Human-Smart Environment Interactions

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In the context of the challenges facing human computer interaction (HCI) on the one hand and the future Internet on the other, the purpose of this study is to explore the multi-dimensionality of smart cities, looking at relationships and interdependencies through correlating selected dimensions of smartness. Through a review of the research literature, key dimensions of smartness are identified for exploration in the context of smart cities in this work. Methodologically, this work combines an exploratory case study approach consisting of multiple methods of data collection including survey and in-depth interviews, with an explanatory correlational design. In terms of results, the main findings of this work shed light on relationships between selected dimensions of the multi-dimensionality construct of smartness in data-rich urban environments. This work is significant in that it provides correlational information for smart city dimensionalities while contributing to the research literature in this domain; uses a hybrid case study and correlational design in relation to the study of multi-dimensionality; and opens spaces for the study of innovative urban initiatives, taking the ideas and experiences of people from many sectors into consideration.

1. Introduction

In the context of a series of human computer interaction (HCI) grand challenges identified by Stephanidis et al. [1], the claim is made that "interactions in smart environments are in the process of being radically transformed", such that "technological environments will not be simply the smart home or workplace but entire smart cities". This is important, because such transformation points to the potential for many dimensions to be involved in interactions in smart cities as smart environments. Komninos [2] articulated the relevance of the future Internet space to smart cities in relation to the Internet of Things (IoT), sensors, cloud computing and the like, forming "innovation ecosystems" at the intersection of citizen empowerment and smart environments. More recently, Komninos [3] expanded on the notion of smart ecosystems enabled through the Internet, web platforms, big data and analytics and civic technologies, among other elements that make it possible for "people, institutions and machines to connect, collaborate and resolve complex problems". Komninos and Kakderi [4] argue for the importance of complementing algorithmic logic with governance that accommodates "citizen engagement and collaboration networks that generate innovations for better cities". As such, the purpose of this paper is to explore the multi-dimensionality of smart cities looking at relationships and interdependencies through correlating selected dimensions of smartness, keeping in mind *human-environment interactions (HEI),* said to be one of the seven HCI grand challenges. This work extends the notion of HEI to human-smart environment interactions (HSEI), acknowledging that humans have always interacted with environments, whereas now the key difference involves more aware humans interacting with and within more technologically infused and aware environments. A conceptual framework is developed for operationalization in this work through a review of the research literature for dimensionalities and multi-dimensionalities of smart cities, focusing on the constructs of openness and innovation, in support of the potential for increased citizen engagement and collaboration. The review of the research literature, together with the theoretical perspective developed in this work, gives rise to the key research question under exploration in this paper—*What is the nature of the relationship between selected dimensions of smartness in human-smart environment urban interactions?*

2. Development

This work is significant in that it contributes to the research literature for smart cities; explores the HCI grand challenge of human-environment interactions (HEI) in smart cities; and, formulates an HSEI conceptual framework for smartness and dimensional relationships in smart cities. Methodologically, the research design for this work involves a hybrid approach while using an exploratory case study consisting of multiple methods of data collection, including survey and in-depth interviews, combined with an explanatory correlational design. The main findings of this work shed light on the relationships between selected dimensions (e.g., openness and innovation, etc.) of the smartness construct and its' multi-

dimensionality in data-rich urban environments and regions. The main conclusion highlighted in this work focuses on the importance of relationships between dimensions of smartness in relation to smart city elements, such as walkability and liveability, which contribute to an understanding of multi-dimensional components in human-smart environment urban interactions that are associated with data in public spaces, more aware people, and more aware environments.

References

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