforms are typically based on open system thinking in the City of Helsinki. This means that actors typically have open access. The purpose might be, for instance, that all service users have the right to get the relevant information on the plans concerning their city district.

The contents of smart city program is very comprehensive in the City of Helsinki. The idea

is that not only city employees are integrated the program but also, for instance, service users and stakeholders, such as private companies. The ideology of the program is based on open system thinking. The programme covers various activities of the city, such as social

and health care services, traffic, and environmental issues.

The smart city program especially brought together two activities: smart technology development and participation. In this context, learning is related to issues on the actors’ participation and technological development as well. The pivotal question is how technological development is linked with actors’ participation.

Advanced analytic models are needed to enable data-driven optimization. The quantitative and computational techniques’ side of big data has longer history, but what is now changing and creating the real revolution is how we are using big data. Big data enables public managers to decide on the basis of evidence rather than intuition. With big data the challenge is that experts and managers cannot follow the old concepts. And for that reason it has the potential to change and even revolutionize public management.

The question is how to use analytics to improve the public services. It refers to the novel ways to render big data, an information technology driven sensemaking process, decision making and learning thru conceptualisation, algorithmic rendition and presentation. Big data leads to proclaim the emergence of dataintensive exploration that can also be seen as a challenge for learning and old management concepts. The technical challenges of using big data are very real, but the adaptive challenges are even greater.

Extensive data also means that there is more open data to citizens, service users, and companies. Smart technology will help to analyse data but people have an essential role as well.

It is important to note that the “smartness” of a city lies not only in infrastructures, but also in the social capital that a region is able to generate to promote social innovation and re-gional development.

Those challenges to adoption of smart technologies are eg. the following:

* Current Smart City models focus on technical solutions for public services (eg. transport)
* Those models bypass the dangers of new digital divides (especially by gender, age, migrant status)
* Models are not accompanied by learning especially non-formal adult learning

**Conclusions**

Even though Current Smart city models promote accessibility and openness of data and thus prepares society for changes triggered by innovative and smart technologies so that citizens are co-constructors of knowledge and value peer-to-peer platforms and information sharing, those models lack of high level strategy linking ‘smart’ and ‘learning’.

The evolution patterns of a smart cities highly depend on its local context factors (Neirotti et al., 2014). In this context smart cities are not possible outside the development of smart communities; communities that have learned to learn, adapt and innovate (Coe *et a*l. 2001; Schuller *et al.* 2000; Schuler, 2001), according to the lifelong learning paradigm (OECD, 1996; UNESCO, 1996). Learning is a process of acquisition and transformation of knowledge that enables continual adaptation to the environment to take place. The key role played by learning processes, both individual and social within the community at different levels (from the individual to the company, to groups of enterprises connected to each other and to government bodies) in the production of constant change is paramount so that an economic organization based on awareness and learning is able to flourish (Florida, 1995).

A challenge is that communities are unlikely to invest in interpreting data, to participate learning activities etc. unless those are linked to action that provides clear local benefits. Following Alex Pentland (2015) it can be stated with big data there is actually novel chances to look at the dynamics of social interactions and how they play out. Smart City does not end there, but understanding social interactions and human-machine systems is what are going to make our future in Smart City context. Then the challenge is to figure out how to analyze and combine statistical data, big data and the social context to build systems based on understanding these connections. Thus there is a real need to connect data analytics and smart statistics to people centric smart City models.

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