

The Sustainability of Smart Cities and Digital Government

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### Abstract

Smart Cities and, broadly, digital government, e-government, together with every other denomination of public administration operated with strong application of modern technology, Big Data, Cloud Computing, and all sorts of connected devices (IoT or Internet of Things), became a theme at the top of the list of medium to large municipality governments across the world.

Beyond the adoption of existing frameworks and the commission of comprehensive projects from global investment agencies and global consulting companies, the transformation of a locally governed territory (cities, districts, counties, municipalities) into Smart Cities will be an adaptation (objective or otherwise) of the concepts, models, standards, and principles of smart governments, combined with the adoption of current technologies to achieve the plans of the public administration, according to laws and regulations, within a time frame fundamentally restricted by the electoral schedule (and the administration's approved budget).

The goal of this article is to introduce sustainable smart cities, having sustainability as both a cause and a consequence of the digital transformation of the standard operations of the government.

A Smart City can have sustainability embedded in its objectives and underlying goals, as much as a consequence of its implementation, with positive or negative outcomes for the population and the geography of the municipality.

*Keywords:* Smart Cities; eGovernment; Digital Transformation; Sustainability

### The Sustainability of Smart Cities and Digital Government

The continued adoption of information technologies (IT) became intertwined with the framework of sustainability. From the early twenty first century movements towards the green IT (Velte, Velte, & Elsenpeter, 2008), to the contemporary controversies behind the extreme adoption of blockchain technologies (related to the different applications of cryptocurrencies) (Shi, et al., 2021), and the perceived net positive footprint of a company after the adoption of Cloud technologies (Chowdhury, Chatterjee, Sardar, Agarwal, & Nath), the sustainable use of technological solutions to operate corporations and governments is a foundational requirement that can represent the path to a successful positive image, or a rejection by the consumers and electoral failure respectively.

### Sustainable Cities or Smart Cities?

Smart City, as a concept, references to the application of modern technology to manage and operate an urban area, collecting all sorts of data, applying analytics, business intelligence and artificial intelligence solutions to improve efficiencies, to better the lives of its citizens, and prevent disasters and even crimes.

The concept, even though of easy understanding, it encompasses complexity in detail, variances, types, frameworks, and applications, as much as it lacks boundaries for its application. It is unlikely that a formally implemented Smart City today that the population, the media, or the officials will consider so if it a Smart City does not include provisions for sustainability (Elgazzar & El-Gazzar, 2017), among other principles regarded as relevant for the betterment of the planet.

**The contemporary economy influence on Smart Cities**

Current ongoing Smart City projects (or initiatives) are influenced by marked trends such as sharing economy, the reduction of the carbon print to reduce human driven impact to climate change, and latest technologies like machine learning and analytics (Akande, Cabral, & Casteleyn, 2020). These trends play relevant role in building sustainable solutions for governments, and specifically for Smart Cities, that we can consider to be the foundation for building state or country wide smart governments, and also to enable sustainable evolutions on the management and operation of the public sector.

**The Carbon Footprint of Smart Cities**

Leveraging IoT, among other technological solutions, to collect large volumes of decision making, forecasting, and preventative data in Smart Cities signifies the use of smart meters for example. These devices, as much as every other connected device and even the different sets hardware equipment in use, consume energy. This is not a widely discussion matter within the broader Smart City topic (Preisel, Diaz, & Wimmer, 2013). The collection and transference of data from the metering point to the physical storage, and the later consumption of such date by the different analytical and intelligence tools represents a full ecosystem of different components consuming electrical energy. This is an important consideration: A Smart City can be an enabler of improved sustainable government operations, as well as a potentially strong impact on the urban area's own footprint.

**The Implication of Sustainability in Smart Cities**

Back in the 1980s, the term “sustainable development” surfaced, including distinct aspects of the process (for example, economic, urban, rural, industrial, agricultural, and technological) (Elgazzar & El-Gazzar, 2017). According to (Butlin, 1987), the World

Commission on Environment and Development defined sustainable development as “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Considering that, the deployment of modern technology does not define a city as smart or intelligent (Elgazzar & El-Gazzar, 2017), its use is supposed to build autonomy and to provide intelligent services and devices, combined with a stable and fast infrastructure, interconnecting data connection and processing, communication systems, and the applications of the smart platform. Cities will only become smart if the services, applications and devices build the intelligent functions to integrate and process the data created, finding meaningful ways to improve the efficiency of public services and the quality of life of the citizens (Kudva & Ye, 2017).

Data sets processed by Smart Cities are far away from the departmental, or even market segments, business professionals witness on their professional activities. Big Data is the phenomenon present in every market segment, being no different for governments and Smart Cities (Kudva & Ye, 2017). Decision making in crime prevention, disaster recovery, traffic flow, and other urban clusters are dependent on sensory data collected on-line and real time, feedback from city officials and citizens, social media trends, different news broadcast, on-line and real time CCTV imagery, among other data sources that might offer insights on the daily life of a city.

Governments have at their fingertips powerful tools to prevent and improve virtually all aspects of the city’s routine, including the forecasting the patterns of a spreading disease and the prevention of losses due to natural disasters (De Las Heras, Luque-Sendra, & Zamora-Polo, 2020).

### **Smart City as a Tool for Sustainability**

When thinking of sustainability, it is likely that energy consumption, carbon footprint, and climate change are the first ideas that come to mind. If we add up sustainability with cities, it is not difficult to formulate the idea that cities are currently important consumers of energy (Chui, Lytras, & Visvizi, 2018). Within the Smart City framework of reference, artificial intelligence, machine learning, and data sciences are important technologies to provide insights for the designing, managing, and deploying smart energy solutions.

It is also important to build a process with a solid method to evaluate the use of technology solutions in sustainable Smart Cities. The assessment and evaluation of the potential of such solutions bring real and net positive contributions to the overall sustainability plan and its underling goals, as much as the possibility to validate the findings of the evaluation process to ascertain officials and the population that the probability of success of investing in the solution being planned is high, is in itself as important as the deployment of the solution (Hilty, Aebischer, Andersson, & Lohmann, 2013). Expectation management and the provision of a precise roadmap to how and when the sustainability goals will be achieved is a high impact aspect to gain support and participation in the efforts (simple but real life examples are the effort to replace water, sewage, gas and electricity metering devices by their smart counterparts to the installation of solar energy generators by the population).

### **Conclusion: Beyond Smart Cities for Innovation and Sustainable Development**

Smart Cities and, more generally, smart economy are topics to include within the local and national government policies for the current administration and, if possible, beyond. The determination of core capabilities and the clear definitions of significance, relationships and specificities for the region is the first step to make the efforts official (Cantuarias-Villessuzanne,

Weigel, & Blain, 2021). To build the regulatory framework to support next smart cities and sustainability efforts by any local government in the country is the foundation for making it real.

The achievement of the Smart City transformation of a given urban area is the experience of the enhanced population's life quality, the reduction of the carbon footprint, and the improvement of work productivity through the deployment of modern technologies. It is important to keep in mind that, achieving the goals of a Smart City is also about the local experience and the national foundation that will enable the perception of achievement (Androniceanu, 2019).

Sustainable Smart Cities start and continues at the national level, by creating a regulatory framework and enabling policies. When this foundation is solid in place, the next step will be the establishment of a smart nation, where the digital transformation will be experienced by the majority of the population and in the main administrative hubs of the country (Kar, Ilavarasan, Gupta, Janssen, & Kothari, 2019).

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