Death Analytics and the Potential Role in Smart Cities

James Braman
https://orcid.org/0000-0001-6080-3903
Community College of Baltimore County, USA

Alexis D. Brown
Community College of Baltimore County, USA

INTRODUCTION

The massive amounts of data available today have opened an unprecedented opportunity for data analysis and understanding trends for improving many aspects of our lives. Through the advancements of the Internet of Things (IoT) and as more and increasingly sophisticated devices are brought online, the ability to collect rich data points as well as the variation in the data collected, will continue to grow. Society as a whole can certainly benefit from knowing more about how people interact and use resources to further make improvements to these tools. As an example, consider the growing number of devices and internet-connected services incorporated into our homes; many can now be considered "smart" homes due to this added technology. Through IoT, more items in our personal spaces contain sensors and the ability to perform tasks, enhancing automation and our productivity. In addition, the proliferation of artificial intelligence and digital assistants in our homes coupled with IoT is likely to grow at a rapid pace. As these devices are scaled from homes to cars and offices, a clear progression can be seen at the macro level.

IoT technology embedded in everyday devices on a macro scale allows us to consider impacts at the city level. Smart cities, therefore, have the potential to record and analyze massive amounts of information at a societal level. When considering the concept of a smart city, there is the potential for widespread continued automation and technology integration. Many people will end up living in these areas as populations increase and as technology evolves. Some estimates suggest that over sixty percent of the world population will live in metropolitan areas by 2030 (United Nations, 2015). As more significant percentages of people live in burgeoning and densely packed smart cities, there are opportunities to utilize this data to help residents make their lives easier and improve their quality of life. However, what is meant by the term smart city? This concept can be interpreted in many ways including measuring the levels of technological use, innovation metrics, goals, and project implementations within a city. Many cities have different approaches to technology, including changing needs, varying budgets, and technology infrastructures.

There still is a need for a clear definition of what exactly constitutes or defines a smart city (Dameri, 2013). It can be said that a smart city is a city whose very infrastructure aims to use technology and its interconnectedness, along with the intentions of its residents, businesses, and governments to use data to automate, monitor, and utilize information sharing to improve the lives and wellbeing of its communities. At the same time, a smart city should be designed in such a way as to minimize the negative impacts of technology use and, given the potential for large population size, strive to be "green" through its use of resources. As both technology and people are the main components of a smart city, these spaces should

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enhance each other for the greater good. Smart cities should be able to address concerns associated with increasing urbanization to address the scarcity of resources, inadequate and deteriorating infrastructure, energy shortages and price instability, environmental changes, and various economic and social needs (Washburn & Sindhu, 2010). It can be said that the overall idea that describes a smart city is one that uses technology to solve urban problems (Dameri, 2013).

A few examples of smart cities include Songdo IBD and Hwaseong Dongtan in South Korea, Masdar City in Abu Dhabi, PlanIT Valley in Portugal, and SmartCity in Malta (Washburn & Sindhu, 2010). Although some smart cities were designed with a technological infrastructure in mind from its original inception, other cities have the potential to grow into a technological mindset as infrastructure is added, changed, and improved over time. Indeed, many cities in the future will experience changes as a society, and needs will evolve that will lend themselves to technological solutions. For this chapter, we can use a definition of a smart city by Dameri (2013) that states, "A smart city is a well-defined geographical area, in which high technologies such as ICT, logistics, energy production, and so on, cooperate to create benefits for residents in terms of wellbeing, inclusion and participation, environmental quality, intelligent development; it is government by a well-defined pool of subjects, able to state the rules and policy for the city government" (2013, p 2549). Indeed, there is a need for a highly coupled system between technology, resources, data, and the city's residents.

BACKGROUND

Data in various forms collected from multitudes of sensors and applications in a smart city is particularly useful. Significant information can be collected and analyzed based on how residents interact with city resources, travel, use energy, live, work, and interact with each other. While there are many security risks with having such enormous amounts of information related to people (Wang, Ali & Kelly, 2015), this chapter highlights the positive aspects. Consider one such positive aspect of digitizing the infrastructure - the improvement of public safety and a decrease in response times for medical and fire services. This can be achieved through better tracking, surveillance, and traffic routing during emergency situations. A plethora of data points can be collected through sensors in highways, buildings, power grids, school systems, hospitals, airports, and much more. Hashem *et al*. present how such IoT-connected sensor systems can be linked through various communication technologies contributing to big data systems that can be analyzed to support smart cities (2016). Real-time data analysis opens the door for ongoing research and improvements. Numerous components of a city infrastructure can be designed with data collection, management, and analysis and are possible to improve traffic, wastewater, power use, and more (Bawany & Shamsi, 2015).

Consider the case where power needs are significant on a scorching day to keep indoor environments comfortable. Reducing strain on city power generation and distribution during peak heavy demand times could be very beneficial. Otherwise, power demand could outpace supply which would be detrimental to critical systems. Instead of having potential shutdowns or brownouts which could impact key infrastructure such as public safety, transportation, traffic or schools, a smart city could automatically determine areas where power can be limited based on population density or current use and thus rerouted as needed. Buildings not in use, streetlights, and other non-essential city components could have their power consumption temporarily suspended or reduced. Another example would be the use of current weather data that can be analyzed to make informed decisions for tasks and scheduling of the day based on a customizable interface that learns the needs of a user (Richard, Braman & Colclough, 2020). Although this is a small