Factors influencing the content of Smart City initiatives (particularly based on institutional theories of organization)

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Abstract
Objectives This paper aims to consider the factors shaping the smart city structures from the perspective of institutional organizational theories and in context of sustainable development. Prior work The previous findings have revealed significant lack of attention to factors impacting the smart city concept. Approach The paper applies literature reviews and survey analysis involving the experts in the field of smart cities. Results The paper applies literature reviews and survey analysis involving the experts in the field of smart cities. Implications The study provides the perspective useful for local and regional authorities as well as other parties involved in smart city implementation and development. Value The paper proposes the extended multi-factor smart city model approach encompassing the factors from different theories.

Keywords: organization theory , smart city, sustainability factors.

1. Introduction and relevance
With a view to the rapid urbanization and increased popularity of smart cities worldwide, there is a strong need to expand theoretical and practical understanding on this topic. The literature on smart city domain has been significantly expanding over the recent years [1] [2]. Most of the existing researches take the smart city model holistically or target the certain dimensions of smart city such as security, partnership structures, risks or others [3]. In comparison to other dimensions, the attention to the forces impacting the content of smart city initiatives is rather lacking, especially, when it comes to organizational perspective. There are studies highlighting that focusing on the smart city driving factors can affect the success of smart city evolution and viability of the chosen model [4]. Treating the city as an organization can be promising on the theory level, keeping in mind the minimum attention to organizational theory in smart city studies [5]. While there is a significant lack of holistic understanding of the complexities involved in the evolution of smart cities, if this issue is addressed comprehensively, it can facilitate informed decision-making and be highly valuable for the cities. It is important to understand the knowns and unknowns in the existing literature and develop the factor classification that could be operationally by the cities during the launching, developing, and monitoring stages of the city life-cycle.

1.1. Paper scope and methodology
The research question is what are the factors determining the smart cities content determined by the literature? This paper employs thematic analysis based on the literature review. This number provides the general understanding of tendencies, revealing the essential factors and laying the directions for further research. Based on the gaps revealed by the literature review, the comprehensive model that could be applied at further research stages for early-stage and mature cities has been proposed.

2. Main findings

2.1. Institutional theory of organizations and smart cities

Schiavone and others [6] have highlighted the need of deepening understanding of how organization theories can apply to address the ICT-driven urban transformations and the societal challenge of fostering smart city development. There is a lack of comprehensive approach that may be applied by the cities in this connection, especially, when it comes to the organizational methodology and factor classifications. According to Wu and others [7], insufficient attention is paid to causal relations between organizational conditions and technology enactment in government-led projects. The gap also relates to the lack of comprehensive classification of the conditions present in particular smart city cases. It was pointed out by the researchers that the comprehensive perspective on smart city organizational structure is rather lacking. As highlighted by Arellano-Gault [5], focusing on modern organization studies, since the late 1990s within social science-based studies, there has been decreasing attention to public organizations as such. Publicness and governance were highlighted as fundamental issues to be explored. There was the so-called "golden age" of studies including the works of Weber [8], Pfeffer [9]. Pfeffer [9] has highlighted that the level of paradigm development in terms of technical certainty and consensus as crucial characteristics have crucial impacts on the social organization and operation of that field. The recent research points out that there are basic organizational dichotomies related to smart city evolution such as (1) technology-led or holistic strategy; (2) top-down or bottom-up approach; (3) mono-dimensional or integrated intervention logic; or (4) double or quadruple helix governance system [6]. Kornberger and others [10] have focused on the ways the local authorities could adopt their organizational frameworks to establish operations in terms of increased openness, transparency and collaboration with external environments. There are insufficient studies raising the collaboration and partnership factors of smart city development.

Another gap in relation to organizational theory and smart cities relates to the concept of organizational field at the national level. The organizational field is defined as "relational space, populated by social actors such as businesses, government agencies, social movements, or communities, which: (i) are engaged in similar or intertwining activity systems; and (ii) interact and/or refer to each other under the influence of institutions of common interest" [11]. In the research conducted by Pierce and others [11], it is stated that viewing smart city as organizational fields has lots of benefits providing the tools needed to track the dynamics of smart city evolution being though embedded in smart city global context. Local organizational field was also considered to be the tool of evaluating the impacts of diverse forms of entrepreneurship.

Mu and others [12], have distinguished four organizational factors of governments impacting the smartness level established, including financial capacity, human resources, information-sharing, and leadership. The researchers highlighted the three levels of smartness related to smart city project implementation such as decisional intelligence, perceptual intelligence, and computational intelligence. The mix of strong financial capacity and facilitative leadership was viewed as the basic factor of reaching the main levels of smartness. Furthermore, the idea of smart cities' social, cultural, and environmental factors of smart city formation did not get sufficient attention. Fountain

[13] was among those pioneering the idea that that organizational environment is essential to understand in context of technology enactment. Abbate and others [14] have drawn attention to the business factors such as the structure of small and medium sized enterprises and smart city projects. Van den Buuse and others [15] focused on organizational usage of smart city approaches by international ICT firms.

Therefore, the existing research has emphasized on the themes such as governance component; organizational frameworks for local authorities; business factors in smart city projects with the lacking attention to social and environmental factors and the promising direction of organizational field highlighted. The identified gaps include insufficient attention to causal relations between organizational conditions and technology enactment in government-led projects, as well as a lack of comprehensive perspectives on smart city organizational structures.

2.2. Smart city concept overview

As pointed out by Yigitcanlar and Kamruzzaman [16], there are numerous definitions of smart city while some involve sustainability components, quite many are limited to solely technological understanding. There is no unified understanding of the smart city concept while it often bypasses sustainable development, people-centeredness, ecological approach, and other perspectives [17]. At the same time, Mora and others [18] have noted that scholars consider smart cities as an urban environment activating the technology-driven approach to sustainable development. As mentioned by Csukás & Szabó, there are myriads of conceptualized models and frameworks proposed that are related to smart cities, but there are no easily adaptable, widely applicable and robust smart city models [19]. There is the research gap requiring the conceptualizing of smart cities to find the most applicable case-by-case concepts. The focus on understanding the pathways towards smart city transformations is also insufficient. Campbell highlighted that "smartness" of the city can be viewed as equal to the "happiness" of its citizens [20] [21]. Hollands has mentioned that the smart city definition has lacked refinement since 2000 [22]. The relationship between smart technology and quality of life has not been defined. The interpretation of smart still poses ambiguity.

2.3. Factors of smart city development

The concepts from organizational theory are not well disseminated when it comes to factor analysis or research. The systematic literature review related to smart city success factors from 2000 to 2018 has been conducted by Aldegheishem [23]. The contributions by Oke and others grouped the resilience impacting factors into five dimensions such as climate change, education, food security, public safety and threat to disease [24]. Then, the findings have highlighted the important aspects to be fulfilled for the smart city to develop such as development of literacy and technical skills of citizens, regeneration of agricultural land and increased localized food production. Camboim, Zawislak and Pufal focused on the driving elements forming the content of European smart cities including Amsterdam, Barcelona, Lisbon, Vienna [25]. It was concluded that to be smarter, the cities should focus on upgrading the elements related to the techno-economic activity, the environmental-urban configuration and the socio-institutional structures in an integrated manner within an

integrated and comprehensive governance model. It is important to highlight that this study reflects a more systemized integrative approach viewing the interplay of factors together. Kogan and Lee [26] have identified citizen's engagement and governance as the two key success factors of Smart City Projects along with ICT and other factors as enablers. At the same time, citizens' engagement was determined as more influential in comparison to governance. The ICT was viewed as a rather insufficient condition of the Smart City success. Myeong and others have classified the priority internal factors as citizen involvement, leadership, and infrastructure and the priority external factors were determined by the order of political will, stakeholders, and the fourth Industrial Revolution [27]. The presence of communication channels, public hearings, and direct stakeholders were viewed as important for analyzing the subfactors.

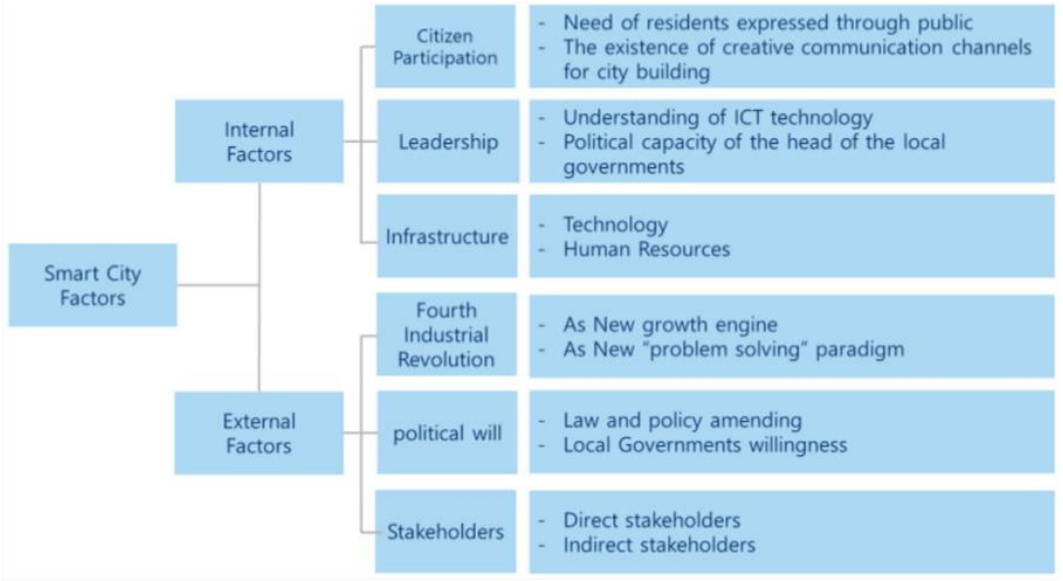

Fig. 1. Smart City Factors [27]

Yigitcanlar and others have employed multiple regression analysis in Australian context related to smart city transformation readiness [17]. The findings have determined that two-thirds (65%) of the smart city transformation readiness are determined by the following factors such as (a) Close distance to domestic airport; (b) Low remoteness value; (c) High population density; (d) Low unemployment level, and; (e) High labor productivity. Important pioneering contribution was made by Habib, Alsmadi and Prybutok in terms of focusing on the factors impacting the adoption of smart city technologies by citizens (in particular, the decision to adopt smart-city technologies) [28]. The role of 7 factors such as effort expectancy, self-efficacy, perceived privacy, perceived security, trust in technology, price value and trust in government were considered as significantly impacting the citizen perception. It is important to note that the perceived security and perceived privacy were viewed as fundamental determinants of trust in technology, while the price value was viewed as a determinant of trust in government. Lopes has defined smart governance as a key factor of smart city implementation, seeing the advanced technologies, innovation and

smart governance as the basis for developing smart, creative, innovative and sustainable cities [29]. Based on the case study analysis, it was concluded that all the considered initiatives are mainly relying on technologies though applying some type of smart governance model that is a mix of collaborative, open and participatory governance. The almost same vision was supported by Anindra and others who have seen smart governance as a critical factor for smart city implementation based on the country case study (analysis of 15 cities in Indonesia) [30]. The results have shown that 51% of smart governance activity has been performed by the assessed smart cities, proving that smart governance was an essential factor. Chourabi and others have revealed the eight critical factors of smart city initiatives including the following such as management and organization, technology, governance, policy context, people and communities, economy, built infrastructure, and natural environment [31].

Table 1. Mapping of the themes found in framework of literature review

Smart City Success Factors [23] [24] [27]	Governance and Policy [25] [26] [29] [30] [32] [7] [33]	Citizen Engagement [28] [16]
Sustainability Factors [34] [35]	Challenging factors [19]	Diversified componential approach [32]
Systemic Approach to Smart Cities rather lacking [36]	Micro & Macro Factors [37]	

Source: Author own work

Nam and Pardo have followed the approach of providing the strategic principles in the framework of the three main dimensions such as technology, people, and institutions [38]. The determined principles for smart city proper evolution are integration of infrastructures and technology-mediated services, social learning for strengthening human infrastructure, and governance for institutional improvement and citizen engagement. As mentioned by Monfaredzadeh and Krueger, the social factors have been systematically neglected in contradiction to deeper focus on technological aspects of smart city [39]. The authors brought more attention to sustainability factors. Alderete has focused on exploring the role of macro factors in terms of smart city measurement approach [37]. The scarcity of literature related to macro or country level factors has been mentioned and it was concluded that the ICT improvement in smart cities are relying both on urban features and on macro-technological dimensions. Understanding the smart factors is likely to also lead to improvements in the smart city index methodologies. Ningrum has concluded that in the literature focused on indicators there are eight groups of factors involving governance, economy, living, mobility, environment, people, branding, and demography [32]. Gil and others have focused on sustainability-related factors of smart cities using the quantitative analysis applied to 73 European cities [34]. Wang and others have focused on the smart city policy as the key factor affecting the development of smart city in China [7].Iqbal and others have established the innovative Multilayer Fuzzy Inference System (MFIS) to evaluate the planet factors of smart city (PFSC) which is categorized into two levels using a low, satisfied, or good assessment approach [40].

Csukas and Szabo have used Porter's Five Forces Framework to determine the impacting factors within the medium-sized smart city context [19]. The added value of this approach lies in its relying on strategic management that is rather omitted when it comes to the smart city topic. The main challenging factors distinguished were the 'knowledge gaps', 'availability and quality of data', 'vendor lock-in', 'biased approaches' and the 'lack of standards'. An interesting approach related to the life-cycle of smart city was introduced by Darmawan and others highlighting factors which affect the readiness of local governments in establishing smart city systems. The researchers have applied the so-called Unified Theory of Acceptance and Use of Technology (UTAUT) model to evaluate data obtained from the questionnaires involving the local and regional authorities. Based on the 4 hypothesis analysis, it was concluded that performance expectancy and effort expectancy factors are the most essential factors impacting readiness of local and regional authorities [33]. Jothimani and others have conducted the confirmatory factor analysis (CFA) applying the sustainable smart city development factors such as traffic problem, parking problem, storm water problem, waste management, road safety problem, pollution problem, drinking water problem and crime-related problem [35]. There are also studies focusing on factors affecting particular aspects of smart cities such as the adoption of AI chatbot for public transport services [41]. Fistola and Rocca have highlighted that viewing the smart city as a system divided into three main subsystems (anthropic, functional and physical) could be the basis for determining the smartness factors while the systemic approach is essential [36].

The theme mapping found in the framework of literature review has revealed a high level of attention to the governance as a factor, the limited distribution of the componential approach and quite common neglection of environmental and social factors. The classifications that use one or several main approaches often underestimate the presence of factors existing in other methodologies. In addition, the universalization of the factors in terms of smart city life-cycle is missing, while there is a need for a relatively fit-all model to be applied both for the early-stage and mature models.

2.3. The extended multi-factor smart city model approach

Keeping in mind the lack of comprehensive multidimensional approach to classifying the smart city impacting factors determined by the literature review, the innovative model has been proposed. This model encompasses the organizational, social, environmental factors and is aimed to serve as the basis for conducting the survey involving the multiple-stakeholders at the next research stages.

Table 2. Comprehensive factors classification

Factor name	Description
Collaboration and Partnerships	Collaboration of different stakeholders such as Quadruple Helix Model (academics, government, business and people) as well as intercity collaborations, C2C, B2B, G2B and others.

Leadership and Governance	Presence of smart city adopted governance approach, availability of efficient city leadership oriented to implement smart city inclusively and sustainably.
Capacity and Skills	Extensive orientation on education, developing workforce skills for smart city staff, authorities as well as training the digital skills of the smart city citizens.
Resources Availability and Economic Factors	The allocated smart city development budget, presence of source deriving mechanisms, possibly generating profits by the city for reinvestment, stable economic environment, investment-friendly regime, affordability of smart city products and so on.
Social and Cultural Factors	Broad citizen involvement in the decision-making processes, the population engagement level, smart city friendliness, food and job security, preserving cultural heritage.
Historical Context	Path dependency, the previous city development towards innovations.
Normative Pressures	Ethical considerations, social responsibility, and adherence to cultural values.
Technological Factors	Availability, accessibility and quality of technological infrastructure, such as effective telecommunications, data centers, IoT (Internet of Things) devices, other technologies both disruptive and basic (laptops, broadband).
Connectivity	The level of network connectivity and broadband penetration in the city, interoperability of existing smart city solutions.
Environmental Sustainability	Clear orientations towards sustainable development, SDGs agenda implementation, environmental efforts including CO2 emissions reductions, energy efficiency and others.
Formal Regulations	Presence of regulations, clear policies, strategic plans, legal boundaries.
Isomorphism	Imitating the practices of successful smart cities, imitating the existing models or smart city elements.
Institutional Entrepreneurs	Change agents challenging existing norms, introducing new smart city practices
Institutional Logics	The logic guiding the decision making prevailing in the city as an organization.
Macro-factors	Peace, external system stability such as state development.

Source: Author own work

3. Conclusions and directions for further study

The paper contributes to scientific discussion on the smart city factors providing the literature review of the existing literature and drawing the light on the organizational theory elements of smart city development. The lack of systemic approach to considering the smart city impacting factors has been revealed. The existing classifications do not fully cover the smart city componential content and are not fully sufficient for being used as a certain guide or checklist while building the smart city model in the early stages. The proposed classification model introduced in this paper has encompassed the different approaches to factor determination as well as added some other elements not previously discussed in the literature. It involved 15 factors from different literature presented approaches as well as the added ones to back up the application of the model. The multistakeholder perceptions and the combination of behavioral and organizational theory could serve as the basis for further study development. It would be promising to conduct the evaluation of factors in framework of particular city or multiple cities case studies to determine which factors are perceived as more crucial by the smart city stakeholders.

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