

Toward Developing a Business Model in the Smart City Initiatives

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Abstract

This study explores how the smart city initiatives, network society approaches, and the Internet of things applications are developing and advancing to impact and re-shape the human life, organizational performance, and societal culture. It examines various approaches in man machine interactions and integration from an individual level to societal level. In particular, the study analyzes the process of their diffusion, impact on human systems, and opportunities as well as the challenges in their development. Based on the network theories and a sociotechnical perspective, the study plans to develop a theoretical framework that could show how we deploy resources, what we could expect in the future, and what such advances mean to individuals and organizations

Keywords: network society, Internet of Things, Sociotechnical system

1. Introduction

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In particular, the study analyzes the process of their diffusion, impact on human systems, and opportunities as well as the challenges in their development. Based on the network theories and a sociotechnical perspective, the study plans to develop a theoretical framework that could show how we deploy resources, what we could expect in the future, and what such advances mean to individuals and organizations.

Numerous smart city initiatives have been experimented or implemented in the urban environment and are making steady progress in various directions. Anthopoulos and Fitsilis (2010) classified them based on the technology applications. Walravens and Ballon (2013) analyzed platform business models of smart city services. Among others, Sivarajah et al. (2014) detailed the impact and outcome on energy management. In most of the smart city initiatives, the information and communications technology is involved as an enabler to address urban societal challenges (Boulos and Al-Shorbaji, 2014, Solanas et al., 2014). Their analysis of how smart city projects progress describes ‘how it affects the human life, the organizations, and the community,’ and ‘what aspects of the human life, the organizations, and the community are affected.’

The research questions to discuss are:

- What are the emerging business models in the smart city initiatives?
- How do we facilitate the diffusion of the smart city initiatives?
- How do we measure the impact of the value created by the smart city initiatives?
- How do disruptive new opportunities emerge in the smart city initiatives?

2. Literature Review and Analysis

In order to explore the research agenda, we apply the network society theories (Castells et al., 2005, Van Dijk, 1999) and the information technology adoption stage (Nolan, 1973) as well as the diffusion of the innovation model (Rogers, 2003) to initiate building a framework of study. Furthermore, the distributed systems and the collaboration literature (Baskerville and Myers, 2002, Townsend et al., 1998) will be employed to support and enrich the development of a framework.

In this research, an important consideration that interests us is the impact of the smart city initiatives at different levels: first, an individual and a group level; second, an organizational level; third, a community and a societal level.

At an individual and a group level, human to human, human to machines, and machine to machine interactions would be examined as depicted below:



Figure 1. Man Machine Interactions

At an organizational level, an analysis of its processes can be depicted as follows:

Different Levels and Approaches in Decision-Making	Transformation
One way Communication, Two way Communications	New Unexpected Effects, Opportunities

Table 1. Organizational Level Interactions

In addition, the study will explore how we measure the impact and value created by the Network of Things (NoT) made possible by the Internet of Things (IoT) and the Web of Things (WoT). WoT tries to apply the architectural principles that made the World Wide

Web and extend those principles to handle the physical smart objects on the Web. WoT also aims to take IoT beyond the connection of things and addresses the problems such as heterogeneity, usability, scalability, and security of, for example, a resulting cyber physical system. NoT encompasses the mobile systems and contactless human machine interface applications and, in particular, includes the agents in the virtual systems (Chung, 2014).

The following figure organizes these concepts together.

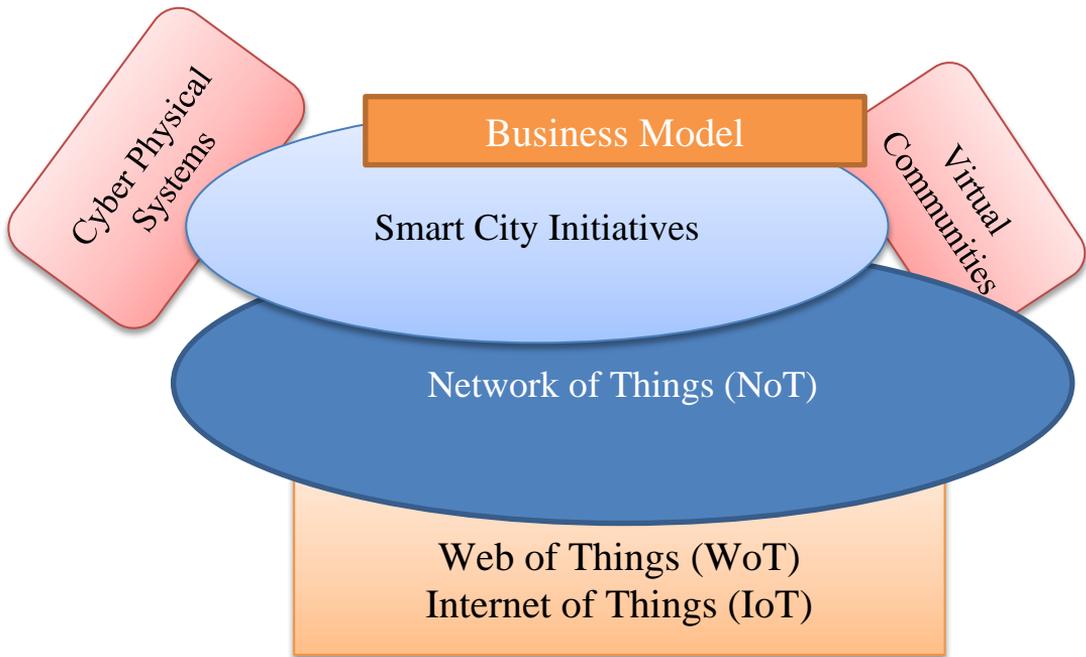


Figure 2. Various Approaches to develop an Integrated Framework

Consider the man machine interactions in a cyber physical system, which involves human in the loop. Schirner et al. (2013) exemplified NoT by designing a complex network-embedded system that augment human interaction with the physical world. Its application has an impact on the consumer life style and employs the robotics and a body area wireless network.

At an organizational level, we consider an inter-organizational system under the umbrella of NoT. On the top of connecting and multiple organizations with the information and communications technologies, an inter-organizational system evolves to be a sociotechnical entity of groups and organizations through boundaries and structures. Wenger (2002) and, later, Reimers et al. (2008) expanded the diffusion and developmental process of the inter-organizational system as Community of Practice (CoP). Their description of the embedding process in an inter-organizational system shows that the boundary objects are modified to resonate within an existing structure

through practices. In this process, there were expected, unexpected, and unplanned impact results. Such outcomes are an interesting and important consideration to observe in smart city initiatives.

Where do we capture value in NoT and consider developing or identifying a business model? According to Sawhney and Parikh (2001), intelligence in the network migrates its location and mobility. For example, back-end intelligence becomes embedded in a shared infrastructure while front-end intelligence fragments into many different forms at the network's periphery, where the users are. For mobility, the disconnected units of intelligence become the small units of floating intelligence that coalesce into temporary bundles as needed. Such dynamic re-organization of intelligence as well as the re-assembly process creates an opportunity to generate value in NoT and the smart city initiatives.

In the virtual communities, a smart city initiative often starts with the type C Virtual Community of Practice (VCoP) (Dube et al., 2006). In this type of VCoP, strong support for knowledge sharing and the direct allocation of resources stand out in the public sector. It then interacts with an individual or community participants as well as other physical organizations.

While VCoP differ from CoP, when they both work together, the frequency and the intensity of boundary crossing among them are higher in VCoP and the degree of reliance on the information and communications technology is also higher. It is similar to the cyber physical system.

At a community or a societal level, Castells (2000) focused on the specificity of the interaction based on the social morphology and the evolving structure. He emphasized that the structural transformation starts when the simultaneous and systemic transformation of the relationship of production/consumption, power, and experience occurs. In production, capital and labor are transformed and, thus, the newer set of value might be created. In particular, he mentioned the cleavage between networked labor and switched-off labor that will ultimately become non-labor. His notion of networked labor will split into self-programmable labor and generic labor. For the former, its individual interest is better served by enhancing its role in performing the goal of the network. And for the latter, however, it has to fight automation or globalization for its survival. It would certainly be interesting to examine the degradation of generic labor in the smart city initiatives.

Castells (2000) states that the networking of production relationships also leads to the inequality in consumption and social polarization, resulting in the winner-takes-all. Digital economy literature supports this phenomenon, which produced numerous cases of the winner-takes-all business models (Eisenmann et al., 2006). He foresees, in the interplay between relationships of production and cultural reframing, leading to new lifestyle among others.

In the social structure, these information and communications technologies impact the power relationship. It allows for the consumers to bypass the centralized sovereign hierarchy and offers them an opportunity to transform itself into becoming a similar or comparable to an equal level of the traditional hierarchy and shares power. In such newer state, the power of flows takes precedence over the flows of power (Castells, 2000).

An extension of the above transformation would lead to subtle changes in relationships of experience (Castells, 2000). His example shows the shift in the basis of interpersonal relationships from nuclei to networks. Finally, the fragmentation of culture leads to the individualization of cultural meaning in the communications network.

The network society in a new perspective includes the above various forms of individuals and organizations. And the information and communications technologies help shape the relationships among them.

Now we consider the process aspect of the initiatives. In addition to the diffusion of innovation materials (Rogers, 2003), Nolan (1973) developed a conceptual model on the degree of computing maturity of a company by taking into account the evaluation of information technologies as an organizational learning process. His model can be applied to gauge the level of maturity and the progress of NoT. His model has multiple stages: Initiation, expansion, control, integration and maturity stages are the ones that can be employed for the NoT study. Organizations progress through a number of successive stages and each stage reflects a noticeable level of different changes and progress from an individual to a society.

For the initiation stage, we can identify the introduction of NoT, at the expansion stage, we can see new network intelligence and value creation that might lead to the development of a new business model. At the control stage, directions, goal achievement, feedback, and return on investment are more emphasized. At the integration stage, a sign of transformation can be observed, which will lead to the maturity stage.

3. Toward Developing a Model

We can now investigate how the networks based on information and communications technology or NoT are affecting and changing the business models in the smart city initiatives.

The following table depicts the framework of its process and typology:

Factors	Transformation of Social Structure				
	Initiation	Expansion	Control	Integration	Maturity
	Technology Disruption	Network Intelligence and Value Creation	Feedback	Digital Transformation	Analog and Digital Integration
		(Smart			

Production of Capital and Labor		Health Seoul), (Smart Health Bristol)			
Consumption	(Smart City Seoul)				
Power	(Smart Health Seoul)				
Experience					
Culture					

Table 2: Framework for Developing a Business Model in Smart City Initiatives

Anthopoulos and Fitsilis (2010) classified the smart city cases and developed the different categories ranging from Virtual Cities, Mobile Cities, Knowledge Bases, Digital City, Ubiquitous City, and Eco Cities among others.

Some smart city initiatives would fit in the above table as shown in parenthesis in the above table. Solanas et al. (2014) described a conceptual smart health environment. Several real world smart city initiatives, Smart City Seoul and Smart City Bristol, fit into the above framework (Rowley, 2014, Smart City Seoul, 2013, Berst, 2013).

As more smart city initiatives are being developed and implemented, we will be able to identify new value creation cases that will lead to construct a generalized business model. At least, an anecdotal evidence shows such phenomena.

4. Conclusion

In summary, the study tries to integrate different technology-based approaches and put them in a theoretical model to portray a clear picture of their practical implications and research propositions that investigates the business models in NoT. The future study will involve analyzing the cases of the smart city initiatives and further follow up their progress and diffusion paths.

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