Informal collaboration: building a smart city through self-organized stakeholders

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Abstract
Today, cities are working on becoming more adapted to urban change and sustainable challenges. To do so, many have undertaken projects, supported by governments, intended to digitalize the interactions, optimize local resources, and become smart accordingly (e.g., Barcelona, Aarhus, and Oslo, etc.). Although most smart city initiatives follow top-down mechanisms, we notice interestingly the emergence of bottom-up processes and self-organized actions. In fact, cities are complex systems that possess qualities of self-organization [1]. Self-organized stakeholders (e.g., citizens, universities, private/public firms, NGOs), through informal collaboration, are capable of conducting innovative projects leading to a smart city. This dynamic has enabled citizens to be more involved in policymaking and to impose, using ICT-based solutions, a new model of governance (i.e., smart governance). In this regard, this conceptual paper contributes to the smart city literature by highlighting the role of informal collaboration between stakeholders in implementing smart initiatives. Eventually, our research will provide guidance in designing smart cities and serve as basis for future empirical studies.
Keywords: Smart city, self-organization, informal collaboration, stakeholders, citizens

1. Introduction
Nowadays, cities are facing sustainability challenges due to the demographic expansion and the scarcity of natural resources [2]. The smart city concept has emerged as the new urban paradigm that provides tools for optimizing resources and sustaining socio-economic development [3]. Technology-based solutions have been introduced into the public sector as major components accompanying urban dynamics and shaping up a new model of governance [4] [5]. Indeed, smart governance promotes smart city initiatives [6], that are based on collaboration – *formal & informal* – as well as on citizen-centric operations and services [7].

More specifically, inter-organizational collaboration is being endorsed in smart governance literature as a way to better serve citizens and promote well-informed decision-making and joint action [8]. So, as cities are heading toward becoming smarter, the contribution of citizens, acknowledged mainly as the cornerstone of smart city development [9], remains theoretically elusive as for its organizational methods and technological approaches. Furthermore, the collaborative behavior of secondary stakeholders (e.g., Academics, private/public firms, NGOs) needs to be explored considering the learning inputs they provide to the innovation journey [10].

Interestingly, several scholars have contributed in the understanding of the role of citizens in the decision-making process in the context of smart cities. Few studies note that self-decisive and independent citizens are the foundation of a Smart City [11]. Also, better

decisions, in this regard, are taken when considerable crowds are involved in the process [12]. In fact, a smarter governance system gives citizens more power [13] and enables them to intervene *informally* in the innovation process following a *bottom-up* approach [14]. Therefore, alongside technology and institution, citizens represent a fundamental resource for the smart city development [15] that can be efficiently exploited through Crowdsourcing activities [2]. This clearly brings to the fore the inevitable involvement of citizens in smart urban projects [16] and their crucial role in the ideation stage of urban Crowdsourcing [10].

The remainder of this article firstly touches on the role of citizens in smart city development and underscores the importance of informality in building smart cities. The goal is to show how informal actions and bottom-up processes can benefit smart city initiatives using ICTs (i.e., e-participation). Then, to exemplify our reasoning, few self-organization processes are presented and analyzed.Ultimately, after tackling theoretical gaps, we conclude with research tracks that will serve as basis for future empirical papers on smart city issues.

2. The role of citizens in smart city development

A smart city relies essentially on the use of ICTs, involved citizens and collaborative governance [15]. Some authors drew attention to the importance of social capital in promoting sustainable urban development [17], considering social change more determinant than new technological practices [5]. Thus, understanding the concept of smart cities requires giving a particular attention to the collaboration of public authorities with citizens [18].

The emergence of new models of governance (e.g., smart governance) has emphasized the role of citizens in public services [17]. However, as cities all over the world are embracing smart change, the active role of citizens in public administration remains a central issue in the scientific community [2] [19] [20]. In fact, empowered citizenship is being endorsed as a form of interaction between a transparency-based government and empowered citizens in the decision-making process and the joint development of public services [21].

Within a smart governance system, citizens play an active role in assessing policies, public strategies and services through their participation in user boards, consultation meetings and public hearings [22] as well as through hackathons, votes and public conferences [23]. Interestingly, this citizen participation dynamic contributes considerably in digitizing government services [24] and developing smarter living places [25] leading to a more transparent decision-making [26]. In this regard, the government must efficiently include citizens in political matters by setting up *participation opportunities* (e.g., public panels, national forums, governmental websites) and giving quality *feedback* to sustain citizens' active involvement and increase their trust in government institutions [27].

The role of citizens is extremely crucial according to [28] in the transition from a control-based government to a service-based government. Thus, to better harness valuable inputs from citizens, public authorities need to bypass one-off participation conditions (e.g., online voting) [25] and promote a more sustainable interaction with its citizens facilitated by ICT-based solutions.

3. Informal yet smart?

Previous empirical work has shown that smart cities development is not promoted by legislation [5]. Surprisingly, this means that smart initiatives can take place without legal rules, leaving the door wide open for informality (i.e., informal collaboration). But how can informal endeavors (i.e., self-organization) between local stakeholders lead to a smart city? To answer this question, it is necessary to stress further the role of citizens in smart city development.

Connected and knowledgeable people are currently able to innovate horizontally at low cost, leading to positive social change and better urban governance [29]. Although, the horizontal method (i.e., self-organization) in the social media era can constructively ease collaboration, it is bound, for some politicians, to break down hierarchies [30]. Building a smart city demands a flexible hierarchy geared toward implementing smarter actions. Yet, this quest to flexibilize the hierarchy and operationalize empowered citizenship [21] can be accomplished through informal pressures on public authorities [31].

In the context of smart cities, governments must conduct smart investments yielding positive results for citizens. Conversely, non-smart governments often opt for high-tech and untested options requiring tremendous funding rather than cheaper and better tested ones [32]. This harshly questions the effectiveness of the vertical approach (i.e., top-down) and opens the discussion about alternative options, generally disregarded by governments in emerging countries.

Informality has been always strongly frowned upon in the corporate level. However, only very few authors have considered studying its positive impacts on smart urban projects [33] [34]. Interestingly, according to [13], an atypical definition of the term "informal" is given in a technology-based environment: "*Informal is not a synonym of irrational, but is closer to what we might term invisible rationality – a form of rationality ICT can make visible."*

Therefore, the smart city development can benefit tremendously from informal channels by emphasizing horizontal collaboration between stakeholders and efficient urban crowdsourcing [10].

4. Informal collaboration: a bottom-up solution for enhanced citizen participation

4.1. Electronic participation at the heart of smart city development

In smart cities, citizens use ICTs as a medium of participation in public issues. This behavior is called electronic participation (e-Participation). Some scholars referred to e-participation using different terms such as e-Consultation [35], web-based citizen inputs [36], or online public engagement [37]. Refreshingly, same as urban crowdsourcing, e-participation is based on citizen engagement, a government 2.0 and the willingness of public organization to benefit from collective intelligence [25].
Web-based platforms promote citizens' administrative participation and enhance transparency as well as decision-making [38]. Indeed, the online interaction, as opposed to offline interaction, enables government employees to better communicate with citizens

[39], reflecting, thus, values of good governance [40]. The highly dynamic and transformative nature of e-participation increases dramatically the capacity to disrupt existing power balances [41]. This explains the emergence of bottom-up methods and citizens' self-organization as a response to ineffective and exclusive urban policies.

The concept of e-participation in the context of smart cities is still hardly explored in the literature. Some authors correlated ICT-based solutions (e.g., social media) to advanced smart city initiatives through increased number of participants [25] [42]. Mainly, scholars have endorsed a top-down approach where governments are the ones to make the first move in engaging and inducing citizens into participation, through consultation and relevant information sharing [43] [44]. Surprisingly, bottom-up methods have yielded positive results in a handful of instances of smart city development processes. The upcoming section highlights how informally conducted collaboration between urban actors is able to operationalize smart city projects.

4.2. Informal collaboration serving the smart city

Collaboration constitutes a leverage of economic development of a city, promoting greater civic engagement [45]. Performed informally, it gives stakeholders the ability to self-organize and to operate in a non-hierarchical way, contrasting, thus, the traditional command-and-control organization [33].

Many cases of smart implementations emerge through experimental research projects, supported by bottom-up processes and private initiatives of individuals who embraced a "smart mindset" [46]. In this regard, Table 1 presents self-organization processes in different contexts of smart city building, emphasizing citizen participation and horizontal collaboration between local stakeholders.

Table 1. Self-organization processes in smart city literature

Authors	***Context***	***Self-Organization Process***
(Klopp & al., 2017) [34]	Nairobi, Kenya High level of informality in service delivery Low capacity to finance big IT infrastructures Urban innovation mostly built on a top-down approach A flourishing digital environment	• **Project Name:** the *Digital Matatus* • **Purpose:** to promote a *smart* solution to the urban transportation system • **Project Initiators:** universities of Columbia and Nairobi, MIT & GroupShot company • **Method:** based on mobile phone's GPS technology, university students collected information on bus routes, schedules, stops, etc. • **Results:** a public transit map is created, local entrepreneurs used the data to improve several apps,

		local researchers exploited the data and map for further research and planning processes and Google uploaded the data to provide the transit app of Nairobi
(Snow & al., 2016) [33]	Aarhus, Denmark Favorable environment for the development and testing of smart city projects Green growth economy leader Well-developed digital infrastructure Paperless public organizations Great access to open data A large number of educational institutions A young population prone to risk taking and experimentation	• **Initiative Name:** *Smart Aarhus* • **Purpose:** making the city of Aarhus more collaborative and *smarter* • **Focal actors:** citizens, firms, research institutions and leaders of key municipal organizations • **Functioning:** guided by the informal principles of the initiative and an actor-oriented organization, stakeholders collaborated using a bottom-up approach, through digital platforms (e.g., Go Green with Aarhus portal, Open Data Aarhus) and events (e.g., Internet Week Denmark) where citizens were actively involved in developing, assessing and operationalizing apps.
(Charitos & al., 2014) [46]	Santander, Spain An active testbed for smart experimentations An environment equipped with middleware services and sensors	• **Project Name:** *Smart Santander* Project • **Purpose:** to promote a sustainable urban mobility paradigm, deliver eco-friendly transportation services to commuters and promote bottom-up community intelligence • **Stakeholders:** European Union research team, architectures & citizens • **Design:** *MITOS* application (Multi-Input Transport planning System) enabled end users to participate in traffic and travel information sharing through free

		text, or predefined messages and/or images (participatory sensing) alongside existing sensors and middleware infrastructure in Santander (environmental monitoring). In order to induce citizens (mobile & desktop users) to participate, game-like activities and a task-reward system were adopted supporting informal learning
(Giovannella & al., 2013) [47]	Villard-de-Lans, France A touristic village based in the French Alps	• **Project Name:** *WeSmartVillard* Project • **Purpose:** to promote smart learning through informal channels • **Stakeholders:** a working group, village dwellers and tourists • **Method:** a workshop was organized following a "person centered in place" design approach. Mobile network enabled tourists and local dwellers to learn from each other informally, be aware of their community's environmental issues, and be involved in crowdsourcing strategies and space gamification activities
(Capdevila & Zarlenga, 2015) [48]	Barcelona, Spain The city was awarded the European Capital of Innovation ("iCapital") prize of Europe (2014) A sustainable innovation environment supported by public and private institutions Ecosystem for innovative districts	• **Project Name:** *Guifi.net* • **Purpose:** to develop low-cost ICT infrastructures • **Participants:** citizens, as stated by the authors: "*Guifi.net is a bottom-up initiative created by engaged citizens without initial institutional support.*" • **Method:** citizens were able to add Wi-Fi access nodes once they accepted an interconnection agreement that preserves the project optimal functioning

Source: Authors' own design

5. Theoretical gaps and research tracks

By analyzing the above-mentioned cases, we noticed that the literature has not deeply broken down the self-organization process in emerging countries, more specifically in the Moroccan context. Indeed, the role of informal collaboration between urban stakeholders (e.g., citizens, private firms, NGOs) in conducting smart experimentations is still conceptually elusive.

Case studies of self-organized stakeholders in the Casablanca Smart City project are lacking. Also, the degree of familiarity between local actors represents a contributing factor to their informal collaboration and prevents conflicts of interest. This means that the motivational aspect needs to be explored and collaboration needs to be incentivized.

Furthermore, the majority of projects that followed a bottom-up process were initiated by universities or public/private firms. Even though ICT-based solutions are now democratized, smart initiatives undertaken by citizens in emerging countries are poorly implemented. Informal collaboration between citizens exclusively through online channels (e.g., e-petitioning, social media initiatives, etc.) demands more attention by scholars interested in smart city issues.

Based on observed theoretical gaps, we will ultimately underscore several research questions that require further investigation by scholars, as shown in Table 2.

Table 2. Research tracks

Mobilized Concepts	Possible Research Questions
The role of stakeholders	*How self-organized stakeholders can co-create a smart city? How informal collaboration can serve the smart city?*
The role of governance	*How a citizen-centric governance model can lead to smart governance?*
Urban crowdsourcing	*How to harness ICT-based solutions to enhance citizen participation in smart city development?*

Source: Authors' own design

6. Conclusion

Our conceptual paper intends to support the importance of self-organization and initiative-taking (i.e., informal collaboration) in building smart cities. We stress the necessity of citizen participation and self-organized secondary stakeholders in enhancing urban governance through ICT-based informal initiatives. The upcoming research should tackle empirically the self-organization dynamic and highlight the effectiveness of informal collaboration in conducting smart projects.

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