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The Smart City as mega project: an investigation of original vision and iterative changes – drawing on the COVID effect

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Abstract

The 'Smart City' is a topic widely discussed in different academic fields. This research investigates the Smart city as a mega project due to the time and budget it consumes. The research has found that some iterative changes (e.g. profit) could reshape projects and planning away from what was originally envisaged and, potentially negatively impact the overall smart city project. The absence of citizens has the potential to detach the project from a focus, in part due to the missing information about actual needs. The aim of this paper is to investigate the reasons why a Smart City vision becomes shifted during the delivery by which the citizens voice becomes lost. Recently COVID-19 has demonstrated vividly that technologies integral to Smart City developments can have a transformative impact on life in cities, which may increase the interests in smart city building. The use of such technologies has also focused attention on the place of the citizen in the technology ecosystem – drawing on the quality of life of citizens as a central theme for the vision of any Smart City.

Keywords: Smart City, Mega project, Citizens involvement, COVID-19

1.0 Background

It is expected that there will be more demand on, among others, energy, transportation, and water in cities in the future (Beretta, 2018) due to the expected world population (about 60%) that will be living in cities by 2030 (United Nations report, 2018). The concept of the Smart City (SC) has been presented as a new approach to tackle urban challenges (Alawadhi et al., 2012). In 2019 there were estimated to be about 1,000 SC projects around the world (Anderlini, 2019; Law and Lynch 2019). It was, however, noticeable that many researchers agreed that the definition of SC is contested (Caragliu et al., 2011; Cocchia, 2014; Neirotti et al., 2014; Grossi and Pianezzi, 2017; Beretta 2018) and this estimate may, as a result, not be robust. A representative definition of SC, as defined by Caragliu et al. (2011, p.70) is:

> *'A city become smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel economy sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance''.*

This definition is highly inclusive of elements such as technology, governance, human investment, and management. Thus, it does not limit a SC to a particular developmental theme or technology, it allows the vision of a city to be negotiated and places participatory governance centrally.

Woo (2017) highlights that a SC can help a city to overcome challenges, such as, traffic issues, environmental problems and a lack of accessible public services. In this sense, a SC has the potential to create a more sustainable and liveable city, by improving the quality of life of it's citizens (Preston et al., 2020).

Technologies, networks and the Internet of Things (IoT) play a key role in enabling the connection of mobile devices (which collect data on people), as well as sensors embedded in objects such as vehicles and buildings (Diaz-Diaz et al., 2017). This generates high volumes of data, which can be monitored, analysed and shared to improve efficiency in a SC (Cilliers and Flowerday, 2014; Fuqaha et al., 2015; Beltran et al., 2017). However, this also presents challenges in relation to privacy and data security (Popescul and Radu, 2016). For example, threats to cybersecurity may provide access to sensitive data, such as financial or health data (Sookhak et al., 2018). Therefore, while a SC has the potential to provide significant benefits, it also raises challenges that may threaten the security of its citizens (Woo, 2017).

The COVID-19 pandemic has forced urban planners globally to re-think technology (Abusaada and Elshater, 2020). Indeed, COVID-19 has acted as a level of focus on precisely the technologies that are identified within SC developments (e.g. IoT sensors, artificial intelligence), as well as the security and quality of life of citizens which feature within SC planning - particularly where they are treated as a coherent vision for a SC, rather than a collection of individual projects which have some element of 'smartness' to them (Hashem, 2016; Lacinak and Ristvej, 2017; Wilson et al., 2019). Coombs (2020) has discussed the use of Artificial Intelligence (AI) /Intelligent Automation as a way to respond to such a pandemic and AI has been used in various applications such as rate detection (Bullock et al., 2020), alongside diverse other technologies such as GPS location of citizens (Das and Zhang, 2020), and robots in delivering food (OECD, 2020). While implementing these exact systems was unlikely to have been a goal for any city planners, and the delivery of them may not have enabled significant profits for the actors involved, their congruence with SC technologies,

visions and goals is striking and serves to demonstrate clearly how such cities can deliver value through such technologies.

The development of a SC as a single process is almost by definition a mega project due to the time and budget that can be consumed. For example, Neom city in Saudi Arabia is projected to cost over $500 billion, to be delivered by 2030.

> *''Megaprojects are large-scale, complex ventures that typically cost a billion dollars or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people''* (Flyvbjerg, 2014, p.3).

Mega projects bring certain characteristics (e.g. multi-actors conflict) (Flyvbjerg, 2013), which have significant congruence with characteristics observed to date in the literature pertaining to SC developments (Singh and Helfert, 2019; Ugljanin et al., 2020). Drawing on the issue of multiple stakeholders, this research is concerned with the ways in which the citizen's voice can be influential in forming the initial vision of a SC and how this is maintained as the project progresses.

Research suggests that not all SC projects have a coherent vision and many are envisioned as a collection of individual projects which claim some level of 'smartness' but do not form part of a single coherent vision of the SC (Coletta et al., 2019; Pevcin, 2019; Sadowski and Maalsen, 2020). Even when there is a single vision when the journey commences, this vision will evolve for many reasons (e.g. technology changes) When the vision evolves iteratively, such changes tend to 'lose' the voice of the citizens – drowned out by the more powerful actors in the ecosystem of SC development (David and McNutt 2019). Therefore, the aims of this paper are to investigate the development phase of a SC and in particular, how and why a citizen's voice may get lost in the process. This is achieved through two objectives a) to understand the motives by which officials and corporates evolve a SC vision; and b) to understand the impact of iterative changes on a SC project. This research highlights that SC offers hope for citizens and society to produce environments which enhance and protect lives and livelihoods. COVID-19 has acted as a trigger and focus for both what such technologically equipped cities can be, and the primacy of citizens in the SC development process.

2.0 Methodology

This research is situated within the current SC development in the Kingdom of Saudi Arabia which has a government policy for the development of SC (Saudi Vision 2030, no date) and seeks to chart and conceptualise the role of the citizen in such developments. The research draws on the philosophical assumptions of interpretivism through a subjectivist ontology (nominalism) and epistemology (social construction).

The research takes a qualitative approach, utilising in-depth interviews, observation and document analysis (see table 1) between March and August 2020. The study aimed to have a variety of participants to allow different actors from across the SC development process, to express their thoughts. Such a mix allows the researchers to have a deeper and wider perspective that could add value to this research. Interviews lasted between 30-60 minutes as suggested by DiCicco Bloom and Crabtree (2006) and were then analysed using coding processes within NVivo.

<table>
<tr><td>Observation</td><td>Document analysis</td><td colspan="4">In-depth interviews</td></tr>
<tr><td rowspan="5">12 hours of meetings observation</td><td rowspan="5">32 internal and public documents</td><td>Category</td><td>Number</td><td>General Manager</td><td>Representation</td></tr>
<tr><td>Officials</td><td>18</td><td>5</td><td>8 authorities</td></tr>
<tr><td>Corporates</td><td>11</td><td>3</td><td>4 companies</td></tr>
<tr><td>Citizens</td><td>17</td><td>N/A</td><td>5 cities in 4 regions</td></tr>
<tr><td>Total</td><td colspan="3">46</td></tr>
</table>

Table 1. Overview of research participants

Activity Theory (AT) has been used as an overarching analytic lens to understand and contextualise the messy and complex process of developing and guiding the delivery of a SC. AT has been used as a methodological and conceptual tool in the field of information systems in the last 20 years (Kuutti, 1999; Allen et al., 2013; Forsgren & Byström, 2018). It is a conceptual framework which emphasises the social factors and their interaction with the environment (Karanasios and Allen, 2013). The framework examines the contradictions that appear in the system to provide a vision that helps people to understand the development within a system (Engestrom 1987; Allen et al., 2011).

Saudi Arabia was selected to investigate the process of SC development for a number of reasons. Firstly, Saudi Arabia has a vision that by 2030 they aim to have three world-class

smart city developments (Saudi Vision 2030, no date). Secondly, Saudi Arabia is also working on both new and existing city projects thus representing both new build and retrofitted approaches to SC development (Aina, 2017). There is considerable active investment in various projects by which the issue of citizen voice can be investigated. Thirdly, Saudi Arabia is representative of many countries seeking to develop SC initiatives in terms of population, technological development and global connection (Saudi Gazette, 2020). It is not the most technologically sophisticated, or the largest – but equally it has significant resource, clear vision and a technological base drawing on connection with key global technology companies.

3.0 Findings and discussion

During the data analysis, a total of 1223 codes emerged from interview data. These have been organised in four levels (codes, categories, sub-themes and themes) by which eight themes represent officials' data and four themes represent citizens' data. Overall, the research found planners' motives change the SC original vision. *Profit, showcase / Tech-show,* and *corporate push* are three motives by which planners give the priority to other projects. It was also found that such changes can impact the projects negatively as they may no longer serve citizens' needs.

For example, a district in Riyadh has had approval for its vision and strategy to develop 'smart' projects. During document analysis it was clear that this district has a coherent and clear list of projects and priorities aimed at delivering a 'smart district' within a developing Smart City. However, in reality the case was different. It was noticed that different projects have been prioritised from those originally planned, and the original coherent vision had not survived. It is, of course, understood that no plan is complete and immutable at the inception of the project and there will be iterative changes. We know through literature that project planners misrepresent mega projects to be approved (Flyvbjerg, 2013) and that in so doing they overestimate the project benefits as well as underestimating project costs (Morris and Hough 1987; Miller and Lessard 2000; Flyvbjerg et al. 2003; Williams and Samset 2010; Merrow 2011; Flyvbjerg 2014; Edkins, Geraldi, Morris, and Smith 2013; Davies et al, 2017).

Data has shown that iterative changes may impact initial plans negatively. To illustrate, a smart parking project become the priority among many other projects (e.g. security and waste

management). After observing meetings and interviewing planners, it was found that smart parking motivates planners as it will fulfil their interests in different aspects:

- First, it will bring revenue to the authority due to the ticket and penalty fees income. In fact, most authorities in Saudi Arabia link the idea of smart parking with paid parking, no matter how badly designed or what problem it will solve.

  Participant MADQGA claimed ‘’*… today in Saudi people see smart parking as good opportunity to have income…*’’

- Second, smart parking tends to create media attention which means that when an authority implements a smart parking project, it will become well known in the media. Thus, in this district, planners may want to tech-show their ability, and that they have achieved something.

  Participant MSDA argued ‘’unfortunately they select things that have a showcase, so they use media and try to promote it’’

- Third, there is a corporate push through a Public-Private-Partnership (PPP) model. Officials become encouraged to invest in smart parking projects because there are corporates who will be willing to become partners. In most cases authorities and corporates share the profits.

  Participant MADQGA highlighted ‘’Waste management around the world is number one while in Saudi there is not a company …. With smart parking there are already four experienced company who have know-how so we call the business is ready’’

Data has also shown that citizens voices became lost during this shift and the process of iterative changes. Although there is a department within the authority which is supposed to communicate with citizens, it was found that neither residents nor visitors were aware of the strategies and implemented projects. Additionally, they have bigger issues that have not been resolved. This indicates that while citizens were consulted when the original vision has been

discussed a failure to continue this dialogue means that the voice of the citizen is almost inevitably lost, and not in the centre anymore.

> Participant G4OS said ‘’… *here sometimes we discover things because we just discover it … they don’t do a good publicity’’*

As already noted, a SC plan which treats the process as a single project with sub elements is, almost by definition, a Mega Project – and we see the above Mega Project issues in the SC process in the KSA. Therefore, it can be argued that iterative changes have impacted the vision of this district by which citizens became lost, and their needs have not been fulfilled. However, COVID highlights that the voice of the citizens, and the demanding action to protect society from this threat illustrated the value of the SC technologies, and also placed the need to prioritise the citizen voice over the desires of different interests. Therefore, COVID as an example of an event requiring resilience in city infrastructures could be seen as a positive iterative change, or even a motive for planners to build a SC. However, if these iterative changes continue to impact projects negatively, citizens voices will be lost. Thus, this means our post-pandemic life will continue to see more individual projects less relevant to citizens’ needs.

4.0 Future steps and research

This is research in progress and, as such, it is being developed and extended. The work to date has illustrated that there is a need for the voice of citizens to be incorporated in the original vision of SC development and that it then needs to be protected through iterative changes. Data collection has illustrated the power of competing interests in the development and iterative refinement of a SC vision to start the journey to becoming a SC. COVID has demonstrated with real clarity that the vision of SC has real worth and can be delivered in such a way as to enhance the security and quality of life of citizens, and that the voice of citizens in the process can shape uses of technologies which deliver the vision.

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