

# A Framework for Understanding Smart City Governance as a Sociotechnical System

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## ABSTRACT

Considering the complex and dynamic challenges of the digital age, a holistic perspective is important for continued development of governance. This ongoing research addresses the following question: Which factors are related to the design of smart city initiatives in a holistic perspective? Therefore, this article aims to develop a multidimensional framework of smart city governance initiatives, considering aspects of the sociotechnical approach. To explore and illustrate it this study takes the perspective that by improving the quality of life and working on the changes in government workforce through technology the results from smart city initiatives will include holistic factors of the urban system. The contribution of this study is the extending of smart city research in a sociotechnical view.

## CCS Concepts

• Applied computing–E-government

## Keywords

Smart Cities; Smart Governance; Sociotechnical Approach; Holistic Factors; Societal Trends; Quality of Life

## 1. INTRODUCTION

The Information and Communication Technologies (ICT) have a potential value in all sectors, such as governments, non-governmental organizations and social movements, which can use them to broaden participation, transparency and accountability [1]. The use of ICT in government is an innovative way for governments to significantly improve service delivery and interaction with stakeholders [2, 3, 4]. Considering the complex and dynamic challenges of the digital age, a holistic perspective is important for continued development of governance [5].

Dawes [5] developed potential scenarios of society and government based on a stakeholder investigation. In doing that, the author presents a framework that encompassing interactions between societal trends, human elements, changing technology, information management, interaction and complexity and the role of government, representing e-governance as a dynamic open sociotechnical system. The open system is one of the most important concepts in developments of the sociotechnical theory. It recognizes that a sociotechnical system is affected by the environment in which it is incorporated, including

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internal subsystems in addition to the external environment becoming more complex [6]. According to Meijer and Bolívar [7] the focus of e-government studies has been the understanding of how governments could use technology to improve the quality and effectiveness of their internal operations and public services delivery. Recently, e-government studies, along with technology and innovation literature, have been connected to urban development to develop a new approach to make cities smarter [8, 7]. In this view, the synergy between social structure and technology has been analyzed at the level of the urban system, besides the organizational one [7].

As well as e-government initiatives, most smart cities initiatives are characterized by ICT-oriented government to better serve citizens [9]. Cities around the world are managing their operations in a more innovative way to prevent social, political and organizational issues from the rapid urbanization [8]. More than technical issues, another set of problems is social and organizational, that are substantially associated with multiple diverse stakeholders, high levels of interdependence, competing values, and social and political complexity [8]. Beyond the traditional concerns associated with e-government, a sociotechnical perspective encompass matters of societal and human needs and capabilities, dynamic interaction among social and technical developments, and the values and institutions that underlie democracy [5]. In that way it is possible to analyze smart cities as a sociotechnical system in which “human, organizational, and institutional considerations exist in a mutually influential relationship with processes, practices, software, and other information technologies” [10, p.392]. Thus, this paper addresses the following question: Which factors are related to the design of smart city initiatives in a holistic perspective? Therefore, this article aims to develop a multidimensional framework of smart city governance initiatives, considering aspects of the sociotechnical approach.

## 2. CONCEPTUALIZING SMART CITY GOVERNANCE AS A SOCIOTECHNICAL SYSTEM

This section aims to explore literature from fields such as e-government, to address initiatives undertaken by the government to become more intelligent. In doing so, it was conceptualized how governments are becoming a smart city adopting not only technology innovation but also worrying about aspects such management, governance and policies. Thus, the smart governance term is used to describe the activities that invest in emerging technologies with innovative strategies to achieve more agile and resilient government structures and governance infrastructure [11].

A key point when dealing with a smart governance scenario is that organizations in addition to increasing efficiency, effectiveness and transparency in the management and delivery of public services [12], create an environment of collaboration with other

organizations and with the public [13, 12]. Meijer and Bolívar [7, p.7] present the following definition of smart city governance: “the smartness of a city refers to its ability to attract human capital and to mobilize this human capital in collaborations between the various (organized and individual) actors through the use of information and communication technologies”. They emphasize the three focus of a smart city definition, the technological one, the human resource focus and the governance (collaboration).

The question of designing synergies between social structure and new technology has been emerging for an urban system level [7]. The sociotechnical approach might help the analysis of e-government initiatives into a humanistic value system that encompasses a concern for personal development and happiness [6]. The sociotechnical approach states that successful systems must provide a simultaneous configuration of social and technical elements [6], besides organizational elements. Thus, the main objective of sociotechnical approaches is ensuring that technical and human factors have the same weight in the design process, so a balance between the efficient use of technology and an improved quality of life for employees impacted at work. Still, the approach has a democratic factor since the values and needs of employees are considered in the design of a project [6].

### 3. CONCEPTUAL MODEL

The proposed framework (Figure 1) is based on the idea that these initiatives undergo a linear structure of input, processing and output.

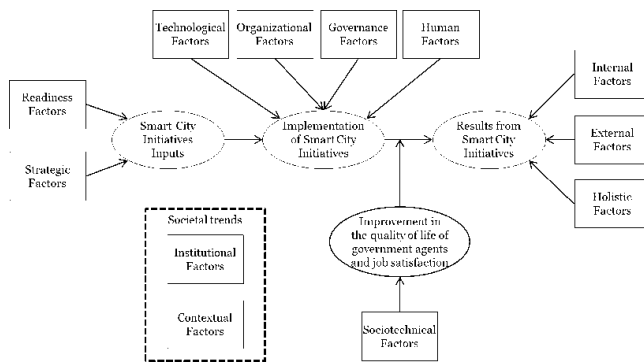


Figure 1. Conceptual Model

Inputs in smart city initiatives consist of strategic factors that represent the purpose and role of government, including aspects such as values, motivations and goals [5]. The processing is associated with implementation of initiatives itself. This implementation involves aspects such as technological factors (interoperability, information and data quality, technical skills), organizational factors (funding, goal-project alignment, resources, intergovernmental relationships), governance factors (collaboration, participation, communication, accountability, transparency) and human factors (integrity, choice, trust, privacy, autonomy) [9, 5, 14]. Improvement in the quality of life of government agents and job satisfaction is related to the sociotechnical design principles [6]. Results from smart city initiatives are: Internal factors: defined by increasing efficiency, effectiveness, and transparency in organizational management; External factors: consist of increasing efficiency, effectiveness, and transparency in service delivery; and holistic factors: create an environment of collaboration with other organizations and with the public [12, 13]. By the end, trends in society at large will have varying influences on the future of society and government, consisting of institutional factors and contextual factors (social, economic and demographic conditions) [14, 5, 9].

### 4. CONCLUDING REMARKS

This paper presents a conceptual model based on the sociotechnical approach to understand implementation of smart city initiatives in a holistic view, by improving the quality of life and the government workforce through technology. The contribution of this study is the extending of smart city research in a sociotechnical view. By including societal trends in the model, the authors emphasize that a sociotechnical system is influenced by the external environment besides the internal environment. It might evidence the differences between countries at different levels of development.

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