Deciphering the understandings and appropriation of the Smart City concept:

A multilevel inquiry

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"A city finishes by being a person"

Victor Hugo

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General Introduction

Studying the concept of "Smart City" is essential because it is considered to be a possible answer to the challenges of human development on Earth. Population growth and increased urbanisation raise a variety of technical, social, economic, and organisational problems (Neirotti, De Marco, Cagliano, Mangano, & Scorrano, 2014). Cities and territories are complex systems that are characterised by massive numbers of interconnections between citizens, businesses, transport, communication networks, services, and utilities. In the context of higher and higher urbanisation there is a need to balance social development, economic growth, and sustainable progress (Ben Letaifa, 2015).

During the last decades, the concept of has evolved and comprises numerous orientations and diverse views of what a Smart City is or could be. Depending on the various orientations emphasised, the Smart City provides different types of response to urban and territorial challenges. Due to this diversity of solutions, actors may differently understand the Smart City and may appropriate the concept in their own way. The aim of this thesis is to undertake a comprehensive inquiry into how the Smart City concept is perceived by its stakeholders. What are the different understandings of Smart Cities? How do the different actors of a territory appropriate the phenomenon? Which elements of this polymorphic concept are assimilated and supported? How do actors at different territorial levels comprehend Smart Cities?

Identifying stakeholders' understandings and appropriation is essential to face the challenges of the Smart City implementation and its governance. This thesis offers answers which are presented through a general introduction (five sections), four scientific papers that form the core of the thesis, and a general conclusion. To introduce the four papers, the introductory narrative starts with a broad discussion of what a Smart City means, and ends with a concrete presentation of the logics directing the structure of the thesis and the articulation of the paper. The first section presents the notion of the Smart City with a discussion of its different inclinations and the reasons for studying this concept. The second section highlights the notions of governance and stakeholders and how these elements are mobilised, envisaged, and linked to Smart Cities. It also presents actors' understandings and the appropriation of the Smart City as an untreated subject in the literature and the key topic of this thesis. Section three emphasises the different theoretical and methodological deficiencies reported in the literature on this subject. The section four introduces the qualitative and quantitative methodologies carried on the empirical research lead in Belgium to face the deficiencies presented on stakeholders' understandings and appropriation. Lastly, section five presents the articulation of the thesis based on four scientific articles which respond to the shortcomings presented in the previous sections.

1. Smart City: a broad concept

The concept of the Smart City becomes a central idea to which cities and, by extension, territories are turning to address their issues. Making cities smarter is something that nobody can be opposed to, if the results offer more effective solutions to a broad range of societal problems (Meijer & Bolívar, 2016). However, the question of what smarter cities and territories encompass in practice remains unanswered.

The term is being used in a prolific way by city officials, technology vendors, academics, think-tanks, and research centres; clouding the view of what it really means to become a Smart City. Despite the growing interest among various stakeholders, there is no consensus about the real meaning of the Smart City as a concept or its actual benefits (Kummitha & Crutzen, 2017). Depending on the definition, it comprises specific features such as enhancing the quality of life, adopting ICTs in urban systems, implementing new governance, focusing on human capital, and reaching a more sustainable territory (Batty et al., 2012; Kumar, Datta, Singh, & Sangaiah, 2016). The choice of the terms that define Smart Cities reflects the emphasis that each actor gives to a certain field, or to the set of strategies they suggest as the best way to build Smart Cities (Lara, Moreira Da Costa, Furlani, & Yigitcanlar, 2016). There is neither a single template to frame the Smart City, nor a one-size-fits-all definition of it (O'Grady & O'Hare, 2012). Smart Cities are composed of numerous components that are highlighted differently by their stakeholders. The phenomenon addresses an extensive thematic scope.

The literature acknowledges a lack of consensus on how to define or conceptualise Smart Cities (Albino, 2015; Hollands, 2008a; Nicos Komninos, Pallot, & Schaffers, 2013a; Mora, Bolici, & Deakin, 2017a). Smart City research is at an interdisciplinary crossroads (Ricciardi & Za, 2015). Conceptual papers as well as models and frameworks, both empirically and theoretically developed, are produced in significant amounts. According to Mora et al. (2017) the literature on Smart Cities is fragmented and lacks cohesion. The divergences on what Smart Cities represent prevent the consolidation of a critical, comprehensive, and global vision of the notion. The conceptualisation of the Smart City is still under construction.

1.1. Different orientations

The process of defining Smart Cities with alternative approaches provokes an increasing scepticism of the Smart City's potential and enriches a futuristic vision called "Smart Utopia" (Allwinkle & Cruickshank, 2011; Hollands, 2015; Söderström, Paasche, & Klauser, 2014; Watson, 2015). In their literature review analysing the evolution of the Smart City from 1992 to 2012, Mora et al. (2017) advocate that Smart City research and its definitions operate on two main development paths. On one side, a holistic conceptualisation of the phenomenon is developed with the integration of notions related to human and social capital, governance, sustainable development, environment, etc. On the other side, a techno-centric conception of the Smart City is promoted based on technology, ICT, and data-driven solutions used to resolve urban problems.

The question of the place and importance of technologies within the Smart City concept remains central in the literature, but the predominance of these technological orientations limits the Smart City's development in considering non-technological dimensions (Chatfield & Reddick, 2015; Gil-Garcia, Pardo, & Nam, 2015; Marsal-Llacuna & Wood-Hill, 2017). A holistic perspective of the Smart City then emerges, as stressed by the role of humans in the dynamic (Caragliu & Del Bo, 2018). In 2011, Nam and Pardo categorised and simplified the constitutive elements of the Smart City into three categories of core components. These stand for (1) technology (infrastructures of hardware and software), (2) human (creativity, diversity, and education), and (3) institutions (governance and policy). According to Ben Letaifa (2015), *"Smart Cities differ from the other concepts (intelligent, sustainable, creative, living city) by offering a balanced centricity between technology, people, and institutions"*.

The definition by Caragliu et al. (2009) offers a fairly comprehensive vision of the various factors which motivate the Smart City phenomenon: *"We believe a city to be Smart when investments in human and social capital and traditional and modern communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance"*. This definition integrates the different concepts with references to technology, human capital, governance, and sustainability as key elements of the Smart City construction. The later inclination toward the inclusive Smart City, with human capital and governance principles as drivers of the phenomenon (Ben Letaifa, 2015; Deakin, 2014; Meijer & Bolivar, 2016; Paskaleva, 2011; Paskaleva, Cooper, Peterson, & Götz, 2015; Bolívar, 2018; Ruhlandt, 2018), is identified by Gregory Trencher (2018) as the emergence of a second-generation of the Smart City called Smart City 2.0.

2. Governance and stakeholders' dynamics

2.1. Governance: a complex and evolving matter

The notion of governance follows multiple trajectories and theories. It refers to processes of societal coordination and steering towards collective objectives (Pierre, 1999). Governance is not limited to government activities and structures. The concept of governance stresses that both state and non-state actors can play a role in shaping the rules and interactions needed to manage society (Gutba, 2016).

Two main trends are leading governance today: firstly, a neoliberal move away from state-centric governance towards network-based governance; and secondly, a model of good governance that emphasises democratic ideals such as transparency and participation (Kooiman, 2003).

The exercise of governance requires not only subjects and actors, but also mechanisms, instruments, and processes. Governance includes formal political instruments such as laws, decrees, ordinances, rules, by-laws, and territorial policies, as well as non-institutional mechanisms such as public-private partnerships, negotiations, citizen participation, etc. (Gales, Trigilia, & Voelzkow, 2004).

2.2. Smart City governance: strong and contrasting approaches

Smart City 2.0 is conceived as a decentralised, people-centric approach where smart technologies are employed as tools to tackle social problems, serve citizens' needs, enhance policy and governance, and foster citizen participation (Trencher, 2018). The emergence of the Smart City concept cultivates reflections on what "Smart governance" or "governance of a Smart City" means from different disciplines and fields. For example, researchers in the field of e-government were interested in the governance of the city with the question of designing, developing, facilitating, and nurturing synergies between social structures and new technology while researchers of urban governance have ventured into the field of technology (Gil-Garcia, 2012). Numerous components of Smart City governance were identified and highlighted. However, the literature does not provide sufficient and systematic analyses which cover the different factors composing this topic and how they are related to Smart City construction (Meijer & Bolivar, 2016). The definition and measurement process of Smart City governance leads to an insufficiently studied question of its status which lies somewhere between a process, an input, an outcome, and/or a distinctive part of Smart City.

Governance is considered by some researchers as an input necessary for cities to become a Smart City. This is particularly the case when governance is part of a large conception of the Smart City. For example, Gil-Garcia et al. (2015) highlight three elements: *"(1) e-governance, (2) engagement by stakeholders, citizens and communities, and (3) network-based relationships such as partnerships and collaborations"* as governance-related elements of a Smart City. Castelnovo et al. (2016) highlight the holistic character of the concept based on the decision-making processes with certain required components. Marsal-Llacuna (2016) measures the *"citizen-centredness"* of city policies and local governance to account for the social pillar of sustainability. Meijer & Bolívar (2016) identify four ideal-conceptions of Smart City governance: (1) Smart City Government, (2) Smart Decision Making, (3) Smart Administration, and (4) Smart Collaboration – which differ in the inputs and priorities to build a Smart City[1].

Smart City governance is also examined as an outcome of Smart City construction and takes different forms. Some of these were identified at a broad level, such as *"public value"* (Bolivar, 2018), temporally with *"short-term and long-term objectives"* (Lin et al., 2015), or based on their potential economic, environmental, and social impact (Kourtit et al., 2012). Meijer & Bolivar (2016) chose another classification in terms of *"first, second, and third-order outcomes"*. First-order outcomes refer to *"changes to the government organisation"*, second-order outcomes are *"changes in the position of government vis-à-vis other urban actors"*, and third-order outcomes are *"improvements to the city"*.

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[1] Smart City Governance is about making the right policy choices and implementing them effectively and efficiently. Smart Governance corresponds to the management of a city by its government. Smart Decision Making involves a process of collecting and processing all kinds of data and information about public management. It focuses on the decision-making process and how this is implemented (or not). Smart Administration concentrates on an open, transparent, and inclusive administration as well as developing e-governance to better serve citizens and communities. Finally, Smart Urban Collaboration concerns intelligent collaboration between the different actors of the territory. It provides a proactive and open governance structure, with all stakeholders involved.

Other authors place particular importance on the combination of social and economic value creation (Batty et al., 2012; Dameri & Benevolo, 2016) or the solving of complex environmental sustainability problems at local levels (Chatfield & Reddick,2016). Among others, being more transparent has been highlighted by de Wijs et al. (2016), Fernández-Güell et al. (2016), and Albino et al. (2015).

Finally, Smart City governance is also studied as a distinctive part of the Smart City. Governance is conceived as one of the building blocks of the Smart City. For example, Giffinger et al. (2007) established six smart dimensions through several indicators to rank European medium-sized cities. Among them, a specific dimension is dedicated to "Smart governance". In their mapping of the components of a Smart City, Gil-Garcia et al. (2015) identified four dimensions "*(1) government, (2) society, (3) physical environment, and (4) technology and data*" underlined by ten components including "*governance, engagement, and collaboration*".

Seven key elements - *stakeholders (1), processes (2), technology & data (3), structures & organizations (4), roles & responsibilities (5), legislation & policies (6), and exchange arrangements (7)* - were identified by Ruhlandt (2018) as regularly employed in the literature on Smart Cities. They are popular components which are differently mobilised in the numerous definitions of Smart City governance, depending on its orientations and goals. In this thesis the notion of governance is considered as a process of coordination of actors, social groups, and institutions in order to attain appropriate goals that have been discussed and collectively defined in fragmented, uncertain environments (Le Galès, 1995). Different aspects of this definition are underlined in the conception of Smart City governance in the literature: stakeholders, actors, and network (underlying powers and relationships); processes, architecture, and the structure of governance (including formal and informal norms and rules); and the quality of governance (containing elements such as rule of law, legitimacy, equity, transparency, and effectiveness).

The discussion of the statutes of Smart City governance as an input, an outcome, a block, or a process of the Smart City exemplifies that there is no one-size-fits-all approach. Nevertheless, governance is considered as a central element of Smart City construction. Among researchers, the lack of appropriate governance arrangements for cities appears to constitute the most serious obstacle for their effective transformation into Smart Cities (Bolívar, 2018; Praharaj, Han, & Hawken, 2018). The lack of governance instruments for Smart Cities could represent the most serious barrier to their successful implementation (Manville et al., 2014).

2.3. Governance in Smart Cities: stakeholders as a cornerstone

For several authors, Smart collaboration is considered to be essential to set up Smart City initiatives. Stakeholders' engagement is judged to be a fundamental cornerstone of Smart City governance. A collaborative governance is necessary, it engages stakeholders in a collective decision-making process that is consensus oriented, deliberative, and that aims to make or implement public policy or manage public programmes or assets (Castelnovo, Misuraca, & Savoldelli, 2015). The term stakeholders is traditionally defined as "*any group or individual who can affect or is affected by the achievement of the organisation's objectives*" (Freeman, 1984). In Smart City initiatives, open innovation is being promoted in the form of PPPP "Public-Private-People Partnerships" that promote collaboration between all the stakeholders involved in a city or territory.

One stakeholders' model is highly prevalent in Smart Cities - the quadruple helix model; It replaces the classic private and public partnership for integrating with universities, industries, and governments, a new agent of knowledge creation: "the civil society" (Leydesdorff & Deakin, 2011). The ensuing Smart City governance encapsulates collaboration, cooperation, partnership, and citizen engagement and participation. It keeps the process of decision-making transparent (Albino, 2015) and enables better citizen participation in implementing, monitoring, and evaluating Smart City initiatives (Walter Castelnovo, Misuraca, & Savoldelli, 2016; Rodríguez Bolívar, 2018). In these perspectives, the traditional methods for governing and managing territories are no longer sufficient for the current public decision-making.

A new form of actors' participation arises with Smart City development which is valuable to open up governance (Bolívar, 2017; Castelnovo et al., 2015; Gil-Garcia, Zhang, & Puron-Cid, 2016). The notion of actors is also employed in the literature on Smart Cities. It may represent the individual, legal person, structure, organisation, etc., and it covers different realities and conceptions depending on the theories selected. Participatory governance (under different stakeholder or actors' roles) is highlighted as a key concept in many Smart City frameworks (Alawadhi et al., 2012a; Albino, 2015; Caragliu, Bo, & Nijkamp, 2009; W Castelnovo et al., 2015; Giffinger & Haindlmaier, 2010; Lombardi, Giordano, Farouh, & Yousef, 2012; Nam & Pardo, 2011; Zomer, Moustaid, & Meijer, 2015).

Cities and territories are considered as pluralistic political spaces, which drives a process of multiplication of actors. For Pinson (2006) the phenomenon of pluralisation of actors is not synonymous with ungovernability or lack of capacity for action. On the contrary, the mechanisms related to participatory governance suggest reorganisation of the relationships between actors, and innovations in the instrumentation of public action.

Derived from urban governance theory, two main dimensions are useful to frame the stakeholders' relationships in Smart City governance. The first is an external dimension characterised by vertical integration, and the second is an internal dimension characterised by horizontal integration (Le Galès, 1998; Pierre, 2014). Horizontal integration refers to the capacity to integrate organisations, actors, stakeholders, social groups, and different interests in the governance of a city, while vertical integration embodies the capacity to represent and lead relationships with regions, central government, other local authorities, and transnational institutions. This vertical integration introduces concerns regarding

"multilevel governance" in Smart Cities, and highlights the necessity to consider the processes and operations at, and between, the varieties of geographical and organisational scales.

The highly interactive forms of governance in Smart Cities generate obstacles in delivering Smart City initiatives. For Washburn & Sindhu (2009), the low number of realisations of Smart Cities partly result from a lack of governance that ensures multistakeholder collaboration, not just at the design and implementation stage but also post-implementation. Several authors (Nicos Komninos et al., 2013a; Schaffers, Komninos, et al., 2011) emphasise that stakeholder dynamics are complicated to define. How participatory governance is to be achieved in a Smart City also remains vague and there are many ambiguities that are as yet unresolved.

2.4. Stakeholders: unexplored understandings and appropriation

The literature review in this thesis shows that few authors have studied how actors understand and appropriate the Smart City concept. Knowing stakeholders' perceptions of Smart Cities is essential in order to enrol them into a Smart City dynamic. Stakeholders have different visions and ambitions. For example, companies do not fully share a common conception of Smart Cities due to different corporate ethos, but also because they are competing and selling different products (consultancy, networks, hardware, devices, chips, software, system solutions, etc.). Governments, political parties, and associations also have distinct priorities. For Kitchin (2014), the nature of these differences and how they negotiate into the complex assemblage of a Smart City needs to be teased apart. Distinguishing actors' points of view of how they envision the Smart City is crucial. The direction they want to give to the implementation of Smart Cities depends on their perceptions. What does the Smart City represent for them: a tool, an instrument of public policy, a threat, a utopia, an academic concept?

The fragmented and distorted view of what a Smart City is lead to a multiplication of stakeholder's reflections on the means, objectives, and results needed to make a city smarter. Stakeholders do not consider the various Smart City dimensions and characteristics in the same way. However, the success of a Smart City is highly dependent on a match between Smart initiatives and the knowledge and attitudes of the relevant actors (Meijer, Gil-Garcia, & Bolívar, 2016). Exploring how stakeholders comprehend the Smart City, and which principles they value, facilitates an identification of the underlying transformation of the territory. Thinking about smartness does not reflect a dichotomy in terms of "being Smart" or "not being Smart" (Schaffers et al., 2011). Actors' discussions and arguments on how to solve the problems of the city may offer a common conception of which solutions to mobilise. Thanks to studies of stakeholders' understanding of the Smart City, this thesis identified tools to improve Smart City implementation. Exploring the orientations that each actor favoured for his own composition of a Smart City may help solidify Smart City construction in the territory. Identifying controversy or association of opinions on the concept offers raw materials to foster its governance. Understanding actors' positioning makes the comparison of existing points of view possible, in order to consider the co-creation and co-construction of Smart City projects.

The necessary identification of stakeholders' understanding and appropriation of the concept requires more than just a literature analysis. Quantitative and qualitative research are methods which are most likely to offer proper results in helping to define what is relevant and useful in the stakeholders' points of view. Stakeholder appropriation of the Smart City is a contextual element of Smart City governance. Actors' possibilities of action and collaboration may differ widely according to the Smart City orientation. The 3RC framework developed by Kummitha & Crutzen (2017) highlights that specific Smart City construction favours several actors. The success of Smart City governance depends on the knowledge of citizens and stakeholders, and the willingness to contribute this knowledge to collective problem-solving.

3. Lack of scientific contributions on Smart Cities

Several literature reviews on governance in Smart Cities (Anthopoulos et al., 2016; Deakin, 2014; Meijer & Bolívar, 2016; Ruhlandt, 2018), as well as the literature review in this thesis, highlight that the Smart City thematic is still largely under exploration and is in need of a theoretical frame. It also lacks empirical research based on quantitative methodologies and qualitative in-depth methods. The literature on Smart Cities needs research on how stakeholders understand and appropriate the Smart City and its different orientations.

3.1. Lack of a theoretical frame

A relatively small cadre of critically-oriented scholars have contextualised and made theoretical sense of Smart City rhetoric and initiatives (Kitchin, 2014). The literature is insufficiently framed in theories; it reinforces a fragmentation of the governance in Smart Cities. The literature review of this thesis calls for global explanatory frameworks on stakeholders' dynamics in Smart Cities through the development of in-depth theoretical analysis. Which theories can offer a truly effective framework of analysis of the Smart City actors' dynamics? It would be essential to carry out an in-depth work of inscription and confrontation of principles of governance and actors' dynamics in the Smart City in relation to strong theoretical approaches. Rodrigues Bolivar (2016) claims that it is time to use new theories based on network management, interactive decision-making, and co-production theories, in order to model new links and interactions between governments and other stakeholders. In order to study the Smart City, it is necessary to tie up the concept theoretically.

Smart City governance should study Smart City development as a complex process of institutional change and acknowledge the political nature of Smart City governance (Meijer & Bolívar, 2016). Moreover, theoretical tools are needed to cope with the complexity of the Smart City, which is strongly inter-disciplinary (Nam & Pardo, 2011a). Traditional management, organisation, and information systems theories are not sufficient to study the Smart City, since they tend to disregard the importance of the built environment for the people, institutions, organisations, and networks rooted in it (Ricciardi & Za, 2015).

In this thesis political sociology and the sociology of sciences are solicited to understand the construction of the Smart City and its appropriation by actors. The Smart City is considered as an instrument for cities and territories, following Lascoumes & Le Galès' (2007) definition of an instrument. This notion was reintroduced through questions of management and governance of public subsystems of societies and policy networks (Termeer & Koppenjan, 1997; Lascoumes & Valluy, 1996). This helps to better analyse the Smart City as inseparable from a contextualised mode of appropriation and representation of problems (Lascoumes, Le Galès, Gardon, Sébastien Pierre Lascoumes, & Le, 2007). In this perspective, the Smart City is studied as an instrument which stands between a device employed to transform the territory and a political issue questioning the future of cities and towns.

For Meijer & Bolivar (2016), research into Smart City governance should also benefit from sophisticated theories of socio-technical change. In this thesis, Smart Cities are also considered as a process of translation taking place in the city, following the actor-network theory (ANT). ANT uses the notion of translation to better understand institutional innovation and change in the network of actors: how the innovation of the Smart City is adopted, how it moves, how it progressively spreads, and how it transforms.

3.2. Empirical research is needed

Although there is no single route to becoming Smart, cities have adopted different approaches that reflect their particular circumstances. Few rigorous statistical analyses have been performed to study how the concept of the Smart City is understood and applied to a territory (Caragliu et al., 2009; Hollands, 2015; Kitchin, 2015; Vanolo, 2014). Empirical proof is insufficiently mobilised for the study of Smart City governance and its stakeholders' dynamics. Several scholars identify problems in how Smart City case studies are developed. Meijer & Bolivar (2016) pointed out the shortage of adequate explanations in terms of contextual factors in case studies related to Smart City initiatives, as well as a lack of clarity around the politics of socio-technical choices in Smart City governance. For Hollands (2008), cities claim themselves Smart with a self-congratulatory note and without a critical check, and for Kitchin (2015b) there is a problem of one-size-fits-all narratives and an absence of in-depth empirical case studies analysing collaborative engagement with various stakeholders in Smart Cities.

There are relatively few detailed case studies of specific cities, programmes, or stakeholders based on extensive fieldwork. These limitations lead to unbalanced explanations of Smart City initiatives. Empirical research should investigate the role of contextual factors and their potential influence on Smart City governance components and outcomes. The implementation of new governance models under the Smart City frameworks needs empirical analyses to study the relevance of developing a networking environment in each city or territory (Bolívar, 2018). To face these methodological criticisms, this thesis concentrates its investigations through empirical research based on two quantitative papers and one qualitative article.

4. Stakeholders' understanding and appropriation of the Smart City: quantitative and qualitative evidence in Belgium

4.1. Filling the gap

Smart City is a fuzzy concept that covers multiple orientations. Over time and across debates, the governance inside Smart Cities has become a central element. In particular, there is a focus on the inclusive dynamics of actors in the Smart City 2.0 (Trencher, 2018). In this thesis, rather than understanding the Smart City as a given set of solutions associated with a certain deterministic effects on society, the Smart City is studied as a process situated in a body of practices, into which actors are enrolled in different ways. The Smart City is considered as a way of looking at smartness, not as an end but rather as a way forward. Smart City is not therefore a status of how Smart a city or territory is, but is viewed as a city's effort to make itself Smart (Gil-Garcia, Pardo, & Nam, 2016). The Smart City is considered both as an instrument of transformation of the city, as defined by the theory of instrumentalisation of Lascoumes and Le Gales (Lascoumes & Le Gales, 2007), and as a transition process as conceived by the actor-network theory (Latour & Callon, 1981).

This thesis concentrates its investigations on deciphering the understandings and appropriation of the Smart City concept. Knowing actors' understandings is crucial in order to be able to engage a smooth stakeholder dynamic within the framework of Smart City governance. In the literature on Smart City governance, there is a lack of empirical analyses based on statistical treatments and on qualitative case studies. Three papers in this thesis integrate these missing methodologies.

4.2. Adjustment to Belgian territories

The questions of scales and spaces are less developed in the literature on Smart Cities. Some models associated to the Smart City concept appear in the literature with different territorial considerations such as Smart village, Smart rurality, Smart state, or Smart regions. Few studies explore the application of the Smart City concept and its broad orientations to the various territorial levels. However, some authors consider that the situational characteristics of cities and territories are a crucial matter for the effectiveness of Smart City construction (Meijer, 2016; Ibrahim, El-Zaart, & Adams, 2018). They mention the need to check the territorial readiness for change before planning the needed transformation to become a Smart City, which has a critical effect on the success of a transformation process that may lead to failure. Territorial and local context conditions are crucial determinants considering the multifaceted structural nature of Smart Cities (Bolívar, 2018; Caragliu & Del Bo, 2018a; Dameri, 2017).These characteristics are either conducive or limiting to the Smart City considered. This means that an in-depth analysis of the smart solutions in their (political, institutional, societal, economic, and cultural) territorial context is needed.

In this thesis, a major assumption leading the research concerns the faculty of the Smart City concept to transform Belgian territories into Smart Territories. Smart City is relevant to apply through the diverse institutional layers of Belgium (communities, regions, provinces, and municipalities) as well as through the different Belgian environments with their own characteristics (urbanised, rural, post-industrial, etc.). Belgium is composed of a

large network of small and medium-size cities with several rural areas mainly located in Wallonia. The country is territorially marked by a phenomenon of peri-urbanisation, a complex centre-periphery relationship, and socio-economical differences between the three regions. The Smart City concept is judged to be sufficiently flexible within its broad orientations to respond to the numerous challenges of each Belgian territorial context. This thesis aims to analyse the stakeholders' understandings of the Smart City in the frame of their respective local and contextual environments. It offers an analysis of the different Smart City orientations that takes into account territorial variables in relation to the intentions of the Belgian actors that were solicited. In exploring how actors of the territory envision the Smart City, this thesis analyses which of its orientations are judged to be adapted, relevant, inappropriate, or inapplicable to the territory.

5. Structure of the thesis

5.1. A logical progression

In order to answer the thematic gaps (understanding and appropriation of the Smart City), the methodological shortcomings (quantitative analysis and case study), and the need for theoretical framing (anchoring the empirical research in theoretical reflection), this thesis analyses stakeholders' understanding and appropriation of the Smart City in an innovative way based on four scientific articles. These consist of three pieces of empirical research carried out in Belgium, introduced by a literature review (as already mentioned). The logic that dominates the writing of these articles is as follows:

- Literature review
- Exploratory study of Smart City understanding: One actor / Belgium
- Study of Smart City as an instrument: Several actors / Belgium
- Study of Smart City as a transition process: Several actors / A city

The second article is an exploratory study that highlights the different understandings of the Smart City by a single actor throughout the Belgian territory. This quantitative study is intentionally exploratory, focusing on a single actor. This methodological orientation is restrictive in this aspect. However, the study is innovative because it questions Belgian municipalities of the entire territory and not a sample of cities; the different territorial characteristics of Belgium are considered. Moreover, in order to open up the fields of Smart City understandings, this article is not locked to a specific theoretical concept. It uses the in-house framing of Smart City literature (six dimensions, quadruple helix model, etc.).

This first exploration opens the way to study several actors' understandings in the second article of the thesis. This research requires a theoretical framework in order to adequately take into account the different understandings and especially the appropriation of the Smart City concept by Belgian actors from the territory who are active in this subject. The theory of instrument answers the theoretical deficiencies expressed in the literature review, and allows the actors' appropriation to be framed into two groups. This quantitative analysis utilises complex statistical analyses in order to highlight the differences and similarities between actors.

Finally, in order to deeply investigate the stakeholders' appropriation of the Smart City concept, the third article is based on a qualitative analysis based on a case study. It is framed by Actor Network Theory (ANT) as a methodological tool and as a theoretical framework to take into account the construction of the dynamics of actors around the Smart City, and is set in the city of Alphaville (Belgium). This article offers an in depth analysis of the stakeholders' understanding and the appropriation of the Smart City, it also goes further by studying the actors' enrolment. Through the methodology used, this qualitative study integrates additional contextual elements to the Smart City analysis provided.

This thesis offers four scientific articles which concretely take into account the shortcomings specified in the literature review of this thesis (thematic, theoric, and methodological shortcomings) in offering innovative approaches with its territorial scope (all of Belgium), methodologies used (statistical calculation and case study), and theories mobilised (instrument theory and ANT). The thesis responds to the questions proposed in Section 1 of this introduction, thanks to three main conclusions which are elaborated from the results presented in the four articles of this thesis – 1. stakeholders' understanding and appropriation vary due to technical and human dichotomy, 2. the Smart City is rejected by several actors, and 3. there is a lack of vertical integration of actors.

5.2. Status of the papers

The four papers have been submitted to scientific journals for peer review. The journals selected for publication are internationally recognised in their respective domains. The status of the papers in the review process is encouraging: two articles have been published in an international journal, a third article has been accepted, and a fourth article is due to be submitted.

Paper	Status	Journal	Ranking	HEC-Liege
Governance and stakeholders of Smart Cities: A call for a stronger theoretical foundation to tackle complexity	Under Submission	Informatics Special Issue "Impact of Emerging Technologies on Smart Governance Systems in Smart Cities"	/	/
Municipalities' understanding of the Smart City concept: An exploratory analysis in Belgium	Accepted, Published May 2019 Volume 142 Pages 129-141	Technological Forecasting and Social Change Special Issue Understanding Smart Cities: Innovation ecosystems, technological advancements, and societal challenges	HI 86 Q1 Management of Technology and Innovation https://www.scimagojr.com/	B
Smart City appropriation by local actors: an instrument in the making	Accepted Available Online September 2019, Volume 92 Pages 175-186	Cities https://www.sciencedirect.com/science/article/pii/S0264275118314069	HI 62 Q1: Urban Studies, Sociology and Political Sciences https://www.scimagojr.com/	OPRA
Actors' centrality in the building of a Smart City: A critical analysis using the actor-network theory process of translation	Under Submission	M@n@gement	Rank 1 ABS (Association of Business Schools, UK)	B

Table 1: Status of the papers

I. Paper One

Governance of Smart Cities: A call for a stronger theoretical foundation to tackle complexity

1. Introduction

Over the past few years, the phenomenon of the Smart City has gained significant popularity worldwide and has been perceived as a new way to transform cities and territories. Despite the popularity of the phenomenon, the concept is still fuzzy and no agreed definition on Smart Cities exists (Allwinkle & Cruickshank, 2011; Anthopoulos & Vakali, 2012; Chourabi et al., 2011; Hollands, 2008; Komninos, Pallot, & Schaffers, 2013).

Themes for Smart City initiatives are very extensive. For example, Nam and Pardo (2011) identify three core components of the Smart City: technology (infrastructures of hardware and software), people (creativity, diversity, and education), and institutions (governance and policy), while Giffinger (2007) highlights six 'Smart' characteristics: economy, people, governance, mobility, environment, and living. The concept of the Smart City addresses an eclectic thematic scope, this provides the opportunity to be studied by many disciplines. Smart City research is at an interdisciplinary crossroads (Ricciardi & Za, 2015).

According to Mora et al. (2017) Smart City research is fragmented and lacks cohesion. There is a deficiency of intellectual exchange between authors. They are subjective and follow personal trajectories in isolation from one another. Moreover, numerous Smart City frameworks and models emerge from the literature. They tackle the notion of the Smart City from different angles: strategy, regulation, management, equipment, monitoring, etc. This complicates the further identification of the concept. Governance is acknowledged as a recurring and transversal theme; the development of Smart Cities requires well-conceived and effective governance (Dameri & Benevolo, 2016; Gil-Garcia, Pardo, & Nam, 2015; Meijer & Bolivar, 2016; Nam & Pardo, 2011). Conceptual terms are able to describe the different aspects and forms of this governance: Smart governance, Smart Cities governance, e-governance, collaborative governance, participative governance, etc. Co-creation processes and stakeholder integration (Ben Letaifa, 2015a) are promoted. A successful Smart City can be built using top-down or bottom-up approaches. It demands active involvement from every sector of the community (Nam & Pardo, 2011).

Based on these observations, the aim of this paper is to critically analyse the state of development of the literature on the governance of Smart Cities. What are the theoretical approaches and how does empirical research focus on this subject? How do models and frameworks address these issues? Which governance principles are highlighted? Which actors are studied? To respond to these questions, this research proposes a literature review based on a broad set of papers. An advanced search query within four databases and a selection of papers furnished a set of 61 publications. Conference papers and papers dealing with the conceptual cousins of the Smart City are not considered.

Two meta-theoretical debates - normative-positive and structure-agent - are presented in Section 2 to better analyse the central concepts of governance and stakeholders in Smart Cities. Some links with the institutional, actor-network, and stakeholder theories are described to enlighten the literature review. In Section 3, the methodology of this research is described and, in Section 4, the descriptive results of the literature review are presented through three dimensions: theoretical foundations, methodology, and content. To conclude, in Section 5, the results are discussed through the lens of the theories previously presented. Finally, thanks to the confrontation of the results with some theoretical considerations, the conclusion highlights key trends, some knowledge gaps, and recommended paths for future research on governance and stakeholders in Smart Cities.

2. Meta-theoretical debates and related theories

To explore and understand the Smart City literature two major epistemological issues are mobilised in this paper. The debates on "positive/normative" and "structure/agent" positions offer the opportunity to analyse the governance of Smart Cities with an epistemological and theoretical focus. The presentation of meta-theoretical debates allows the introduction of three theories closely related to these dichotomies: institutional theory, the actor-network theory, and stakeholder theory. These are used as lenses through which valuable analysis of the Smart City literature can be made.

2.1. The "positive-normative" debate

The dichotomy between positive and normative has been the subject of multiple debates. This distinction between descriptive versus prescriptive, facts versus values, is versus ought, has its origins in philosophical discussions which can be traced back to David Hume (1738). For this reason, the dichotomy is also called "Hume's dichotomy", "Hume's fork", and "Hume's guillotine". Harris and Freeman (2008) agree that the positive/normative distinction is the manifestation of the fact/value dichotomy.

Mill (1981) makes the distinction between "what is" and "what ought to be". The difference is substantive enough to be called a dichotomy (a distinction between two fundamentally different things). The positive says what "is" the case, while normative and ethical inquires say what "ought to be". Keynes (1937) defines, on one hand, a positive science as a body of systematised knowledge concerning what is. On the other hand, a normative or regulative science is a body of systematised knowledge relating to the criteria of what ought to be. The object of a positive science is the establishment of uniformities and the object of a normative science is the determination of ideas with the formulation of precepts (Keynes, 1937). Some authors have also demonstrated that there are no purely empirical or purely normative methodologies (Werhane, 2008), and that methodologies can be both empirical and normative (Donaldson & Dunfee, 1994)

Finally, Yuengert (2002) considered that there is a hierarchical relationship between positive and normative inquiry, where positive inquiry serves the needs of normative inquiry, and normative inquiry guides positive inquiry.

2.2. The "structure-agent" debate

Bourdieu (1977, 1979) and Giddens (1984) deeply investigate the dualism between agency and structure. This question has been central to the discipline of sociology (Giddens, 1984; Thornton, 2008). Agency can be understood as *"an actor's ability to have some effect on the social world—altering the rules, relational ties, or distribution of resources"* (Scott, 2008). "Structure" is one of the most important and elusive terms in the vocabulary of social sciences; no formal definition can succeed in fixing the term. Structure operates in the social discourse as a powerful device, identifying some part of a complex social reality to explain the whole. The structure can be represented as "hard"/"material" or derived as "soft"/"mental" and connected to culture. Structures shape people's practices, but it is also people's practices that constitute (and reproduce) structures.

Giddens (1984) transcends the dualism of agency and structure, he writes: *"The constitution of agents and structures are not two independently given sets of phenomena, a dualism, but represent a duality".* The structure must be regarded as dual: both the medium and the outcome of the practices which constitute social systems (Giddens, 1976, 1984a, 1984b). In reformulating the concepts he contributes to the synthesis between structuralism and interpretation.

The relationship between structure and agency are represented in many different ways. This interplay of structure and agency characterises a meta-theoretical debate. It implies that social orders (structures, institutions, routines, etc.) cannot be conceived without understanding the role of agency in producing them; similarly, agency cannot be understood "simply" as human action, but rather must be understood as pre-configured by structural conditions. The structures are enacted by "knowledgeable" human agents (people who know what they are doing and how to do it), they act by putting into practice their necessarily structured knowledge. Some authors also recognise non-human agents in the debate.

2.3. Theories

Three theories are mobilised - institutional, actor-network, and stakeholders - to analyse the literature review. They allow a theoretical framing of the results of the research. The choice of these three theories is based on their facility to tackle the complex relations and interactions between organisations, actors, and stakeholders. Institutional theory acknowledges how organisations function, appear, evolve, and disintegrate, as well as how they are structured and are bearded of value. It also integrates considerations for groups and individuals interacting, influencing, and being influenced by their environments and institutions. Actor-network theory investigates how actors come together and work as one assemblage. The theory concentrates its attention on network creation, operationalisation, and the relationship that integrates human and non-human agents. Finally, stakeholder theory stresses the need for stakeholders' consideration within this interplay. The utilisation of these three theories makes it possible to cover the broad concept of governance with a focus on actors and stakeholders as conceived in the literature of Smart Cities, using a structured and comprehensive approach.

A. Institutional theory

Institutional theory acknowledges the organisations and structural factors that constrain organisations. "Institution" refers to an overarching system of values, traditions, norms, and practices. Institutional theory explores the different means/mechanisms of legitimacy and social acceptance that are established in organisations (Meyer & Rowan, 1977). It offers a comprehensive approach which takes into account factors that may influence organisations. Therefore, institutional theory has a broader view of the social system surrounding organisations (Meyer & Rowan, 1977). This social system is often referred as an organisational "field", which according to Scott (1995) is defined as *"the existence of a community of organisations that partake of a common system of meaning and whose participants interact more frequently with one another than with actors outside of the field"*.

Institutionalists first studied the phenomenon of bureaucratisation and other forms of organisational change. The notion of "isomorphism" developed by Di Maggio and Powell (1983) explains the processes that make organisations more similar. In the "new institutionalism", organisations are considered as political actors. They are not only responding to external factors, but also trying to dominate their environments and fight for survival (March & Olsen, 1989). Organisations may also disappear through the process of deinstitutionalisation (Dacin, Goodstein, & Scott, 2002). Finally, new institutionalism introduces the concept of the "institutional entrepreneur" who may initiate changes in the organisation.

B. Actor-network theory

Actor Network Theory (ANT) is a method used to investigate situations. The development of the ANT is significantly led by the work of Bruno Latour (2005), Michel Callon (1986), and John Law (2009). ANT investigates how actors can come together as one assemblage containing both human and non-human elements to achieve their desired ends (Fox, 2000). ANT focuses on following networks and associations between actors and on understanding their interactions and organisations. The term "actor" refers to both human and non-human entities, such as a person, a plant, a machine, a budget, etc. A fundamental quality of an actor is that it acts, transforms, and impacts something or influences situations (Pollack, Costello, & Sankaran, 2013). For ANT, it is desirable to talk of humans and non-humans in the same analytical terms.

To sum up, ANT helps to understand how networks are created, how connections between networks and actors operate, how they influence and they are influenced, and how these relationships can be organised and stabilised (Callon, 1999).

C. Stakeholder theory

Stakeholder theory highlights the interplay and communication between an organisation and its stakeholders. Since Freeman's (1984) book "Strategic management: A stakeholder approach" was published, numerous conceptions of the stakeholder have appeared. The stakeholder approach aims firstly to understand the firm in its environment. Stakeholder models have become an important tool to transfer ethics to management practices and strategy (Fassin, 2011). They illustrate the relationships between the various groups of

actors in, out, and around the firm. Stakeholder theory has extended these principles to organisations other than firms; it puts additional emphasis on the opportunity dimension of the stakeholders' analysis.

Research on stakeholder theory has proceeded into 3 sub-disciplines that regularly become tangled: the descriptive, the normative, and the instrumental (Donaldson & Dunfee, 1994; Donaldson & Preston, 1995; Fassin, 2011; Friedman & Miles, 2006). The descriptive stakeholder theory focuses on describing how organisations manage or interact with their stakeholders. Normative stakeholder theory prescribes how organisations should treat their stakeholders. Finally, instrumental stakeholder theory claims to pay attention to stakeholders' impacts on the achievements of an organisation's goals. Stakeholder theory also focuses on issues related to stakeholder power and how this power impacts the organisation (Deegan & Blomquist, 2006). Thus, the interests of the organisation may be nurtured by an interactive and symmetrical two-way communication with its stakeholders (Madsen & Ulhøi, 2001).

3. Methodology

The aim of this paper is to explore the state of the development of governance in Smart Cities through a literature review. This review is built on a two-step process. The first phase identifies a set of papers using an advanced search query with the keywords "Smart City", "stakeholders", and "governance". The query was run in four databases (July 2017): Ebsco Host, Scopus, ScienceDirect, and ProQuest. Articles, book chapters, and published proceedings are included, conference papers are omitted. The results are shown in Table 2, 222 articles remain after the deletion of duplicates.

Keywords (2017)		Scopus	ScienceDirect	Ebsco	ProQuest	Sum
"Smart Cit*"	Stakeholder*	130	15	38	5	188
"Smart Cit*"	Actor*	75	14	17	4	110
"Smart Cit*"	Governance*	180	13	58	9	260
Smart City	Stakeholder*	182	27	116	20	345
Smart City	Actor*	122	20	124	15	281
Smart City	Governance*	244	19	164	31	458

Table 2: Results of the research query

In a second phase, after reading the titles and abstracts of the articles produced, only papers which have the consideration of governance as a central theme or subject of analysis are selected. Moreover, papers on conceptual cousins of the Smart City, such as 'intelligent city', 'virtual city', 'innovative city', 'digital city', 'ubiquitous city', 'knowledge city', and 'creative city', are not taken into consideration. The result of this selection generates a corpus of 61 papers which display a variety of aspects of governance in Smart Cities. The notion "Smart" in the papers is considered as a significant criterion. The selection of the papers was run independently by both authors.

Based on the analysis framework used by Crutzen & Herzig (2013), the documents selected are investigated according to three dimensions: theoretical foundations, methodology, and content, as presented in Table 3. There is also a section of general information which

highlights the evolution of publications on the topic through the types of documents and over time. Theoretical foundations deal with the theories, models, and frameworks mobilised and the epistemological positioning of the papers on the normative/positive and structure/agent debates. The methodology investigates criteria related to the methodological aspects of the research such as the type of research (conceptual paper, empirical paper, and literature review), the development of models and frameworks, and the empirical methodology adopted. Finally, the content analysis offers a study of the set of papers in terms of stakeholder types, emphasis on governance, and technological positioning.

General Information	Theoretical foundation		Methodology	Content
Year of publication	Theories mentioned		Research method (quantitative, qualitative, and review of literature)	Stakeholder types (Loet Leydesdorff & Deakin, 2011)
Type of document (book chapter, article)	Epistemological positioning:		Models and frameworks developed Empirical method used (subject studied)	Governance focus (Meijer & Bolívar, 2016)
First author's department	Normative/positive	Structure/agent	Location and scale (countries, scales)	/

Table 3: Analysis framework

4. Results

4.1. General Information

The number of papers increases over time, from 2003 (1 paper), 2013 (8 papers), to 2015 (19 papers). In 2015, the number of publications reached its maximum. In 2016, the number of papers decreased to 15. Only one document is processed from the beginning of 2017. The oldest paper in our selected dataset dates to before 2010. In 2003, the concept of Smart City is studied in the paper *"Information and communication technology and local governance: Understanding the difference between cities".* Nancy Odendaal (2003) examines Smart City initiatives incorporating ICT in the local governance of Brisbane (Australia) and compares it with that of Durban (South Africa).

The selected literature includes a large number of book chapters, with 11 (18%) relevant documents identified. These books mostly have a specialised subject related to the governance of Smart Cities like *"Democratic ecologies"*, *"Transforming city governments for successful Smart Cities"*, and *"Smart Cities: Governing, modelling, and analysing the transition"*. Some books present general themes such as: *"Handbook of research on social, economic, and environmental sustainability in the development of Smart Cities"* and *"From information to Smart Society"*.

The first author's affiliation mainly corresponds to two orientations: the technical and technological field (informatics, ICT, engineering, technology, etc.) with 22 papers reported; and the economic and management field (business, management, economy, etc.) with 20 related papers. First authors of the human sciences domain (sociology, law, political sciences, etc.) produced 12 papers, while first authors in urbanism, planning, geography, and architecture developed 7 papers. Some authors are counted several times: Gil-Garcia (7-57-61) and Scholl (8-16-46) each redacted 3 papers. Additionally, Walravens (30-34) and Paskaleva (15-53) have each published 2 papers.

First author's affiliation	Sum
Informatics, ICT, Engineering, Technology	22
Business, Economy, Management	20
Human Sciences	12
Planning, Urbanism, Architecture, Geography	7

Table 4: Authors' affiliations

4.2. Theoretical foundation

A. Theories mentioned

Less than half of the articles explicitly mention at least one theory in their corpus. Only 25 articles refer to a theory, of these 7 mention more than one theory (4 with two theories, 2 with three theories, and 1 with four theories). The theories used in the set of 25 papers are divided into five categories:

- Theories connected to urbanism and planning
- Theories related to governance and governance principles
- Theories focusing on stakeholder and actors' dynamics
- Institutional and grounded theories
- Other theories

Theories related to urbanism and planning are cited 8 times, which correspond to urban growth, urban comparative, and planning theories. Theories with a focus on governance or governance principles (participatory democracy, new public management, public choice theories, urban governance) are mentioned 10 times. Theories on actors' dynamics (actor-network, social network, and stakeholder theories) are referenced 7 times. Institutional and grounded theories are named 3 times. Finally, 5 other theories are referenced: replication logic, human capital, human resource management, complex systems, and socio-techno change theories. Two of these are related to human management while the other three are associated with technologies and systems.

Type of theory	Article number	Name of theories
Theories connected to urbanism and planning	1-12-13-32-36-46-47-48	Urban sociology, urban growth, urban comparative, urban geographic economy, critical urban studies, planning (2x), new urbanist, development
Theories related to governance and governance principles	2-2-3-4-6-11-18-25-32-38-58	Urban governance theory (4x), governance theory (1x), new public management (NPM) (2x), public choice theory, participatory democracy, e-governance
Theories focusing on stakeholder and actors' dynamics	8-12-18-38-49	Social network theory (2x), stakeholder theory (2x), actor network theory
Institutional and grounded theories	2-14-31	Institutionalism (2x), grounded theory
Other theories	2-12-21-39-44-52	Replication logic theory, human capital theory, human resource management theory, complex systems theory, socio-techno change theory

Table 5: Classification of articles by theory

B. Normative-positive positioning

To explore the literature, the distinction between normative and positive papers is established using the descriptive versus prescriptive criteria. Articles are distinguished on the basis of the design of their contents. Thus, if authors have concentrated on "what is", "what happens", and "how a Smart City functions" the papers are labelled "positive". When authors expose "what a Smart City ought to be", the article is classified in the category "normative". The sections dedicated to conclusions and paths for future research are not considered in the analysis; these systematically offer a normative approach.

However, some papers are not purely positive or purely normative, they encompass both approaches. For example, in the article *The empty rhetoric of the smart city: From digital inclusion to economic promotion in Philadelphia"* (2016), Wiig develops an extensive case study which follows a positive approach. But through this case, he also strongly promotes a Smart City which should not "sell" the city and should address urban inequalities. These suggestions represent a normative approach in the paper. Thus, this article is both positive and normative.

Positioning	Sum	Article number
Normative	*18*	1-7-10-23-27-35-36-37-39-40-43-45-50-51-55-56-57-59
Positive	*28*	2-3-4-5-6-9-12-13-15-16-17-18-20-21-22-25-28-29-30-31-34-38-41-44-48-49-53
Both	*15*	8-11-14-19-24-26-32-42-46-47-52-54-58-60-61

Table 6: Normative and positive positioning of articles

The results demonstrate that the literature is still elaborating what the governance in a Smart City should be, and 18 articles have positive positioning. Half of the articles (28 articles) analyse the current situation of the Smart City and its development through positive positioning. Finally, 15 articles mix views on what a Smart City is and what it ought to be.

C. Structure and agent distinction

In this literature analysis, the concept of structure is considered to be "hard" or "material" and as "soft" or "mental". Structure consists concretely of infrastructures, organisations, and functioning/non-functioning compositions. They can take different forms: a model of governance, an ICT platform, a Smart administration, a company, an app, and so on. Despite these numerous forms, all of them are based on an organised structuration in the different articles. They are not emphasising individual actions or initiatives in their corpus. For the articles with an "agency" focus, only human agents are considered as they are influencing the structure.

Focus	Sum	Article number
Structure	25	1-6-9-12-15-16-17-18-20-23-30-33-34-37-38-39-40-42-48-50-51-52-59-60-61
Agency	36	2-3-4-5-7-8-10-11-13-14-19-22-24-25-26-27-28-29-31-32-35-36-41-43-44-45-46-47-49-53-54-55-56-57-58

Table 7: Articles with a focus on structure or agency

The majority of the papers present an agency focus (36) with major considerations. They are mainly centred on stakeholders' interactions but some focus on one stakeholder (citizens, entrepreneurs, workers). They focus particularly on their dynamics and/or how they influence the city. There are 25 articles with a structure focus, which mainly emphasise how a city or its governance could become Smarter (more efficient, inclusive, transparent, etc.). The various structures considered in the papers are differently composed. For example they are based on technical solutions (platforms, ICT infrastructures, data usage), governance forms (established on frameworks and models), or the ideal configuration to aim for (for a city, an organisation, an ecosystem, etc.).

4.3. Methodology

A. Research method

Empirical papers represent the highest source of articles, with 40 corresponding articles. There are 17 purely theoretical papers and 4 literature reviews, and normative discussions on governance and stakeholders in the Smart City are present. The 40 empirical studies are unbalanced in the methodology used. Single and multiple case studies represent 31 papers. Only 6 papers are constructed using a quantitative methodology: 3 are based on the results of surveys and 3 on data analyses (territorial data and app data). Finally, 3 papers present a qualitative analysis (Delphi, expert interviews, focus group, and policy document examination).

Of the 61 papers, 29 develop models or frameworks. These are divided between purely theoretical models and models constructed using empirical research. 13 papers integrate models or frameworks which are elaborated on the basis of purely theoretical reasoning or on the results of a review of literature. 16 papers develop models in relation to field analysis.

B. Empirical method

The 31 case studies and the 6 quantitative research papers have different subjects of study; a typology in three categories is conducted in order to classify them. The first category: 13 papers contain either the results of cross-sectional projects (conducted in several cities or territories) or the results of a cross-sectional analysis (survey results, comparison of applications, etc.). They form the category "transversal". "Transversality" of the analysis is the criterion of differentiation.

The second category "depth case" includes studies that are carried out on a specific territory with a detailed analysis of one or more cases (Smart City strategy, Smart City project, etc.). These case studies include only 1 to 3 cases maximum.

Finally, the last category "actor focus" contains 7 papers which study one or several actors in particular (IBM, CISCO, MIT, etc.) in their Smart City operations.

C. Locations and scales of empirical research

The corpus of papers mainly covers case studies developed in Europe; more than 50 projects or territories are analysed in this area. Some cities are the subject of several papers, such as Amsterdam, Edinburgh, Brussels, Malmo, Barcelona, London, and Bologna. Countries from Southern, Northern, Eastern, and Western Europe are covered, but the projects are mainly centred on the EU territory. Only 9 cases are studied on the American continent with a large majority of these in North American territories (New York, Montreal, and Philadelphia). Only one South American area is represented by the Brazilian city of Curitiba. In Asia, 9 analyses are conducted; these are concentrated in Korea, Japan, Singapore, and China. The city of Bandung in Indonesia is also studied. Africa counts 5 examined projects (Durban, Abidjan, Masdar, and the Mediterranean African coast). Finally, only one analysis is conducted in Oceania with the case study of Brisbane.

Another classification of the empirical research is possible; this new classification distinguishes the scale considered in the papers. On the basis of the different territorial levels, three categories are established. The micro level represents an analysis of Smart City projects (transversal or not) that operate in a territorial portion of the city (district or neighbourhood) in a specific sectorial area (grids, apps, etc.). The mezzo level embraces studies that focus on the entire territory of the city and reaches a global scope (Smart City strategy). Finally, the macro level concerns analyses which have a wider scope than the city perimeter (region, country, etc.). The micro, mezzo, and macro levels respectively comprise 19, 15, and 2 papers.

4.4. Content

A. Actors

Two specific criteria can describe the research on actors in the literature on the governance of Smart Cities. The first tackles the notion of interaction of actors in the articles. The objective is to know if this topic is addressed and is subject to a particular treatment (and not just a citation). At least 36 articles out of 61 address this matter.

The second criteria emphasises the presence of actors in the papers, as shown in Tables 8 and 9. For each actor of the quadruple helix model (Leydesdorff & Deakin, 2011) - government, companies, citizens, and universities - the question asked is whether they are each subject to an in-depth examination. This may relate to positioning, perspective, criticism, etc. Mentioning the actor's name or leading a superficial approach to its position is not sufficient to be positively considered in this criterion.

Actor's name	Sum
Government administration	55
Companies	52
Citizens	49
Research centres and universities	27

Table 8: Actors studied in the set of papers

The actor who has the highest concern is the government (local, regional) and its administration, with 55 papers. The private sector (multinationals, companies, start-ups) follows with 52 papers. Citizens and civil society is third with 49 articles. Research centres and universities are present in 27 papers. Finally, out of this analysis, 5 papers deal with one of the four actors, 10 papers deal with two actors, 23 papers deal with three actors, and 23 papers address concerns on 4 actors. It is interesting to note that 2 papers do not have any focus on actors, the first paper thoroughly describes a technical model (Nanni & Mazzini, 2014) and the second presents a territorial model (Garcia-Ayllon & Miralles, 2015).

No. of actors studied	Sum	Article number
0	2	17-33
1	4	3-19-22-26-51
2	9	6-13-18-23-28-38-46-50
3	23	1-9-11-12-14-15-21-25-27-31-34-35-36-37-40-42-43-47-48-52-57-58-59
4	23	2-4-5-7-8-10-16-20-24-29-30-32-39-41-44-45-49-53-54-55-56-60-61

Table 9: Number of actors studied per article

B. Governance

The four categories of Smart Governance conceptualised by Meijer & Bolívar (2016) are employed to examine the literature. These authors identified four ideal-conceptions of governance - (1) Smart City Government, (2) Smart Decision Making, (3) Smart Administration, and (4) Smart Collaboration - they differ on the means and priorities needed to build a Smart City. The corpus of research is investigated through the lenses of these four conceptions of Smart City governance. The papers may cover one or several of these ideal-conceptions.

Conceptions of governance	Sum	Article number	No. of conceptions	Sum
Smart City Government	30	1-7-8-9-10-15-16-19-20-21-23-24-29-34-37-39-40-41-43-44-46-47-52-53-54-55-56-57-59-60-61	0	11
Smart Decision Making	20	1-6-7-8-9-10-12-13-14-16-17-20-23-28-40-46-47-48-57-59-61	1	16
Smart Administration	8	8-9-20-37-57-59-60-61	2	21
Smart Collaboration	42	1-2-4-5-7-8-10-11-12-13-14-15-16-19-20-21-23-24-27-28-29-31-32-34-35-36-39-40-41-42-43-44-46-47-48-49-53-55-56-58-60-61	3	10
None of them	11	3-18-22-25-26-30-33-38-45-50-51	4	3

Table 10: Conceptions of Smart governance across the dataset of papers

The results show that Smart Collaboration is the ideal-conception which is the most discussed in the literature, almost 70% of the papers address it. The forms, manners, practices, and positions of governments in Smart Cities are also extensively discussed in the literature, whether through Smart City Government (30 papers) or Smart Decision Making (20 papers). Only 8 articles tackle the subject of Smart Administration.

The majority of the papers encompass several conceptions of governance, the connection seen most frequently links Smart Government and Smart Collaboration (14 papers). This demonstrates an interest in the literature for a public lead and collaborative governance of the Smart City.

Three papers deal with the four conceptualisations of the Smart City in parallel. However, these papers develop different approaches: the first explores three case studies (Santinha & Anselmo de Castro, 2010), the second elaborates a framework which highlights the components of the Smart City (Gil-Garcia et al., 2015), and logically, the last is the literature review which develops the four-ideal conceptions (Meijer & Bolívar, 2016). It is also interesting that 11 papers do not consider any conception of the proposed governance. These articles generally focus on the analysis of one actor or a technology such as an app, a company, entrepreneurs, citizens, and so on.

5. Discussion

5.1. Evolution of the literature: origins and publication paths

Papers dealing with the governance of the Smart City really emerge in the literature after 2014. This year characterises the passage from the publication of less than 10 papers to more than 15 documents. A high growth of publication on Smart Cities is identified by Mora et al. (2017) from 2010-2012. The subject of governance and stakeholders is tackled after this sharp increase. Nevertheless, the annual number of papers on governance and stakeholders remains relatively small in (3 between 2010 and 2012) in comparison to the mass of publications on Smart City topics (more than hundred referenced annually). Many articles are also published in books. Therefore, the subject of governance is an emerging topic in the flood of publications on Smart Cities. However, a literature review on these subjects already exists; a fairly complete review is developed by Meijer and Bolivar (2016): "*Governing the smart city: a review of the literature on smart urban governance*". Other literature reviews are produced but with specific angles such as a focus on Smart government (Gil-Garcia, Zhang, & Puron-Cid, 2016), e-government (Anthopoulos & Reddick, 2016), or on a general context (Gil-Garcia et al., 2015).

The first authors' disciplines show that Smart City governance is considered to apply to several specialities. This corresponds to the notion of the Smart City itself, which is broad and encompasses multiple orientations as defined at the beginning of this article. Nevertheless, for the corpus of papers studied the disciplines of authors are mainly from technology, economy, and management fields which are already traditionally connected to the literature on Smart Cities. These interconnected disciplines were identified in the article "*Smart City research as an interdisciplinary crossroad"* (Ricciardi & Za, 2015). Therefore, it would be interesting to open the literature to additional disciplines.

5.2. Theoretical foundations

Few papers are described using theories, less than half of the papers explicitly refer to one theory. The theoretical grounding is weak and there is a lack of homogeneity in the adopted approaches. This may explain the significant presence of conceptual papers, reviews of literature, as well as models and frameworks both empirically and theoretically developed. The substantial number of normative papers and papers mixing normative and positive approaches increases this deficit of theoretical foundations. It shows that the theorisation and conceptualisation of governance within the Smart City are still under construction.

Moreover, the current theories used in the set of papers are already used by other disciplines. These theories come from the fields of urban planning, political science, or management. It would be essential to carry out an in-depth work of inscription and confrontation of governance principles in the Smart City in relation to strong theoretical approaches. The literature also lacks articles which deeply study how one or several actors understand, appropriate, influence, and/or impact the creation, implementation, and dynamics of a Smart City. It is necessary to consider how human and non-human agents may impact the Smart City (as a structure).

5.3. Methodologies

The corpus of papers contains a high number of empirical methodologies. The research is mainly located in Europe, and worldwide cases are missing. Moreover, out of the interviews realised, documents studied, surveys, and data analysed, only one Delphi (Anthopoulos & Reddick, 2016) was conducted and two focus groups were organised (Anthopoulos & Reddick, 2016; Van Den Bergh & Viaene, 2016). Again, the literature lacks methodologies which deeply analyse the actors' understanding and positioning on the notion of the Smart City. Four papers study how specific stakeholders subscribe to the concept of the Smart City: the stakeholders are citizens in Klimovský, Pinterič, & Šaparnienė (2016); experts in Anthopoulos & Reddick (2016); entrepreneurs in Kraus, Richter, Papagiannidis, & Durst (2015); and city officials in Dameri & Benevolo (2016).

The numerous conceptual and empirical models allow an exploration of the infinite thematic of the Smart City. These models address numerous subjects which do not consolidate into a critical, comprehensive, and global vision of the development of governance in the literature. For example, many models emphasise the use of applications and platforms in the Smart City that are associated to governance principles such as public governance (Anttiroiko, Valkama, & Bailey, 2014), public business models (Walravens, 2015), and information services for citizens (Khan, Kiani, & Soomro, 2014). It would be interesting to consolidate these different models into a theoretical framework.

5.4. Governance and stakeholders

The literature highlights different conceptions of Smart City governance, promoting cooperation between stakeholders and governmental management as the main developments. However, some papers do not deal with any conception of governance. Smart City Government, Smart Decision Making, Smart Administration, and Smart Collaboration are not framed in these papers. Therefore, an in depth analysis using the lenses of the 3 sub-disciplines of stakeholder theory (descriptive, normative, and instrumental) could theoretically explore the missing aspects of Smart City governance.

The majority of the papers discussed interactions between actors. Governmental and private actors are the most discussed players in the papers with their respective challenges, criticisms, and relationships. Actors of civil society are also gaining in importance in the literature. Authors also address universities and research centres, to some extent. However, stakeholder relations are a central subject of analyses in the set of papers. Thus, this result shows an illustration of the principles of horizontal integration developed in urban governance theory (Galès, 1998; Jon Pierre, 2014). However, in comparison to horizontal integration, vertical integration is not a matter considered in the literature. Despite the numerous transversal analyses, research is concentrated on local dynamics of cities or on their substructures, at a micro or a mezzo level. Only two papers work on a territorial macro level (region or country). What about the dialogues, influences, coordination, representations, or conflicts with the other levels of territories and powers and their respective actors? These aspects are only taken into consideration in some papers such as: *"The intelligenter method (II)"* (Marsal-Llacuna & Segal, 2016), *"Smart networked cities?"* (Tranos & Gertner, 2012), *"Towards a Smart State?"* (Gil-Garcia, 2013), *"Smart learning eco-systems: 'fashion' or 'beef'?"* (Giovannella, 2014).

Authors should pay attention to the "multilevel governance" in Smart Cities and study which sorts of processes and operations operate, both within and between the varieties of geographical and organisational scales. How can multilevel governance help smarter territories? Which interactions and processes can facilitate a vertical integration of actors in a Smart City? Is vertical integration absolutely necessary? Is this sometimes bypassed via shortcuts and governance mechanisms? Which Smart City cases require an absence or a strong vertical integration for their development?

6. Conclusion

What do we know about the governance and stakeholders in Smart Cities? To answer this central question this paper deeply analyses Smart City literature. It starts by exposing the current evolution of the Smart City concept and its general development. Next, the question of the dichotomy between normative & positive and the debate on structures & agents offers some theoretical lenses to analyse the literature. The presentation of institutional theory, actor-network theory, and stakeholders theory, closely connected to these two meta-theoretical debates, offers other theoretical tools of analysis. Through an advanced search query within four databases, 61 articles are selected. A descriptive analysis shows the results of this investigation across three sections: theoretical foundations (1), methodology (2), and contents (3) of the set of papers. Finally the results are put into perspective with the theories and their principles.

The paper presents a snapshot of the literature on governance in Smart Cities in 2017. At times, this limits the evolution of this concept which is still under construction. Moreover, numerous other documents produced by non-academic authors (grey literature) exist and influence the development of governance in Smart Cities. Finally, the critical approach is broad as it uses two epistemological debates and three theories. A deeper theoretical framing using only one of these or using another adequate theory could be beneficial.

It is apparent from this study that the literature on governance in Smart Cities had a late development (2014) after the publishing rise recorded for Smart Cities between 2010 and 2012. The literature is quite scarce compared to the global publications on the subject. Normative positioning is strongly present in the set of papers. This confirms that the academic formation of the governance of Smart Cities is still under construction. Moreover, the research is fragmented and lacks cohesion, for example numerous frameworks and models - empirical or conceptual - are elaborated. This fragmentation is reinforced by literature that is insufficiently framed in theories. The existent theories that are mobilised mainly come from different disciplines.

Consequently, it is necessary to reach global explanatory frameworks on the governance of Smart Cities through the development of in-depth theoretical analyses. Further research is necessary to face these theoretical deficiencies: Which theories can be applied to deeply analyse the governance models of the Smart City? How could the components of the Smart City (people, governance, and technologies) be tackled using a theoretical model? Which theories can offer a truly effective framework of analysis for Smart City actors?

Some development paths have already been proposed in this article, for example it would be relevant to consider ANT. Stakeholder theory, and specifically the sub-disciplines, could also be used to study in detail actors' interactions through a structured analysis. Finally, institutional theory may be used as a canvas to examine cities as a structure or an organisational field.

The stakeholders' interactions and collaborative governance are addressed in the majority of the papers. In the literature, the horizontal integration of actors in Smart City governance is preponderant. Additionally, the main subject of analysis remains the local or supra-local territory of cities. There is a lack of national and regional Smart City analysis and a lack of large empirical studies on a local level with a national and/or regional scope. The literature should explore the vertical integration of actors and the multilevel analysis of the governance of Smart Cities. Finally, the set of papers includes mainly case studies and empirical research which are focused in Europe.

Considering all these concerns, some paths for future research are proposed:
- Out of case studies and surveys, which methodologies should be investigated to study governance in Smart Cities?
- Which sorts of Smart City governance operate in African, Asian, American, and Oceanian territories?
- How do the different stakeholders understand and appropriate the notion of Smart Cities?
- How are universities, centres of research, and civil society concretely operating in a Smart City? How do they collaborate as a network?
- What are the roles of international institutions in Smart Cities, such as the EU, BEI, or WTO?
- How can vertical integration or multilevel analyses be integrated into the Smart City system of actors?

7. References

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II. Paper Two

MUNICIPALITIES' UNDERSTANDING OF THE SMART CITY
concept: an exploratory analysis in Belgium

1. Introduction

The Smart City is a fuzzy concept which is not yet well defined and not fully understood (L. G. Anthopoulos & Vakali, 2012; Lazaroiu & Roscia, 2012). Depending on the definition, Smart Cities have specific characteristics including digital infrastructure, ICT usage, business-led development, creative industries, social capital, and environmental and social sustainability (Caragliu et al., 2009; Hollands, 2008a). However, due to the lack of proper conceptualisation, defined method, or credentials (Angelidou 2015; Nam & Pardo 2011), cities claim themselves 'smart' with a self-congratulatory note (Hollands 2008). Moreover, the different purposes of the concept are challenged in the academic literature, especially the technocentric approach and the central position of private companies (Hollands 2015; Kitchin 2015; Vanolo 2014). Despite the increasing popularity of Smart Cities, there are few rigorous analytical or statistical analyses of the concept and its application to territories (Caragliu et al. 2009; Hollands 2015; Vanolo 2014).

Therefore, the aim of this paper is to study how Belgian municipalities understand the concept of Smart Cities in 2016. The main research questions investigated are the following: What are the different understandings of Smart Cities? Which explanatory factors (such as territorial variables) can explain the differences in understanding the concept? How do these understandings influence the perception of difficulty in implementing Smart City projects, and how they influence the acceptance of the concept by the municipalities?

From the approaches addressed in the literature on Smart Cities and the results of a survey among Belgian municipalities, a typology based on four understandings (technological, societal, comprehensive and non-existent) is elaborated. The sample of studied municipalities is representative in terms of degree of urbanisation (urban, rural) and geography (Flanders, Brussels-Capital and Wallonia). The size of municipalities (small, medium, large) is not representative. The exploratory results show municipalities without any understanding (non-existent) or with a technical understanding are mostly located in small and rural municipalities. These municipalities largely reject the concept of the Smart City for their territories. They also consider the launching of Smart City projects to be complicated. Conversely, medium and large-sized municipalities mostly develop a societal or comprehensive understanding of the concept. They esteem the phenomenon to be relevant for their territory, even if they regard the implementation of such Smart City projects as relatively complicated. Hence, the results of this study show a dichotomy of understanding and acceptance of the Smart City between rural and urban municipalities. Explanatory factors are suggested such as the renewed interest in urban and city policies and the increase in competition and collaboration between cities. Another important factor is the current lack of adaptability of the concept for small and rural areas. Finally, the influence of regional and national Smart City strategies has a potential impact on this difference in understanding.

This paper is divided into six sections. The first section questions the definitions and conceptualisations of the Smart City phenomenon. This section also includes a categorisation of the Smart City approaches based on the literature. The second section presents the Belgian territorial context and the Smart City dynamics in the country. The third section details the methodology with a presentation of the survey used, the data collected and a typology of municipal understandings. The fifth section presents the statistical analyses and results. It first explains the distribution of the municipalities in the typology and generates a new typology adjusted to Belgium. Secondly, it compares this typology to explanatory factors such as territorial variables. It also tests the relationships between the typology and the municipal perception of difficulty in implementing Smart City projects, and with the municipal acceptance of the Smart City phenomenon. Thirdly, it presents some explanatory factors for the differences in understanding. Finally, the last section concludes with remarks on Smart City development in Belgium and suggests some paths for future research.

2. Literature Review

The literature review explores the evolution and conceptualisation of the Smart City through debates, criticisms, orientations and characteristics. The first section presents the debate surrounding the definition and conceptualisation of the Smart City. In this part, the divergences between the techno-centred and the holistic views of the Smart City are exposed. In addition, considerations of the technological prominence in Smart Cities open the field to a more human and sustainable approach to the Smart City.

The second section offers a categorisation of Smart City approaches, which is developed as a result of the conceptual dissertation. Six categories emerge: technological, human & creative, sustainable, institutional and holistic.

2.1. Definitions and conceptualisations of the Smart City

Over the past few years, the Smart City phenomenon has been perceived as a new way to transform territories and to reinforce sustainability. However, the concept is not well defined and not fully understood (L. G. Anthopoulos & Vakali, 2012). Smart Cities combine their objectives to enhance the quality of life, adopt ICTs in urban systems, implement new governance and focus on human capital and sustainability. The line between Smart Cities and conceptual variants such as intelligent, digital and creative cities is blurry (Albino et al. 2015). Many definitions of Smart Cities exist. There is no single template for framing a Smart City, nor a one-size-fits-all definition of it (O'Grady & O'Hare, 2012). The Smart City movement inspires the world's academics, politicians, citizens and businessmen. Therefore, the Smart City emerges as a fuzzy concept, often improperly used (Nam & Pardo 2011). The notion of a Smart City is used in ways that are not always consistent. Despite the growing interest among various stakeholders, there is no consensus about the real meaning of Smart City as a concept or its actual benefits (Kummitha & Crutzen, 2017). Nowadays, rankings, competitions, fairs, congresses and research projects are all launched using the label "Smart". Company associations, research centres, cities etc. desire to be part of the movement. The Smart City is developed with a product-oriented angle which emphasises an interconnection between the market and the urban systems, with a strong positioning of

service (IBM, Siemens, Schneider, Alstom) and consulting (Accenture, McKinsey) companies. Cities auto-proclaim that they are 'smart' with self-declaratory attributions (Hollands 2008). Therefore, a certain "Smartwashing" is currently being pursued.

The literature acknowledges this lack of consensus on how to define or conceptualise Smart Cities (Albino, Berardi and Dangelico 2015; Hollands 2008; Komninos, Pallot and Schaffers 2013; Ben Letaifa 2015; Mora, Bolici and Deakin 2017). Nevertheless, in their recent literature review, Mora et al. (2017) advocate Smart City research and their definitions distinguish two main development paths. On one side, peer-reviewed publications from European universities have developed a holistic conceptualisation of the phenomenon with the integration of notions related to human and social capital, governance, sustainable development, the environment, etc. On the other side, grey literature based on technology and data driven understanding produced by the American business world refers to a technocentric conception of the Smart City.

The question of the place and importance of technologies within the Smart City concept is a central discussion. The implementation of technologies and mostly ICT into city infrastructure is promoted in order to increase effectiveness and efficiency in the city. The construction of Smart Cities is summarised by the deployment of sensors, networks and intelligent systems in order to improve the efficiency of local territories. It is what the techno-centred conceptualisation reflects through the transformative power of technology, which does not necessitate human input for Smart City development (Kummitha & Crutzen, 2017). However numerous authors (Deakin and Waer 2011; Hollands 2008; Komninos, Pallot and Schaffers 2013; Nam and Pardo 2011; Schaffers et al. 2011) assert that having well-functioning, efficient and technological infrastructure is not enough to become Smart. These authors emphasise that ICT or other technologies have to be considered as a medium to reach certain ends, rather than an end in itself. Actualities of municipalities are much more complex than the technological approach. Territories cover many other dimensions than those of infrastructure.

The second development path of the Smart City deeply considers non-technological dimensions. This conceptualisation is based on a more holistic perspective of the phenomenon, where authors first stress the role of human infrastructure, human capital and education in territorial development (Caragliu et al., 2009). A Smart City operates for people, who are a central component of the concept (Giffinger & Haindlmaier, 2010). This human conception comprises various factors like affinity to lifelong learning, social and ethnic plurality, flexibility, creativity, cosmopolitanism or open-mindedness and participation in public life (Albino et al. 2015). Social infrastructure (intellectual capital and social capital) is an indispensable endowment for people and their relationships in a Smart City. The question of governance (Deakin 2014; Meijer & Bolivar 2016; Paskaleva 2011; Ben Letaifa 2015) is encapsulated with the promotion of transparency, collaboration, cooperation, partnership, citizen engagement and participation. Human creativity is also taken into consideration in the concept. The Smart City points to clever solutions by creative people (Chourabi et al. 2011; Caragliu et al. 2011; Gil-Garcia et al. 2015).

In 2011, Nam and Pardo categorised and simplified the described constitutive elements of the Smart City into three categories of core components. These components stand for (1)

technology (infrastructures of hardware and software), (2) human (creativity, diversity and education) and (3) institution (governance and policy). According to Ben Letaifa (2015), "*Smart Cities differ from the other concepts (intelligent, sustainable, creative, living city) by offering a balanced centricity among technology, people and institutions*".

Nevertheless, another notion complements the holistic conceptualisation of the Smart City: sustainability. This has become one of the central topics of contemporary debates with a focus on resolving social and environmental problems. Over the last decades, the preservation of non-renewable resources occupies international political and economic agendas (Brundtland, 1987; United Nations, 1972, 1992). The term Sustainable City emerged; cities have become the focal points of sustainable development because they represent major consumers and distributors of goods and services (Bătăgan, 2011). The integration of the notion of sustainability into the Smart City is explored in several articles and books (Girard 2013; Rai & Challa 2016; Dameri 2012; Ahvenniemi et al. 2017; Araya 2015). Kramers et al. (2014) found that some Smart City conceptions included explicit sustainability objectives. Smart Sustainable Cities (SSC) is studied and is seen as an aggregate concept, which means that three parts: City, Smart and Sustainable have to be present for an entity to be qualify as a Smart Sustainable City (Kramers et al., 2014). The SSC is designed to solve the issues faced by cities and its ultimate goal is to improve the quality of life of citizens through the triple bottom line of environment, society and economy (Katarzyna et al. 2015).

The definition by Caragliu et al. (2009) offers a fairly comprehensive vision of the various factors and goals which motivate the Smart City phenomenon: "*We believe a city to be smart when investments in human and social capital and traditional and modern communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance*". This definition integrates the different concepts sub-mentioned with references to technology, human capital, governance and sustainability as key elements for the construction of a Smart City.

2.2. A typology of Smart City approaches

Based on the reasoning of the technocentric and holistic Smart City approaches, six categories of approach are generated from the multiple variations of the concept (Nam & Pardo 2011; Albino et al. 2015; Bătăgan 2011). These different key features of the Smart City are listed and assiduously explained in this section. The paper considers five fundamental concepts, which were expressed in the previous section - technological, human & creative, sustainable, institutional and holistic.

Technological	Human & Creative	Institutional	Sustainable
Holistic			

Table 11 : Categories of Smart City approaches

- Technological: A well-functioning infrastructure is necessary to become a Smart City. The use of ICT transforms life and territories in significant and fundamental ways. In addition, mobile, virtual and ubiquitous technologies gain importance. These technologies integrate hardware, software and network solutions that provide systems with real-time awareness and advanced analytics. These solutions help people to act

and make decisions that are more intelligent and sustainable. A Smart City offers network equipment (fibre optic channels and Wi-Fi networks), public access points (wireless hotpots, kiosks), and service-oriented information systems. The use of ICT and modern technologies is a key to becoming a Smart City (Harrison & Donnelly 2011; Paroutis et al. 2013; Washburn & Sindhu 2009; Lee et al. 2013; Dameri & Rosenthal-Sabroux 2014; Domingo et al. 2013)

- Human & Creative: Human capital and education are essential in a Smart City. Smart Cities use creativity, human knowledge and cooperation to respond to societal challenges. Smart Cities aim to improve the knowledge economy. The label Smart highlights clever solutions by creative people. The concept highlights creativity, social learning and education. This component also integrates the notion of Smart community (Neirotti et al. 2014; Giffinger & Haindlmaier 2010; Hollands 2008; Chourabi et al. 2011; Calzada & Cobo 2015; Cardullo & Kitchin 2017; Allwinkle & Cruickshank 2011)

- Institutional: Vision, leadership, organisational transition, as well as the re-arrangement of legal and regulatory barriers are important features in the development of a Smart City. The support of government and policy is fundamental to the design and implementation of the concept. Nevertheless, a key element of the phenomenon is the governance. This governance has to encapsulate collaboration, cooperation, partnership and citizen engagement. For the government this means collaboration across departments and with communities, as well as becoming more transparent and accountable, managing resources more effectively and giving citizens access to information. E-governance is a way to reach these objectives but it does not cover all these aspects. This governance also pays attention to the various stakeholders' (especially citizens') engagement in decision-making and public services. (Schaffers et al. 2011; Hollands 2008; Nam & Pardo 2011; Komninos et al. 2013; Deakin & Al Waer 2011; Meijer & Bolivar 2016; Anthopoulos et al. 2016; Rodríguez-Bolívar 2015)

- Sustainable: Smart Cities promote a green economy and a high social awareness including quality of life and place. Brundtland (1987) defined sustainable development as *a development that meets the needs of the present without compromising the ability of future generations to meet their own needs*. Therefore, the development of a Smart City integrates the protection of the environment with attention to social and economic equity. (Ahvenniemi et al., 2017; Batty et al., 2012; Bibri & Krogstie, 2017; Colding & Barthel, 2017; Ramaswami, Russell, Culligan, Sharma, & Kumar, 2016)

- Holistic: Smart Cities are a combination of technologies, human capital and creativity, with institutional factors for sustainable development. This holistic conception of the Smart City suggests that Smart Cities bring human and sustainable-centric approaches and technological advancement to enable a smart economy, smart mobility, smart environment, smart people, smart living and smart governance. (Mora et al. 2017; Kummitha & Crutzen 2017). A holistic Smart City was defined by Caragliu et al. (2011).

The categorisation offers an analysis grid of what constitutes the Smart City. These six approaches are lenses to perceive how the Smart City phenomenon is tackled. Few rigorous statistical analyses have been performed to study how the concept of the Smart City is understood and applied to a territory (Caragliu et al. 2009; Hollands 2015; Kitchin 2015; Vanolo 2014). Insufficient studies have been conducted over an entire territory to survey the

comprehension and application of the Smart City. Taking into account municipal Smart City dynamics in a whole country or in a whole region is poorly investigated. The current scientific analyses focus, on one side, on case studies of one or several cities or, on the other side, on Smart City projects in one or several territories. There is a lack of research on the understanding and application of the Smart City at a local level through a national or regional scale. Facing this situation, this research aims to identify how Belgian municipalities understand the concept of the Smart City.

3. The Belgian context

To understand the Smart City dynamics in Belgium, it is necessary to clarify the institutional structure and territorial dynamics of the country. The Belgian regions – Flanders, Brussels-Capital and Wallonia – present different characteristics leading to increasingly distinct urban and rural dynamics as well as centre-periphery disparities. These special features generate numerous challenges for decision makers and stakeholders on their way to "smarter" their territory.

3.1.   Institutional structure

In Belgium the institutional structures of the country are based on centrifugal federalism, and have been built and modified over four decades and six state reforms. The unitary state has been transformed into a federal state based on three linguistic and cultural communities (Flemish, French and German-speaking communities) and three regions (Flanders, Wallonia and Brussels-Capital) that overlap the same territory (Deschouwer & Reuchamps, 2013). Regions are responsible for matters concerning territorial subjects: regional planning, environment, transport (except railways, which remain federal), regional economic development, etc. At the same time, Communities are responsible for matters relating to people – education, culture, health care, family, etc. (social security remains at the federal level). The territory of Brussels-Capital is co-managed by two Communities and one Region. Flanders has merged the executives of the Flemish Region and the Flemish Community, while the French Community and the Walloon region are still separate. The Belgian federalism movement is still in progress; new competencies are being attributed to the regions and communities. A phenomenon of agencification (creation of structures and agencies) to capture these competencies is taking place in each territory. This phenomenon is particularly expansive in Brussels where the regional administration amplifies this mode of internal organisation.

Municipalities are under the regulatory authority of the Regions. Belgian municipalities were reduced in 1977 to 589, with 308 municipalities in Flanders, 262 in Wallonia and 19 in Brussels-Capital. The municipal power is strong and independent. In Belgium, there is no legal recognition of a metropolitan level. Municipal and regional authorities predominantly establish policies related to the management of cities. There is a strong respect for municipal autonomy.

3.2. Territorial dynamics

The country is composed of a dense network of small and medium cities, with rural areas concentrated in the south of Wallonia. In 2016, the country counts less than 10 municipalities of more than 100 000 inhabitants. The economy across the country varies between the regions: Flanders boomed after WW2, attracting foreign investment and developing technological and ICT companies thanks to high-tech industries, research centres, ports and an open economy (CPDT, 2009). Brussels-Capital has developed as an important service economy as the Belgian capital, which drastically increased as it became the venue of European institutions on the territory, followed by headquarters of multinational companies. The region is considered to be the economic centre of the country. Inversely, Wallonia struggles as a European postindustrial region with weak economic growth[2], with a deterioration of income per capita and an elevated level of unemployment.

Urban municipalities in Flanders and Wallonia concentrate on economic activities and services (social, education and culture) but recognise the important phenomenon of rurbanisation and peri-urbanisation. This movement takes its sources from centrifugal dynamics (the Keynesian economic development, mass individualism and motorised mobility) and the weakness of regulatory mechanisms (Halleux, Brück, & Mairy, 2002). The peri-urbanisation movement mainly grows around the city of Brussels and large cities. Rural areas are perceived as multifunctional places and responses to the multiple needs of the population (housing, liveability, quality of life, economic development) [3]. Consequently, for decades there has been major use of these peripheral rural territories.

The Belgian centre-periphery structure has negative consequences, particularly on the revenues of local administrations and on mobility. The wealth produced in cities does not remain in their territories. The average incomes per capita are generally lower in cities than in their suburban peripheral municipalities. Persons commuting into the city cause large journey flows between suburban municipalities and centre municipalities[4]. Moreover, cities host a major part of the immigration flow and a more precarious population. However, planning policies have clearly evolved in Belgium during recent years. Currently, the dominant tendency is reinvesting in cities and attracting the higher social strata of the population to urban centres. Meanwhile, there is a will to slow down and even stop the land use in rural areas.

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[2] GDP per capita below the EU28 average in four of five Walloon provinces (Eurostat 2017)
[3] Two cities are an exception: Arlon (which takes advantage of its proximity to Luxembourg) and Hasselt (Atlas de Belgique: *http://www.atlas-belgique.be/cms2/index.php*)
[4] Large Belgian cities (Brussels, Antwerp, Liège) are regularly the most congested in Europe (Inrix, 2017)

3.3. The Smart City movement

At the national level, federal authorities are not involved in a concrete Smart City strategy. Nevertheless, the main considerations are currently based on the digital development of the country through the Digital Belgium strategy. However, the current government has prepared a major national investment pact5. Six directions are identified: mobility, energy transition, economy digitisation, security and justice, health and education. In these six directions some aspects are dedicated to Smart Cities. Concerning Belgian regions, the authorities show interest in Smart City dynamics. However, the regional focus is currently strongly connected to the technological approach to the concept.

- In Wallonia, the strategic plan Digital Wallonia (2015) aspires to develop a connected and intelligent territory as well as to transform the region into a digital hub. The main operator to implement this plan is the Walloon Numeric Agency. However, Wallonia was recognised in 2012 as one of two creative districts of the EU. After this recognition, regional authorities launched the strategy "Creative Wallonia".

- In Flanders, the plan Smart Flanders (2017) aims to "smarten" the regional territory through the development of ICT, data flow and the digital economy. Nevertheless, several large municipalities of Flanders foster an environmental approach for their territories thanks to collaborations and projects with specific research centres, such as Energyville and Vito.

- In Brussels-Capital, the Smart City strategy (smartcity.brussels: 2014-2019) integrates different visions of the Smart City. The strategy has retained five themes connected to governance, education, health, digital services for businesses, smart mobility and safety. Nevertheless, one of the first initiators of the Smart City movement in Brussels is the agency Bric: Brussels Regional Informatics Centre, which launched a white paper on Brussels Smart City in June 2014. Although this white paper has holistic objectives (a connected region, a sustainable region, an open region and a safe region) the ways to achieve this mainly follow an ICT process. However, numerous other regional agencies (Brussels Mobility, Brussels Environment, Brussels Cleaning, etc.) are launching Smart City projects connected to their institutional missions.

Finally, Belgian municipalities in Flanders, Brussels-Capital and Wallonia desire to integrate the concept of the Smart City. From the survey lead by the Smart City Institute in 2017 (Desdemoustier & Crutzen, 2017), it appears that some municipalities have already developed a Smart City Strategy and have nominated one or several persons to oversee the subject. The municipalities that responded have listed Smart City projects for their territories, but the number of projects varies significantly in each municipality. Numerous municipalities have implemented no Smart City projects, while some municipalities count more than five projects launched. Therefore, some municipalities are pioneers; they create Smart City strategies, hire Smart City managers or launch Smart City projects on their territories. Other municipalities reject the concept (mainly in Wallonia in comparison to Flanders and Brussels Capital).

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[5] Accessed 20 November 2017: http://plus.lesoir.be/113562/article/2017-09-11/pacte-national-dinvestissements-avance-doucement & http://trends.levif.be/economie/politique-economique/pacte-d-investissement-60-milliards-d-ici-2030-prone-charles-michel/article-normal-676843.html

4. Methodology

The aim of this research is to study the differences in understanding the Smart City phenomenon between Belgian municipalities. The paper uses data which comes from the results of a quantitative survey among Belgian municipalities, conducted in 2016 by the Smart City Institute. The research highlights key statistical observations and provides quantitative data on the dynamics around the Smart City phenomenon in Belgium. In this methodological chapter, a typology of understanding is designed to reflect the Belgian local territorial realities. The Smart City approaches inferred from the literature review and the results of the empirical research are used to build this typology which facilitates the identification of the different local Smart City comprehensions.

4.1. Data collection and analysis

A. Data collection

Data were collected through an online survey. The questionnaire was sent to all the Belgian municipalities. The survey was available in two languages: Dutch and French, through an online platform (SurveyMonkey). The data collection lasted 5 months (from May to October 2016). The 589 Belgian municipalities compose the population of this study.

B. Sample

Of the 589 Belgian municipalities, 113 municipalities responded to the survey. This represents a response rate of 19%. This sample is representative of the population (Belgian municipalities) in terms of geography (Wallonia, Flanders and Brussels-Capital) and in terms of degree of urbanity (rural versus urban municipalities)[6]. To calculate the representativeness of the sample, the Chi-Square adjustment test is used for the different categories of municipality. The majority of respondents to the survey are general directors and heads of departments of municipalities (55% of the respondents)[7].

C. Data selection

Topics of the questions used to assess the municipal understandings are presented in Figure 1. They cover the components of the defining Smart City approach (Q1), the representation and meaning of the phenomenon (Q2) and the main characteristics of the corresponding projects (Q3).

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[6] An urban territory is a territory which has a population density of more than 150 inhabitants per square kilometres (OCDE)

[7] Detailed distribution is available in the Appendix

Importance of the Smart City components		
Question 1: In a Smart City, which importance do you give to these factors? Assess each proposition from 1 to 5	• Institutional • Human • Technological	More detailed questions
Representation of the Smart City phenomenon		
Question 2: What does the Smart City phenomenon represent for you? Assess each proposition from 1 to 5	• An urban fashion phenomenon • Some city branding (a communication tool) • The future of cities and towns • A way to govern • A privatisation of public spaces and public powers • A technological challenge • Opportunities for cities	
Means of a Smart City project		
Question 3: What is a Smart City project? Select one to several proposition(s)	• A project that includes new technologies • A sustainable project • A structuring project carried out by local authorities • A project that implies different actors of the city • A creative project	

Figure 1: Questions and responses used

D. Data analysis

The empirical construction of the typology and the Belgian municipal distribution are explored in the next chapter. The Pearson Chi-Square test is used to calculate the relationship between the typology and some territorial characteristics, as well as some municipal statements on the concept of Smart Cities. The Pearson Chi-Square test calculates the rejection of the null hypothesis and the Phi and Cramer V tests determine the intensity of the relationship. The effects of these two tests are quantifiable as small ($\Phi > 0.1$), medium ($\Phi > 0.3$) or large ($\Phi > 0.5$) (Cohen, 1988).

5. A typology of Smart City understanding

Thanks to the typology of Smart City approaches developed in the literature review and the questions selected from the Belgian survey, a typology of understanding is operationalised in this section to correspond to the local Belgian territorial realities.

5.1. Discriminating characteristics

To create the typology of understanding, the first step consists of establishing some discriminating characteristics using the responses to three questions selected out of the survey. These characteristics emerge from the categorisation of the literature presented in the previous chapter. In this paper, a technological, human or institutional approach is considered to be a specific orientation. To be assigned to one of these orientations, a municipality has to respond exactly to the three questions, as explained in Table 12, otherwise they are in the orientation "Absence".

Orientations	Technological	Human	Institutional	Absence
Q1	Technological **Rate 4&5**	Human **Rate 4&5**	Institutional **Rate 4&5**	Technological/ Human/ Institutional **Rate 1 to 3**
Q2	A technological challenge **Rate 4&5**	Sustainable future of cities and towns **Rate 4&5**	A way to govern **Rate 4&5**	Previous propositions **Rate 1 to 3**
Q3	A project that includes new technologies **Selected**	A creative project or A sustainable project **Selected**	A project that implies different actors of the city **Selected**	Previous propositions **Unselected**

Table 12 : Discriminating characteristics

In this classification, the human orientation is more extensive than the approach presented in the literature (Nam & Pardo 2011). It effectively comprises creativity and human factors, but it also integrates the notion of sustainability. The environmental aspect is therefore considered. Consequently, this discriminating characteristic also features the sustainable construction of the Smart City (Bătăgan, 2011; Monfaredzadeh & Krueger, 2015)

5.2. Foundation of the typology

Five subgroups and eight categories of understanding emerge from the application of the discriminating characteristics. This process supports the elucidation of the possible types of municipal understanding of the Smart City. Figure 2 and Table 13 illustrate the foundation of this typology.

- The first subgroup ABSENCE: There isn't any clear orientation on the concept of the Smart City. This corresponds to the category *Non-existent (1)*.

- The second subgroup EXCLUSIVE includes three categories. A unique and single orientation is developed in each category. An exclusive understanding of the phenomenon emerges based on a purely *Technological (2), Human (3) or Institutional (4)* comprehension of the Smart City.

- The third subgroup DUAL contains categories with a combination of two different orientations of the Smart City. Three categories emerge from this subgroup: *Techno-Human (5), Techno-Institutional (6) and Human-Institutional (7).* The notion of the Smart City is understood through two aspects.
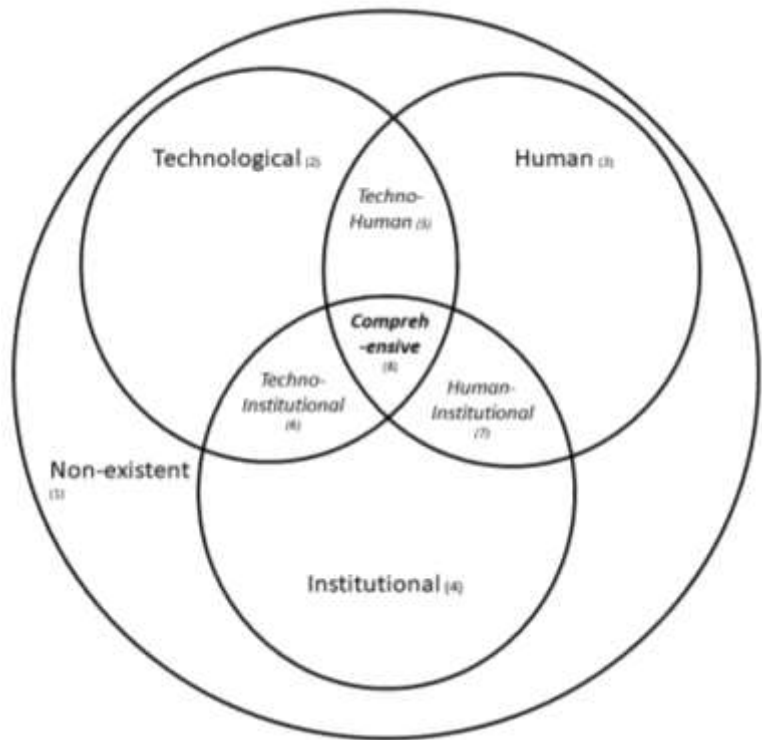
Figure 2 : Discriminating characteristics

- The last subgroup "holistic" covers the development of the three orientations in parallel. The corresponding category is *Comprehensive (8).* The notion of the Smart City is understood within a combination of concepts related to use of technology, institutional aspects, creativity, human, social capital and sustainable development.

Subgroups	Technological	Human	Institutional	Categories	
ABSENCE	-	-	-	*Non-existent*	1
EXCLUSIVE	X	-	-	*Technological*	2
	-	X	-	*Human*	3
	-	-	X	*Institutional*	4
DUAL	X	X	-	*Techno-Human*	5
	X	-	X	*Techno-Institutional*	6
	-	X	X	*Human-Institutional*	7
HOLISTIC	X	X	X	*Comprehensive*	8

Table 13 : The eight categories of the typology

6. Statistical results

6.1. Distribution of Belgian municipalities across the typology

Through the allocation of Belgian municipalities to the typology as presented in Table 14, the results of the distribution show that many municipalities have different visions of the Smart City concept. The results indicate that 33% of the municipalities have developed an exclusive vision of the Smart City concept, either with a purely technological orientation (18%), purely human orientation (7%) or with a purely institutional orientation (7%). Nevertheless, less than half of the municipalities surveyed (44%) consider that the Smart City is composed of several orientations. However, a significant number of municipalities remain which do not know or do not position themselves clearly in a specific orientation to the Smart City. Indeed, 23% of the Belgian municipalities do not express any clear vision of the Smart City.

Figure 3: Belgian understandings
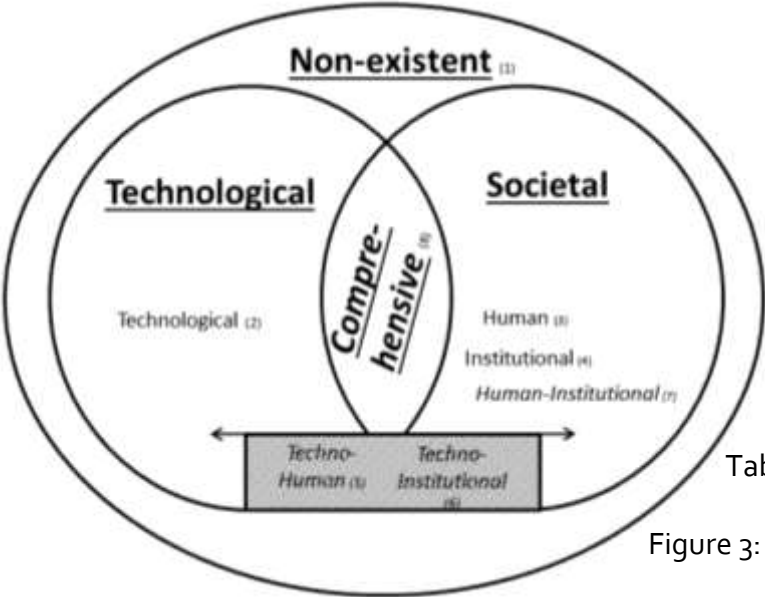
Subgroups	NB	%	Categories	Sum	%
ABSENCE	26	23	*Non-existent*	26	23
EXCLUSIVE	37	33	*Technological*	21	19
			Human	8	7
			Institutional	8	7
DUAL	30	26	*Techno-Human*	16	14
			Techno-Institutional	7	6
			Human-Institutional	7	6
HOLISTIC	20	18	*Comprehensive*	20	18

Table 14 : Distribution of municipalities across the typology

6.2. Adaptation of the typology to Belgium

The typology presented in the previous section is adjusted as indicated in Figure 3 in order to enhance the main results of this first distribution of Belgian municipalities. The first typology follows a rather theoretical and complicated conception. The new typology, the Belgian typology aims to simplify the classification with fewer groups and subgroups and presents a clearer structure. In this logic, the typology aggregates the previous results in no more than four categories. The Belgian adaptation reaches also an upper threshold of municipalities in the four categories offering more complex statistical treatments. Finally, this new typology advances a richer vision of what Belgian municipalities perceive in relation with the literature on Smart Cities. The Belgian typology comprises four understandings: Non-existent, Technological, Societal and Comprehensive. To reach this typology, the subgroups ABSENCE and HOLISTIC and their respective categories are automatically transformed into two understandings: Non-existent and Comprehensive.

Additionally, two new sorts of understanding are generated from the subgroups EXCLUSIVE and DUAL and their 6 categories[8]. These correspond to the **Technological and Societal** understandings as presented in Table 15. These two understandings exemplify the divergence debated in the literature for the place and importance of technological and non-technological factors, such as human influence, in the development of the Smart City (Angelidou 2015; Gil-Garcia et al. 2015; Alberto Vanolo 2014; Lara et al. 2016; Nam & Pardo 2011). These two categories support the observation of Albino et al. (2015) that strategies in Smart Cities follow two paths: a "hard" direction (smart buildings, smart energy grids, smart water management, smart mobility) or a "soft" direction (education, culture, social inclusion, social innovation). In the "hard" domain, ICT and technologies play a decisive role, while in the soft domain ICT is not decisive (Albino et al. 2015). This typology also offers categories which allow statistical analysis with less variation due to the size of the groups.

Subgroups	Categories	Sum	Belgian typology of understandings	
ABSENCE 26	*Non-existent*	26	*Non-existent (26)*	
			Technological	*Societal*
EXCLUSIVE 37	*Technological*	21	21	/
	Human	8	/	8
	Institutional	8	/	8
DUAL 30	*Techno-Human*	16	4	12
	Techno-Institutional	7	4	3
	Human-Institutional	7	/	7
HOLISTIC 20	*Comprehensive*	20	*(29)*	*(38)*
			Comprehensive (20)	

Table 15 : Distribution of municipalities and generation of a Belgian typology

- The **Technological** understanding assembles municipalities with a strong technological approach. A Smart City is a way to implement new technologies in territories, especially using ICT solutions. For these Belgian municipalities, technological projects are key elements of the construction of a Smart City. Municipalities develop modern infrastructure, based on software and hardware solutions to enable the accessibility and availability of systems. It comprises mobile, virtual and ubiquitous technologies.

- In contrast, the **Societal** understanding aims to reach a Smart City based on people, sustainability and governance. This understanding tackles three angles of the Smart City: the concept of creativity & human capital (1), sustainability (2) and institutional factors (3). Municipalities foster one of these or a combination. These municipalities already transcend the technological character of the Smart City phenomenon to emphasise human-centricity, sustainability and/or on governance.

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[8] The 30 municipalities of the subgroup DUAL are specifically distributed into these two categories of understanding. This follows their orientations presented in the first step (Technological, Human and Institutional). If they are part of the category *Human-Institutional*, they are automatically ordered in the Societal understanding. If they comport a technological orientation such as *Techno-Human & Techno-Institutional*, they are balanced. Based on a comparison of scores to the two assessment questions in Table 2, if the dominant orientation is technological, the municipalities fall in the Technological category, otherwise they go into the Societal category.

- The **Comprehensive** understanding transcends this technological and non-technological debate with a holistic approach. For Belgian municipalities developing this understanding, Smart Cities are a combination of concepts related to the use of technology, sustainable development, governance, creativity, and human and social capital. They consider it necessary to develop these different aspects in parallel. The comprehensive understanding corresponds to the description of the rationalistic school of the 3RC framework (Kummitha & Crutzen, 2017). This school advances the necessity of a holistic development of Smart Cities.

- Finally, the **Non-existent** category represents municipalities which have not developed a clear understanding of the Smart City; they stand in a situation of conceptual impreciseness on the phenomenon. This type does not form any connection or similarities with a particular orientation of a Smart City. The existence of this category clearly shows the problem of the absence of a common and unified definition of Smart Cities.

In Belgium, it appears that the Societal understanding is primarily developed (34%). Then, many Belgian municipalities have developed a technological understanding of the Smart City. Technology remains a central element for more than a quarter of the municipalities (26%). Finally, 23% of the municipalities have still not developed a clear understanding on the concept. This is in opposition to 18% of the municipalities which understand the Smart City holistically with a Comprehensive understanding.

Understandings	Sum	%
Technological	29	26
Comprehensive	20	18
Societal	38	34
Non-existent	26	23

Table 16 : Typology of Belgian Smart City understandings

6.3. Belgian Smart City understandings considering territorial characteristics

This article considers that some intrinsic characteristics of Belgian municipalities are closely related to the results of the Belgian typology established above. Three territorial factors are taken into account: the demographic, socio-spatial and institutional characteristics. The first factor, demographic, corresponds to the size of municipalities as described by the number of inhabitants[9], not representative. The second characteristic, socio-spatial, highlights the degree of urbanisation of municipalities: urban or rural based on the OCDE standard[10], representative. Finally, the last factor, institutional, reflects the localisation of municipalities in the three Belgian regions: Flanders, Brussels-Capital and Wallonia, representative.

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[9] Three groups of municipality classified by size are defined (in terms of inhabitants): small (less than 10 000 inhabitants), medium (between 10 000 and 50 000 inhabitants) and large (over 50 000 inhabitants).
[10] An urban territory is a territory which counts a density of population of more than 150 inhabitants per square kilometres (OCDE)

Sample		Size			Degree of Urbanisation		Regions		
Typology	*Distribution*	*Small*	*Medium*	*Large*	*Urban*	*Rural*	*Flanders*	*Brussels*	*Wallonia*
Technological	29	15	10	4	16	13	11	2	16
	26%	**41%**	**19%**	**17%**	**19%**	**45%**	**21%**	**25%**	**30%**
Comprehensive	20	2	12	6	18	2	9	4	7
	18%	**5%**	**23%**	**26%**	**21%**	**7%**	**17%**	**50%**	**13%**
Societal	38	10	19	9	33	5	23	0	15
	34%	**27%**	**36%**	**39%**	**39%**	**17%**	**44%**	**0%**	**28%**
Non-existent	26	10	12	4	17	9	9	2	15
	23%	**27%**	**23%**	**17%**	**20%**	**31%**	**17%**	**25%**	**28%**
Total	113	37	53	23	84	29	52	8	53
	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tests	Value	Df		A.. Sig	Value	df	A. Sig.	Value	df	A.. Sig
Pearson Chi-Square	10.906	6		0.091	12,362	3	0.006	12.43	6	0.053
Likelihood Ratio	11.653	6		0.07	12,68	3	0.005	13.499	6	0.036
Phi	0.311	/		0.091	0,331	/	0.006	0.332	/	0.053
Cramer's V	0.22	/		0.091	0,331	/	0.006	0.235	/	0.053

Table 17: Belgian characteristics and typology of understanding

The results of the Pearson Chi-Square test (Table 17) show a dependent relationship between our typology and the three territorial characteristics which is statistically significant[11]. The descriptive analysis demonstrates that the technological understanding of the Smart City dominates in rural (45%) and small (41%) municipalities. The societal understanding prevails among urban municipalities (39%), as well as medium (36%) and large (39%) size municipalities. When the size of municipalities increases, on one side, the percentage of municipalities with a societal and comprehensive understanding of the Smart City increases and, on the other side, the percentage of municipalities developing a technological understanding or an absence of understanding decreases.

The percentage of municipalities developing a comprehensive understanding is highest in two categories, urban (21%) and large municipalities (26%), which exceed the average at 18%. Moreover, these categories count the lowest percentage of municipalities with no understanding (under the average of 23%).

The three Belgian regions develop a different understanding of the Smart City phenomenon. In Wallonia, the percentage of municipalities with a technical understanding (30%) is the most important (above the average). In Flanders, the societal understanding dominates (44%) while in Brussels-Capital, the comprehensive understanding over performs (50%). Only the Flemish region counts fewer municipalities without an understanding of the Smart City than the average. Nevertheless, in Brussels-Capital, the number of municipalities developing a holistic vision exceeds the average, whereas the

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[11] A lower P value (P <0.01) is reached in the category of urban and rural municipalities, while the P value for the size and the institutional ownership of municipalities is higher (P <0.1). Therefore, these results conclude an existing relationship between the typology of understanding and the size of municipalities, their urban or rural natures, and their regional status. The results of the Phi and Cramer's V tests show that the measures of association are medium for the nature of municipalities and small for the size and institutional belonging. Following Cohen's recommendations on interpretation (1988), the relations between our typology and the three territorial characteristics are statistically significant with a phi (Φ) superior to 0.1.

percentage of Walloon municipalities is situated below this average. However, these results have to be tempered for the Belgian regions. A bias can be attributed because of the degree of urbanisation in each of them. Wallonia has a higher number of rural municipalities compared to Flanders. The region of Brussels has entirely urban municipalities. Therefore, logically the technological perception of the Smart City is more important in Wallonia, and the societal perception is more common in Flanders and in Brussels.

6.4. Belgian Smart City understandings and degrees of difficulty in implementing the Smart City

This typology may highlight some aspects of the Belgian local Smart City implementation. Two aspects are taken into account: the degree of difficulty in implementing Smart City projects, and the relevance of the concept for Belgian municipalities. The study of these two elements makes it possible to more deeply apprehend the local adoption of the Smart City phenomenon according to the Belgian understandings. Two other questions from the quantitative survey are used. The same empirical analyses are conducted using the statistical tests: Pearson Chi-Square, Phi and Cramer's V[12].

Sample		Level of difficulty			Relevance	
Typology	*Distribution*	*High*	*Neutral*	*Low*	*Yes*	*No*
Technological	29	16	1	3	10	19
	100%	80%	5%	15%	35%	66%
Comprehensive	20	10	7	0	19	1
	100%	59%	41%	0%	95%	5%
Societal	38	10	17	3	32	5
	100%	33%	57%	10%	87%	14%
Non-existent	26	14	5	2	12	13
	100%	67%	24%	10%	48%	52%
Total	113	50	30	8	73	38
	100%	57%	34%	9%	66%	34%
Tests		Value	df	A. Sig	Value	df	A. Sig.
4 Under-standings	Pearson	17.871	6	0.007	30.758	3	0
	Likelihood R	21.708	6	0.001	33.425	3	0
	Phi	0.28	/	0.391	0.526	/	0.006
	Cramer's V	0.198	/	0.391	0.526	/	0.006

Table 18: Typology and municipal estimation of the level of difficulty and relevance of the concept of the Smart City

The results of the Pearson Chi-Square test allow the null hypothesis to be rejected for the links between the typology and the level of difficulty, as well as for the relevance of the Smart City concept, as shown in Table 18. The results indicate that Belgian municipalities without understanding and with a technological understanding mainly reject the implementation of the Smart City concept for their territories (respectively 52% and 66%). In contrast, municipalities with a comprehensive understanding are almost unanimously interested in the concept (95%). There is an 87% positive response for municipalities with a Societal understanding.

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[12] Detailed methodology and statistical results are given in Appendix

Belgian municipalities consider it difficult to set up Smart City projects on their territories. Municipalities without understanding (67%) or with a technical understanding (80%) are likely to consider it to be difficult. However, this is also true for municipalities with a comprehensive understanding (59%). For municipalities with a Societal understanding, the implementation of Smart City projects is mostly considered to be either simple or complicated to set up. When municipalities are engaged in a comprehensive understanding, none of them (0%) consider it easy to implement Smart City projects.

The lack of vision does not allow an easy implementation of the Smart City. Municipalities with a societal understanding consider that it is neither complicated nor simple to implement Smart City projects in comparison to municipalities with other types of understandings. This situation may demonstrate that approaching the Smart City with a sustainable, human and governance angle offers an easier development of projects. Municipalities with a technical understanding consider very complicated the implementation of the Smart City project. The construction of a technological Smart City seems blocking itself. Is it related a difficulty of implementing technologies across Belgian territories? The comprehensive vision of the Smart City seems cause difficulties to municipalities. It may be related to the complexity to integrate the different factors highlighted by this Smart City understanding into concrete projects. Therefore, should a societal Smart City be promoted to facilitate its implementation in Belgium ?

7. Discussion

7.1. Differences of understandings between central municipalities and peripheral municipalities

In Belgium, the results of the research show that the concept of the Smart City is still understood by numerous municipalities as a technological phenomenon. However, this paper highlights a dichotomy of understanding between large and urban municipalities, termed by this paper as "central municipalities" and rural and small municipalities as "peripheral municipalities". Why do these municipalities not develop the same understanding? A majority of peripheral municipalities are still convinced that the technological conception of a Smart City is the most relevant. These municipalities also do not have a clear understanding of the phenomenon. The technological vision of the Smart City has been strongly stated and criticised in the literature. Consequently, the Smart City phenomenon has integrated some of these criticisms and has taken some distance from the technocratic conception (Calzada and Cobo 2015; Caragliu et al. 2009; Hollands 2015; Kitchin 2015). Nowadays, the phenomenon incorporates notions such governance, sustainability, human-centricity, and creativity for a more holistic conception. The central municipalities are supporting this trend: a majority of them have developed a comprehensive or societal understanding of the phenomenon.

A difference of competition and collaboration between municipalities could explain the dichotomy of understanding between the central and peripheral municipalities. European cities (and Belgian central municipalities) compete to welcome inhabitants, entrepreneurs, investment and tourists (Ewers, 2007; Gospodini, 2002). To be attractive cities have to be up to date on urban trends such as the Smart City phenomenon in order to be competitive. Cities follow the evolution of the concept in order to integrate these trends into their territorial developments. Modern cities try to provide a high quality of life for their inhabitants and users (Glaeser and Berry, 2006). This also causes certain types of city branding (Hollands 2008). Nevertheless, networks of cities and city participation in European projects reinforces conceptual discussions and collaboration (Batten, 1995; Malecki, 2002). Benchmarking encourages the dissemination of a more holistic conception of the Smart City phenomenon.

On the other side, rural and peripheral Belgian territories are already highly attractive for new inhabitants and economic promoters. Belgian peri-urbanisation and rurbanisation enhance this attractiveness (Halleux et al., 2002). Moreover, networks of rural municipalities and associations deal with specific territorial problems of the rural area (FRW, GAL, Boerenbond). Therefore, these rural municipalities seem less interested in discussing the Smart City phenomenon. Nevertheless, some technological developments such as Internet and mobile connectivity are still underdeveloped in these rural areas, therefore municipalities may see the concept of the Smart City as a possible solution to their technological problems.

This explanatory hypothesis raises the question of the relevance of the Smart City label between two categories of municipalities (central and peripheral). Scientific literature deals with the return of cities to the foreground (Barber, 2013; Le Galès, 1995; Mattina, 2003; Pinson, 2006). The holistic Smart City is conceived for complex urban realities (Nam & Pardo 2011; Leydesdorff & Deakin 2011). Central municipalities face territorial realities that the holistic consideration of the Smart City aspires to solve. Therefore, Belgian municipalities with a comprehensive and societal understanding are almost unanimously convinced that the Smart City concept is relevant for their territory. Conversely, few studies have been carried out on the adaptation of the Smart City concept for small and rural municipalities, the peripheral municipalities. The notion of Smart Rurality is scarcely mentioned in the literature (Naldi, Nilsson, Westlund, & Wixe, 2015). Therefore, Belgian rural municipalities cannot embrace the phenomenon. They remain hung up on the first meaning of the concept, based on building technological infrastructure.

7.2. Belgian regional impacts on understandings of the Smart City

Another disparity is identified regarding the understanding of the concept of Smart City: a divergence appears between the three Belgian regions. Municipalities of Flanders, Wallonia and Brussels-Capital do not develop the same types of understanding. While Brussels-Capital and Flanders encompass a majority of municipalities developing a comprehensive or societal understanding, Wallonia counts a majority of municipalities with technological or non-existent understanding. Regional territorial characteristics and regional Smart City dynamics may possibly explain this trend. Wallonia is less densely populated, has more rural municipalities and comprises numerous small cities. These characteristics are closely related to the non-existence of understanding and the development of a technological understanding. In contrast, in Flanders and Brussels-Capital the population density is high and the territory is extremely urbanised. These characteristics are correlated with the development of a comprehensive and societal understanding.

Another element could influence these municipal understandings: the impact of regional Smart City strategies and dynamics. Digital Wallonia supports a technological development of the territory. The Smart.Brussels strategy tends to stimulate an open interpretation of the concept. And finally in Flanders, despite the technological goals of the Smart Flanders strategy, regional research centres are sources of inspiration to encourage the sustainable and human-centred development of territories. Therefore, what are the effects of the territorial dynamics on the municipal understanding of the Smart City concept?

The subject of territorial scales and influences (national, regional, metropolitan, local and neighbourhood) in the development of a Smart territory is still poorly addressed in the literature (Jose & Miralles 2015; Kourtit & Nijkamp 2012; Walters 2011). The city and metropolitan levels are the main subjects addressed. The Smart City landscape is shaped under local characteristics, priorities and the needs of cities (Angelidou 2014). For example, few researchers study the implementation of Smart City strategies at a national level (Smart country), intermediate level (regional, departmental or provincial) and other spatial scales (municipalities, supranational forms). However, the upper spatial level allows a broader view, coordinates resource pooling and provides a very strong point of reference for Smart City strategies (Angelidou 2014).

For example, Walters (2011) advocates that strategic regional planning has a significant impact on Smart City development, to harmonise and coordinate top-level policies with low-level policies. Nevertheless, city-scale Smart City programmes encourage the accomplishment of short term achievable goals and provide a platform to assess the viability of specific Smart City solutions (Angelidou 2014; González & Rossi 2011). Therefore, the question of territorial scales is potentially an interesting element in explaining the difference of understanding between Belgian municipalities and regions.

7.3.   Vicious and virtuous circle

The four-understandings typology is relevant when associated to the question of applicability of the Smart City concept for Belgian municipalities. Municipalities without understanding and with a technological understanding reject the Smart City's relevance for their territories. This refusal can be justified through three reasons, the current inadequacy of the Smart City phenomenon for their territorial characteristics (1), their technological visions of the concept (2) and their feeling that it is highly difficult to implement Smart City projects (3). The technological vision of the Smart City reinforces the impression of difficulty in setting up projects and the inadaptability of phenomenon for the territory. This understanding leads peripheral municipalities in a vicious circle where the concept is rejected.

In contrast, municipalities with a comprehensive understanding mainly adhere to the Smart City phenomenon. Nevertheless, municipalities engaged in a comprehensive understanding judge it to be highly difficult to set up Smart City projects. An explanation: when these municipalities desire to develop Smart City projects, they integrate the different underlying principals with their understanding (human-centricity, sustainability and governance). Therefore, if all these characteristics have to be joined in a project, the level of difficulty can be considered to be high. Meanwhile, thanks to their specific orientations, municipalities with a societal understanding have an approach that allows them to optimistically assess the establishment of Smart City projects. Therefore, the label Smart City is considered by municipalities with a societal and comprehensive understanding as a possible answer to their territorial problems. They adhere to the concepts with their holistic or non-technological comprehension. These central municipalities therefore are part of a virtuous circle.

8. Conclusion

A typology of Smart City approaches is created using the different meanings of the concept of the Smart City mentioned in the literature. Through the results of a study among 113 Belgian municipalities, a Belgian typology of perceptions is established with four types of understanding: technological (a technology implementation), societal (a human, sustainable and institutional positioning), comprehensive (an integration of technology, human-centricity, sustainability and institutional factors) and non-existent (an absence of understanding).

A limit of the study concerns the number and the nature of the respondents. On one side, only 113 Belgian municipalities out of 589 participated in the study, although the sample is representative. On the other side, per survey, only one or two persons have expressed their opinion, therefore the study cannot claim to officially represent the complexities of understanding in the municipalities. However a relationship between the typology and the territorial characteristics of Belgian municipalities is statistically significant. The results of the research show a cleavage between central and peripheral municipalities and between municipalities of the three Belgian regions. A majority of rural and small municipalities, as well as Walloon municipalities, view the concept as not appropriate for their territories. These municipalities mainly understand the phenomenon with a technological angle or without a clear understanding. In contrast, a majority of urban, medium and large municipalities, along with Flemish and Brussels municipalities, adhere to the concept. This adhesion can be explained thanks to their holistic and societal understanding. Is the concept of the Smart City only relevant for the most populated, service based, economically advanced cities or territories? It will be interesting to expand the scope and analyse if these differences in understanding persist across the perceptions of different actors from the same territory. The return of city and urban policies is undeniable, inter-city competition and collaborations may partially explain the difference in municipal understanding.

However, further research needs to be developed to answer this question. The concept of the Smart City is still poorly adapted to small and rural municipalities. Therefore, it would be interesting to study, on the one hand, how territorial characteristics impact understanding of the Smart City phenomenon, and on the other hand, how the Smart City can adjust itself to different territorial realities, mainly in rural areas and small municipalities. Finally, Smart City strategies at different levels – regional and national – may impact local comprehension of the concept. It would be interesting to prove or invalidate this explanatory assumption of potential influence.

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Interchapter

The first empirical research shows that public respondents in Belgian municipalities have different understandings of the Smart City. Respondents of rural and urban entities do not develop the same vision. On one hand, urban municipalities are mainly positioned with a rather societal Smart City viewpoint, which is certainly related to the need to respond to the numerous social and environmental challenges of urbanised spaces. Nevertheless, some of them also incorporate technology into their Smart City understanding. They are developing a more socio-technical construction of the Smart City, related to a comprehensive vision of the concept.

On the other hand, rural respondents stress a more technological approach to the Smart City (when they have one). This technological understanding of the Smart City is certainly connected to the necessity to respond to technological deficits in rural municipalities, some of them are still in a *"white zone"*. It would be interesting to analyse how this technology is perceived and envisaged as a way to respond to the challenges of rural areas. The differentiated understandings of Belgian municipalities - comprehensive, societal, and non-existent - seem to be shaped by the local characteristics, priorities, and needs of territories.

The literature views Smart Cities to be mainly constructed as an assembly shaped by multiple actors and interactions rather than centred on public authorities. This thesis follows this logic and aims to decipher the actors' understandings of the Smart City. Therefore, the following research aims to go beyond the sole point of view of municipalities and to extend the scope by taking into account the appropriation of the Smart City by other actors from the Belgian territory.

III. Paper Three

Smart City appropriation by local actors: an instrument in the making

1. Introduction

Since the mid-2000s, the Smart City has become a dominant discourse as a new approach to mitigate and remedy current urban problems and societal challenges (Alawadhi et al., 2012). At the European level, the ambition to transform cities and territories to smart places is of some importance (Luque-Ayala & Marvin, 2015). Research and policy projects have emerged to deal with various issues of the Smart City (Yigitcanlar, 2017). Caragliu and Del Bo (2018a) show strong evidence of a positive association between investing in Smart City policies and Urban GDP growth. Their empirical results show that Smart City policies foster economic performance and that cities engage in Smart City development as a way to address local challenges. The local context conditions are a crucial determinant (Caragliu & Del Bo, 2018a). However, the literature on Smart Cities identified that such initiatives encompass several technical, managerial, and governance challenges arising from the inherent nature of a Smart City (Manville et al., 2014; Praharaj, Han, & Hawken, 2018). This article aims to explore how the different actors of a territory appropriate the Smart City and its orientations. It is necessary to understand how the Smart City is encompassed by actors who composed it before trying to act on their behaviours.

The literature on Smart Cities lacks research on how actors understand and appropriate the Smart City. The phenomenon is often perceived as a development of the territory pushed, by technologies and/or a whole series of notions such as sustainability, governance, human-centricity, public value creation, citizen participation... In an innovative way, this paper stands out from these conceptualizations and uses the Instrument theory developed by Lascoumes & Le Gales (2007) as the framework of analysis. According to this conceptual framework, the Smart City may either be considered as a functional instrument: a kind of evidence, a denaturalized technical object, and a pragmatic solution at disposal or as a public policy instrument: not neutral, provoking debates on political goals, influencing policies, affecting actor's resources.

The empirical study questions the appropriation of Smart City by practitioners. It is based on an online survey amongst 193 respondents so as to offer a picture of the different approaches adopted by Belgian actors active in this domain. Three statistical treatments—cross tabulation, Principal Component Analysis (PCA) and K-sorting—offer several angles of approach to analyse the opinion collected among five categories of Belgian actors. The results show that the Instrument theory is relevant to analyse the actors' appropriation of the Smart City, which does not follow a homogeneous trend. In fact, each actor follows his own logic, which will be interesting to study. Future research may investigate the influence of the actor's role in the decision-making process, actors' level of development in Smart City initiatives (mature versus emerging) and actors' ideological background. Most importantly, regarding the Smart City as an instrument calls for more research about the evolution of the position and perception of actors all along the design to the implementation of Smart City policies.

2. Literature review on the Smart City conceptions

The concept of Smart Cities is composed of numerous components that are differently highlighted. Depending on the definition, it comprises specific features like enhancing the quality of life, adopting ICTs in urban systems, implementing new governance, focusing on human capital, favouring public value creation, supporting innovation and reaching a more sustainable territory (Batty et al., 2012; Bolívar, 2017; Caragliu & Del Bo, 2018b; Ibrahim, El-Zaart, & Adams, 2018; Ramaswami, Russell, Culligan, Sharma, & Kumar, 2016). A techno-centric understanding of the Smart City first emerged in the literature with a product-oriented angle that emphasized an interconnection between the market and the urban systems with a strong positioning of service and consulting companies. Solutions against the 'sick city' are pushed by firms (Söderström, Paasche, & Klauser, 2014). These corporate discourses focus on reimagined ICT tools as management systems for cities. Smart Cities are advertised as the future of globalization (Araya, 2015a). Nevertheless, a critical work in the literature stresses the neo-liberal ethos underpinning this conception of Smart City (Greenfield, 2013; Hollands, 2015; Kitchin, 2015; Vanolo, 2014). Issues such as panoptic surveillance, technocratic and corporate forms of governance or technological lock-ins are argued (Greenfield, 2013; Kitchin, 2014; Townsend, 2013).

Meanwhile, facing these corporate and technological trends in Smart Cities, the development of a holistic Smart City composed of various concepts is fostered in the literature (Mora, Bolici, & Deakin, 2017). As primarily a counter-reaction, a human conception of the Smart City is advanced (Chatfield & Reddick, 2015; Gil-Garcia, Pardo, & Nam, 2015; Marsal-Llacuna & Wood-Hill, 2017). Social infrastructure (intellectual capital and social capital) is considered as an indispensable endowment for people and their relationships in a Smart City. It comprises various factors such as affinity for lifelong learning, social and ethnic plurality, flexibility, creativity, cosmopolitanism or open-minded and participation in public life (Albino et al. 2015). Moreover, numerous authors introduce also a reflection on governance as a driver of the phenomenon (Deakin, 2014; Meijer & Bolivar, 2016; Paskaleva, 2011; Ben Letaifa, 2015). There is a dominant belief that the transformation of governance is desirable and necessary to make cities smart and to create public value in the context of Smart Cities (Bolívar, 2017). Kourtit and Nijkamp (2012) argue that 'smart governance' implies pro-active and open-minded structures. Actors' collaborations in the Smart City governance are advocated with the principles of participatory design (Paskaleva, Cooper, Peterson, & Götz, 2015). Participatory governance makes cities smarter and more efficient. It also means that cities that foster the co-participation of public and private institutions in smart projects make such projects more prone to success (Rodríguez Bolívar, 2018).

However, empirical evidence shows that the opening of governance structure to the various actors in the Smart City dynamics is not concretely operated. Angelidou (2017) examines the Smart City plans of 15 world-wide major cities; she shows that they are mainly focusing on ICT as the key factor to foster urban innovation. Her critical review highlights, on the one hand, a lack of bottom-up approaches and actor involvement and, on the other hand, a general disregard of local conditions. On his side, Bolívar (2017) concludes after a study of 64 cities that Smart City actors are not in favour of citizen participation, which could influence the creation of public value in smart cities.

The growth of Smart Cities has to force governments to focus their efforts on increasing public value creation. The active engagement of citizens and actors in urban governance helps to create higher public value. For local governance to be truly effective, it is essential that public managers and politicians engage citizens in open and participative information-sharing and decision-making (Bolívar, 2017). Governance and collaboration are crucial for smarter cities; they reflect how public value can be generated with the participation of citizens and other social actors (Gil-Garcia, Zhang, & Puron-Cid, 2016).

Another notion complements the holistic conceptualisation of the Smart City: sustainability. This has become one of the central topics of contemporary debates with a focus on resolving social and environmental problems. Sustainable and wise management of natural urban resources, in fact, is a necessary condition for the development of territories. The depletion of natural resources can seriously affect the availability of production factors for future generations (Caragliu & Del Bo, 2018a). The term Sustainable City emerged; cities have become the focal points of sustainable development because they represent major consumers and distributors of goods and services (Bătăgan, 2011). Most of the literature typically finds that a compact urban form is more sustainable, and, therefore, conducive to a better long-run economic performance. Scholars started to consider the term 'Smart Sustainable Cities' and incorporate the different aspects of sustainability in the Smart City concept (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017; Araya, 2015b; Garau & Pavan, 2018; Girard, 2013; Ibrahim et al., 2018; Kramers, Höjer, Lövehagen, & Wangel, 2014; Dameri 2013; Rai & Challa, 2016). The interpretations of urban sustainability have promoted an anthropocentric approach that encourages cities to respond to people's needs by designing sustainable solutions to mitigate social and economic weaknesses (Garau & Pavan, 2018). Transforming a city into a Smart Sustainable City (SSC) is a continuous long-term process that requires changes to be introduced at all city levels with the help of an SSC roadmap, which provides a high-level view of the objectives and goals of the transformation process and identifies the transformation phases and milestones (Ibrahim et al., 2018). The notion of a smart sustainable city is treated as an ideological dimension dependent on strategic directions, to find a good balance between territories and human societies via ICT and behavioural changes (Cugurullo, 2018). The city must become a powerful generator of value, beginning with its own spatial, social, cultural, and relational resources (Garau & Pavan, 2018).

There is neither a single template for framing a Smart City, nor a one-size-fits-all definition of the Smart City (O'Grady & O'Hare, 2012). According to Mora et al. (2017), Smart City research is fragmented and lacks cohesion. Conceptual papers as well as models and frameworks empirically and theoretically developed are significantly produced. Angelidou (2014) and Caragliu & Del Bo (2016) try for example to identify the main features of Smart City policies, which consist of focusing on core areas of intervention and existing strengths; incorporating a co-ordination between different policy departments; involving actors in the design and implementation of the policies; matching investment of ICTs with physical and institutional changes; and finally operating at a relatively small scale of interventions.

More efforts should be undertaken in evaluating the impacts of Smart City programmes and initiatives (Caragliu & Del Bo, 2018b). The literature on Smart Cities identified that such initiatives encompass several technical, managerial, and governance challenges arising from the inherent nature of a Smart City (Manville et al., 2014; Praharaj et al., 2018). The literature lacks a detailed analysis of the management of Smart City initiatives as well as descriptions of the underlying drivers and challenges faced. In particular, the literature on Smart Cities lacks a first research stage based on studies stressing how actors appropriate the Smart City and its different orientations. It is necessary to understand how the Smart City is encompassed by the different actors involved before trying to study its management. Which elements/components of the polymorphic Smart City concept are assimilated and supported by actors? How do actors stand themselves on Smart Cities and what are their views on it? Is the Smart City considered as a tool to build the city or as a policy debate to imagine the future? Identifying actors' interests and appropriations is essential to face the challenges of building and managing the Smart City and its governance.

Political sociology and sociology of science are solicited to understand the construction of the Smart City and its appropriation by actors. In this perspective, the Smart City is envisaged as an instrument that accounts for processes of public policy change. This notion of instrument is introduced through questions of management and governance of public subsystems of societies and policy networks (Termeer & Koppenjan, 1997; Lascoumes & Valluy, 1996) which corresponds to the open and multi-actor governance context of Smart Cities. Political science studies instruments to understand better the linkages between policy formulation and policy implementation, and to gain insights into the public policy decision-making process. Public policy instrumentation becomes a major issue, as it reveals a theorization of the relationship between the governing and the governed (Lascoumes & Le Gales, 2007). In this regard, for some authors, local governments play a crucial role in the efficient adoption of collaborative and/or participative models of governance in Smart Cities (Bătăgan, 2011; Batty et al., 2012) This type of engagement is hardly political in nature and needs new models of governance in cities different from those of traditional bureaucratic governance (Bolívar, 2017). The citizenry and other actors must be considered target groups of the local government creating and using smart technologies to increase their quality of life (Gil-Garcia, Pardo, & Nam, 2016). For Caragliu and Del Bo (2018b), the decision to implement Smart City policy initiatives and their policy goals should be firmly kept in the hands of local public authorities, based on the involvement of actors, including citizens and local businesses, in partnership with ICT companies providing technical solutions. While for Ben Letaifa (2015), the co-ordination and leadership roles in Smart Cities can shift from one actor to another depending on the identity, resources, and ecosystem readiness.

3. Theoretical Framework

The Smart City is considered as an instrument that ensures a choice of practical device and some modes of operation. In fact, the Smart City emerged as a new way of imagining, organizing and managing the city and its flows. The question of Smart City as a territorial and societal instrument is framed in this article by the theories of instrumentalization developed by Lascoumes and Le Gales (2007). In this perspective, the Smart City is studied as an instrument that stands between a device utilized to transform the territory and a political issue questioning the future of cities and towns. That helps to understand better the difficulties of implementing the Smart City.

A multiplication of actors has also been noticed in cities and territories. Some authors considered the city as an ungovernable place that hosts a 'street fighting pluralism' (Yates, 1977). However, the phenomenon of multiplication of actors generates mechanisms of reorganization of relationships between actors. It implies a multiplication and an innovation of public policies instruments (Pinson, 2006). In Smart Cities, actors at all levels are embracing the notion of smartness to distinguish their policies and programmes for targeting sustainable development, economic growth, better quality of life for their citizens, and creating happiness (Ballas, 2013). The emergence of the creation of public value and the need for citizen involvement in Smart Cities entails a substantial change in the management of cities and the need to create innovative forms of governance based on the concept of network governance (Rodríguez-Bolívar, 2015). In this topic, instruments may determine what resources can be used and by whom as well as the forms of collective action. Instruments may be legislative, regulatory, economic, agreement, and fiscal, as well as incentive, informative, and communicative.

> *An instrument constitutes a device that is both technical and social, that organizes specific social relations between the state and those it is addressed to, according to the representations and meanings it carries. It is a particular type of institution, a technical device with the generic purpose of carrying a concrete concept of the politics/society relationship and sustained by a concept of regulation* (Lascoumes & Le Gales, 2007).

This definition of instrument fits with what Angelidou (2015) considers as smartness, which is a continuum in which local government officials, citizens, and other actors think about and implement initiatives that strive to make a city a better place to live in, 'smarter'. The Smart City is an instrument used by managers, politics, and economics to support specific development policies (Hollands, 2008; Vanolo, 2014).

An instrument orients relations between authorities and civil society through tools and devices (Lascoumes & Le Gales, 2007). In the literature on Smart Cities, Nam and Pardo highlight three main factors -technologies, people, institutions- which constitute the main components of a Smart City. Associated to each other, they represent a certain form of device that supports the construction of the Smart City. Ben Letaifa (2015) considers that Smart Cities differ from other concepts in offering a balanced centricity among technology, institutions, and people. The expansion of city missions is accompanied by a development

and diversification of instruments. The public policy instruments are a means of adapting relations between actors through intermediaries in the form of devices that mix technical and social components in a more or less standardized form (Lascoumes & Le Gales, 2007). It assimilates the factors of the Smart City: technology, people, and institutions.

The classic forms of city government 'command and control' regress due to the multiplication of interactions with the market (privatization in particular) and the forms of actors' collaboration (public–private, contracting, PPP, citizen collaboration). New approaches appear via new public policy instruments where a 'new governance' perspective strives to take into account large networks of heterogeneous actors (private/public, profit/non-profit) to co-ordinate them better (Bolívar, 2017; Caragliu & Del Bo, 2018b; Lascoumes & Simard, 2011; Salamon, 2002). In the literature on Smart Cities, authors promote a holistic ecosystem that allows co-creation among all actors. Smart governance stresses collaboration between the various actors in the city. In this perspective, one actor model is highly prevalent. The four helix model, suggested by Lombardi et al. (2012) incorporates the outcome of government policies, academic leadership qualities, corporate strategies, and civil society expertise.

An instrument may favour certain actors and interests and exclude others. Actors have capacities for action that differ widely according to the instrument chosen (Lascoumes & Le Gales, 2007). The 3RC framework developed by Kummitha and Crutzen (2017) highlights a specific Smart City construction that favours several actors. Some privileged actors build a neoliberal Smart City, where the power relations are contained by corporations and governments. They turn the public space into private space and control technological advancements (Critical school of thought). There are also actors that preferentially take part in the construction process of the Smart City. They are present in the consultancy, planning, and building of the Smart Cities on the basis of ICTs, data management, IoT, and technologies (Restrictive school). An instrument influences the way in which actors are going to behave. It creates uncertainties about the effects of the balance of power; they eventually privilege certain actors and interests and exclude others; they constrain actors and they drive forward a certain representation of problems (Gardon, Lascoumes & Le Galès 2007).

An instrument is never a closed device; it is inseparable from a contextualized mode of appropriation. This appropriation implies some mobilization (like the affirmation of new competencies), some reformulation (in favour of interests and relationships of the power of actors) and some resistance (by reducing the scope of the instrument or by circumventing alliances) (Lascoumes & Simard, 2011). The Smart City is considered an instrument that could be appropriated by actors as either a functionalist instrument (1) or as a public policy instrument (2). For Lascoumes & Le Gales (2007) there is a considerable difference between a functionalist approach of the instruments—called hereafter 'functionalist instruments'—and a socio-political approach of the instruments—called hereafter 'public policy instruments'.

The functionalist instruments are considered as a kind of evidence. The choice of tools and modes of operation are superficial. These instruments are viewed as being 'at disposal' and conceived as a pragmatic political and technical approach to solve problems. They are neutral and equally available. The central set of issues is around the effectiveness of instruments. The issue of selecting instruments and their mode of operation is presented as a matter of simple technical choices.

The public policy instruments are considered as not purely technical, inert, and with perfect axiological neutrality. On the contrary, they are bearers of values, fuelled by interpretation. Instruments tend to produce original and sometimes unexpected effects. They have their own force of action, structure public policy according to their own logic and develop socio-political mobilizations. Instruments also produce a specific representation of the issue they are handling.

The Smart City once viewed as a functionalist instrument (1) promotes a management and regulation of the city that operates via information and analytic systems. This vision promotes a technocratic model of urban governance. It presumes that a city can be measured, monitored, and treated as a technical problem, which can be addressed through technical solutions. It represents what Mattern (2013) calls 'instrumental rationality' and Morozov (2013) names 'solutionism', wherein complex social situations can be disassembled into neatly defined problems that can be solved or optimized (Kitchin, 2014). The functionalist instrument of the Smart City follows a 'hard' direction where ICT and technologies play a decisive role (Albino et al., 2015). Companies offer Smart City solutions against the 'sick' city (Söderström et al., 2014) in developing projects and proof of concepts on the territory. A neoliberal development of the Smart City operates through the promotion of (public)–private ventures as a way to smarten the territory.

The Smart City once viewed as a public policy instrument (2) is an ideological construct according to which being smarter entails specific strategic directions (Ballas, 2013). In Smart Cities, proposing visions for the city of the future and developing policy instruments to achieve those visions are important capabilities of actors. A Smart City should not be about technologies only but should also consider important management and policy aspects (Chourabi et al., 2011). A Smart City takes also a 'soft' direction integrating elements such as education, culture, social inclusion, and social innovation. In a Smart City, it is important that smartness has not to be considered as a dichotomy in terms of 'being smart' or 'not being smart (Angelidou, 2014). Such an approach stresses questions on introducing a distinction between the 'good' and the 'bad' city (Vanolo, 2014). The Smart City is an example of a 'political assemblage' (Mcfarlane, 2011). Smart Cities as a public policy instrument are a new way to enhance local innovation ecosystems and knowledge economy overall (Schaffers et al., 2011). Smart City policies do tend to make cities more efficient, innovation processes are expected to be fostered, mainly through a general improvement of local knowledge production functions (Caragliu and Del Bo, 2018a, 2018b). Actors discuss and argue how to solve problems of the city with a holistic conception of the solutions to mobilize ranging through participative, collaborative, or self-governing models, depending on the degree of participation of the networking actors and the governance independence of governments (Bolívar, 2017).

The theoretical framework that Lascoumes & Le Gales (2007) proposed on instruments is an innovative way to approach Smart Cities. This paper studies how actors—politicians and public servants, private actors, members of the civil society and researchers—are appropriating the Smart City between a functionalist instrument (1) and a public policy instrument (2). The assumption made by the authors is that the Smart City may be considered as a functionalist instrument by some actors and as a public policy instrument by others according to their role in the decision-making process, their level of development in Smart City initiatives (mature versus emerging) and their ideological background.

This distinction offers a comprehensive appropriation of the multifaceted Smart City by its practitioners. It also allows an identification of actors' interests through their appropriation of the Smart City. And finally, it permits detection of actors' common and opposite visions of territorial, societal, and practical development of the Smart City. An empirical study questioning actors is established. It validates the theoretical statements on Instruments applying to Smart Cities and the author's assumptions on actors' appropriations.

4. Methodology

To understand the actors' conception of the Smart City, this study directly questions practitioners. Empirical research targeting the thinkers, users, designers, and makers of the concept offers the opportunity to analyse how they appropriate the phenomena in its complexity. The quantitative analyses carried out in this study on the actors' positioning aims to identify how the theoretical Smart City conceptions are handled in practice by actors of the Belgian territory. The study aims at identifying the similarities and differences within and between actors as well as the possible classifications of their appropriations. An innovative canvas based on the theory of instrument frames the results. This empirical research aspires to transcend the traditional examination carried out on the Smart City orientations between human, technology, governance, sustainability, infrastructure, etc. To analyse concretely the actors' appropriation of Smart City, a questionnaire with 31 short statements is redacted on the basis of:

- The three factors of the Smart City: technologies, people, institutions (Nam & Pardo, 2011).
- The critics presented in the 3RC framework developed by Kummitha & Crutzen, (2017), especially the critical school of thought and restrictive school.
- Territorial matters stressed by Angelidou (2014) focusing on spatial considerations between the various territorial levels (municipal, regional, and national).
- Actors 'model based on the quadruple helix developed by Lombardi et al. (2012).

These elements are presented in the literature review and in the theoretical framework. The statements encapsulate the different aspects and orientations of the Smart City as well as the interrogations around it and its practices. They allow interviewed actors to position themselves pro or contra the 31 statements (Likert scale from 1 totally disagree to 5 totally agree).

The statements are distributed across four sections: General considerations, Technology, Governance, and Territorial Aspects. The 31 statements represent transversal elements which are considered as determinants to study the actors' appropriation of a Smart City. They are data in this empirical analysis and serve as raw materials for the statistical treatments like the actors' categories. Five of them are instituted: Elected politician (1), administrations and public organizations (2), private companies (3), research centres & universities (4), and associations (5). The study population is limited to the actors which are already involved in the Smart City movement in Belgium. The authors decided to build the study on actors who develop certain Smart Cities' knowledge. The objective is to interrogate actors who are at a minimum working on some Smart City aspects in their respective activities. The goal is to take into account their meaning of the Smart City. They are able to express their opinions on the phenomenon. For this purpose, the respective actors are selected through the Belgian society on the basis of their participation in Smart City events, programmes, studies, or competitions. The selection of these Smart City activities allows targeting actors who possess sufficient knowledge of the topic.

The responses of actors were collected through an anonymous online survey. A questionnaire was sent to the different actors in two languages: Dutch and French (Qualtrics). The data collection lasted 3 months (from February to April 2018). 193 responses were collected. There is an equilibrium of respondents across the three Belgian Regions & the Federal level and across the five actors' categories as shown in Table 19. The numbers of solicitations by e-mails is also indicated, it allows calculating the participation rates for each category of actor. Public organizations and private companies represent the highest number of respondents in comparison to associations and elected politics.

Localization / Actors' category	Elected politics	Admin & publics	Privates	Research centers & uni	Civil Society (Assocs)	Total
Flemish Region	7	11	10	8	4	40
Walloon Region	5	25	8	9	7	54
Brussels Capital Region	11	8	4	11	14	48
Belgium (Whole country)	3	9	30	3	6	51
Total	26	53	52	31	31	193
Sample	92	158	240	122	110	722
Response Rates (%)	28	35	22	25	28	27

Table 19: Number of actors' respondent inside the five categories

The actors' distribution takes into account the institutional complexity of the country and the actors' types present in the territory. Three main statistical treatments are planned to dissect the actors' appropriation of the phenomena in its complexity. These statistical methods are conducted independently of each other. They aim to study separately the similarities and differences within and between the five categories of actors as well as the possible classifications of the 31 statements depending on the actors' positioning.

- The first statistical treatment corresponds to a classical sorting and cross sorting by actors' categories reinforced by ANOVA tests. These calculations provide in Section 5.1 a global overview of the actors' positioning on the 31 statements. This allows identifying the preference of each actor to determine their appropriation of the Smart City.

- The second statistical treatment consists of a Factor Analysis using the method PCA—Principal Component Analysis. This multivariate technique, presented in Section 5.2, studies the interdependence of the 31 statements according to the actors' responses. The calculation offers a logical grouping of proposals according to the actors' perception of the Smart City. It highlights the different Smart City significations of the interviewed actors.
- The third statistical treatment is based on a K-sort, which identifies relatively homogeneous groups of cases (respondents) based on selected characteristics (31 statements). The results offer, in Section 5.3, a classification of actors as a function of their common positions on specific proposals. This allows identifying groups of actors sharing the same perceptions according to the 31 statements.

These treatments are performed using the SPSS software. They aim to offer an overview, on the one hand, on the dynamic into the categories of actors identifying similarities and differences of appropriation in and in-between the five groups, and on the other hand, on the appropriation on statements to determine how actors are positioned on them.

5. Results

The results of the crosstabs, PCA and K-sorting offer several angles of approach to analyse the opinion collected from the Belgian actors. These three statistical methods allow deciphering actors' appropriations of the phenomenon; taken together; they will invalidate or confirm the original hypothesis. They offer different types of classification of statements and actors. It will, therefore, be possible to analyse the Smart City as a functional instrument or as a public policy instrument.

5.1. Crosstabs: Actor's means

The crosstabs offer a first exploration of actors' position on the 31 statements and allow identifying their preferences. For the five categories of actors, the mean is calculated for each statement. These means show that actors on average develop similar points of view on some statements while, for others, disagreements exist between actors. Nevertheless, in general on the 31 statements the values stay high (between min 1.83 and max 4.38). Indeed, several statements are acclaimed by the different categories of actors with on average a rating superior to 4–Strongly agree. They highly approve that Smart Cities include green technologies (no. 13: 4.03/5) and is a key technological challenge for cities and towns (no. 10: 4.16/5).

In contrast, two statements receive a strong negative evaluation with on average a value below 2.5, showing a certain disagreement. Actors are mainly opposed to the fact that the Smart City is a menace on regulation and rules of law (no. 8: 2.46) as well as a fashionable concept that may soon be outdated (no. 2: 2.48). In relation to these statements, private companies evaluate this statement (no. 2) with the lowest value, 1.83 out of this statistical treatment (the only evaluation under 2/5). Nevertheless, differences of evaluation exist between actors as well as similar conceptions on the several statements. To study these similarities and differences, the results of a one-way ANOVA comparing the means of actors is available in the last two columns of Table 20. A result smaller than 0.05 in the last column confirms a significant difference of means between actors.

N	Statements Means of actors' categories	Elected politics	Admin Publics	Privates	Research & Uni	Civil Society	Total	Min Max[13]	F-Value	P-Value
1	Smart City is an essential tool for branding towns, cities and territories	3,77	3,38	3,81	2,77	3,03	3,39	1,03	5,7	< 0,001
2	Smart City is a fashionable concept that may soon be outdated	2,31	2,68	1,83	3,19	2,68	2,48	1,37	7,7	< 0,001
3	Smart City is an essential tool for the future of cities and towns in Belgium	3,92	3,75	4,31	3,39	3,48	3,82	0,92	4,9	0,001
4	Smart City is related to the threat of privatization of public spaces and public services	2,19	2,42	2,15	3,03	3,19	2,54	1,04	5,2	0,001
5	Smart City is an essential tool to enhance the sustainability of cities and territories	3,92	3,79	4,38	3,61	3,61	3,91	0,77	4,1	0,004
6	Smart City may further increase marginalization of some inhabitants and social failures	3,42	3,36	2,65	3,97	3,84	3,35	1,31	7,2	< 0,001
7	Smart City is an essential tool to improve the quality of life of inhabitants	3,85	3,70	4,04	3,55	3,65	3,78	0,49	1,3	0,281
8	Smart City menaces regulation and rules of law	2,19	2,34	2,29	2,65	2,97	2,46	0,78	2,6	0,036
9	Smart City will mobilize considerable financial resources in the coming years	3,85	3,62	3,67	4,00	3,74	3,75	0,38	0,9	0,455
10	Smart City is a key technological challenge for cities and towns	4,35	4,11	4,38	4,00	3,84	4,16	0,55	2,4	0,049
11	Smart City is mainly based on the use of ICT, Big & Open Data	3,46	3,43	3,65	3,32	3,58	3,50	0,33	0,6	0,659
12	Smart City is a tool to enhance transparency in decision making	2,92	3,40	3,29	3,13	3,32	3,25	0,47	0,8	0,543
13	Green technologies are part of Smart Cities solutions	3,77	3,98	4,29	3,97	3,94	4,03	0,52	1,4	0,230
14	Smart City is a threat: it menaces privacy protection, facilitates hacking...	2,73	2,75	2,81	3,26	3,06	2,90	0,53	1,2	0,301
15	Smart City improves governance principles (Decision making, actors' cooperation, …)	3,19	3,11	3,06	3,23	3,13	3,13	0,17	0,2	0,956
16	Smart City should be based on initiatives led by civil society actors (citizens, associations)	2,96	3,19	3,25	2,94	3,29	3,15	0,35	0,9	0,474
17	Local government should play a leading role in the Smart City development	3,50	3,25	3,37	3,10	3,39	3,31	0,40	0,7	0,609
18	Smart City construction can not start without the setup of a strategic plan	3,35	3,11	3,71	3,17	3,48	3,38	0,60	4,2	0,003
19	Smart City should entail a sharing of power between the different actors	3,27	3,66	3,04	3,23	3,68	3,37	0,64	1,9	0,118
20	Administration is the best actor positioned to manage local implementation of Smart City strategy and solutions	2,88	3,09	2,88	3,00	2,94	2,97	0,21	0,2	0,915

[13] Calculated on the categories of actors' results out of the sample (not based on the aggregate means).

N	Statements Means of actors' categories	Elected politics	Admin Publics	Privates	Research & Uni	Civil Society	Total	Min Max	F-Value	P-Value
21	*Smart City can not be developed without loca startups and entrepreneurs*	2,62	3,25	3,46	3,00	3,06	3,15	0,85	3,3	0,013
22	*Research centers and universities are essential contributors to Smarter cities and towns*	2,92	3,13	2,96	3,45	3,29	3,13	0,53	2,3	0,059
23	*Smart City should be based on a balanced mix of projects from public authorities and projects from citizens, associations and private companies*	3,08	3,30	3,60	3,42	3,61	3,42	0,54	2,7	0,030
24	*Smart City is primarily a political process involving elected officials*	3,23	3,25	2,58	3,10	2,94	2,99	0,67	1,4	0,220
25	*The development of Smart City is largely relying on private consultancy*	3,38	3,09	2,98	2,94	3,06	3,07	0,45	0,4	0,808
26	*To accelerate the development of the Smart City, It is important to lighten the administrative procedures*	2,77	3,25	3,31	3,16	2,90	3,13	0,54	1,7	0,158
27	*Large multinationals (IBM, Google, Uber, Accenture) primarily benefit of Smart City development*	3,15	3,06	3,27	3,35	3,32	3,22	0,30	0,4	0,810
28	*Smart City is directly related to an increased competition between cities and territories*	2,77	2,50	2,73	2,97	3,39	2,82	0,89	3,3	0,013
29	*Smart City can be adapted to any territory, including rural areas*	3,81	3,87	4,15	4,06	3,87	3,97	0,35	0,8	0,522
30	*Smart City will mainly benefitting to large cities in Belgium*	3,62	3,17	3,15	3,42	3,32	3,29	0,46	0,9	0,465
31	*Smart City has to be elaborated at the regional level within the framework of a Smart Region*	3,85	4,06	3,79	3,81	3,65	3,85	0,41	0,8	0,550

Table 20: Actors' means by statements and ANOVA test results

Of the 31 statements, the five actors develop similar considerations on:
- The lowest difference—0.17—on a statement is recorded concerning the Smart City as a tool that improves governance principles (no. 15). The different categories of actors seem quite indistinct with an evaluation average of 3.19/5. This is confirmed by the results of the ANOVA test, which indicates that the differences between the means are not significant. (Sig. 0.956).

- Actors' opinions also coincide (2.88) along the affirmation that the administration is the best actor positioned to manage the local implementation of Smart City (no. 20) with a difference between them of 0.21 (ANOVA: Sig. 0.915).

- They are also indecisive on a similar way concerning 'The development of Smart City which is largely relying on private consultancy' (no. 25) and that 'Large multinationals (IBM, Google, Uber, Accenture) primarily benefit from Smart City development' (no. 27) with respective values of 3.07 and 3.22 (ANOVA: Sig. 0.810 and 0.810).

- They are poorly convinced (3.46) that Smart City is mainly based on the use of ICT, Big, and Open Data (no. 11), the difference between the categories of actors reaches only 0.33 (ANOVA: Sig. 0.658).

- Finally, actors have a quite similar opinion on the fact that Smart City will mobilize considerable financial resources in the coming years (no. 9). The difference between the categories of actors is low and is established at 0.38 with a shared opinion in favour between 3.74 and 4.00/5 (ANOVA: Sig. 0.454).

In contrast, there are differences of opinions between actors concerning certain subjects:

- There is a disparity (1.03) on the claim that Smart City is an essential tool for branding towns, cities, and territories (no. 1). Numerous researchers do not accept this statement while a number of private companies strongly support the Smart City in this branding function. The results of the ANOVA test with a Sig. smaller than 0.05 confirms the difference of means between actors (Sig. 0.001).

- The largest difference (1.37) recorded is opposing the categories on Smart City as a fashionable concept that may soon be outdated (no. 2). While several politicians and private companies are not convinced by a possible fading of Smart City, actors of the research and civil society largely agree on the fashionable vision and doubt the long-term effect of the concept (ANOVA: Sig. 0.001).

- Finally, among others, the statement 'Smart City is directly related to increased competition between cities and territories' (no. 28) is characterized by an important difference (0.89) of appreciation between the categories of actors. Actors of the Civil Society perceive a risk whereas privates do not consider it as a threat (ANOVA: Sig. 0.012).

These results show that the different categories of actors have on average a harmonious vision on several topics concerning the Smart City. But their own positioning varies on specific statements. It shows a difference of appropriation on the concept that needs a deeper study. The next step offers the opportunity to refine the analysis and group statements inside a limited amount of determining factors so that further on it allows internal differences within some groups.

5.2. Factor Analysis: Principal Component Analysis

A Principal Component Analysis offers a logical grouping of proposals according to the actors' perception of the Smart City. The PCA is conducted on the 31 statements based on the eigenvalue criteria using the Varimax rotation (the rotated component matrix is available in the Appendix). It regroups the different statements when interviewees tend to react in a similar way to the statements. The Kaiser–Meyer–Olkin (KMO) and Bartlett's tests show for the measurement of sampling adequacy a significance rate of 0.763 (KMO). The PCA rotation reduces the number of factors from 31 statements to 11 factors thanks to the rotation. These factors explain 63.725% of the variance.

The reduction to 11 factors shows there is little association between the statements. It illustrates a certain independence between them. For each category of actors, the means of the 11 factors' residuals are calculated and shown in Table 21. The 11 factors are labelled according to the meaning of the different statements composing each of them.

N	Factors	Statements	Elected Politics	Admin & publics	Privates	Research & Uni	Civil Society
A	*Smart City as a tool*	3-5-7-1-10-12-2-13	,14	-,16	,44	-,31	-,21
B	*Smart City as a threat*	8-14-4-6-28	-,24	-,28	-,05	,25	,50
C	*Smart City as a set of actors*	17-16-25	,08	,06	-,14	-,13	,21
D	*Smart City as a concept for cities*	30-31	,30	-,03	,00	-,06	-,10
E	*Smart City as based on open governance*	22-23-15	-,37	,04	-,10	,31	,22
F	*Smart City as a structure at a regional level*	18-31	,02	-,15	,25	-,05	-,02
G	*Smart City as an administrative procedure*	26	-,45	,18	,03	,16	-,09
H	*Smart City as a potential threat (Too expensive, concurrence and top-down)*	24-9-28	,24	-,02	-,17	,10	,04
I	*Smart City as a capture by multinationals*	27	-,09	,10	-,19	,13	,14
J	*Smart City as an implementation by the administration*	20	,19	-,08	,07	-,17	,00
K	*Smart City as driven by techno and start-ups*	21-11	-,31	,00	,33	-,24	-,10

Table 21: Factors of the PCA

Factor A integrates eight statements, it mainly considers the Smart City as a way to build and enhance the territory. This factor regroups statements highlighting the Smart City as a tool (no. 3-5-7-1-10-12) with green solutions (no. 13) and technological challenges (no. 10) which is not a fashionable concept soon outdated (no. 2).

The 11 factors obtained can be classified into the two types of instruments discussed in the theoretical framework. Three factors correspond to the technical and functionalist Instrument: A-I-K. These factors may be assimilated to a pragmatic set-up of the Smart City. The concept is apprehended as an adequate instrument for the development of cities and towns (A) with the involvement of some actors like multinationals and start-ups (I & K). These factors composed together a vision of the Smart City centred on a functionalist and technical implementation of the concept. There are no question and ethical considerations in these factors.

In contrast, four factors match with a public policy instrument approach (B, C, E, H). These instruments encompass two aspects, on one side, a critical reasoning on the construction of the Smart City and, on the other side, a call for specific development of the Smart City. The critical factors (B and H) comprise statements that highlight a Smart City with numerous menaces: threats on the rules of law and privacy, risk of privatization and hacking, danger of expensive spending and concurrence between territories, and finally menace of a potential top-down approach. These two factors put into perspective the Smart City under its potential negative effects. The two other factors (C and E) contain statements requesting a Smart City based on open governance and a mix of actors (privates, politics, and citizens) to manage it. These four factors feature the Smart City as a public policy instrument without neutrality and potentially producing negative effects on the society.

In these statistical results, four factors (D, F, G, J) are not yet clearly associated with an instrument with a public policy or a functionalist approach. These factors stress considerations for the construction of the Smart City based on territorial aspects (D & F) and administrative process (G & J).

5.3. K-sorting

The k-sorting gathers relatively homogeneous actors sharing the same perceptions of the Smart City according to the 31 statements. The clustering is realized using the Two-Steps technique, which does not require pre-establishing the expected numbers of clusters before the treatment. One of the main outcomes of this clustering is that it generates only two groups. Further on, respondents are almost equally distributed across the two clusters as shown in Table 22.

The Pearson Chi-Square tests for three characteristics of actors are not statistically significant for genders and the three regions (Flanders, Brussels-Capital, and Wallonia). They are statistically significant for the categories of actors (Appendix). The numbers of respondents vary depending on the information furnished in the anonymous profile.
The results show an equal distribution of elected politicians among the two clusters. While a majority of actors coming from Civil Society, Research centres & Universities and Administration & Public organizations are located in the second cluster; private actors are mainly gathered in the first cluster.

Besides this, it is also possible to classify the 31 statements into groups. The differentiation of opinion on the statements between the two clusters of actors is the classifying characteristic. A two-sample t test (t test for equality of means) determines the sorting calculation. Two groups emerge out of the statistical results; it shows that the clusters of actors have a different appropriation on 20 statements. The first group consists of 13 statements supporting a functional instrumental approach; the second one is composed of 7 statements offering a public policy instrumental approach. It misses 11 residual statements; they are not sorted because there is no independence. The actors' opinions are similar across the two clusters. They share a common appropriation on these statements, which mainly focus on governance aspects.

**Group 1 : Functionalist Instrument**
N	**Statements**	**Mean Group 1**	**Mean Group 2**	**Means difference**	**T-Value**	**P-Value**
1	Smart City is an essential tool for branding towns, cities and territories	2,94	3,89	-0,95	-6,167	< 0,001
3	Smart City is an essential tool for the future of cities and towns in Belgium	3,18	4,49	-1,31	-10,243	< 0,001
5	Smart City is an essential tool to enhance the sustainability of cities and territories	3,27	4,62	-1,35	-11,341	< 0,001
7	Smart City is an essential tool to improve the quality of life of inhabitants	3,22	4,39	-1,17	-8,895	< 0,001
10	Smart City is a key technological challenge for cities and towns	3,83	4,49	-0,66	-5,345	< 0,001
11	Smart Citiy is mainly based on the use of ICT, Big and Open Data	3,16	3,79	-0,63	-4,321	< 0,001
12	Smart City is a tool to enhance transparency in decision making	2,73	3,82	-1,09	-6,928	< 0,001
13	Green technologies are part of Smart Cities solutions	3,61	4,47	-0,86	-6,664	< 0,001
15	Smart City improves governance principles (Decision making, actors' coop, …)	2,86	3,39	-0,53	-3,809	< 0,001
18	Smart City construction can not start without the set-up of a strategic plan	3,17	3,59	-0,42	-3,515	0.001
26	To accelerate the development of the Smart City, It is important to lighten the administrative procedures	3	3,29	-0,29	-1,965	0.051
29	Smart City can be adapted to any territory, including rural areas	3,56	4,38	-0,82	-5,847	< 0,001
31	Smart City has to be elaborated at the regional level within the framework of a Smart Region	3,59	4,08	-0,49	-2,989	0.003
**Group 2 : Public Policy Instrument**
N	**Statements**	**Mean Group 1**	**Mean Group 2**	**Means difference**	**T-Value**	**P-Value**
2	Smart City is a fashionable concept that may soon be outdated	3,07	1,88	1,19	7,557	< 0,001
4	Smart City is related to the threat of privatization of public spaces and public services	3,09	1,97	1,12	6,734	< 0,001
6	Smart City may further increase marginalisation of some inhabitants and social failures	3,91	2,77	1,14	6,59	< 0,001
8	Smart City menaces regulation and rules of law	2,88	1,99	0,89	5,966	< 0,001
14	Smart City is a threat: it menaces privacy protection, facilitates hacking…	3,57	2,15	1,42	10,321	< 0,001
28	Smart City is directly related to an increased competition between cities and territories	3,1	2,52	0,58	3,604	< 0,001
30	Smart City will mainly benefitting to large cities in Belgium	3,56	2,96	0,6	3,653	< 0,001

Table 22: Statements along the functionalist and public policy instruments (Cluster results)

The Group 1 comprised 13 statements; they are highly supported by the actors of cluster 1 in comparison to the weak support registered by the actors of cluster 2. The 13 statements emphasize the Smart City in two aspects. The actors of cluster 1 consider the Smart City as a tool useful for branding towns, enhancing sustainability, improving transparency, governance principles, and quality of life. They also consider it necessary to follow specific concrete directions to apply the concept to the territory.

It consists of developing the Smart City using ICT, Data, and green technologies, as part of a local strategic plan, under the framework of a Smart region with a lightening of administrative procedures. The Smart City is adapted for them to any territory, including rural areas even if its implementation reveals a key technological challenge for cities and towns. This assortment of practical considerations advocates for a functionalist instrumental approach to the Smart City. The vision of these actors is centred on a functionalist and technical implementation of the concept without questioning the consequences of such an implementation.

Group 2 is composed of 7 statements. Actors in the first cluster do not clearly assent to these statements while the actors of the second cluster strongly support these proposals. They question the formation of a Smart City and stress some dangers in its implementation. For them, the Smart City is a fashionable concept which may mainly benefit large cities and increased competition between them. The Smart City is also a threat which may cause privatization of public spaces, a marginalization of some inhabitants, may facilitate hacking and may menace the regulation, rules of law, and privacy protection. All these considerations push to recognize the Smart City as a public policy instrument with potential (negative) value. For the actors of this cluster, the Smart City construction produces mainly undesirable effects on the society.

Clusters	Elected politics	Admin & publics	Privates	Research & Uni	Civil Society	Total
1	14 53,8%	31 59,6%	17 32,7%	20 66,7%	18 58,1%	100 52,4%
2	12 46,2%	21 40,4%	35 67,3%	10 33,3%	13 41,9%	91 47,6%
Total	26 100,0%	52 100,0%	52 100,0%	30 100,0%	31 100,0%	191 100,0%

Table 23: Distribution of actors across the two clusters

These results stress that there is not a clear distribution of categories of actors into one or the other cluster. Some slight trends exposed hereunder are pertinent but the distribution of profiles across the two clusters is not monolithic. However, the classification between functional and public policy instrumental appears relevant.

6. Discussion

The statistical results validate that the instrumental approach is pertinent to consider the concept of Smart City. The Belgian actors' appropriation of the Smart City supports the partition between two types of instrument, the functionalist and the public policy. The distributions of statements across the two instrumental approaches emerge mainly from the results of the CAP and the k-sorting statistical treatments.

However, both views converge in a Smart City as an instrument that proceeds the management and government of cities and territories. Some actors put tags and warnings for its implementation. As shown in the results of this study, the first necessary step is to investigate how actors appropriate these instruments before their implementation. Considerations on instruments offer the opportunity to question the circulation of ideas and models (Hood, 2007). The statistical results show that the actors' appropriation is operated in different directions.

The results highlight that some actors consider the Smart City as a functionalist instrument. Smart City is appropriate as a management device for a city and territory based on an efficient mode of governance where complex social problems can be solved or optimized (Kitchin, 2014). This actors' appropriation corresponds to a functional instrumental approach where the Smart City is considered as a kind of evidence, 'at disposal', and conceived as a pragmatic political and technical approach to solve problems (Lascoumes & Le Gales, 2007), what Morozov (2013) calls 'solutionism'. The Smart City in this perspective is a denaturalized technical object, neutral, equally available and without political value and consequences. It is a pragmatic solution, a device utilized to transform the territory.

The results also underline that some actors consider that the Smart City should be conceived as a public policy instrument. The actors' appropriation shows an ideological dimension of the Smart City. They mainly stress their own force of action and the potential effect of the Smart City (Lascoumes & Le Gales, 2007). Their appropriations focus on the consequences of the Smart City as an instrument that impacts territories and societies. They mainly concentrate on the potential negative effects. The underlined elements are pointed out by a restrictive and critical school of thought (Kummitha & Crutzen, 2017). The Smart City is not purely technical, inert, and with perfect axiological neutrality (Lascoumes & Simard, 2011). On the contrary, the Smart City is full of values questioning the future of cities and towns. The Smart City is an instrument full of consequences provoking debates on political goals, influencing policies, and affecting actors' resources.

For Belgian actors, Smart City does not follow a dual development. Nuances are needed in the Belgian actors' appropriation. Indeed, actors are not clustered in one or in the other conception and direction of the Smart City. The naïve views of policy makers promoting a political vision, companies promoting a technical conception and associations promoting a governance approach of Smart City are not adequate. Belgian actors follow, on the one hand, a partition following the two types of instruments, and on the other hand, a division and associations of actors on certain topics. But the association/division of actors does not follow necessary a homogeneous trend. The results show there is a certain hybridity in the situation of the most categories of actors studied.

Nevertheless, the assumptions made by the authors are verified. The Smart City considered as functionalist and public policy instruments by Belgian actors corroborates with the statistical results. Politicians & public servants, private actors, members of the civil society, and researchers appropriate the Smart City through the two types of instruments. However, there are differences of appropriation inside the categories of actors. Their role in the decision-making process, their level of development in Smart City initiatives (mature versus emerging) and their ideological background may have a potential effect on their appropriation of the Smart City.

This study focuses on the entire Belgian territory. It makes it possible to take into account the verticality of relationships between actors, which is missing in many scientific analyses of Smart Cities. This verticality is taken into account thanks to the variety of respondents. But Belgium as a case study requests critical considerations to extend the analysis to other territories and actors. It is necessary to take into account the intrinsic characteristics of the country, such as the institutional complexity, the dense network of small- and medium-sized cities, the mix of urban and rural territories, the important peri-urbanization phenomena and the open economy. The reality of Smart City understanding and appropriation is much more complex.

However, this article offers a new research path and scope circumventing these differences in focusing directly on the Belgian actors involved in the Smart City dynamics across the territory. The respondents embody the representativeness of the rich economic, social, political, and cultural diversity at the regional and local levels, which is indirectly taken into consideration in the study. Another limitation concerns the temporal factor of the study. Indeed, this article takes the pulse of Belgian actors at a given moment on a fixed territory. It does not take into account the dynamics and processes existing in time. Actors' positioning and appropriation of the Smart City development is a fixed picture. In addition, the representativeness of the actors interviewed is not measurable. Nevertheless, this article offers a comprehensive view of the multifaceted Smart City by its practitioners. It allows an identification of actors' appropriation of the Smart City through an instrumental approach theorized by Lascoumes & Le Gales (2007). It encompasses also their common and opposite opinions on the territorial, societal, and practical development of the Smart City.

7. Conclusion

This paper questions in an innovative way the Smart City appropriation by actors. Smart City is often perceived as a development of the territory pushed on the one hand by technologies and on the other by a holistic development that includes a whole series of notions such as sustainable development, governance, human centred … This study stands out from these conceptualizations and uses the Instrument theory conceived by Lascoumes & Le Gales (2007).

In this paper, the Smart City is considered as an instrument of territorial construction. The question that arises is how do actors appropriate the Smart City as types of instrument? Is It a functional instrument: a kind of evidence, a denaturalized technical object, and a pragmatic solution at disposal or a public policy instrument: not neutral, provoking debates on political goals, influencing policies, affecting actors' resources?

On the basis of an online survey with 193 Belgian respondents, the results of different statistical treatments carried out demonstrate that:

- First, the use of Instrument theory is relevant. The positioning of actors on the questionnaire's statements follows the logic of the functional and public policy instruments.
- Second, Smart City actors do not fit into one or the other category of instrument in a monolithic way. Trends emerge for some actors and verify the assumptions proposed by the authors.
- Third, in some cases actors oppose certain conceptualizations of the Smart City and in others form coalitions of opinions.

These results show that the actors' appropriation of the Smart City does not follow a homogeneous trend based on either a technical or a holistic direction. It is necessary to nuance the current affirmations on actors' consideration in the Smart City literature. In fact, each actor follows his own logic. The theoretical lenses used in this article are older than the concept of Smart City itself and thus provide insights to study it. Undeniably, this paper contributes to the Smart City literature by analysing through instruments the Smart City as a public policy instrument on one side versus a functional instrument on the other side.

To go further in the analysis of the Smart City as an instrument, and to take into account the dynamics and processes underlying Smart City appropriation, it will be necessary to study the impacts of the actors' role in the decision-making process, actors' level of development in Smart City initiatives (mature versus emerging) and actors' ideological background.

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Interchapter

The second empirical research shows that Belgian actors develop different appropriation of the Smart City. The categories of actors do not develop a common perception of the Smart City. There is a definite heterogeneity of standpoints.

Some outcomes of this second research make it possible to highlight a transversal contradiction between the results obtained and the results of the first empirical research on municipal understandings. While the impacts of regional localisation on municipal understandings are relevant for local public authorities, the statistical results show that the regional localisation for Belgian stakeholders is not relevant to their appropriations of the Smart City concept. The institutional factor does not seem to affect Belgian actors in the same way. This is an element that would be interesting to analyse in empirical studies. It reinforces the need to take into account the complexity of factors that influence the Smart City appropriation by actors.

In this perspective, to enhance the comprehension of the Smart City by Belgian actors, the next study of this thesis changes its intrinsic methodology. In order to more deeply decipher actors' conceptualisation and appropriation of the Smart City, a case study is conducted using a qualitative methodology. It allows a profound analysis of the discourse and standing of actors with regard to the Smart City.

IV.   PAPER FOUR

ACTORS' CENTRALITY IN THE BUILDING OF A SMART CITY:
A critical analysis using the actor-network theory process of translation

1. Introduction

Since mid-2000, the "Smart City" has emerged as a popular discourse describing a new approach to mitigate and remedy current urban problems and societal challenges (Alawadhi et al., 2012). A corporate and technological development of the Smart Cities was identified and criticised in the literature, with a later inclination toward an inclusive Smart City with human capital and governance principles as drivers of the phenomenon (Ben Letaifa, 2015; Bolívar, 2018; Deakin, 2014; Kourtit & Nijkamp, 2012; Meijer & Bolivar, 2016; Paskaleva, 2011). This evolution is identified by Gregory Trencher (2018) as the emergence of a second-generation of the Smart City called Smart City 2.0. This new generation of Smart Cities is conceptualised as a decentralised, people-centric approach where Smart technologies are employed as tools to tackle social problems, serve citizens' needs, enhance policies and governance, and foster citizen participation (Trencher, 2018). These evolutions are a counterpart to the first generation of Smart Cities, based on a technocentric approach with a diffusion of Smart solutions benefitting corporate and economic interests. The different Smart City approaches coexist, but they remain ambiguous and generate increasing discussion in relation to their feasibility and potential (Anthopoulos, 2017). Smart City initiatives encompass several technical, managerial, and governance challenges arising from the inherent nature of a Smart City.

The lack of appropriate governance arrangements for the majority of cities appears to constitute the most serious obstacle to their effective transformation into Smart Cities (Manville et al., 2014; Praharaj, Han, & Hawken, 2018). These lines of reasoning continue to be mainly theoretical. Empirical proof is insufficiently mobilised for the study of Smart City governance (Ruhlandt, 2018). Several scholars have identified problems in how Smart City case studies are developed. Meijer & Bolívar (2016) pointed out the shortage of adequate socio-technical explanations in case studies related to Smart City initiatives, as well as a lack of clarity around the policies for technical choices in Smart City governance. The governance of Smart City is still under exploration and needs to be tied up theoretically using methods from three areas: (1) organisational studies, (2) information systems, and (3) science and technology studies.

For Hollands, cities claim themselves Smart with self-congratulatory note (Hollands, 2008), and Mora et al. (2017) report that grey literature is produced by the American business community. They encompass case studies of Smart Cities which tend to look favourably on those who create them. The most prominent cases are often canonical examples. Finally, in his critical paper, Kitchin (2015) underlined several shortcomings including the "one-size-fits-all" narrative, an absence of in-depth empirical case studies, and a weak collaborative engagement with the various stakeholders.

To face these critics, this article explores the transition of the city of Alphaville (Belgium) into a Smart City through the use of actor-network theory (ANT). Mixing science, technology, and society studies, this methodology is exploited in management and in information systems to describe pragmatic processes of making networks. ANT does not use the term socio-technical; instead it refers to a heterogeneous network comprised of both human and non-human entities. ANT allows a greater understanding of the actual organisation of cities through an interpretation of networks via a variety of qualitative methods (Smith, 2003). Based on the four-stage model by Callon (1986), this paper studies the translation process which may take place in the city of Alphaville across the implementation of their Smart City projects. The case study interrogates how negotiations, compromises, and adaptations between stakeholders generate the evolution and transformation of the network around Smart City initiatives.

2. Smart City governance and the actor-network

In this paper, the Smart City is studied as a process situated in a body of practices, into which actors are differently enrolled. Smart City initiatives are considered as a process of translation taking place in the city following the ANT approach. Smart City initiatives include a combination of different technologies and solutions which are labelled as Smart, implemented by combinations of local actors in response to varied agendas, and enacted in particular ways and spaces (Cowley, Joss, & Dayot, 2018).

This ANT-led approach goes hand in hand with the principle of Smart urban collaboration highlighted by the second-generation of Smart Cities. It stresses the necessary role of collaboration between the various actors in the city (Meijer & Bolivar, 2016). It integrates the increased importance of the citizen which is related to the principles of participatory design in Smart City governance (Paskaleva, Cooper, Linde, Peterson & Götz, 2015). Smart City projects have to be built not from a top-down or bottom-up approach but with active involvement from every sector of the community (Nam & Pardo, 2011a). With this in mind, the triple helix model - universities, industry, and government - integrates a new agent of knowledge creation: the civil society (Leydesdorff & Deakin, 2011). It replaces the classic private and public partnership model to become a quadruple helix model. The advanced model presupposes that the four helices operate in a complex urban environment such as that characterised by the Smart City. Accordingly, the Smart City is an assemblage shaped by multiple inter-related agencies and interactions, rather than being imposed by state or corporate actors from 'above'.

This suits Ben Letaifa's (2015) claim, the city is "Smart" when it integrates and synchronises formal leadership and democratic participation in the urban ecosystem with new technologies. This relates to what Kourtit et al. (2012) stressed: to shift the governance of a city to Smart governance, *"it is necessary to develop pro-active and open-minded governance structures, with all actors involved, in order to maximise the socio-economic and ecological performance of cities, and to cope with negative externalities and historically grown path dependencies"*. For Mejier & Bolivar (2015), it corresponds to the highest degree of transformation since it is not only about the transformation of the internal organisation of the city but also of the external organisation.

3. Actor-network theory

Translation is the process that allows actors to be represented by a single entity or network (Latour & Callon, 1981). At the starting point, actors and universes (in this case public-private-academic-civil actors and smart technologies) are separate and had no means of communication with one another. At the end of the process these have been unified, or rather have been brought into a relationship with one another in an intelligible manner (Callon, 1986).

In the ANT, the translation is a process before it is a result (Michel Callon, 1986). It involves *"transformation, modification, change, renovation, and identity construction – with a blending of the new and the old"* (Tsui-Auch, 2001). ANT uses the notion of translation to better understand institutional innovation and change in the network of actors. ANT helps to understand how an innovation such as the Smart City is adopted, how it moves, how it progressively spreads to be successful. The movement of adoption is a movement of adaptation. This adaptation generally results in a collective elaboration; it is the fruit of a growing interessement. Successful implementation requires a mobilisation of actors to diffuse the innovation (Whittle & Spicer, 2008).

As a methodology ANT helps to better analyse how disparate actors mobilise, juxtapose, and join together for the same purposes (Law, 1992). It also explains the process by which actors constitute their own agency and pursue a common agenda (Law, 2009). ANT helps to understand how relationships can be organised and stabilised to create a durable and robust network (Callon, 1990). To succeed in this innovation process, actors must be able to react to all fluctuations; they must be in a position to seize all opportunities (Callon, 2001). Rigid and mechanical models, overly precise tasks and role definitions, and constraining programmes must all be avoided in order to innovate. Key words in these dynamics are *"interaction"*, *"de-compartmentalisation"*, *"circulation of information"*, *"cooperation"*, *"adaptation"*, and *"flexibility"* (Akrich, Callon, Latour, & Monaghan, 2002).

In place of a single dominant social group, ANT claims that power operates in and through a heterogeneous network of people and things (Latour, 2005). On one hand, ANT is useful to investigate if Smart City projects are successfully conceived according to a partnership and collaborative approach. It also constitutes a relevant grid in order to study the construction of an actor-network around Smart City initiatives. On the other hand, the innovation and translation processes which may take place in a city are studied through the implementation of Smart City projects (Tompson, 2017). The project analysis emphasises negotiations, compromises, and adaptations, which generate the evolution and transformation of actors and networks. The translation process makes it possible to establish a link between the heterogeneous activities in the city, and the actors and organisations with a different nature. To that end, the four-stage model of Callon's foundational study (1986) is applied to identify how the actors' network is created. This methodology offers a comprehensive vision of how the actors' network in a Smart City is produced, how interests and involvements operate in and through this network (Latour, 2017), and how this network tends to evolve (Callon, 1986). The iterative process of translation is described in four logical steps: problematisation, interessement, enrolment, and mobilisation of allies.

3.1. Problematisation

Problematisation corresponds to the emergence of a common problematic that is accepted by actors, which leads to a convergence around an "Obligatory Passage Point (OPP)". Actors are mobilised by the definition of local problems to be solved (Callon, 1986). Problematisation integrates into a local environment the identification of controversies that unify or separate the different actors. This stimulates a convergence and the establishment of a network. It generates a passage from a singular context to the acceptance of cooperation (to form a network). This stage allows heterogeneous actors to come together around issues and agree to work on them jointly.

For Callon (1986), the first and crucial step in the creation of networks is the establishment of obligatory passage points through the problematisation. They have a different nature depending on the situation; this can be a place, a technical object, it can be physical, immaterial, institutional, verbal, etc. They encourage convergence and the resolution of the problem is inseparable from it.

3.2. Interessement

The aim of the development of interessement is to make the project appealing within the focal field to attract support. Other actors must be convinced that the resolution of the problem will benefit them. Discursive or material means are presented to the various actors with the gains that they would potentially obtain from their participation. Allies are locked into the project with some roles and related benefits for the resolution of the problems identified during the previous step. Problematisation and interessement aim to present possible solutions through the actors involved.

3.3. Enrolment

At this stage, a definition and allocation of roles are necessary through the use of some devices to embody actors. Helped by spokespersons, the roles, tasks, and missions are defined to concretely mobilise the actors into the project. The devices work as intermediaries. When everyone has accepted a role to play in the project which will satisfy their interests, the stage of enrolment begins. The diverse devices articulate the institutionalisation of the project and reduce the range of possible discussion (Latour & Woolgar, 1986). In the network, they are related to *"anything passing between actors that defines the relationship between them"* (Callon, 1991). The devices stabilise the problematisation and diffuse the solutions.

The spokespersons are considered at this stage as a few individuals who are chosen to represent the participants. They have to be relevant and to represent the collective entities by properly representing all members of the network that are acting as a single agent (Akrich, Callon, Latour, & Monaghan, 2002). While every actor is an intermediary (Callon, 1991), the number of spokesmen remains limited. The use of spokesmen reduces the number of representatives and stabilises the network.

3.4. Mobilisation of allies

Mobilising the involved actors by using effective coordination with others is a necessity. This is made possible due to the expansion of the network, which is a condition of its sustainability. This mobilisation is successful when the first actors involved bring their support and the others give their consent to the project or at least conform to it. A network of supporters that backs up the project emerges (Callon, 1986). This step contains a process of stabilisation of the network where supporters of the networks acquire a relative stability. Actors gain a feeling of identity from belonging to the network (Callon, 1986). At this step the new institution will either tend to become irreversible or fail. The network begins to be perceived as a macro-actor (Czarniawska-Joerges, 1996).

4. Methodology: case study

4.1. Case Study: Alphaville

This paper concentrates its investigation on a case study that innovatively uses actor-network theory as framework of analysis. Empirical research on small European cities is poorly developed in the literature on Smart Cities. Belgium is characterised by a dense network of small and medium-sized cities. It was decided to anonymise the case study for two reasons, to respect the privacy of the respondents and protect their freedom of speech, and to promote an internationalisation of the case study. The city of "Alphaville" was chosen for its intrinsic characteristics. The city is a medium size (+/-100 000 inhabitants in 2018), mixing urban and rural territories. The city of Alphaville also welcomes numerous public offices and several headquarters of companies. Additionally, the city is classified as advanced Smart City in Belgium according to some national ranking.

The city has solicited and obtained a large budget from the European ERDF funds (2014-2020) for a portfolio called "Alphaville Innovative City" to transform the city into a Smart City. Projects arising from this portfolio and other regional and local projects aim to establish Alphaville as a pioneer thanks to diverse Smart City initiatives such as:
- "Hive": a living lab and meeting space 2.0 centred around urban planning and urbanism where actors (mainly citizens) meet and co-create (initiated by a public consortium);
- "Truc": a creative hub with fablab, relab which organises events and workshops centred around the creative industry (initiated by a public-private-academic consortium);
- "Digit Centre": a space for demonstrators and demonstration of new and smart technologies (initiated by a public-private-academic consortium);
- "Box Festival": an international digital arts festival (initiated by Cat Studio);
- Other technological urban innovations: Smart Bin, Smart lighting, E-Locket, Open Data, Co-working Platform, real-time mobility information, etc.

These projects are developed in the territory to smart the city. At different institutional levels, they are initiated by different actors to face local challenges. The selection of actors relies on the criteria of the quadruple helix model (Leydesdorff & Deakin, 2011) which aims to represent a plurality of actors and standpoints.

Project leaders of the main Smart initiatives of the city ("Hive", "Truc", and "Box Festival") are interrogated with an objective of balanced-centricity between civil society and public actors. The selection process also aims to fairly represent local authorities, with representation from civil servants from the administration and political decision makers. Finally, to take into consideration the counter-powers present in the territory, associative actors who are active at the local level with an activist recognition are targeted, as are members of the political opposition.

4.2. Collection of data

The collection of qualitative empirical materials, composed of primary sources and 22 semi-structured interviews, underpins the methodology of this article. The collection of qualitative materials was carried out between May 2018 and June 2018. The project managers were met, as were different partners participating in these projects. Different stakeholders were also interviewed; they came from the public, private, and academic sectors. To consolidate the analysis, several civil society actors were interviewed. In total, twenty-two semi-structured interviews were conducted and distributed as shown below (Table 24). The different political forces active in the city are also represented in the interviews.

Public Authorities (1)	Private Companies (2)	Academic and Research Centres (3)	Associative Structures (4)
Mayor	ISC: Informatics & Services Company (regional and national levels)	Alphaville High School	"Truc" Project Manager
Inter-Municipality (IMS) Smart City Project Manager	Cat Studio: event, web design, etc. (local and international levels)	UAlphaville	Citizen Forum
Urban Office Manager	Local Trade Association	FormAlpha (continuing education)	Cultural Point
"Hive" Project Manager	Pong: Creative Economy (local start up)		District Committee
Alphaville Smart City Manager	MuSi: Municipal Services (regional level)		Digital-café
Alderman in charge of Mobility			Trade Association
Alderman in charge of Environment and Green Spaces			Socialist Party

Table 24: Actors interviewed

The interviews focused on the reasons for the actors' participation in the project, the modalities of participation, their roles, their *a posteriori* evaluations, their expectations, and their development tracks. The interview structure follows a grid constructed from the four step translation process of actor-network theory.

With the aim to triangulate data, a series of secondary data were also collected. Public and private documents were consulted, in particular the strategic plan of the city, ERDF descriptive files, press articles, websites, and folders.

4.3. Data Analysis

The interviews constitute the major sources of this study. The raw materials generated by the semi-directive discussions are examined through a thematic analysis. This analysis highlights the negotiations and transformations of the Smart City projects as well as the network dynamics around the different Smart City initiatives. A thematic content analysis (Glaser & Strauss, 1967) of the empirical elements is developed through the frame of actor-network theory.

An in-depth horizontal (inter-case) analysis of the interviews is carried out on the basis of four logical steps: (1) problematisation, (2) interessement, (3) enrolment, and (4) mobilisation of allies. The paper presents nuances and compares the interviewees' perceptions of the Smart City projects and the actors' dynamics. The translation process of the ANT is the conducting wire of the analysis. Each sentence cited by a stakeholder included in the body of the article is identified to a category of actor by the adjacent number (see Table 24).

5. Results

The Smart City dynamic of Alphaville is examined through the prism of the translation process. The four steps of the translation highlight how the network of actors is set up and structured, how it works and malfunctions.

5.1. Incomplete problematisation

The actors' definitions of the Smart City is a subject of discussion that lies between technological, citizen-centred, and sustainable orientations. From this issue, three main subjects arise which drive the controversy around the Smart City of Alphaville. The first concerns a question of territoriality, the second concerns an issue of communication around the Smart City, and the last asks questions about the added-value of Smart City projects and the utility of developing this concept. Attention on the first controversial subject stresses a lack of capitalisation on the territorial issues in the Smart City dynamic of Alphaville.

A. An absence of Smart City territorial vision for Alphaville

Public actors stress the need to consider the existing rural areas of the municipal territory. This urban-rural issue represents a question related to the intelligent management of the territory. Private actors are less attentive to the links between the countryside and the city. However, they are interested in two other territorial subjects. The first questions the role of the Walloon Region in the dynamic and the integration of this level of government. The second questions the concentration of the Smart City projects in the central-territory of the city (called "Le centre"). *"The concentration of projects in 'Le centre' does not sufficiently take into account the needs of the neighbourhoods and the surrounding villages of the territory of Alphaville"* (1). This issue is shared by various associations which report that neighbourhoods are forgotten in the current Smart City dynamic. *"The size of Alphaville is modest, it is necessary to take into account the periphery of the city and the surrounding villages and their realities for the development of Smart City projects"* (4).

Issues around the competition between cities are shared by private and public actors. The competition with the neighbouring city is frequently mentioned. This question stimulates the need to work on territorial attractiveness. For these actors, Smart City projects represent a possible answer. Between local actors, the question remains open on which territorial scale should be chosen for Smart City development.

B. A Smart City considered as a problematic tool of communication

The Smart City is recognised by all the actors of the quadruple helix as a form of territorial marketing and political branding. The Smart City is perceived as a marketing tool, publicising the city of Alphaville. It is perceived as an opportunity to promote projects and achievements. *"This allows a consolidation of the image of the city"* (1) and is *"a certain eye-catching"* (2) feature. This opinion is generally supported by both public and private actors, although some of them mention a movement toward a demagogic approach related to a Smart City that was mainly initiated to appear modern.

For some actors, especially associations, the Smart City means a trend in the development of Alphaville. The Smart City is *"a trendy concept related to technologies"* (4), *"a broad polymorphic concept"* (3), *"a fashionable term with a very bling-bling side"* (4). *"Attention to the fashionable effect of the Smart City is necessary, adequate Smart City tools are essential to improve the welfare of citizens"* (3). The Smart City is also perceived as an object of communication and a branding tool for political purposes. This perception is strongly felt by associations and even some public actors. The Smart City is considered as a political communication, a proposal by elected officials who develop a discourse tarnished by *"Smart Washing" (1-2-3-4)*. Some actors speak of *"Smartshit"* (4). They do not recognise themselves in this practice and have a tendency to reject the concept of Smart Cities. Actors in general underline the lack of popularisation of the Smart City concept in Alphaville. It is *"necessary to explain and demonstrate what the Smart City is and what its applications are in plain English"* (4). The Smart City is a theoretical concept for many actors. *"The Smart City does not talk to people, we do not know what's behind it"* (4). Some actors mention that the coexistence of numerous definitions of the Smart City implies different visions, objectives, and appropriations of the concept.

C. A vague added-value and utility of the Smart City

The majority of the local actors emphasise that the Smart City is an opportunity to work with the collective intelligence of the territory. *"Smart City is a process that involves co-creation and a willingness to empower citizens"* (4). A human-centred Smart City orientation is defended by public, associative, private, and academic actors. This orientation is in opposition to the current development of the projects in Alphaville which are based on infrastructure construction lead by local authorities. *"New technologies, IOT, and connectivity is part of the Smart City but the involvement of citizens and other actors must be preferred"* (1). *"The SC is not just a gateway for geeks"* (2). Some actors from Civil Society consider that this perspective is not yet fully taken into consideration nor applied in Alphaville. *"A technocratic Smart City based on technologies and service providers is still accurate"* (3). The concept of the Smart City must give people the opportunity to express themselves: *"It requires co-construction using the new technologies"* (2).

Associations and some academics highlight that social problems have to be solved before the technological problems.

Public actors consider the Smart City as a useful development tool; it makes it possible to network between the cultural, creative, and economic dimensions of the city. *"Smart City creates jobs, economic development, and sustainable growth"* (1). New services are offered, and a partnership dynamic is initiated between different actors of the territory via, among others, the creation of exchange spaces such as "Truc" and "Hive". According to the private actors, this approach already capitalises on the DNA of the city thanks to the "Box Festival". It is a successful element of differentiation. The amplification of these recognised spaces should prevent the departure of talent and promote business creation, which are two major challenges for the city. *"An economic transition is necessary for Alphaville, with an entrepreneurial dynamic and a growth of service offers in the city"* (2). For public and private actors, the Smart City is not a gadget but a tool, it is a help, a support that allows good decision-making. The Smart City is considered as a *"toolbox"* (1). Within SMEs, the Smart City is also considered as a link to the digitalisation of society. It makes permanent education based on the digital revolution possible. The *"Smart City connects citizens to digital practices through various services and easy access"* (2). It is also a link between culture and digitalisation.

Associations have more doubts about the utility of the Smart City project, they wonder if the implementation of Smart City projects is useful: *"Does the Smart City meet a need?"* (4). Some civil society actors do not see any immediate interest: *"There is no solution for the inhabitants; the Smart City is established for outsiders and not for locals"* (4). On the ground, there are not many tangible tools: *"Some projects are smoke and mirrors"* (4); *"They do not meet any needs of the population"* (4). There is no enthusiasm for the Smart City from the population of these associations. It is considered as a closed milieu. There is also a social cleavage that the Smart City is not solving. *"The Smart City must not be a tool for itself; it must be based on Smart People"* (3).

D. A lack of capitalisation on the territorial issues

Of the three topics addressed during the problematisation, only two obligatory passage points are actually covered in the three subsequent stages of translation. They are subjects of dissension between actors. Issues of communication and around the Smart City utility/added value are both points of divergence and breaks between actors. They are central and valuable elements in the translation process which are seen as controversies. These issues may foster a process of stakeholders' gathering and unification around the construction of a common vision of the Smart City.

The third OPP based on the territoriality of the Smart City disappears almost entirely from the translation process. Even if the different actors emphasise the territoriality of the Smart City as a central problem, it becomes a non-subject in the phases of interessement, enrolment, and mobilisation. The subject is indirectly handled with the participation of extra-municipal actors such as the IMS and the Digital Agency of the Walloon Region. The questions around the concentration of Smart City projects in the city centre and on the rural development inside the Smart City dynamic in Alphaville no longer became a subject of concern and debate mobilising actors.

5.2. Partial interessement

The Smart City is not a panacea for the actors of Alphaville. As explained in the next sections, the interessement does not affect actors the same way (first section: The mayor leads, the administration commits, the college follows, and the associations wait). The interessement process is mainly based on the establishment of Smart City projects on the territory of the municipality (second section: An interessement by the setting up of projects). But three main limitations – (1) lack of adequate communication, (2) the missing Smart City strategy, and (3) the problematic nature of the ongoing Smart City projects – do not allow a complete materialisation of interessement (third section: Three limitations in the interessement process).

A. *The mayor leads, the administration commits, the college follows, and the associations wait.*

The mayor is the initiator of the Smart City vision in Alphaville. It took some time and convincing before the aldermen's college joined the initiative. Some aldermen immediately perceived the usefulness of the implementation of Smart City projects in the territory, while some others grasped the dynamic later on for various reasons, including a generational problem. *"Each alderman adapts the Smart City to their specific issues"* (1), *"Elected officials are weaker drivers"* (3), and *"some have missed the ERDF call (European funds) for projects on the Smart City subject"* (1). The "Hive" project is a subject of political divergence between the mayor and the alderman in charge.

At the level of the administration, despite several services and recalcitrant civil servants, the administration is "*fairly open to transformation and some people are proud to change*" (1). *"There are no brakes or strong refusals in the administration but everyone is moving at their own speed"* (1). Nevertheless, the civil servants do not know what the Smart City concretely represents. They admit that there is a lack of *"sufficient technical baggage" (1-3)*.

The local university shows favourable echoes on the theme. During the last few years, the university focused on being *"a university serving its territory" (1-2-3)*. This refocusing is due to a change of direction, and also to the failure of a merger with another Belgian university.

Associations are interested in the possibility of more transparency and possible participation in local political decisions via the Smart City. Yet they are waiting to be involved in the dynamic. The associations are not currently targeted to be part of the dynamic, except for the creative sector.

Some projects can be considered as devices of interessement. There are key elements that are recognised by a majority (but not yet all actors) as intermediaries in the process of making Alphaville smarter. These projects are formal investments that actors can relate to. Some of them are based on physical infrastructures such as the "Hive" and "Truc", others are nonphysical such as the Alphaville Innovative City portfolio and the Open Data Platform. They emerge as possible connections between actors or desired flagship locations for the Smart City construction.

- The "Alphaville Innovative City" project portfolio. This ERDF project portfolio symbolises several benefits for the actors involved: the recognition of the mayor's leadership and avant-gardism; the actor collaboration process that started between the university, the IMS (Inter-Municipality Structure), some city departments, and the respective aldermen; and, finally, the emergence of concrete smart initiatives. Two of these benefits are often mentioned: the construction of the "Hive" (the architectural vision and not the underlying project) and the hiring of a Smart City Manager.

- The "Truc", this second space is a creative hub funded in response to a call from the Walloon region in its Creative Wallonia programme. This project offers collaboration between private actors and associations from the creative economy, as well as academic and public actors. In the region, the hub is becoming a reference for co-creation and multidisciplinary relationships between actors of the creative and digital economy. "Truc" capitalises on the assets (in terms of image, expertise, and recognition) of the "Box Festival". The project allows the federation and consolidation of the ecosystem of actors over a long period of time (compared to the "Box Festival"). For several actors, the "Truc" is not a part of the Smart City dynamics due to its creative orientation. However, its digital character, its links with new technologies, and its methods of co-creation push for assimilation with the dynamic in the Smart City of Alphaville. For different local actors, the relocation of "Truc" to a new building under construction is an element of amplification of the Smart City dynamic.

- The "Hive": from the "sustainable week" event, the urban pavilion was born and imposed itself as a device of the Smart City. It emerges from the municipal administration and was initiated by an alderman. Compared to the two previous projects, this is less based on a collaborative foundation. Two projects carried out by the civil servants from the urban pavilion - the digital thermography and the 3D map of the city - are recognised by a large number of players as being a success in attracting citizens and local actors. This allows the pavilion to present itself as a gateway for meetings, discussion, and collaboration between local actors (mainly the civil society) around the themes of urban planning and real estate projects in Alphaville. It is also considered as a potential living lab on these topics. The project will become central in the future by being housed in the main building of the ERDF portfolio "Alphaville Innovative City". The name "Hive" was chosen internally after a brainstorming session within the administration to anchor the concept of the pavilion in this new building.

- The Open Data Platform demonstrates that the city, and especially its administration, is committed to evolving into a Smart City. It is also an element of openness and transparency that is appreciated by numerous actors from the private and associative sector. The platform requires more data from among these actors who consider it as a first step.

- A mission to Lyon initiated by the mayor and organised by the urban pavilion allowed an alignment of the various actors involved around the visit of the Tuba. This stay reinforced the vision of the Smart City of Alphaville and the development of the projects from the ERDF portfolio, the "Hive" and "Truc". It allowed participants (elected officials, members of the administration, journalists, private individuals involved in the previous projects) to learn through benchmarking and showed what is done successfully elsewhere. It also helped to convince participants of what local projects may become and what the potential benefits are for the city and its inhabitants. The majority of the participants interviewed came back convinced.

From the process of interessement it appears that the Smart City dynamic in Alphaville is mainly developed with a top-down approach; public authorities initiated a majority of projects (Open Data Platform, Smart transportation system, "Hive", Alphaville Innovative City portfolio, Smart Bin, Smart City manager hiring, etc.). The mayor is a central figure; he is a political leader and a conductor of the dynamic.

C. Three limitations of the interessement process

The lack of concern for the Smart City seems to come from the three limitations of the interessment process. The first limitation relates to the lack of adequate communication on the Smart City that seizes the actors' interessement.

The ongoing communication is affected by an excessive use of political branding and too little communication that is adapted to the different actors' languages. This causes misunderstandings about projects and leads to a rejection of the Smart City. The ongoing Smart City projects in Alphaville are not sufficiently presented, described, and explained to citizens and other actors. These projects are not appealing and do not bring in the support of actors due to a failure of communication. The process of interessement is incomplete because actors are not convinced that they will benefit from the problem resolutions suggested using Smart City solutions. There is a strong demand that project leaders should communicate the current initiatives without self-branding.

The second limitation is the absence of a Smart City strategy which means that players do not identify themselves within the local Smart City dynamic and therefore are not interested in this subject. The current Smart City dynamics of the city are mainly based on a "trial and error" and "opportunity seizure" construction centred on project setting. At the moment, a global strategy is absent in Alphaville. The management of the Smart City policy lacks a clear strategy where actors may find their own interests in the different Smart City orientations and initiatives.

The last limitation is intrinsically connected to the nature and organisation of the ongoing Smart City projects. Their functioning modes slow down the Smart City appropriation by actors who are not directly taking part in the project dynamics. Many actors do not clearly see the usefulness of some Smart City projects such as the "Hive" and "Truc" which are currently functioning in Alphaville. The building of physical infrastructures is not a sufficient process of attraction although there are elements that drive controversies. The interessement process carried out via the ongoing Smart City project cannot work on a long term perspective. The project set-ups are not concretely interesting to the entire panel of actors in the territory due to their thematic scopes and modes of operation.

5.3. Enrolment in isolation

The number of actors enrolled in the Smart City dynamic of Alphaville is small. Numerous stakeholders do not partake of any role or mission in the local Smart City dynamic. Inhabitants, SME, craftsmen, shop owners, associations, and research centres are mostly not taking part in the projects and programmes around the Smart City dynamic.

Some elements were identified to explain this weak and complicated enrolment of actors. Firstly, a top-down process is operating with a lack of debate and involvement of actors. Projects are mainly launched unilaterally. Citizens, associations, and private individuals (for the majority of them) have a role of validation. City authorities carry on without them, especially on important projects: *"the city decides alone"* (4). There is a *"lack of consultation"* (3) of actors. Secondly, spokespersons who completely fulfil their roles are missing; they are not able to mobilise and federate actors. Finally, several Smart City projects are managed by small committees. Projects are initiated in a closed room without sharing tasks and responsibilities with other actors. The committees are mainly composed of the IMS, the city, and the university.

These elements are considered as underlying factors in the next three sub-sections. The first section presents the actors state in the enrolment process. The second tackles the spokespersons' limitations, and the last section discusses the lack of willingness to enrol actors.

A. Actors' state in the enrolment process

An administration between a rock and a hard place

The administration is involved at different levels of the Smart City dynamic, but it is considered to still be too slow and it still operates in silo. External actors must *"be aware of the meanders of the administration and the complexity of the projects"* (1). However, the Smart City Manager can count on many allies in the different departments to work on a Smart Governance perspective.

The administration blames elected officials who want their own Smart City projects but do not know exactly what to do. It is the various departments which have to concretely set up and put in place the projects to *"fill the desires of politics"* (1). *"What aldermen desire is sometimes hollow and the content is not always concrete"* (1). In addition, politicians do not always ensure the decisions made.

The Inter-Municipality Structure (IMS) is working on refining the Smart City concept at the provincial level and aiming to work on a Smart territory perspective. It coordinates a number of projects and has been mandated by the municipal college to work on concrete Smart City initiatives in Alphaville. It is one of the linchpins of the projects "Alphaville Innovative City" and "Truc".

A university involved and missing research centres

UAlphaville is closely involved in the various Smart City projects. *"The connections with the authorities of the university are better because UAlphaville is more open to working in the territory"* (1), but it is a complex player in project management because the university is less flexible. UAlphaville has to consider research objectives. The timing is different *"The university has a role of reflexivity; it gives a certain added value to the Smart City approach"* (3). It provides experts and offers expertise, *"a grey intelligence"* (2). The other actors of education and training facilities, as well as research centres, are not yet enlisted in the Smart City dynamic.

A partial enrolment of private actors

Some private actors are closely involved in the Smart City dynamic; this is the case of Cat Studio. This company brings in *"wealth for the local economy"* (3); *"It is a scratch, a precursor, an explorer in the field of digital business"* (1). Cat Studio organises the "Box Festival". It instils a positive dynamic but *"the company is a bit alone"* (2). Although other companies are active in the entrepreneurial and creative dynamics around Alphaville through the "Truc", other local companies are lacking in the Smart City dynamic. Private companies, outside the digital and creative sector, are not involved in the Smart City dynamic. The non-market sector is also absent and shop owners are excluded. *"Shop owners are not players in the Smart City, it's not their job, and they do not do that"* (2). There are no meetings with shop-owners or co-construction projects with them. *"There has never been any discussion between the shop owners and the authorities on the Smart City, it is a non-subject"* (2).

Associations caught in the middle

Opinions diverge on the degree of involvement of the citizens and co-construction within the projects and the Smart City dynamic of Alphaville. On one hand, part of the aldermen's college tempers this co-construction by insisting on the difficulty of setting up this method. *"It is necessary to explain that the co-construction is not simple"* (1). *"There is an excessive interest in the notion of the expert citizen in certain situations"* (1). The citizen (sometimes) lacks global vision. Political leaders report that they have been elected and that it is up to them to make decisions. *"We must not remove the legitimacy of the elected official, even if he does not know everything"* (1). There is a tension between the representative system and the participatory system.

Nevertheless, according to certain officials it is necessary to stimulate debates between the decision-makers and citizens. Politics does not yet use collective intelligence; there is no durable consideration for the actors of the civil society. However, there are bottom-up Smart initiatives developing, such as the Citizen Forum which is a platform of exchange and

debate for a co-construction process. *"In the neighbourhood, no need for statistics and data, just living in the city is sufficient to know what has to be done"* (4). *"The citizen participation in Alphaville is an uncontrolled improvisation"* (4). *"Politicians must learn to manage the bottom-up movement"* (3). For Associations the current dynamic is closed and not integrative: *"You have to fight to get info"* (4), *"What is done by the locals has no value"* (4).

B. Spokespersons' limitations and problems

In the enrolment process, a definition and an allocation of roles is necessary to embody actors. With the help of spokespersons, roles, tasks, and missions are defined to concretely mobilise the actors into the different projects. Spokespersons with different backgrounds are identified by the interviewed actors, yet they cannot assume all the dedicated missions. They are not able to gather and mobilise the reluctant actors around the Smart City dynamic. There are deficiencies in their spokesperson's role. Their networking actions only attract a small number of stakeholders. Three examples show these shortcomings. The "Truc" project is recognised as a networking place, but today it mainly enrols the actors of the creative and digital economy. The University of Alphaville is perceived as an active player in the territory but its actions around the Smart City are not visible enough to attract new supporters. With a strong presence on the ground and a well-established aura, Cat Studio is cited as *"an entrepreneurial leader"* (2-3) in some Smart City domains, but the company mainly focuses on the digital economy and is considered to be alone. Finally, an external actor is mentioned "the Digital Agency of the Walloon Region" but no concrete actions in Alphaville were identified by the actors interviewed.

Nevertheless, the Inter-Municipality Structure (IMS) is recognised as the backbone of Smart City dynamics in Alphaville. It acts as a *"treating agent"* (2) which works *"to refine the concept"* (1-3). Among other actions, IMS promotes the concept in accessible jargon that is adapted for and clearly understood by the territorial actors. The structure is appreciated for its competences of project coordinator and project manager. It gives a *"beautiful vision of the Smart City"* (1). IMS is a territorial actor which tends to be a translator thanks to its participation and coordination of the various projects where numerous actors are involved. Yet an insufficient audience of actors take part in the different Smart City projects.

The mayor personifies the impulse of the Smart City dynamic in Alphaville. He is the political referent, the authority, and the guarantee of the concept. This propels him as a leader. He is *"the contact point, the locomotive"*. He *"brings change, represents a vision, politically supports, and maintains confidence"* (1-3). He is a *"flag, a centrality"* (2). He embodies a leadership that is recognised by a large majority of the local actors but he is also perceived as an *"object of speech and marketing"* (1-4). The mayor represents a personification of the Smart City but in a top-down perspective where the other actors follow. *"The mayor defines, the others follow"* (4).

The Smart City manager is recognised by a number of actors as a *"Don Quixote"* (4) who fights in-house against the silos of the municipal administration. *"It's the civil servant who is wrangling against the rest of the administration"* (3); *"The Smart City Manager is internally known by everyone but he is not recognised by everyone"* (3). He carries out the daily dynamic of the Smart City inside the local administration of the city.

He assumes the role of disrupter with a certain freedom of movement even if he lacks influence, consideration, and legitimacy. Some actors would like to see him as the right hand of the mayor. He is quite isolated despite his broad mission and freedom of action. His impact on the actors is not sufficient and is not known outside of the administration.

Therefore, these spokesmen get a limited action scope. They partially represent and carry on the Smart City dynamic. They are not able to enrol local actors by offering them clear roles and missions in the local Smart City process. They trigger pro and contra reactions and have limits in their actions. They are not fully recognised. The current spokesmen may not stabilise the network because of their lack of influence, agency, and organisation.

C. Lack of willingness to enrol

Only a small number of actors are concretely enrolled in the Smart City dynamic of Alphaville. A small community of actors around the mayor and the IMS emerges via the ERDF portfolio "Alphaville Innovative City". Even if the mayor is considered as a central figure, a leader, and a conductor of the local Smart City dynamic, he does not succeed in federating the civil society around his close network with associations, citizens, as well as shop owners, craftsman, and others. Thus, a question arises, is there a real desire to involve all the actors or is it an involuntary negligence?

The projects "Hive" and "Truc" are mentioned as potential tools to co-construct the dynamic Smart City. Politicians, civil servants of the administration, intermunicipal representatives, and university researchers work together in these projects. A strong network of actors is deeply involved through these two projects; they form a first circle of players. But for actors who are not direct stakeholders in these projects, there is a perception of *not knowing what is happening nor what will happen"* (2). Nevertheless, only Cat Studio and the digital & creative ecosystem seem to have successfully integrated the current Smart City dynamic of both projects. The university is involved but without having federated the research and teaching sector. Shop owners and many associations are missing. Civil society actors do not feel listened to or included. There is a lack of recognition of their projects and their expertise.

To conclude, despite the potential of the three spokespersons, the top-down process, the lack of willingness to take into account the expertise of actors, and their integration in the decision-making, all induce a weak inclusion in the enrolment process. The lack of adequate structures which can facilitate the interaction between actors and policy makers and the obvious absence of enrolment mechanisms illustrate this existing situation. These elements and the current management process of projects in small committees of actors represent an enrolment in isolation

5.4. Awaiting mobilisation

There are great expectations of mobilising more actors in the Smart City dynamic in Alphaville. Three development paths are identified in the current dynamic: a capitalisation on the ongoing project (1), a transformation of the discourse on Smart Cities (2), a change in the form of governance (3). These directions are identified thanks to the conclusions highlighted in the previous sections that presented the three first steps of the translation process.

A. Capitalisation on the ongoing project

Interviewees emphasise that it is absolutely necessary to focus on ongoing projects like "Truc" and "Hive" to be *"more tangible and less obscure"* (2). *"We must take advantage of what has already been done, but above all ensure more visibility for the projects"* (2). The current projects are conceptual and emerging, it is "*innovation in progress*" (1). *"We have to make the places lively and animate them so that people understand the projects and make them their own" (*1).

B. Transformation of the discourse on Smart Cities

The current discourse on Smart Cities is perceived as not clear enough. It does not explain the development of the Smart City in Alphaville in a simple way. For several actors, the physical buildings will be frequented places and will increase the visibility of the Smart City projects in the city, but they will not be enough. *"You have to make people understand what's done and who's doing what"* (3), *"You have to explain to people what the Smart City is and show its practical applications"* (4) to attract and involve actors and citizens as allies of the dynamic.

C. Change in the form of governance

In order to extend the Smart City dynamic to new allies, a new form of governance is required by actors. Some of them highlight the need for a Smart City policy carried out by more than one person in the administration or in the city government. For some associations and private actors it is necessary that the administration takes the lead with a neutral and apolitical leadership. *"We must depoliticise the Smart City and return it to the administration to make the Smart projects sustainable"* (4)*.* Moreover, a *"360° policy"* (3) with a clear processing unit, *"a task force"* (2), is necessary to coordinate projects. Several project managers have to adapt the dynamics to include other actors of the territory, including shop-owners and associations. Finally, a major reflection on *"how to involve the citizen in the Smart City dynamic" (*3) is indispensable. One of the challenges of Alphaville is to know *"among the 1000 ways to enlist, involve people, which are the most effective?"* (1).For several public actors, the answers lie in the concrete achievements that will emerge with the major Smart City projects. For others, the territory needs a citizen-oriented, 2.0 administration and government. *"The question of what to set up to open and attract new stakeholders is crucial"* (2). For several actors, bottom-up projects that sustain their autonomy have to be recognised by public authorities. It implies *"co-construction through partnerships in true win-win relationships"* (4). For example, the university and some public actors are concerned by the necessity to associate shop-owners, self-employed, and other types of entrepreneurs in the Smart City dynamic.

6. Discussion

The Smart City dynamic of Alphaville lacks consistency; the four steps of the translation process are not carried out properly. Essential processes are missing such as capitalising on problematisation subjects, the incomplete and selective interests of actors, reduced enrolment of stakeholders, and lack of mobilisation of actors. This discussion opens debates on some suggestions for corrective actions and solution paths inspired by the literature on Smart Cities.

6.1. Problematisation: Working on a territorial dynamic of integration

The Smart City dynamic of Alphaville lacks consideration of all its multi-faceted territorial realities; rural areas and fringe spaces are considered by numerous actors to be left out. The current ascendency of city-regional models in Europe fosters this situation, but this city emphasis carries risks of addressing rural localities solely in terms of their relation to the urban, and drives a marginalisation of rural concerns within structures dominated economically and demographically by cities (Hoggart & Henderson, 2005). However, the literature on Smart Cities stresses the need to pay attention to local context concerns to fully reap the benefits of Smart City investments and solutions (Caragliu et al., 2011). Transforming a city into a Smart City is a continuous long-term process that requires changes to be introduced across all the territory (Ibrahim, El-Zaart, & Adams, 2018). Local context conditions (territorial, socio-economic, institutional, etc.) are a crucial determinant in considering the multifaceted structural nature of Smart Cities. The links between the city and the countryside are a point of attention for the Smart City dynamic of Alphaville. It raises the question of the proper scale of a Smart City strategy. According to Garcia-Ayllon & Miralles (2015), the real challenge for the future is to move from an urban vision or scale of the phenomenon to a global vision or scale, which considers the challenges of urban and rural areas and the deployment of these policies in the most integrated way possible. Therefore, it is necessary to work on the integration of the rural environment and to address their realities to reach geographically balanced governance. To be "Smart", the whole city must act in a holistic way. A comprehensive district approach offers the most likely and effective scale at which the overall goals of a Smart City can be addressed (Antonini, Boulanger, & Gaspari, 2015). A spatially-determined perspective that takes into account the characteristics of the city's districts is important to organise and support its effectiveness. The urban and rural features of the territory have to be considered in the local dynamic (Desdemoustier, Crutzen, & Giffinger, 2018). Public authorities should pay attention to the different districts, clusters, or even smaller areas such as neighbourhoods (Komninos & Sefertzi, 2009).

The notion of "multilevel governance" is another concern which may be useful to integrate into the development of the Smart City in Alphaville in its territorial approach. It stresses the necessity to integrate institutions and actors at a variety of geographical and organisational scales. The notion of vertical integration developed by Le Galès (1998) and Pierre (2014) is not addressed in the current dynamic of Alphaville. The City should find a way to align its Smart City strategy with the complex web of policy agendas already operating at the other territorial level (Nam & Pardo, 2011). Smart City projects are mainly based at the micro level without a robust interaction with actors outside of the perimeter of

the city. Mobilising actors and institutions at the regional and national levels is necessary. The city of Alphaville is a major city of Wallonia, it may capitalise on its status to attract and engage supra-local actors. Small-sized cities (like Alphaville) compete for resources against larger and better-equipped cities; therefore they are less likely to be able to receive or afford the necessary funds for their Smart City projects (Giffinger & Haindlmaier, 2010). An important challenge for Alphaville consists of a double integration of actors and institutions, firstly from its own territory from the rural and fringe areas, and secondly from outside of its territory.

6.2. Interessement: Formulating a global and open strategic vision and building a compelling narrative

The Smart City transformation of Alphaville is currently being viewed by several actors as an object of promotion based on a political discourse, without providing a concrete behavioural or physical transformation of the city. Some of them call this development "*Smartshit*". This perception corresponds to what Hollands (2008) blames cities for in his criticism of the self-congratulatory tendency. To face these critics, local government should share concepts, visions, goals, priorities, and even strategic plans of the Smart City development with the different stakeholders (Ben Letaifa, 2015). A strong supportive vision is fundamental to the success of Smart Cities (Nam and Pardo, 2011). A strategy should be formulated in an inclusive way taking into account all the actors of the territory. Mintrom & Luetjens (2017) indicate that it is very important to conduct an explicit discussion of policy goals and the outcomes that they are intended to promote. Actors can identify the benefits of Smart City projects and connect these to the resolution of the problems identified. Ben Letaifa (2015) calls it "acceptance", gaining social acceptability among different actors to ensure project adoption and success. Smart iteration and agility enhance the definition and development of the project through a shared vision of the Smart City. Policymakers need to define and share the strategy that they are going to use in the development of the city, which should be more receptive to the effective involvement of stakeholders in the co-production of smart initiatives (Bolívar, 2018). An exercise of interest was successfully conducted by local authorities of Alphaville. The Tuba tour in Lyon was a success and demonstrated that this kind of communication action can reinforce the Smart City projects in the city. This exercise was fruitful, but only a small delegation took advantage of this visit. Local authorities should work on a process of interessement of all actors of the territory, who are meant to enjoy the benefits of the district/neighbourhood they live in/work in/visit (Angelidou, 2014). A clear Smart City strategy is a tool to launch as a means of interessement, constructed and presented to the various actors. They may visualise the gains that they would potentially obtain from their participation in the Smart City projects.

Additionally, a co-construction process in the definition of the Smart City may ensure the engagement of a wider range and type of stakeholders, including citizens, from all city levels. The co-construction promotes the transformation process from the early stages, aiming to boost transparency and improve citizens' investment (Lee, Phaal, & Lee, 2013). The need to communicate the new city vision, mission, and strategies with locals using all possible communication channels (Carpenter, Bauer, & Erdogan, 2012) will follow.

Thus the current Smart City communication of Alphaville should be more inclusive and adapted with direct (meeting, discussion, physical interaction, site visits) and indirect (brochures, videos, platforms, etc.) mechanisms. A compelling narrative based on specific and agile communication tools should be a development path; it should cover concrete actions to become an involvement device in order to change the perception of the Smart City as meaningless branding. The current physical Smart City infrastructures such as "Hive" and "Truc" may also be supportive resources to build a shared narrative. If the strategy and vision of the Smart City is communicated properly as an accepted narrative, a wide range of stakeholders including different types of citizens will understand the city vision in the right way and want to participate (Kotter & Cohen, 2012). The production of this Smart City discourse involves a new geometry of power relations requiring the production and circulation of knowledge, rationalities, subjectivities, and moralities suited to the management of the Smart City project (Vanolo, 2014). In order to be interested in the real value of the projects and begin the process of enrolment, actors should feel concerned. For the various actors, the Smart City communication as a form of narrative is a gateway that presents the gains that they would potentially obtain from the projects.

6.3. Enrolment: Opening governance, increasing spokespersons' visibility, and adopting an adaptive and open leadership

Open governance, increasing spokespersons' visibility, and adopting an adaptive and open leadership are potential responses to face the enrolment in isolation identified in Alphaville. Issues of power and democracy play a key role through the Smart City as a process to open governance. Smart City governance is about crafting new forms of human collaboration to obtain better outcomes and more open governance processes. It strengthens the citizen participation and opens the forms of collaboration (Meijer & Bolivar, 2016). In Alphaville, the current governance process is still based on a top-down movement and on a locked circle that privileges certain actors. However, the literature stresses that Smart City projects should be built neither from a top-down nor bottom-up approach but with active involvement from every sector of the community (Nam & Pardo, 2011).

The multi-stakeholder collaboration for smarter policies and regulations consists in opening it up to actors who are directly and indirectly implicated (Marsal-Llacuna & Wood-Hill, 2017). It results in a collective co-creation of policies and facilitates the subsequent co-production of projects. Smart Cities are hybrid models combining open innovation and coordination of policies with stakeholders' dynamics (Nicos Komninos, Pallot, & Schaffers, 2013). Governance and collaboration are crucial for smarter cities, since they reflect how public value can be generated with the participation of citizens and other social actors (Gil-Garcia, Zhang, & Puron-Cid, 2016; Maynard et al., 2016). Therefore, one of the main pillars of Smart Cities is the creation of structures based on the negotiated involvement of multiple actors – public, private, and individuals – with the aim of creating this public value (Rodríguez Bolívar, 2018).

The results show that the city of Alphaville lacks spokespersons who are able to facilitate the enrolment of the multiple actors of the territory. Except the mayor (who already has great recognition and high power), the Smart City Manager and the IMS should have more freedom and more power to directly collaborate with local actors. They should also assume a deeper representation of the Smart City dynamic of the city. This only happens with better visibility for these two spokespersons. This may allow a representation of the different Smart City initiatives in the territory and favour the "Truc" and "Hive" projects as intermediary places for actors. Spokespersons entirely fulfilling their role are an element which may favour the interest of reluctant actors. Cat Studio, for the private sector, and the university, for the research sector, should take a leading role in representing and involving all the actors in their respective sectors. The effective spokesperson can reduce the number of representatives and stabilise the network (Callon, 1991). The Smart City needs spokespersons who are able to strengthen the network through a participative and inclusive dynamic. Governments in Smart Cities (and particularly the mayor in Alphaville who is recognised as a spokesperson) are called upon to play a key role in promoting and developing Smart Cities (Bătăgan, 2011).

For Caragliu and Del Bo (2018), the decision to implement Smart City policies should be kept firmly in the hands of local public authorities, based on the involvement of stakeholders, including citizens and local businesses, in partnership with companies providing technical solutions. Smart Cities have to be part of an open innovation ecosystem (Nicos Komninos et al., 2013). This means that Smart City management is more complex than traditional local management. Ben Letaifa (2015) considers that "*a city is 'Smart' when that city can integrate and synchronise formal leadership, and contains democratic participation in an ecosystem*". In Alphaville, the formal leadership is present and is mainly represented by the mayor, but it lacks the democratic participation of the ecosystem of actors. An open and adaptive leadership is necessary to implement effective Smart City projects (Bolívar, 2018; Washburn & Sindhu, 2009). A city needs champions or leaders capable of driving the innovation. However, in a Smart City, the roles of these actors should be completely renewed. Top-down political leadership is no longer required. Instead, the city will need political coordination capable of transforming shared innovative visions into concrete initiatives (Caragliu & Del Bo, 2018; Maynard et al., 2016; Rodríguez Bolívar, 2018). Smart City policies should have a balanced bottom-up, demand-driven component and should be closely monitored by municipalities and local governments, and many more efforts in evaluating the impacts of these programmes should be undertaken (Caragliu and Del Bo, 2018). For local governance to be truly effective, it is essential that public managers and politicians engage citizens in open and participative information-sharing and decision-making (Meijer & Bolivar, 2016).

6.4.   Mobilisation: Actively involve citizens, private individuals, and research centres and articulate local projects to them

A local dynamic could not be considered "Smart" without real engagement and the willingness to collaborate and cooperate between public institutions, the private sector, civil organisations, knowledge centres, and citizens (Nam & Pardo, 2011). Cities that foster the co-participation of public and private institutions in smart projects make such projects more prone to success (Rodríguez Bolívar, 2018). Moreover, the citizen involvement in the management and development of the smart city has become central in the Smart City definition; its implementation increases the democratic participation of people, which leads to a better quality of social life (Dameri, 2014). Therefore, to improve the Smart City dynamic of Alphaville, it is necessary to open the circle to other actors. Authorities should no longer work in isolation in terms of actors involved; there is still a lot of work needed to reach more stakeholders who have been neglected so far. Authorities should engage in a mobilisation campaign for actors absent from the Smart City flagship projects, such as the rural-periphery inhabitants, private individuals from the creative-economy, and research centres.

Angelidou (2015) suggests the importance of building on a city's existing strength, focusing on a limited number of interventions, coordinating the policy definition and implementation within the different municipal departments, and involving the various stakeholders of the city. Citizens and other stakeholders must be considered the target groups of the local government in creating and using smart technologies to increase their quality of life (Johannessen & Berntzen, 2016). However, for Cardullo & Kitchin (2017) in cases where participation and co-creation are initiated by authorities, rather than from the citizens or local actors themselves, the ideals of shared or citizen-dominated decision-making are rarely present. Co-creating a Smart City project that actively involves citizens and actors in its operation is difficult in practice because the mechanisms through which such initiatives are formulated can create pre-determined hierarchical pathways (Rodríguez Bolívar, 2018). Moreover, with Smart City initiatives, projects encompass frictions and negotiations, with teams rarely staying stable and the outcome is a compromise and a makeshift solution (Perng and Kitchin 2016). Therefore, for the authorities of Alphaville, the notion of coordination of actors and articulation of top-down and bottom-up projects is essential to smooth and encourage the development of the local Smart City dynamic.

7. Conclusion

The concept of the Smart City is ambiguous and contains multiple orientations, it is necessary to understand how it is concretely perceived, assimilated, and applied by local actors. The current city challenge lies in the creation of a Smart City 2.0 based on the implementation of a collaborative ecosystem that responds to issues in terms of management of stakeholder dynamics. There is a lack of structured analysis questioning the process to "Smarten" small and medium-sized European cities. The purpose of this article is to conduct a qualitative analysis of the obstacles and barriers encountered by the city of Alphaville – a medium-sized city in Belgium – in becoming a Smart City through a specific analysis framework: the actor-network theory.

The study is mainly limited by the research method. The quantitative responses collected during the interview vary according to time, availability, personality, access to data, and according to the mood of the respondent. The data mainly used for the research is constituted of 22 interviews based on the opinions of actors. The result of this study depends on the different statements of the people interviewed. This analysis is thus limited by the subjectivity of the respondents. Several stakeholders depend on the municipal authorities (with financial or hierarchical relationships) and certain actors are involved in municipal projects, these factors may have an influence on their comments. The social desirability, the co-dependent relationships between some actors, and the political stakes are therefore limited this study. Moreover, the city of Alphaville counts many more actors across its territory than these 22 respondents, which may narrow the scope of points of view on the subject of the Smart City. Additionally, this research does not contain any direct data relating to the perception of the citizens themselves, their perceptions are considered through the associations' comments. However, the interviewees are representative of the quadruple helix model and portray the local dynamic. The interest of this study comes from the aggregation of the standpoints which contain the very diverse orientations of the stakeholders interviewed.

The article studies the development of Alphaville in becoming a Smart City through the 4-step translation process composed of the problematisation (1), interessement (2), enrolment (3), and mobilisation of allies (4). In order to examine the Smart City dynamic in place in the city, an ANT grid of analysis offers a synthetic vision of the interviewed actors and the meaning behind their responses. A horizontal analysis allows the identification of the problems encountered in the local Smart City dynamic through the 4 stages of the transition process. The contributions of the ANT procedure offer a clear understanding of the underlying and hidden dynamics of actors and their stance on the Smart City subject. The ANT analysis offers valuable managerial paths of action, nourished by the Smart City literature to improve the local Smart City dynamic and its network of stakeholders. The methodology used is applied to Alphaville; numerous cities may benefit from its application. It promotes the formulation of recommendations to tackle the problems of incomplete problematisation, partial interessement of actors, enrolment in isolation, and the expected mobilisation, as identified in the four steps of the translation process. The proposed solutions are mainly centred on aspects of governance. The current actors involved in the dynamic should open their circle to new stakeholders.

Local authorities should promote and construct open governance based on inclusive decision making, a co-creation process, and a coordination of actors and projects. Moreover, adapted communication built on a compelling narrative, the conception of a sharing strategy, an increase in spokespersons' visibility, and the adoption of adaptive leadership are potential development paths for the Smart City dynamic of the city. These recommendations aim to attract new allies and offer the creation of a strong network around the Smart City conception in Alphaville.

These practical recommendations may be refined by analysing the case study of Alphaville with other theoretical and methodological perspectives to complement the ANT. Firstly, the theory of organisations, and specifically the strategic analysis of organisations, may offer an interesting entry point to study the behaviour of actors as strategies. This theory could be helpful to deeply understand the positions of actors on the Smart City and their desired guidance for its development in Alphaville. Secondly, transition management as a governance approach may offer useful analysis tools which could facilitate and accelerate the process of Alphaville's transition into a Smart City. This method stresses the participatory process of actors with visioning, learning, and experimenting phases. Thirdly, the urban governance theory with the concept of multilevel governance may introduce a deeper reflection on the vertical and horizontal integration of actors, and encourage territorial reflection. These theories and methods offer some development paths to deeper understand the actors' dynamics in Alphaville. These theoretical and methodological approaches could offer interesting clarification on the identified problems of Alphaville and other cities engaged in a Smart City transformation.

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V. GENERAL CONCLUSION

Summary of the papers and main contributions

1. Governance and stakeholders of Smart Cities: A call for a stronger theoretical foundation to tackle complexity

The concept of the Smart City addresses a large variety of challenges, domains, and approaches. The question of governance is a recurring theme. This paper critically analyses the state of the literature on the governance of Smart Cities. An analysis framework (theoretical foundations, methodology, content), two epistemological debates (structure/agency and positive/normative) and three theories (institutional, actor network, and stakeholder) are mobilised. Findings highlight that the literature is still under construction and lacks strong theoretical foundations. Empirical research dominates and concentrates on micro/mezzo levels of analysis. Further research focusing on diverse geographical and organisational scales is necessary, as is research dedicated to actors' understanding and appropriations of the concept.

2. Municipalities' understanding of the Smart City concept: An exploratory analysis in Belgium

The paper studies how Belgian municipalities understand the concept of Smart Cities in 2016. Based on the groundwork of the literature on Smart Cities and the results of a survey of 113 Belgian municipalities, a typology of four understandings of the Smart City (technological, societal, comprehensive, and non-existent) is elaborated. The results also show that municipalities with no understanding of the Smart City concept or with a technical understanding are mostly located in small and rural municipalities. This could be a sign of rejection of the phenomenon in this context. Conversely, medium and large-sized municipalities mostly develop a societal or comprehensive understanding. Therefore, this study highlights a dichotomy of understanding and acceptance of the concept of the Smart City between peripheral (rural and small-sized municipalities) and central municipalities (urban, medium, and large-sized municipalities).

3. Smart City appropriation by local actors: An instrument in the making

This paper questions local actors' appropriations of the phenomenon in an innovative way. The Smart City is considered as an instrument, following the theory of Lascoumes and Le Galès (2007). Is the Smart City a functional instrument? Is it a kind of evidence and a pragmatic solution to be disposed, or an instrument of public policy? Is the concept neutral, does it provoke debates and influence policies? An empirical analysis is conducted based on a survey of 193 Belgian actors who are active in the domain. The results show that instrument theory is relevant for analysing the actors' appropriation, which does not follow a homogeneous trend. In fact, each actor follows his own logic, which will be interesting to study.

4. Actors' centrality in the building of a Smart City: A critical analysis using the actor-network theory process of translation

Empirical proof that is framed in socio-technical theories is insufficiently employed to study the Smart City. To face these shortages, this paper concentrates its investigation on a case study - Alphaville in Belgium (an anonymisation of the City Case) – that innovatively uses actor-network theory as framework of analysis. A qualitative analysis based on 22 in-depth interviews of stakeholders was conducted to investigate the local Smart City dynamic. From these interviews the process of translation was assessed, composed of four steps: problematisation, interessement, enrolment, and mobilisation of allies. The results show that for the Smart City dynamic in Alphaville the translation process is incomplete and lacks consistency. There is a lack of capitalisation on the problematisation topics, an imperfect interessement process, a partial and selective enrolment, and a need for further mobilisation of allies. Concrete recommendations are proposed to handle these deficiencies; they are mainly based on the promotion of co-constructed, open, and inclusive governance.

General discussion and main conclusions

The aim of this thesis is to undertake a comprehensive inquiry into how the Smart City concept is perceived by its stakeholders. What are the different understandings of Smart Cities? How do the different actors of a territory appropriate the phenomenon? To answer the main research questions of the thesis, concrete empirical studies were carried out in Belgium at various territorial levels, through diverse methods, and using varied theoretical frames. Which elements of this polymorphic concept are assimilated and supported? How do actors at different territorial levels comprehend Smart Cities?

The literature on Smart Cities displays a wide variety of orientations on the concept. The results obtained in the four papers indicate that the Smart City is not understood by its stakeholders as an exclusive conceptualisation and perception of the concept. Empirical research stresses that Belgian stakeholders develop a variety of understandings, which are underlined by different orientations of the Smart City (Section 1). The results of the studies also demonstrate that stakeholders present different appropriation of the phenomenon that lie between rejection and adoption (Section 2). Finally, stakeholders' understandings and appropriation of the Smart City are related to territorial issues (Section 3).

These results are subject to several methodological limitations related to their "snapshot in time" aspect, the territorial scope, and the selection of actors for the empirical research (Section 4). Nevertheless, the results obtained in the four papers allow conclusions to be drawn with concrete practical recommendations and future research paths to further examine Belgian stakeholders' understandings and appropriation of Smart City (Section 5).

1. Stakeholders' Smart City understandings: Several approaches co-exist

In the second paper of the thesis, five fundamental concepts are generated from the multiple variations of the Smart City: technological, human & creative, sustainable, institutional, and holistic. This categorisation is used as a grid to study how the Smart City is constituted and how the phenomenon is tackled by municipalities across Belgium. A typology of perceptions emerged with four types of understanding: technological (a technological positioning), societal (a human, sustainable, and institutional positioning), comprehensive (a technological, human-centred, sustainable, and institutional positioning), and non-existent (an absence of positioning). The results of this study show that Belgian municipalities do not develop the same understanding of the Smart City; they are divided across the five types of perceptions of the concept.

After studying the perception of a single type of public actor – Belgian municipality – the third paper of this thesis studies how Belgian stakeholders appropriate the Smart City concept. The stakeholder's consideration is framed by instrumental theory. The Belgian stakeholder supports the Smart City as a functional instrument: a kind of evidence, a denaturalised technical object, a pragmatic solution to be disposed; it is a public policy instrument: not neutral but provoking debates, full of political goals, influencing policies, and affecting actor's resources. The results show that politicians and public servants, private actors, members of the civil society, and researchers do not fit into either category of instrument in a monolithic way.

There are differences in the appropriation of the Smart City, showing different understandings and comprehensions of the concept within the categories of stakeholders. Stakeholders follow a partition in relation to the instrumental approaches and a division or association on certain topics depending on their own appropriation of the Smart City concept. Belgian actors follow their own logics.

Finally, in the city of Alphaville, local actors perceived the Smart City phenomenon differently in their territory. They do not agree on a common representation of the Smart City concept, their opinions differ greatly. Public actors consider the Smart City as a useful development tool; private actors see it as a support that allows good decision-making, and economic and urban development. Associations are more doubtful on the utility of the Smart City; they question the concept and ask if it meets the needs of citizens. Some civil society actors do not see any immediate interests. For associations the Smart City represents political branding, a communication tool, and a political object used by authorities. These positions among stakeholders show that the local Smart City implementation is differently understood. It shows controversies among stakeholders on how to consider the Smart City and how to concretely implement it in the territory.

2. Smart City appropriation: In-between rejection and adoption

The understandings and perceptions presented in the previous section have an impact on the appropriation of the Smart City by Belgian actors. The second article highlights that peripheral municipalities (mainly rural and small-sized) that have no understanding or have developed a technological understanding, reject the application of Smart City projects in their territories. This rejection may be justified through three possible reasons, the current inadequacy of the Smart City phenomenon in providing solutions for their territorial characteristics (1), a limited vision of the concept (2), and their feeling that it is highly difficult to implement Smart City projects (3). In contrast, central municipalities (urban and large-sized) with a comprehensive and societal understanding mainly adhere to the Smart City phenomenon for their local development. This dynamic generates a virtuous and a vicious circle.

Actors are adopting the Smart City phenomenon differently across the country. The results of Paper 3 emphasise that some actors mainly sustain a functionalist instrumental approach to the Smart City, they consider it as a useful tool of branding for towns, to enhance sustainability, improve transparency, governance principles, and the quality of life. They deem it necessary to follow specific concrete directions to apply the concept in the territory. These consist in developing the Smart City using ICT, data, and green technologies as part of a local strategic plan, under the framework of a Smart region, with a lightening of administrative procedures. For these actors, the Smart City is adapted to any territory, including rural areas although its implementation reveals a key technological challenge for cities and towns. They are highly convinced that the Smart City is an adequate solution for development. Meanwhile, some Belgian actors recognise the Smart City as a public policy instrument and consider the phenomenon to have potential (negative) value. They question the Smart City utopia and stress some dangers in its implementation. For them, the Smart City is a fashionable concept which will mainly benefit large cities and increase competition between them.

The Smart City is also a potential threat which may cause the privatisation of public spaces, marginalisation of some inhabitants, facilitate hacking, and could prove to be a menace to regulation, the rule of law, and privacy protection. For these actors the Smart City construction produces mainly undesirable effects on the society, which have to be discussed and avoided.

The process of acceptance and rejection feeds the controversies identified in Paper Four and vice-versa. Some issues cause misunderstandings and provoke a certain rejection of the Smart City concept by some actors. The Smart City dynamic is rejected due to several reasons such as a non-understanding of what a Smart City means, inappropriate communication, a tendency toward branding, a focus on city-centre projects, an insufficient participative construction, and so on. The local process of Smart City implementation may also favour this rejection. Public authorities (mainly the mayor) are leading the dynamic but with a lack of a clear, shared, and inclusive strategic vision. Despite these issues, some actors are actively involved in the local Smart City construction. They are part of a network supporting the Smart City transformation where they work together, collaborate, and appreciate the projects framed by the Smart City dynamics. The Smart City structures a circle of players with representatives from the academic world, the private sector, associations (mainly the creative economy), and public institutions. They are nevertheless aware that the circle is rather close and must be enlarged in the future by convincing and involving new actors.

Belgian actors are situated throughout different levels of acceptance and rejection of the Smart City, depending on their perceptions, situations, environments, and conditions.

3. Smart City understandings and appropriation related to territorial issues

This thesis indirectly accommodates some territorial variables in analysing the stakeholders' understandings of the Smart City in the frame of their respective local and contextual environments. The subject of territorial scales and influences (national, regional, metropolitan, local, and neighbourhood) in the development of a Smart Territory is poorly addressed in the literature (Jose & Miralles, 2015; Kourtit & Nijkamp, 2012; Walters, 2011). From the literature review, the city and metropolitan levels are the main subjects addressed; the Smart City landscape is shaped under local characteristics, priorities, and needs (Angelidou, 2014).

A key assumption leading this research stresses that Smart Cities should be relevant for the different Belgian territories with their diverse institutional layers (communities, regions, provinces, and municipalities) and specific environments (urbanised, rural, post-industrial, etc.). In the second paper, a disparity is identified regarding the four understandings of the Smart City concept across the country. The results of the research show that a majority of rural and small municipalities reject the Smart City phenomenon for their territories, while large and urban municipalities support its development. The Smart City phenomenon seems not to be adapted to small cities and rural areas.

Another divergence related to three Belgian regions emerges in the thesis. Municipalities of Flanders, Wallonia, and Brussels-Capital do not develop the same types of understanding. For several authors (Ibrahim, El-Zaart, & Adams, 2018; Bolívar, 2018; Caragliu & Del Bo, 2018b; Dameri, 2017), the local context with the characteristics of cities and territories seems to be an important matter. These characteristics are either conducive or limiting to the Smart City implementation.

In contrast, in the third paper the statistical results show that the regional localisation of Belgian stakeholders is not relevant to their appropriation of the Smart City. This territorial characteristic does not affect all Belgian actors in the same way. Moreover, in the fourth paper actors emphasise the territorial theme as a central controversy for local Smart City development with issues related to a concentration of projects in the city centre, a lack of supra-local actors involved, and rural realities left out. However, this becomes a non-subject in the other phases of the ANT process. Territorial issues become a missing subject of concern and debate in mobilising the stakeholders.

In deciphering how actors of the territory envision the Smart City, the results of the research offers a clue to the territorial conditionality for Smart City implementation. Yet the territorial characteristics seem not to be a considerable factor among stakeholders in guiding or influencing their understandings and appropriation of the Smart City.

4. Limits of the studies

The research undertaken in the papers is limited by several methodological choices. The empirical research is restrained by the territorial scope, the timing, and the selection of actors.

4.1. Territorial scope

In Belgium, analysing the implementation of a new concept such as the Smart City is complex because the institutional characteristics of the country are difficult, the territorial realities are diversified, the economic and social situations are multifaceted, and the dynamics of cities and towns are complicated. The population density fluctuates across the three regions, and the territory recognises the important phenomenon of peri-urbanisation and rurbanisation. The country has a small economy that is open to the world, and the economic situation varies greatly between Brussels, Flanders, and Wallonia. However, the social difficulties encountered in cities are similar (at different levels) in the three regions. The regional power is responsible for numerous competencies and Belgian municipalities have a strong, independent power of decision-making.

Studying municipal understandings is relevant due to these economic, social, and territorial elements; however generalisation to other regions and countries should be carefully achieved. The selection of the urban-rural criteria, for example, may be questionable for the Belgian analysis. The selected norm is a global standard (OECD) that is internationally recognised, and other more suitable geographical criteria exist. National and regional criteria are more specific, precise, and tailored to take into account the complex territorial realities of the country. The selection of Alphaville in Wallonia (anonymisation) as in-depth case study has a limited scope, it is one city in Belgium among a strong network of small and medium-sized cities across the Belgian territory. Other cities have to be analysed using the same perspective to compare the visions and dynamics of the Alphaville stakeholders to what is happening in the municipalities of the Brussels-Capital, Flemish, and Walloon regions. The research offers different scopes for analysis across the Belgian territory, but without sufficiently entering into the interactions between the different Belgian levels, or considering multi-level governance.

4.2. Timing

The scientific research represents a "picture" of the situation for Belgian stakeholders concerning the Smart City concept. The research in the papers is a snapshot taken at a certain time. This time limit has to be taken into consideration for the stakeholders' evolution of understanding and appropriation, which is still under construction. Belgian stakeholders' perceptions of the concept may change outside of the periods of the different studies. The elections of 2018 (municipal) and 2019 (regional, federal and European), the results of scientific research, and the development of regional programmes may also influence the stakeholders' perception of Smart Cities, with many other internal and external factors.

These studies are limited by the temporal factor. The Belgian actors' pulse is taken at a given moment. It does not take into account the dynamics and processes that exist over time. The actors' positioning and appropriation of the Smart City development reported here is therefore a fixed picture.

4.3.   Selection of actors

The main results of this thesis are based on empirical data from various actors. The collection of these data differs in the methodological approach, using qualitative methods and quantitative treatments.

In Paper Two, a questionnaire was used to collect municipal understandings. The questionnaire was completed by only one or two respondents from each of the municipalities, who are part of the internal municipal organisations. The study is not based on a triangular analysis that takes into account the different visions of each direct and indirect actor. The municipal understanding does not consider the entire municipal visions of the Smart City. In Paper Three, a questionnaire was sent to hundreds of actors working on Smart City projects across the Belgian territory. The representativeness of the respondents is not measurable, but matching bundles from different databases are used. Finally, in Paper Four, 22 actors were interviewed through a semi-directive interview to collect the data of the case study. The city of Alphaville counts many more actors across its territory who are interested and involved in the Smart City dynamics. Although representative actors from the quadruple helix model are portrayed, more interviews may provide a stronger panoramic point of view. The dependence of several stakeholders on the municipal authorities (financial or hierarchical relations) and the involvement of certain actors in municipal projects may also have had an influence on their comments.

In the empirical analysis and the quantitative and qualitative responses may vary according to time, availability, personality, access to data, and according to the mood of the respondent. The data mainly used for the research is constituted of the opinions of actors. The results of this study depend on statements from the people asked. This analysis is thus limited by this methodology and the subjectivity of the people interviewed. The wealth of the studies comes from the aggregation of stakeholders' standpoints, which includes very diverse orientations.

5. Paths for future research and practical recommendations

For further academic research, this thesis highlights two elements for the academic development of the Smart City. On one side, there is a need to explore some factors of stakeholders' understandings and appropriation. On the other side, the Smart City development requires more territorial consideration. For Belgian actors, the study emphasises three elements needed in order to facilitate the deployment of the concept: Capitalise on the understandings of Smart Cities, improve the Smart City thanks to new forms of management, and exploit the territorial characteristics to develop Smart City policies.

5.1. Paths for future research

A. Explore factors of stakeholders' understandings and appropriation

The results of the research show that different understandings of the Smart City concept coexist among Belgian actors. The Smart City is experienced as a new phenomenon composed of several orientations. Even if some common tendencies appear among the actors composing the quadruple helix model, they follow their own logics. It would be valuable to further study the potential factors influencing the stakeholders' understanding and perceptions of the Smart City.

Throughout the research results, the Smart City may be considered as a political object with a multitude of possible nuances, which are the subject of debates and choices between Belgian stakeholders. Should the Smart City be considered as a neutral political axiom, as it is defended in Paper Four, or as an influencing political factor, as it is embodied in Paper Three? How does the role of stakeholders in the decision-making process or their ideological background affect their appropriation? For example, accepting or rejecting the Smart City concept may be due to a political decision. The different appropriations of the Smart City demonstrate that the Smart City represents certain values of the society and prioritises different objectives for the territories. The empirical research, mainly in Papers Three and Four, shows that the Smart City is a subject of political discussion and political branding. It involves a political questioning of how to manage cities and territories that have specific priorities and implementation. These factors provoke discussions and controversies between the Belgian stakeholders on the desired Smart City outcome and its concrete construction. Smarter cities and territories is a process with varying political factors. This raises several research questions about the interactions between the Smart City development, the political process, and the stakeholders' appropriation: How do political Belgian actors envision and elaborate the Smart City? Which actors integrate the Smart City into their political agenda and how do they defend it? What political processes are developed to launch a Smart City transformation in the territory? How is the Smart City promoted, defended, and discussed as an object of public policy? How important is the political process in the Smart City governance?

The heterogeneous Belgian appropriation of the Smart City with its multiple orientations does not present a homogenous approach between factors but displays related features across the papers. However, in the thesis there is no in-depth analysis of a structuration of interactions between these factors. The socio-technical construction of the Smart City may be a possible development path to consider. The nature of socio-technical practices offers complex analyses to develop an academic understanding of the Smart City (Fountain, 2001; Orlikowski, 1992). The socio-technical practices advocate for a deeper consideration of the political and social fabric. It implies that many other socio-institutional factors must simultaneously co-evolve to make new technologies and innovations fit to territories, such as users' preferences, cultural practices, legal standards, planning requirements, actors' networks, privacy expectations, business models, etc (Carvalho, 2015). Scaling up the search for a socio-technical synergy from the organisational level to the urban and territorial levels will be valuable. Research should avoid a simplification of the relationship between technology and social structures (Meijer & Bolívar, 2016). The Smart City should be considered as an assemblage composed of technologies, networks, actors, and institutions which tend to stabilise and produce policies and projects through non-linear co-evolutionary processes. These processes take place across technological, social, political, and economic domains, over long periods of time. Nevertheless, sustainable considerations should be integrated to this socio-technical conception because this is also an intrinsic factor of the Smart City.

Of these considerations, there is no "one-size-fits-all" model of the Smart City that integrates the heterogeneous stakeholders' understandings of the concept. Detecting the critical factors for each of them may offer an opportunity to explore their appropriation of the Smart City or face their possible rejection. Individual or collective analyses offer the occasion to efficiently adapt the Smart City concept to the stakeholders' context, environment, and behaviour. These reflections and statements suggest a series of questions for academic researchers: Which general and specific factors influence the stakeholders' understandings and appropriation of Smart City? How does the stakeholders' context and environment support their Smart City perceptions? How do the actors' background, position, and behaviour impact their Smart City assimilation?

B. Call for territorial considerations

Smart City policies support new ways of imagining, organising, and managing the territory and the interactions between actors. The territorial characteristics seem to be either conducive or limiting to the Smart City appropriation and development in Belgium. Is the concept of the Smart City only relevant for the most populated and service-based cities? A certain rejection of the Smart City concept comes from rural and small-sized Belgian municipalities. The notion of Smart Rurality is also scarcely mentioned in the literature (Naldi, Nilsson, Westlund, & Wixe, 2015). The Smart City conception is still poorly adapted to small and rural municipalities. It would be interesting to study how the Smart City can adjust itself to different territorial realities. Rural areas and the peripheral zones of cities are weakly addressed. This is an element that would be interesting to analyse in empirical studies. It reinforces the need to consider the complexity of the territorial conditions that influence the evolution of the Smart City concept. Future research with detailed analysis studying the degree of urbanisation and the socio-economic structure of the territory should be interesting. Exploring this theme beyond the dichotomy of urban versus rural should make it possible to refine the results of this research. Considering peripheral and peri-urban areas in Belgium may also offer new prospects for research that foster a more detailed comprehension of the Smart City understandings and appropriations across the territory. The question remains unanswered of how to adapt the Smart City concept as an efficient territorial and social instrument that is suitable for the intrinsic characteristics of every territory, including rural areas and peripheral spaces.

The Belgian institutional level seems to influence stakeholders' understandings. Regions may impact the municipal understanding of the Smart City (Paper Two) while regional differences seem not to impact stakeholders' appropriation across the country (Paper Three). These opposite results require deeper study into how the numerous Belgian institutional levels (regions, communities, and provinces) shape stakeholders' understandings, appropriation, and behaviour in relation to the Smart City. For example, regional strategies across the three Belgian regions (Flanders, Wallonia, and Brussels) are not developing the same priorities, orientations, tools and actions to smarter their territories. How do these programmes concretely influence local Smart City construction? How do Smart City regional strategies and projects impact the local implementation? To what extent are stakeholders' understanding and appropriations of the Smart City influenced by regional or supra-local programmes? These questions concern issues related to the multilevel governance and vertical integration of actors. The results of the empirical research show a lack of involvement of actors from the local territory, a shortage of debates on territorial issues, and a disagreement on the role of supra-local structures and institutions. It will be appropriate to conduct research on how the vertical integration of actors and multilevel governance operates or may operate in Belgium throughout the Smart City policies developed. Academic investigations should look at how "multilevel governance" performs or should perform in Smart Cities. There is also a push to consider the verticality of relationships between actors.

5.2. Practical recommendations

A. Capitalise on Smart City understandings for Smart City implementation

The different Smart City understandings which coexist amongst Belgian stakeholders impact the appropriation of the phenomenon. Across the results of the research controversies emerge due to the different visions of how to develop Smart City projects in the territory. Capitalising on the problematisation topics and stakeholders' interests is important for an inclusive Smart City development. Public authorities should not dismiss actors because they cultivate a different understanding and vision of the phenomenon, but should consider and exploit these differences. Belgian stakeholders might capitalise on the "acceptance" process to gain social acceptability to ensure Smart City project adoption and success (Ben Letaifa, 2015). One way to manage this is to set up a common and shared Smart City conception between actors. The construction of the territory is elaborated between actors in adapting the individual behaviors. Stakeholders meet and collaborate with each other. Forums, discussion meetings, co-construction workshops, chatting platforms, or any participative practice should be developed in order to foster common objectives and a shared vision to support the Smart City. Academics may act as a facilitator and/or disruptor in this dynamic. Capitalising on a network of stakeholders who defend the Smart City conception has the potential to interest reluctant actors. This leads to several questions for practitioners, such as how can actors be encouraged to share the same Smart City vision? Which behaviours should be adopted in order to develop a common and shared appropriation of the Smart City?

This approach, based on the accommodation of converging and divergent opinions of actors to develop a shared vision of the Smart City, generally implies inclusive and participative mechanisms of governance. This is ideally constructed by mixing bottom-up and top-down processes. However, Belgian authorities do not necessarily desire to implement a Smart City by focusing primarily on an "acceptance" process or an opening of governance. Other styles of Smart City implementation emerge out of the results of this thesis, such as the functional instrumental approach. This point of view should be respected and considered for Smart City development, especially by Belgian actors involved in local and regional Smart City elaboration. Yet through this they can implement a Smart City based on the development of technological solutions, the implementation of efficiency processes, the provision of new services, the construction of infrastructure, or the launching of specific and selected partnerships. This Smart City construction implies different objectives, priorities, and set-ups. It supports another place for stakeholders. Actors are interested in the city's development through Smart City services and structures. Smart City project achievements and results provide another Smart City appropriation process for stakeholders.

Through the stakeholders' understanding and way of appropriating the Smart City, actors develop a whole panel of implementation methods. The thesis results and conclusion show that exploring how actors appropriate the Smart City is useful to consider how they envision the Smart City construction. A methodology that collects and capitalises stakeholders' opinions and idealised constructions of the Smart City should be a useful tool for practitioners. It also provides knowledge on which stakeholders develop similar or different opinions.

This methodology should confront actors' opinions to identify and nourish the points of divergence, convergence, and controversy on the Smart City. From this identification process practitioners should capitalise on the federative dynamics and controversial topics to launch adequate interest and enrolment policies. Policies should be constructed or co-constructed according to the stakeholders' dynamics and the political will to develop open or closed governance.

B. Improving the Smart City thanks to new forms of management

Open governance raises the question of a new form of management, new decision-making, and new roles for leaders. The new management implies coordination, interaction, and co-creation among the stakeholders to take into account the different perceptions on Smart Cities and integrate reluctant actors. The challenge primarily concerns the establishment of a partnership dynamic based on a true enrolment of stakeholders and a shared conception of the Smart City. Competences related to this new form of governance should be assimilated by territorial actors. Sensitisation and training are needed to enhance stakeholders' appropriation and participation. Governments in Smart Cities should rely on collaboration, learning and networking processes to implement Smart initiatives and make the Smart City dynamic more stakeholder-centric.

The (new) role of public authorities should weave, manage, and arbitrate the modes of partnerships. This innovative way of functioning requires new skills (both for politicians and civil servants) and changes in the practice of public management. Public authorities and the administration should develop a balanced bottom-up approach with some targeted top-down actions based on a shared strategy. Governments should remain involved, but their roles must change. They should be the conductors of the Smart City dynamic as facilitators, organisers, and even referees of the stakeholder relationships in order to transform the territory. They are key actors to create an interactive, participatory, and information-based environment. Public authorities should set up long-term exchanges between the various stakeholders to create a virtuous circle. Government structures and operations need to be transformed to some extent (more or less radically). A key challenge in the Smart City involves the new mediating role of authorities that encourages the diverse societal actors to share a common agenda to improve local conditions. Smart Cities are hybrid models combining innovation, monitoring of policies, and stakeholders' dynamics with authoritative support and coordination mechanisms.

These suggestions raise questions for practitioners to investigate in their Smart City implementation: How can the construction of a local strategy connect actors of the territory? How can communication with the different stakeholders be made more efficient? How should leaders act and react to improve the collaborative and inclusive Smart City dynamics? Which tools should be mobilised to launch long term and efficient PPPPartnerships? Which interessement and involvement processes can smooth the collaboration between actors to reach the strategic goals?

C. Take advantage of territorial characteristics to develop Smart City policies

The Smart City appeared as a possible process of transforming territories. The empirical research highlights new ways of imagining, organising, governing and managing the territorial dynamics within the Smart City. But the question remains unanswered on how to adapt the Smart City concept as an efficient territorial and social instrument that is suitable for every territory. Practitioners should check the "territorial-readiness" before starting a Smart City transformation. Analysing which territorial characteristics influence the Smart City construction in its political, institutional, societal, economic, and cultural context is required. There is no "one-size-fits-all" or "ready to go" Smart City solution. Public authorities should focus on and pay attention to the districts and areas with their intrinsic features. Every Smart City solution should be adapted to the territory where it will be implemented.

Urban Smart City development (mainly in city centres) appears to be more important in comparison to the initiatives set up in rural territories, as evidenced in this thesis. Rural and peripheral characteristics seem to not be sufficiently considered across the Belgian Smart City strategies and implementations. A spatially-determined perspective must be acknowledged by practitioners to organise and support an effective Smart City policy for such areas. A multilevel analysis across the country may be also beneficial to consider the provincial or regional levels. An upper spatial level may allow a broader view, a coordination of resource pooling, and provide a stronger point of reference for Smart City implementation across the local levels (Angelidou, 2014). Regional planning may have a significant impact on Smart City development to harmonise and coordinate top-level policies with low-level policies. Considering the "multilevel governance" in Belgium is important for Smart City development. Practitioners should pay attention to the missing connections with the upper or lower institutional levels. They should capitalise on the institutions and actors at, and between, the varieties of geographical and organisational scales. It is necessary to mobilise missing actors from the regional and national levels through specific enrolment. More generally, actors at any intermediate level of power of a territory should be considered in the local Smart City dynamic. Moreover, when they are drawn up, Smart City plans and strategy should find a way to be aligned with the complex web of policy agendas already operating at the other territorial levels.

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VII. Appendix:

1. Paper 1: Set of papers of the literature review and first authors

Reference No.	Article Name	First Authors' name
1	A framework for cloud-based context-aware information services for citizens in smart cities	Khan
2	A Participatory Approach for Envisioning a Smart City	Van Waart
3	A strategic view on smart city technology: The case of IBM Smarter Cities during a recession	Paroutis
4	Advancing urban ecosystem governance in Rotterdam: From experimenting and evidence gathering to new ways for integrated planning,	Tillie
5	An Innovative, Open, Interoperable Citizen Engagement Cloud Platform for Smart Government and Users' Interaction	Reforgiato
6	Big data and urban governance	Taylor
7	Conceptualizing smartness in government: An integrative and multi-dimensional view	Gil-Garcia
8	Creating More Intelligent Cities: The Role of ICT in Promoting Territorial Governance	Scholl
9	Creating Smart Governance: The key to radical ICT overhaul at the City of Munich	Scholl
10	Creating Smart-er Cities: An Overview	Allwinkle
11	Critical interventions into the corporate smart city	Hollands
12	Crowdsensing in smart cities: Technical challenges, open issues, and emerging solution guidelines	Bellavista
13	Designing for participatory governance: Assessing capabilities and toolkits in public service delivery	Van der Graaf
14	Designing next generation smart city initiatives: The SCID framework	Ojo
15	E-governance as an enabler of the smart city	Paskaleva
16	Five Trends That Matter: Challenges to 21st Century Electronic Government	Scholl
17	From the smart city to the smart community, model and architecture of a real project: SensorNet	Nanni
18	Global firms and smart technologies: IBM and the reduction of cities	McNeill
19	Governing Smart Cities: An Empirical Analysis	Dameri
20	Governing the smart city: a review of the literature on smart urban governance	Meijer
21	How Are Citizens Involved in Smart Cities? Analysing Citizen Participation in Japanese "Smart Communities"	Granier
22	Human limitations to introduction of smart cities: Comparative analysis from two cee cities	Klimovský
23	Informating Smart Cities Governance? Let Us First Understand the Atoms!	Paulin
24	Information and communication technology and local governance: Understanding the difference between cities in developed and emerging economies	Odendaal
25	Information Reuse in Smart Cities' Ecosystems	Abella
26	Innovating and Exploiting Entrepreneurial Opportunities in Smart Cities: Evidence from Germany",2015,"Creativity and Innovation Management	Kraus
27	Living labs and urban smartness: The experimental nature of emerging governance models	Concilio
28	Local e-government Benchlearning: Impact analysis and applicability to smart cities benchmarking	Montserrat

Reference No.	Article Name	First Authors' name
29	Making smart cities work in the face of conflicts: Lessons from practitioners of South Korea's U-City projects	Kim
30	Mobile city applications for Brussels citizens: Smart City trends, challenges and a reality check	Walravens
31	Multi-layered urban strategies to foster the smart cities development	Antonini
32	Multi-stakeholder co-creation Analysis in Smart city Management: An Experience from Bandung, Indonesia	Mayangsari
33	New Strategies to Improve Governance in Territorial Management: Evolving from "Smart Cities" to "Smart Territories"	Garcia-Ayllon
34	Platform business models for smart cities: From control and value to governance and public value	Walravens
35	Programming environments: Environmentality and citizen sensing in the smart city	Gabrys
36	Smart cities and the network society: Toward commons-driven governance	Araya
37	Smart cities are transparent cities: The role of fiscal transparency in smart city governance	David
38	Smart cities as corporate storytelling	Söderström
39	Smart Cities Governance: The Need for a Holistic Approach to Assessing Urban Participatory Policy Making	Castelnovo
40	Smart cities in the new service economy: Building platforms for smart services	Anttiroiko
41	Smart cities through the lenses of public policy: The case of Shanghai	Tian-Cheng Zheng
42	Smart cities, smart places, smart democracy: Form-based codes, electronic governance and the role of place in making smart cities	Walters
43	Smart cities: Big cities, complex governance?",2015,"Transforming City Governments for Successful Smart Cities	Rodriguez
44	Smart cities: Governing, modelling and analysing the transition	Deakin
45	Smart Cities: Implications of Urban Planning for Human Resource Development	Thite
46	Smart governance as key to multi-jurisdictional smart city initiatives: The case of the eCityGov Alliance	Scholl
47	Smart Government, Citizen Participation and Open Data	Mellouli
48	Smart learning eco-systems: "fashion" or "beef"?	Giovannella
49	Smart neighbourhood learning - the case of myneighbourhood	Petersen
50	Smart Networked Cities?	Emmanouil
51	Smarter universities: A vision for the fast changing digital era	Coccoli
52	Smartmentality: The Smart City as Disciplinary Strategy	Vanolo
53	Stakeholder engagement in the smart city: Making living labs work	Paskaleva
54	The empty rhetoric of the smart city: from digital inclusion to economic promotion in Philadelphia	Wiig
55	The Intelligenter Method (II) for "smarter" urban policy-making and regulation drafting	Marsal-Llacuna
56	The Triple-Helix Model of Smart Cities: A Neo-Evolutionary Perspective	Leydesdorff
57	Towards a Smart State? Inter-agency Collaboration, Information Integration, and Beyond	Gil-Garcia
58	Understanding different organizational roles in smart city platforms: Preliminary evidence and emerging issues	Canonico
59	Understanding Electronic Government Research and Smart City: A Framework and Empirical Evidence	Anthopoulos,
60	Unveiling Smart City Implementation Challenges: The Case of Ghent	Van Den Berg
61	What Makes a City Smart? Identifying Core Components and Proposing an Integrative and Comprehensive Conceptualization	Gil-Garcia

2. Paper 2: Methodological information

On the 589 Belgian municipalities, 113 of them fully participated to the survey. It represents a response rate of 19%. Four categories of municipalities compose the analysis of the sample. They represent the geographical and institutional specificities/characteristics of the Belgian territory. Four categories of the sample are described below:

1) Entire sample: All the municipalities of the sample
2) Nature of the municipality: Urban / Rural municipalities
3) Institutional structure of the country: Flemish / Brussels / Wallonia municipalities
4) Small (-10 000), medium (10 000-50 000) and large size municipalities (+50 000)

To calculate the representativeness of the sample, the Chi-Square adjustment test is used throughout the four categories. The sample is representative of the population (Belgian municipalities) in terms of institutional characteristic (Wallonia, Flanders and Brussels) and in terms of nature (rural versus urban municipalities). In terms of size, the sample is not representative. Largest Belgian municipalities (23) are over-represented (100% of the respondents) in the research comparing to small (37) and medium (53) municipalities.

The categorisation "Urban/Rural" is based on the characteristics of OCDE: an urban territory is a territory, which counts a density of population of more than 150 inhabitants per square meters.

Categories of respondents to the survey and distribution across the two representative categories:

Main respondents to the survey						
Categories	Urban	Rural	Total	Flanders	Brussels	Wallonia
Municipal Director	32	16	48	25	2	21
Mayor	0	1	1	0	0	1
Alderman	2	2	4	0	1	3
Financial director	3	0	3	3	0	0
Head of department	3	3	6	0	1	5
Others	10	1	11	0	2	0
Total	50	23	73	28	6	39
No response	34	6	40	24	2	14

Distribution of respondents				
Categories	Population	Sample	Rate Population	Rate Categories
Rural	134	29	21,6	25,7
Urban	455	84	18,5	74,3
Total	589	113	19,2 %	100,0
Flanders	308	52	16,9	46,0
Brussels	19	8	42,1	7,1
Wallonia	262	53	20,2	46,9

3. Paper 2: Degree of difficulty to set-up Smart City projects and relevance of the concept

The degree of difficulty in setting up Smart City projects and the relevance of the concept for Belgian municipalities are revealed using two questions from the survey: the first question asked municipalities to assess (from 1: very complicated to 5: very simple) the difficulty of implementing their own Smart City projects. The second question asked if the concept of the Smart City is relevant for their territory, to which they can agree (Yes) or disagree (No). For the first question three groups of municipalities are created: difficult (notation 1-2/5), neutral (3/5) and easy (4-5/5). An additional assumption for these two questions is established: municipalities with an understanding of the Smart City concept have a more powerful impact than municipalities without any understanding (four types). The results of the tests are given in the Table below.

Level of difficulty and relevance of the Smart City concept and typology of responses:

Sample		Level of difficulty			Relevance	
Typology	*Distribution*	*High*	*Neutral*	*Low*	*Yes*	*No*
Technological	29	16	1	3	10	19
	100%	80%	5%	15%	35%	66%
Comprehensive	20	10	7	0	19	1
	100%	59%	41%	0%	95%	5%
Societal	38	10	17	3	32	5
	100%	33%	57%	10%	87%	14%
Non-existent	26	14	5	2	12	13
	100%	67%	24%	10%	48%	52%
Total	113	50	30	8	73	38
	100%	57%	34%	9%	66%	34%
Tests		Value	df	A. Sig.	Value	df	A. Sig.
4 Under-standings	Pearson	17.871	6	0.007	30.758a	3	0
	Likelihood R	21.708	6	0.001	33.425	3	0
	Phi	0.28	/	0.391	0.526	/	0.006
	Cramer's V	0.198	/	0.391	0.526	/	0.006
3 Under-standings	Pearson	16.025	4	0.003	28.646	2	0
	Likelihood R	20.322	4	0	29.067	2	0
	Phi	0.489	/	0.003	0.577	/	0
	Cramer's V	0.346	/	0.003	0.577	/	0

The results of the Pearson Chi-Square test allow the null hypothesis to be rejected for the links between the typology (both hypotheses) and the level of difficulty, as well as the relevance of the Smart City concept. These tests are measured at a high level of confidence (0 to 0.007). In addition, the results of the Phi and Cramer's V tests determine a statistically significant intensity of the relationship ($\Phi > 0.1$). Moreover, for both questions the intensity of the relationship grows when the typology does not comprise the type "non-existent understanding". For the level of difficulty, the measures of association increase from small (0.198) to medium (0.346). Regarding the relevance of the concept, the relationship becomes stronger (from 0.526 to 0.577).

4. Paper 3: Clustering calculation results

Results of the clustering calculation

Clusters	N	% Combined	% Total
1	101	52,3%	51,3%
2	92	47,7%	46,7%
Combined	193	100,0%	98,0%
Excluded	4		2,0%

Results of the clustering calculation across three variables

Tests	Actor's categories		Regions		Genders	
Chi-Square	Value	Asymp. Sig.	Value	Asymp. Sig.	Value	Asymp. Sig.
Pearson Chi-Square	12,05	0,017	2,826	0,419	1,76	0,184
Likelihood Ratio	12,234	0,016	2,853	0,415	1,764	0,184
Linear-by-Linear Assoc	0,139	0,709	1,379	0,24	1,754	0,185
Phi	0,251	0,017	0,121	0,419	-0,096	0,184
Cramer's V	0,251	0,017	0,121	0,419	0,096	0,184
N of Valid Cases	191		192		192	

5. Publication of articles 2 and 3