How Nudge can support Smart Governance in Smart Cities Ecosystems: an A4A framework

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Abstract. Smart cities can be defined as a place where traditional networks and services are made more efficient through the use of ICT innovations for the benefit of their citizens and business (European Commission, 2022). This implies that smart cities are ecosystems where each actor, thanks to new technological solutions, can contribute to the good of the community by nudging a series of behaviors aimed at social rather than individual well-being. Nudging can improve citizens' engagement in the smart governance decision-making process and influence their behavior in smart cities. There is a similarity between nudges and smart cities as they both aim to offer an optimal lifestyle as well as a sustainable and healthier one. Thus, the purpose of this study is to present how nudge can influence smart governance, supporting factors such as policy domain, trust, political and institutional environment, and internet reach and use by using the cyclical model of the actor-for-actor model (A4A), which gives a panorama on their intentionality and finality alignment, while exploring how resource integration works. Therefore, this theoretical study shows all variable's relationships and their impact on supporting smart governance in smart city ecosystems by having citizens as major actors. This research can support policymakers to understand better the citizen's engagement citizens and prepare through ICT technologies the possible choices for them to help integrate their resources.

1 Introduction

Smart City (SC) can be defined as "*an integrated city containing networks of digital sensors and control systems, enabling the operation of urban infrastructure by communicating through wireless networks and supported by distributed processing centers to produce real-time guidance alerts and notifications for continuous city operation*" [1]. SC is a comprehensive concept: although it makes use of technology, it does not operate solely to improve technical and operational aspects of the city, but this is a means to achieve social and environmental goals. This enhances prosperity and competitiveness on the one hand, and the well-being of citizens on the other, thus nurturing a continuous cycle of growth and development [2, 3].

The scope of Smart Cities is very broad, as it involves many aspects of cities: from the economy to the environment, from people to governance. In order to schematize these dimensions, a model proposed by researchers at the Vienna University of Technology is widely agreed upon in the literature [4].

This model summarizes the ecosystem of a Smart City, which comprise six (6) dimensions: Smart Mobility, Smart Environment, Smart Governance, Smart People, Smart Living, and Smart Economy [5]. The Smart Mobility axis encompasses transportation but

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also information technology, so it focuses not only on the sustainability of public transport or its effectiveness but also on the creation of infrastructure for information. Smart Environment includes all those factors related to the elements that constitute local natural attractions or relate to the management of resources, environmental protection as well as actions against pollution. Instead, within Smart Governance are included factors such as citizen participation or transparency of government, as well as its services to citizens. Smart People includes elements that relate to human and social capital, involving aspects not related to educational or occupational level but also to mental flexibility or the quality of social relationships. The Smart Living aspects that are taken into consideration are related to the quality of life, the health care system or housing availability, but also tourism, education, and culture. Finally, the Smart Economy includes factors involving competitiveness and innovation such as productivity or entrepreneurship. The European Parliament's ITRE Committee on Industry, Research and Energy stated in 'Mapping Smart Cities in the EU' that at least one of the six characteristics listed in the European Smart City Project must be present in any SC project or initiative.

Referring to Smart Governance is a participatory platform that supports collaboration between the government and all the SC's system actors as well as the political participation of citizens [6, 7]. The goal is to make governance more efficient, transparent, and interconnected [8]. Such a platform is developed using new methodologies, such as co-creation, or implementing new technological solutions aimed at managing city services and functionalities and providing them to citizens or businesses. In this regard, IoT technologies can foster public engagement through user-centered platforms, such as OPTs (Online Participatory Platforms: participatory applications).

OPTs make possible the integration of governance with resources, environment, social services, and smart mobility. Citizen involvement is realized as they act as "smart sensors" in identifying and solving public problems. In fact, through OPTs, citizens can provide active input into the city's development and planning processes, realizing true crowdsourcing. Beyond involvement, the management of services becomes a second focus, as it is often a source of inefficiency. In such a case, OPTs can be used to design and manage services (social, health, and security including military and police forces, rescue forces, and government departments) in the city that put the citizen at the center and improve their quality of life [9].

In this scenario, it is worthwhile to widen the discussion and include nudges among these stimuli aimed at increasing public awareness and involvement. Nudge strategies are design elements that lead or urge users to choose the designer's preferred pathways throughout the decision-making process. We can therefore say that a nudge aims to modify a change in a predictable way, thus in the desired direction. To do this, it is of course necessary that the nudge is tested in an experimental and controlled manner and that there is then empirical evidence that it works. However, it may be fascinating to arrange and interpret it from a more conceptual standpoint by using an established observational lens: the Actor-for-Actor (A4A) approach [10-12].

So here is the research question driving this study:

RQ: Can nudging techniques be interpreted through the A4A lens to guide citizen decision-making in smart city governance?

To answer these issues, this study aims to give clarification by analyzing the data collected through a review of the literature on Smart Governance (par. 2.1), nudges approach in smart cities (par. 2.2), and what is the theoretical foundation of A4A in the context of smart cities (par. 2.3). Lastly, there are discussions in which an attempt is made to address the research question (par. 3.1), as well as conclusions and implications (par. 4).

2 Theoretical background

2.1 Smart governance

Pereira et al. [13] highlight the fact that the concept of smart governance has undergone considerable interest from the academic community and policymakers over the past few years. Scholars such as Gil-Gracia et al. [14], defined smart governance as a term that describes "emerging technologies coupled with innovative strategies to achieve more agile and resilient government structures and governance infrastructures". Moreover, smart governance is seen as a tool closely related to the usage of technology by the government, which follows up firstly, open data and technology ubiquity, secondly, the understanding of social problems in smart cities, which impacts positively the relationship between government and smart citizens [15]. In this sphere, Gil-Garcia et al. [16] introduced different dimensions that are incorporated within smart governance starting from integration, innovation, information sharing, citizen-centricity, sustainability, creativity, efficiency-effectiveness, equality, entrepreneurialism, citizen engagement, openness, resilience, and technology savviness. In addition, scholars like Pereira et al. [13] argue that smart governance. On the other hand, Albino et al. [17], noticed three components' domains of smart governance: e-services, e-democracy, and participation of smart citizens. Scholars like Scholl and Alawadhi [18], give a more precise definition of what smart governance is by emphasizing the fact that it is related to the applying digital technologies and intelligent activities in processing data/information and decision-making. Pereira et al. [13] discussed in their study that smart governance is related to data and evidence-based policymakers and the collaborative, open, and citizen-centric forms of governance. This study underlined again just like the other authors that at the center of "smart governance" is government itself which uses technology to gather data that will help improve itself and establish a better relationship with smart citizens which will have a significant impact on the future of the smart city itself. Furthermore, Bolívar et al. [19], in their study adapted a model of smart governance in which they showed the impact that smart governance has in smart cities starting from the: 1. Strategies for implementing smart governance, 2. Smart governance arrangement and 3. Highlighting the outcomes of smart governance. In their model, it's noticeable the fact that ideas (vision) and actions (legislations, policy, organizational transformation) are the core of the whole process which will in the end the government – citizens – city, as an inseparable chain. Hence, different academicians agree on the fact that ICT is one of the most common attributes given to smart governance systems (20-23).

2.2 Nudging and smart cities

The literature on nudge theory is largely based on the studies of Nobel Prize-winning in economics, Richard Thaler and his colleague Cass Sunstein. These studies define nudge theory as an approach of behavioral economics and psychology, according to which it is possible to influence individual behavior that is deemed socially useful, without this leading to the forced exclusion of other possible options, through appropriate strategies in input selection. In this regard, Sunstein and Thaler [24], and Hansen [25] define the latter as 'libertarian paternalism', in that the government paternalistically redesigns choices to make it easier for citizens to make decisions, but leaves the final decision to the individual, without any behavioral coercion. Their behavior is influenced by how the different choices are presented by the decision-makers, i.e. the choice architecture.

In recent years, private and public organizations have become interested in behavioral science. Glowacki [26] states that cities have become increasingly interested in the behavioral dynamics of citizens, as interventions in choice architectures allow governments to optimize decision-making in terms of time and cost. In agreement with this, Burgess [27] argues that nudges offer local authorities an economic means of tackling social problems. In this regard, local governments have begun to adopt behavioral insights to optimize the public value proposition, impacting areas such as health, tax payment, civic engagement, transparency of services, etc. [28]. Therefore, the assumption behind the nudges theory states that individuals need to be guided through behavioral pathways to be engaged in the choice process and contribute to the resolution of problems of public interest such as climate change, food waste, etc. In the context of smart cities, policy-makers, therefore, have the task of offering an appropriate choice architecture to citizens, so that they can be incentivized to adopt behavior that can bring both personal and collective benefits [29]. Yeung [30] stated that as time passes, it is possible to merge behavioral insights with digital technology and data science in order to develop accurate predictive models that can identify citizens' choices, biases, and behavioral inclinations and systematically hyper-nudge them to choose in a way that would benefit them most. It is important to emphasize that the margining of technology in gathering data and processing it plays a crucial role in the relationship between government – smart citizens because by redesigning the policy a better service will come to the citizens and as well as understanding their choices. In addition, this reshaping of public policies comes as a matter of fact from the adaption of smart governance, which is using technology that will create new opportunities for accurate nudging. Nudging fits perfectly in smart cities because it represents the mission of smart cities which is to improve quality of life and allow its citizens to live a healthy and sustainable life while making the right choices [31]. The nudging approach is also compatible with the shift from an institutional concept of a smart city to an experimental approach of a smart city that sees citizens as decision-makers [32]. Furthermore, nudging in an institutional concept treats citizens as passive subjects, whereas in the experimental one, citizens are involved in the management of urban goods and the co-creation of sustainability [33].

2.3 Smart cities and A4A framework contribution

Over the past few years, the smart city concept has received increasing interest from scholars. Therefore, smart cities act as an ecosystem where new technologies and traditional infrastructures come together to improve the quality of life of its citizens, the interactions between businesses, and the common interests of all actors [34, 35]. These relationships are based on the assumption that each party involved in the exchange of value integrates its resources with the aim of obtaining a benefit in return, for themselves and for the other parties involved in the context [10, 11]. In this regard, Troisi et al. [36] state that through the mutual exchange of resources, smart cities are a key vehicle for community welfare. This thought has also been taken up by other authors [35, 37] who also see smart cities as an environment that can promote technological, managerial, and organizational innovation, as well as social well-being. Local authorities aim to improve citizens' inclusion in community life, well-being, and participation. Consequently, the importance of relationships emerges as a possible key to understanding smart cities and how the various actors involved, particularly citizens, can actively participate in the inherent dynamics, to make choices in the collective interest.

In this respect, the actor-for-actor (A4A) (as shown in Figure 1) model can be introduced. This is a structured process of mutually satisfying relationships between actors, paying special attention to the co-creative aspects that occur in 'crowded' contexts, as in the case of smart cities [10, 12, 35]. In the context of smart cities, the A4A model pays particular attention to the degree of commitment citizens demonstrate in actively participating in the

dynamics of the smart city. To this end, the 7 phases of which the model is composed (1. actor's commitment; 2. actor's relations; 3. subjective awareness; 4. shared intentionality; 5. alignment of purposes; 6. integration of resources; 7. emergence into action) can be used as guidelines in order to redesign the key factors of smart governance through a choice architecture.

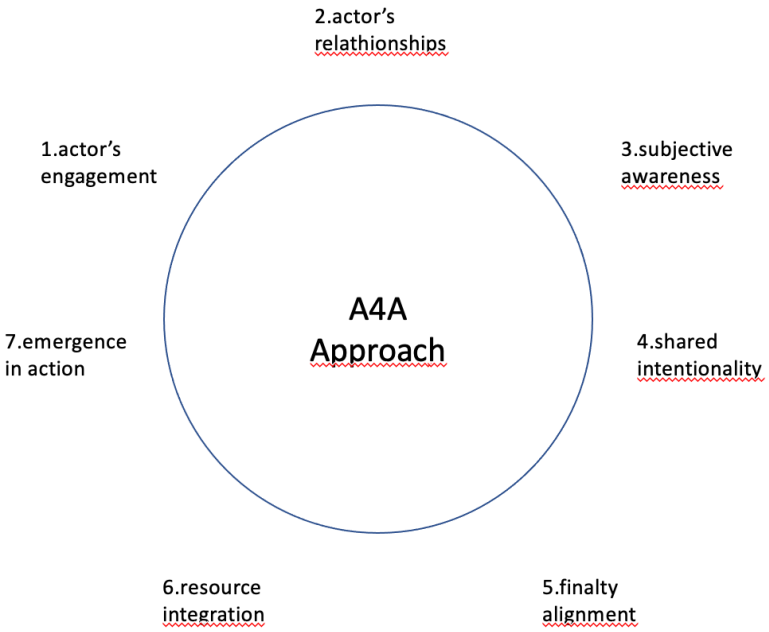

Fig.1. Authors' elaboration. A4A approach

3 The citizens' participation aims in smart governance under the magnifying glass of A4A model

Effective governance

This aspect could be traced back to steps 1, 2, and 3 of the A4A model. Smart governance is effective when policymakers are able to address all the issues they set out to solve, in response to a common need [38]. This is the first aspect that constitutes smart governance and is based on three fundamental pillars, which are commitment, responsiveness, and operational management [39]. Regarding the first pillar, i.e. commitment, local authorities should commit themselves to develop communicative and collaborative networking platforms through ICT platforms (39-41). On the other hand, regarding responsiveness, local governments should ensure the development and maintenance of e-government programs. This would allow them to solicit feedback from citizens and increase their involvement in the decision-making process on the one hand, and a more timely response to reported issues on the other. An example here could be crowdsourcing platforms. Fix My Street, a platform used in the UK, allows citizens to report problems to the municipal administration by entering

data such as postcode or street name and description of the problem [42]. Finally, operational management concerns collaborative arrangements between the different actors involved in the governance process through ICT platforms [43].

Legitimacy

Legitimacy can be traced back to phases 4 and 5 of the A4A model. According to Dalton [44] and Nye et al. [45], there has been a growing distrust of local government by citizens over the years. Trust refers to the perceived image of a government by citizens, the existing policies, and the respective involvement in decision-making. In addition, many scholars [39, 41] claim that trust can play a positive role in the willingness of citizens to actively participate in smart governance, using their time and resources. However, other scholars [39] argue instead that increased trust of citizens in local government may lead them to exercise less control over the activities prepared by decision-makers and consequently even less participation. In this case, creative participation, through gamification systems (based on the concept of rewards), could represent a nudge capable of engaging even those 'lazier' citizens [46, 47]. In this sphere, Marczewski [48] defined gamification as "the application of gaming metaphors to real-life tasks to influence behavior, improve motivation and enhance engagement". Therefore, as mentioned above gamification in the smart cities umbrella is connected with 3 main components as stated illustrated below:

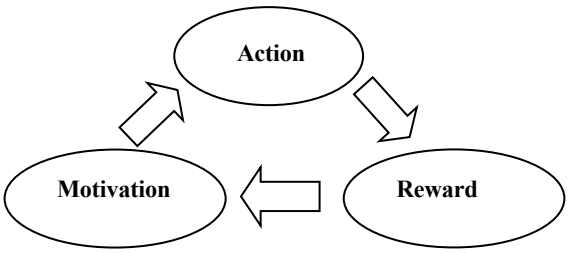

Fig.2. Authors' elaboration. Gamification system

Furthermore, gamification in the smart city framework can touch three fields: economic sustainability, environmental sustainability, and social sustainability. The citizens/customers are given different stimuli in order to engage more which includes rewards. Gamification and Smart Cities have a lot of things in common because of the engagement that they need to have with the citizens/customers/players. Therefore, gamification plays a crucial role when it comes to decision-making as more citizens engage in different areas that impact the development and longevity of smart cities.

Social justice

Social justice could instead be traced back to steps 6 and 7 of the A4A model. Often, smart governance mechanisms could produce beneficial effects for certain groups of citizens, to the detriment of those who are not able to exert enough influence to ensure public policies and actions that could strengthen their economic or political position [38]. In accordance with Kolotouchkina et al. [49] and Shin et al. [50], this problem could be remedied by introducing measures that bridge the digital divide, fostering digital inclusion and equity through the standardization of digital access, developing shared and multifaceted stakeholder engagement and, finally, turning urban performance and inclusion of all citizens into the core of smart initiatives.

4 Conclusions and implications

In general, nudges are non-regulatory measures that aim to influence an individual behavior through subtle and cost-effective changes [51]. Recently, scholars in their studies, have noted that technology function has changed over time. Before its first aim was to gather this data and to process it, however as time passes and smart cities evolve technology is seen as a nudge to change smart citizens' behavior. The relationship that smart governance and citizens have reflected on the lifecycle of a smart city. As mentioned before smart governance uses technology as a means to redesign policies that help the government improve. Therefore, as the government improves itself, in the same way, the services offered to citizens do as well, which has a domino effect impact. As policies act as regulators in smart cities it is important to mention what affects them most. In addition, seeing over time that another attribute is added to technology that has a significant impact on the citizen's behavior has helped smart cities evolve as well. As mentioned in the sections above, smart citizens' participation/collaboration is crucial when it comes to smart governance as it is seen as one of its dimensions, and the open data and technology act as a nudge to analyze and later impact their decision-making process is what helps the smart cities evolve as well. Furthermore, most of the smart cities around the world collect and process data and then develop informational nudges that provide information and offer feedback. Moreover, if the smart cities act as "regulators" of a market failure, this feedback will reach its goal, because the gathering of information by using it as a tool for smart governance will accelerate the process of doing things good and beneficial for both sides. Smart citizen behavior is different from last decades now it can be digitally captured and analyzed through a network of sensors. Eggers et al. [52], state that having all this information through IoT surveillance devices, for example, it can help to obtain different insights about desirable or undesirable and suitable and unsuitable behavior and find a way to improve them so in the future the decision-making process will be facilitated and improved.

Despite the originality of the topics discussed and presented in this paper, there are limitations that are related to the methodology. This study is only a conceptual integration to be further explored later with quantitative or qualitative studies.

This study could be a good starting point to continue studying cities that use nudges, using the pillars of the A4A approach; moreover, this study could help policymakers, i.e. those who are called upon to prepare the architecture of choices within smart cities, to prepare nudges that are able to involve citizens more.

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