

# Challenges and Unwanted Features of the Smarter Cities Development

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**Abstract.** This keynote paper establishes the framework for three introductory sessions at the Mobility and Smart Cities conference held in Roma 27–28 October 2014. In the light of the latest knowledge and scientific projects findings the authors present actual R&D trends in the field of smart solutions for sustainable mobility based on ICT. New ideas, cutting-edge innovations and technologies for mobility agenda are needed together with multidisciplinary perspective and holistic approach applied. However, the positive expectations of sustainable mobility growth might also have some negative effects on the life and behaviour of citizens and institutions. The paper indicates both positive and negative aspects of the smart city developments to open the floor for cross-fertilization of critical and incentive ideas.

**Keywords:** Smart city · Mobility · Infrastructure · Security · Sustainability

## 1 Introduction

This contribution has been prepared as the keynote paper whose principal intention is to flag up the core message of the conference and to set the mood and tone for it. The main term being in the centre of the attention is the “Smart City” concept. Although it can refer to futuristic concepts such as fridges that order groceries from the local supermarket when their stocks run low, we can already see examples of smart city systems in the Gulf in countries such as Qatar, Kuwait, Saudi Arabia and the UAE. Therefore, when defining the content of this term we could identify with the definition applied in documents of the EC DG CONNECT [1, 2]: “Smart cities should be regarded as systems of people interacting with and using flows of energy, materials, services and financing to catalyse sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society”. The concept of the “smart city” emerged during the last decade as a fusion of ideas about how Information and Communication Technologies (ICTs) might improve the functioning of cities, enhancing their efficiency, improving their competitiveness, contributing to sustainable development and high quality of life and providing new ways in which problems of poverty, social deprivation, and poor environment might be addressed [3, 4]. The essence of the idea has revolved around the need to coordinate and integrate technologies that have previously been developed

separately from one another but have clear synergies in their operation and need to be coupled so that many new opportunities which will improve the quality of life can be realized. Thus the ICT is merged with traditional infrastructures, coordinated and integrated using new digital technologies. Cities are becoming smart not only in terms of the way we can automate routine functions serving individual persons, buildings, traffic systems but in ways that enable us to monitor, understand, analyse and plan the city to improve the efficiency, equity and quality of life for its citizens in real time... [5]. Currently the central role of ICT lies at the core of the concept, but the term “smart city” goes beyond the idea of ICT-driven cities, embracing also the investment in human, social, and environmental capital.

The topic of Smart Cities has been on the table for more than a decade, discussed at different forums. Inevitably the interest in the agenda permanently grows - this conference is one of many events on the way towards integrated, interdisciplinary and holistic understanding of the whole concept.

It is not surprising that Smart Cities have become an Agenda of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) which brings together cities, industry and citizens to improve urban life through more sustainable integrated solutions. This includes applied innovation, better planning, a more participatory approach, higher energy efficiency, better transport solutions, intelligent use of ICTs, etc. The Partnership aims to overcome bottlenecks impeding the changeover to smart cities, to co-fund demonstration projects and to help coordinate existing city initiatives and projects, by pooling its resources together. This initiative has a budget of €365 Million and includes energy, transport and ICT sector with the launch of the Partnership in July 2012 [7]. The Action Clusters Kick-Off Conference was held on 9th October 2014 in Brussels where key objectives and role of Action Clusters under the Partnership were presented.

## 2 Challenges and Unwanted Features

The concept of Smart City brings a lot of challenges when seen from various perspectives of different stakeholders with different interests and expectations. They should be seen in the context and solved within the given EU framework: the level of urbanization in EU is above 75 %, to rise to 80 % by 2020, with cities consuming over 70 % of energy and emitting as much of greenhouse gases in EU. To achieve EU 20-20-20 climate and energy goals there is need to act now [1]:

- 20 % reduction of CO<sub>2</sub> compared to 1990.
- 20 % share of renewable energy in total energy mix.
- 20 % improvement in energy efficiency.

To create the markets the EU has adopted the approach mostly based on:

- Tackling common challenges and bottlenecks.
- Developing innovative and replicable solutions.
- Bundling demand from cities and regions.
- Attracting and involving business and banks.

The common aim is to transform a number of European cities by exchanging of Best Practices, learning from each other and funding through H2020 for selected demonstration projects. The following areas have been given the highest priority [1]:

- Urban sustainable mobility (multi-modal transport planning, alternative energy carriers, smart logistics, etc.).
- Districts and built environment (integration of renewables, positive energy districts, deep retrofitting, etc.).
- Integrated infrastructures (cross-sectorial infrastructures integration, joint planning and business models, common standards, ...).

Development and implementation of partial goals gives a lot of challenges together with potential obstacles and unwanted features. Official documents summarize existing challenges - a reader may go through them easily. Therefore at this point let us leave the official frame of EU documents, goals, projects and/or initiatives and try to consider at least some of them, explaining their subjective understanding by the authors.

**Common Language:** The success of smart cities solutions highly depends on understandability and the common language used by all involved parties - stakeholders. For the sake of illustration let us mention particular example of situation which occurred within EIP-SCC Action Cluster Kick-off Conference on 9th October 2014 in Brussels. When presenting the City Platform action cluster, the given Criteria, Key questions etc. were typically based on ICT language (Open APIs, Open SDK, Open authentication, Interoperability of OSs ...). Logically this became a point of criticism raised from the presented mayors. Their practice requires completely different language based on solutions of everyday problems of citizens and their needs. Not many of them are ICT-educated and fully understand potential of technical solutions for development of urban areas.

**Focus on Citizens:** To make any successful application – two subjects are very important: citizens and their needs. Any change must come bottom-up, i.e. be based on (smart) citizens' needs. The problem is what these needs are? Are they really known? How to collect them? How to scale their importance? Are there any “common problems” typical for every city/town that bring some “common needs”? What about specific needs resulting from local specificities – what do they depend on? Building a change without knowing the needs is risky since it may cause wide public unacceptance and thus losing invested money and opportunities to grow. It is not a good strategy to bring a technical solution fulfil some needs (e.g. because a “suitable provider” is at disposal) and consequently to search for potential recipients. Vice versa approach must be ensured.

**Involvement of Local Government:** Politicians on the local level (and usually not only on that) may be often close minded if talking about the projects exceeding time of their election period. The sore point is then how to really involve mayors into such projects especially if some long-term financing/co-financing is needed to reach goals behind duration of their mandates. Municipalities should know the actual (and predict the future) needs of their citizens. However, at present we are often observers of collecting data without any output.

**Focus on the Right Target Group:** Another legitimate question is who is the proper audience for the Smart City and Mobility agenda? Some of the previously mentioned events (e.g. Smart Living City – Dubai 2014) could raise a presumption that we are mostly talking about projects focused on either existing cities or on Greenfield initiatives, building the cities from the ground up and investing billions of dollars. The European statistics gives a little bit different dimension to our considerations: 65 % of EU population can be found living in the cities with population about ca 60.000 inhabitants. Those cities seem to be ideal candidates and recipients of the EU initiatives on Smart Cities and Mobility.

**Concentration on Abstract or Technical Level First?:** Actually predominant view is that technical solutions are in principle well available and thus one should concentrate on the abstract level first and postpone discussions about technical aspects to later stages to avoid technocracy approach, overshadowing the real needs and added values for each group of stakeholders (mayors, citizens, energy suppliers, traffic operators, etc.). In any project it must be clear from the very beginning who is a partner to whom and what the roles of all stakeholders are. That requires an abstract and high-level approach first.

**A Kind of Needed Research Generally:** Implementing the smart cities is more on integration and sharing of existing sources and solutions than on a specially focused new research. Obviously, validity of this statement is not categorical – new scientific findings are coming and being implemented all the time. The progress is needed, motivated by achieving new solutions ensuring energy savings, less negative impacts on environment, or helping focused group of citizens (e.g. disabled, elderly, children etc.). New interrelations and social behaviour will also bring the need to search for new data models. Talking about Smart Cities is often about executing sustainable activities in a more integrated way.

**Replicability and Open Solutions:** What is actually most needed are open data and open solutions (knowledge) how to do something that could be replicated and shared. The question is what is common and transferrable since every city/town is unique, having its historical heritage, fragmentation to various city islands, etc. The risk is that cities pursue the wrong concepts that may need huge amounts of money. They often don't realise availability of quick-win solutions that suit the city. Replicable solution can be available after finding what is common in the existing problem (needs) and in open data. The process may be fastened by standardisation and harmonization. One of the introductory steps to be taken is creation of the list what is and what should be standardized (ETSI, CEN, ISO, etc.). Both technical (application platforms) and non-technical standards (best practices) are valuable. As inspiring examples the BSI standards PA180 and PA181 could be mentioned – the former related to the Smart Cities vocabulary, the latter establishing a Smart City network [8]. The application domain is so large-scale and complex that coincidence and interrelation of multiple standards must be expected. However, the consequences of complexity may be analogical to standardisation of the ITS domain: lack of the standards in the proper time (remember non-interoperable electronic toll collection devices spread across Europe), and a high number

of existing standards which makes difficult or even impossible to effectively work with those standards, related to the given task. The latter indicated problem could be effectively solved by applying the ontological approach. From technical point of view open data and open standards indicate a trend of building one European cloud solution.

**Scalability and Measurability:** According to Haydee Sheombar from IBM [10] a part of a Smart City vision is indeed people driven, and does not require technology. However, in order to solve a specific problem, things must be measurable and incentives must be transparent. A new paradigm of smart city solutions evokes a question of scalability and measurability, i.e. how to measure performance of the achieved “smart systems”. The most common approach relies on the use of Key Performance Indicators (KPIs) that define a set of values against which to measure. They enable evaluation of the success of an organization or of a particular activity in which it engages, or defined in terms of making progress toward strategic goals. There is a need to understand well what is important, various techniques to assess the present state of the business, and the key activities, are associated with the selection of performance indicators. New ISO 37120:2014 gives cities a common performance yardstick. It provides a set of clearly defined city performance indicators and a standard approach to measure each.

**Legislation Frame:** Increasingly we can see sensors embedded in our environments that monitor and interpret our behaviour. Sensors, including cameras and microphones, position, proximity, and wearable physiological sensors, gather knowledge about our activities, interpret them in real-time, and anticipate future activities and behaviour. Actuators allow making changes to the environment, its physical appearance and its interaction and display facilities, including augmented and virtual reality display and interaction possibilities. The problem that will highly probably occur and possibly block replication of achieved sustainable solutions may arise from the actually existing legislation. As a typical example the problem of “privacy” might be indicated - privacy as the ability of an individual or group to seclude themselves. The boundaries and content of what is considered private differ among cultures and individuals, but share common themes. At the moment there are many across Europe, concerning the ways of how and where to allow collection of personal data, what are concepts of appropriate use, storage and protection of personal information. Thus the domain of privacy partially overlaps security.

**Social Dimension:** The worst thing to happen in the future is to prefer a different kind of profit (financial, personal...) of involved parties to social dimension. Reality of this threat can be seen even nowadays – one could find examples of activities where money profit prevails over humanity. The new solution may not disqualify, handicap or eliminate any selected group of citizens (disabled, elderly, children, etc.). For example the neighbourhood public open space is recognised as particularly important for older people in terms of its potential role in providing opportunities for physical activity, social contact and contact with nature. Opportunities of what could be involved in relation to social dimension of human life are practically unlimited. Being able to control a physical environment and the way its inhabitants can interact with it designers of smart (urban) environments can even create humorous situations or provide the

environment with the possibility to create humorous situations or to create potentially humorous situations that can be exploited by their human inhabitants [9]. What is more, the city is a unique location for play: its vibrancy, diverse material environments and intense social interactions provide a great basis for the creativity and challenges of playing. The goals and challenges could then be as follows: to achieve real impact on citizen's lives, to promote social cohesion in urban area, to provide support to local projects and partnerships and promote networks from local base, to reconcile the vision of decision-makers with the ideas and visions of citizens and make decision makers learn from the people they are deciding for.

### 3 Conclusions

The paper has been written with the motivation to frame the program of 3 sessions on the 1<sup>st</sup> day of the conference. The paragraph 1 and the introductory part of paragraph 2 summarize state-of-art based on publicly available official sources and research results. The rest of structured parts of the paragraph 2 contains discussion on selected problems (challenges together with threats) and reflects subjective meanings of the authors. As such it has a potential to generate discussions and information exchange.

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