# Is this a smart city? Narratives of city smartness and their critical assessment

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# **Keywords**

resources, process, information and communication technologies, stakeholder, governance, data monitoring, smart cities, conceptualisations

# Abstract

Smart Cities have been repeatedly suggested as a solution leading to resource efficient, low carbon cities. However, up to now the term Smart City has remained a fuzzy concept, which is only vaguely defined. This article shall contribute to a better understanding of the term. Based on the results of a media analysis and a small number of expert interviews with representatives from European cities, city associations and consultancies, it is argued that the Smart City concept does not provide a specific new normative orientation. Instead, our data analysis revealed three process-related dimensions of Smart Cities: 1) the way of collecting, processing and connecting available information through information and communication technologies (instrumental dimension), 2) the rules and processes of defining objectives and actions for future city development (administrative dimension) and 3) the reorganization of interaction patterns between city stakeholders, that is a multi-stakeholder, participatory, experimental, and "co-creative" transformation processes (governance dimension). We critically discuss these conceptual foundations, namely its idea of technically "optimizing" cities (1<sup>st</sup> dimension), its slightly naïve expectations towards transversal urban planning structures (2<sup>nd</sup> dimension), and its harmonic, uncontroversial picture of city transformation processes, where power struggles appear to be largely absent (3rd dimension). All in all, we argue that the Smart Cities concept as revealed by our data has a strong utopian bias which neglects the hurdles of real life urban transformations.

# Introduction

In the ongoing discussion on the role of cities for fighting climate change and resource depletion, the Smart City term has recently become increasingly popular. While the importance of local action was already stressed in the Brundtland Report of 1987 (United Nations, 1987), the debate on the role of cities has only recently gained further momentum (Höjer and Wangel 2014). This is for various reasons: First, several studies indicate that cities are responsible for a large amount of greenhouse gas emissions (e.g., Stern, 2007; United Nations, 2007).<sup>1</sup> Furthermore, already today half of the world population lives in cities, and this share is expected to reach 67 % in 2050. In the most developed regions, the proportion of urban dwellers might even amount to 86 % (United Nations, 2012: 2). In the near future, this urbanization trend is likely to result in an even stronger carbon footprint of cities. However, the city in its current form is the outcome of an era marked by the seemingly inexhaustible availability of cheap fossil fuels (Steiner & Veel, 2014). In view of an increasing scarcity and rising costs of raw materials, one can seriously doubt whether cities can go on with business as usual or will have to reorganize the ways their inhabitants move, consume, work and live. Second, cities are also heavily affected by the repercussions of climate change such as smog or water shortages (Alber & Kern, 2008).

Last but not least, compared to the national or global level, the local level may be most suitable when it comes to experi-

<sup>1.</sup> However, there is considerable disagreement as far as the exact amount of cities' contribution to overall anthropogenic greenhouse gas emissions is concerned. According to a large number of sources, cities account for 75 to 80 % of greenhouse gas emissions (e.g., Stern, 2007; United Nations, 2007; for more examples see Satterthwaite, 2008). Yet, this figure is challenged by Satterthwaite (2008) who claims that the cities' share does not exceed 30 to 40 %.

menting with innovative concepts and solutions (Rohracher & Späth, 2013; Bulkeley, Broto & Maassen, 2013; Schneidewind & Scheck, 2010). City authorities are closer to the concerns of the citizens and can react in a more flexible and direct way. Innovative concepts for city management are thus needed in order to reduce cities' impact on climate change, while at the same time securing a high quality of life.

Thus, cities face the challenges of urban growth and its related, negative environmental and climate impacts, but at the same time they are possibly best suited to develop local solutions to respond to these challenges. In the wake of this debate on sustainability and cities, Smart Cities are brought forward as one solution that leads to resource efficient, low carbon cities (see also European Commission, 2012). However, for the time being, there is no accepted standard definition of Smart Cities. Rather, the term remains still quite vague and the interpretations of what a Smart City is or should be are numerous (Nam & Pardo, 2011, p. 186, Höjer and Wangel 2014).

In the remainder of this paper, we first present the research method which consists in a mix of literature analysis and experts interviews (section 2). The third section is dedicated to the key findings of our empirical work. We propose a distinction between three different process-related perspectives: the instrumental perspective, the administrative perspective and the governance perspective. These findings are critically discussed in the concluding discussion.

# **Research Methods**

This paper aims to identify core conceptual characteristics of Smart Cities. To address this question empirically, we first carried out a media and desktop analysis, which revealed very different perceptions of Smart Cities. In order to consolidate these findings, we then conducted semi-structured interviews with experts who have a broad view of current developments in the area of sustainability and cities. Semi-structured interviews are a qualitative method of data collection in social sciences and are typically applied in research fields with multiple variables and complex interdependencies. They are particularly helpful for exploring collective understandings as well as consensus and conflicts between different actors. For this study we conducted 7 interviews with representatives from the German Association of Towns and Municipalities (No 1), the Climate Alliance (No 2), the cities of Mannheim (No 3), Amsterdam (No 4), Stockholm (No 5), as well as two international consultancies (No 6, No 7). The conversations took around 90 to 120 minutes. The interview contents were broadly defined in an interview guideline, which was intended to structure the conversation, but yet should leave sufficient room for spontaneous and dynamic interaction between interviewer and interviewees. The conversations were recorded and transcribed for systematic analysis. Subsequently, the resulting texts were structured along certain content-defined categories referred to as "codes" - for instance "implementation". Finally, the data were aggregated to more complex sequences of arguments. For this analysis, the software MaxQDA was used.

The results of our study need to be interpreted with caution, since the number of interviews was quite limited, compared to the multitude of stakeholders shaping the conceptualization of Smart Cities. Furthermore, our data was collected back in 2011 and our analysis would hence benefit from more recent data. Indeed, we believe that combining our work with more recent, similar studies may reveal interesting findings on the dynamics in the understanding of Smart City.

# **Conceptualizing the Smart City**

In contrast to other city concepts such as Green Cities, Eco Cities or Low-Carbon cities, Smart Cities seem to lack a clear and exclusive conceptual content idea (see also Rohde, Loew & Institute 4 sustainability, 2011). Although energy and transportation are often mentioned as important fields of application (European Commission 2012; European Innovation Partnership on Smart Cities and Communities 2013; Europolitics 2009), thus implying the aspiration of low-carbon forms of living, Smart Cities are not limited to those policy areas. They also comprise fields such as health, education, public safety, social inclusion, competitiveness, transport systems (Neirotti et al. 2014; Budde, 2014; Deutsche Akademie der Technikwissenschaften Acatech, 2011; Vienna University of Technology, University of Ljubljana & Delft University of Technology 2007). Thus, based on our data, we claim that until now Smart Cities do not have a clearly defined core in terms of content. The novelty of the Smart Cities concept seems to lie rather in its conceptualizations of change processes (see similar Nam & Pardo, 2011, p. 186). According to some of the interviewed experts, Smart Cities can be seen as some kind of overarching process strategy, which is open for varying policy inputs:

This is not a vision of "liveable city" or something like that. It is a tool that allows me to achieve different things. To my understanding, the Smart City concept is very much tool oriented. With the Smart City approach I do not necessarily get to a sustainable city, or an eco-city. Therefore, for me it is neutral. (No 2)

Hence, the concept of Smart Cities does not suggest one exclusive normative idea of what a "good city" is but rather how a good city might be achieved. This means that, compared to other city concepts, Smart Cities lack a specific content perspective and rather make a difference with regard to change processes.

In the following sections we will more closely examine the constitutive elements of this process "superset" Smart City, as well as potentials and deficiencies linked to each perspective. We derive three important *process perspectives* on Smart Cities. The first one approaches the topic of Smart Cities in an instrumental logic, as it suggests supporting city transformation processes through the use of information and communication technologies (section 2.1). The second perspective deals with the way goals for city developments are set, relative actions for the achievement of these goals are identified and success is monitored (administrative perspective, section 2.2). Finally, a third understanding of Smart Cities points out the importance of multi-stakeholder, participatory, experimental, and "co-creative" transformation processes (governance perspective, section 2.3).

# THE INSTRUMENTAL PERSPECTIVE: INFORMATION AND COMMUNICATION TECHNOLOGY FOR IMPROVED RESOURCE EFFICIENCY

In the understanding of this perspective, information and communication technologies (ICT) help to improve municipal infrastructure systems and services such as energy grids, water, waste and transport systems, health and education facilities or city administration departments. More precisely, ICT are expected to enable cities to better collect, process, analyse and visualize information on public goods and services, thus allowing for a more efficient organization of the latter. In this sense, IBM (2010) highlights the role of ICT as core element of Smart Cities:

Instrumentation enables cities to gather more high-quality data in a timely fashion than ever before. Interconnection creates links among data, systems and people in ways not previously possible. Intelligence, in the form of new kinds of computing models and new algorithms, enables cities to generate predictive insights for informed decision making actions across the city's core systems. (p. 1)

Overall, the literature, media and desktop analysis revealed the importance attributed to this instrumental perspective (Deutscher Städte- und Gemeindebund, 2010; Neirotti et al. 2014; IBM, 2010; Budde, 2014; Batty et al. 2012; Nam & Pardo, 2011). This evidence was confirmed in our subsequent interviews as the following argument illustrates:

It is about using information that is available as efficient as possible. [...] The big difference with 20 years ago is that we produce loads more of data and we have loads more of opportunities to process the data, and to visualize the data and to get hold of it. So [...] according to me, [Smart Cities make; the authors] use of available information as good as possible. (No 4)

According to the interviewed experts, another important evolution that differentiates Smart Cities from other cities is their ability to handle complex datasets, frequently referred to as "big data", and aggregate information from different datasets to make interdependencies between them obvious. For instance, in the transport sector this would imply bringing together information from smart phones and local transport system operators and search for convergence between datasets and, ultimately, provide targeted and real time services according to occurring mobility needs.

I think the smart concept is really the aggregation of those network infrastructures and the idea that there are large datasets that will be existing within cities coming from different network infrastructures and that there is value in understanding the relationship between those datasets. (No 6)

All interviewees make, to a varying extent, reference to this "tool" perspective, which highlights the potential of ICT to organize important services and infrastructures more efficiently and smoothly. However, a major challenge is to professionalize the services around this Smart City business model. This implies the development of technological standards that allow replicating approved solutions in a sufficient and economically viable way (No 2, No 6). In this context, the definition of legal standards (for example concerning data privacy) is a crucial aspect (see also Deutsche Akademie der Technikwissenschaften Acatech, 2011, p. 17; European Innovation Partnership on Smart Cities and Communities, 2013, p. 18).

Apart from that, the problems occurring with rapid urbanization – land use, rising greenhouse gas emissions, social inequalities, insecurity to name just a few – are so "wicked" that purely technological solutions appear insufficient (Nam & Pardo, 2011, p. 185). In this sense, most of our interviewed experts find that, if limiting Smart Cities exclusively to the application of intelligent technologies, one fails to fully grasp the innovative nature of Smart Cities.

I think if you look at it from the other angle – and some people do – which is [...]: 'what technology do we need to apply within the city?' then actually [...] all you are doing is implementing technology, but you are not delivering outcomes. So it is all about the outcome ultimately for us. (No 6)

This implies that "service oriented architectures" need to be developed (No 6). Companies wanting to 'sell the Smart City' would need to go beyond purely technological propositions and offer "value propositions" in order to raise cities' interest (No 4, No 6).

To sum up, this instrumental perspective can be challenged for its technological fix. In the following two sections we will hence explore the non-technical dimensions of the concept that, which go beyond the intelligent use of ICT in the city.

# THE ADMINISTRATIVE PERSPECTIVE: BACKCASTING, TRANSVERSAL, SYSTEMIC ACTION AND MEASUREMENT OF RESULTS

Our data suggests that Smart Cities bring about new procedures of conceiving city transformations at the level of city administrations. Roughly spoken, today's city administrations would be characterized by self-referential departments that function according to their specific rationales of action and procedures and lack a holistic and long term view of city development. Synergies are not sufficiently exploited and the impacts on other policy fields are rarely considered (No 1). In contrast, Smart Cities overcome those "silo" structures (No 1) and streamline activities of different departments and stakeholders towards jointly defined objectives of city development. As Nam and Pardo argue (2011, p. 188), this understanding implies that Smart Cities entail policy integration across different sectors and policy fields. Overarching strategies would have to be developed, fostering the transversal, systemic character of policy interventions (No 3). At the same time, flexible solutions are considered as crucial, which allow for adequate responses to changing circumstances (No 1).

Several interviewed experts put forward that this new approach of systemic and issue-centred policy making also involves alternative administrative procedures. Roughly spoken, these alternative procedures follow a sequence of steps, starting with joint vision-building and goal setting, followed by identifying relevant fields of action across departments and defining concrete measures to achieve the goals. Finally, progress is continuously monitored against appropriate indicators. Following the backcasting idea, the first step of "smart" policy making processes would consist in imagining a role model of what citizens' life would look like in the best of the worlds, compared to the current (imperfect) situation.

I think what is actually much more helpful is to start with your starting point. What is life like now? If you live in Mumbai: What does a day in the life of a commuter going to work in Mumbai look like? [...] And then to look at what aspects of life suck. And if you were to make it better, what would make it a more attractive place to live? And I think a lot of that is about consumer engagement, understanding the frustrations of urban life. [...] The frustrations of life drive the outcomes. (No 6)

Once the vision of city development has been defined, these abstract goals are broken down to several fields of action and concrete measures with verifiable targets.

Let's suppose I have made the decision to strive for a certain kind of society or city, for example one that puts emphasis on social capital, community cohesion etc. [...]: Then the question is how can I organize the different tasks such as education, [...] multigenerational houses [...], how shall I conceive the objectives to make them practicable and to monitor their implementation on a given timeline. (No 1)

Thus, our interview partners claim that the Smart City concept entails a different management style, both as regards organizational aspects, but also human resources. Staff needs to be adequately trained in order to respond to these changing circumstances (No 1). To date, the city staff seems to lack, in most cases, the appropriate skills and transversal perspective (No 1, No 6).

The implementation of Smart City concepts may thus help developing truly integrative city administrations, which overcome departmental rules and taken-for-granted ways of organization. This means that all forces are bundled to move towards more attractive cities that correspond to the local situations and expectations. However, city staff is not the only relevant actor, but, as the next subsection will show, another perspective highlights the involvement of citizens and other stakeholders as a central issue of Smart Cities.

# THE GOVERNANCE-PERSPECTIVE: THE LEARNING, INTERACTIVE AND CREATIVE CITY

In line with claims for a "demand-focused" and "truly citizencentric" approach (Nam & Pardo, 2001, p. 189), our data suggests that Smart Cities avoid unidirectional, top-down policy making and adopt inclusive and multi-stakeholder governance forms. This concerns both stakeholders at the city level and regional actors whose actions have an impact on policy outcomes. One of our interview partners stresses that this is not only an objective of its own, but rather a prerequisite for the successful implementation of a Smart City. According to him, it is crucial to establish a "common stakeholder engagement", consisting of those stakeholders who have the required competencies and the decision-making power (No 7).

Furthermore, our interview partners stress the necessity to involve citizens (No 7). In this context, it is striking that most of the interviewed experts conceive citizens and city stakeholders as creative change agents who jointly shape urban transformation. Citizens are no longer seen as passive "target groups" that need to get "convinced" of policy measures in order to achieve "social acceptance". According to one of our interview partners, the Smart City concept implies the rise of a "community era", where people seek common ways of commuting, living or consuming (No 4). Thus smart cities seek means of including citizens in the decision-making process and of activating a common responsibility to shape the urban space (No 3, No 1). Our interview partners claim that Smart Cities have the potential to promote social innovation, as they create a social environment that facilitates the emergence of new forms of living. For instance, Smart Cities would enable the collective re-organization of consumption patterns. The current materialist lifestyles may be questioned, and eventually replaced by emerging forms of collaborative consumption, i.e. sharing, lending and bartering (Botsman & Rogers, 2010). Similarly, other forms of an emerging "collaborative economy" may arise. For example, "crowdfunding" initiatives may raise money for projects that are not beneficial for banks and lend it to private households on a nonfor-profit basis (No 1, No 4). Smart Cities would support such experiments by providing expertise and space and by creating an interactive and open environment. One of our interviewed experts expects that these new forms of governance will promote creative solutions and strengthen citizens' identification with their city:

I consider this society, which is emerging, to be incredibly enriching and creative. And I also consider this a question of communicative ambiance of a city, to work this out – the aspect of well-being, of identification, of feeling at home, perhaps as opposed to the cold globalization. The city as a place for living and working. (No 1)

From a governance point of view, Smart Cities stand for an innovative understanding of the organization of public life. In this perspective, the Smart City is a place of continuous social learning and experimentation between city stakeholders (Campbell, 2010), or, as one interviewee puts it, a "living lab". This will lead to a reorganization of the ways we live, work, commute, consume, and spend our leisure time.

So the living lab for me is a self-learning concept where you have a large scale laboratory on site, in the city itself, with active participation of end users [...] So this is something very specific of the Smart City, that living lab concept. And also in this context, a project does not stand alone any longer but is interconnected in a learning process of other projects in the city. (No 7)

When it comes to implementation, Smart Cities would thus need to adopt an inclusive approach allowing the continuous participation of all citizens (No 4). Furthermore, efficient and open exchange platforms would have to be built up to share experiences and discuss different available options (No 1). However, our interview partners remained rather vague on the concrete implementation of such an inclusive approach. This points to a largely unexplored field of future research: how can participation and co-creation processes be organized to be fair, efficient and innovative?

In conclusion, our – limited – data indicates that the innovative aspect of the Smart City concept is not a pre-defined, fixed normative outcome, but its perspective on organizing change processes. This relates to the extensive use of ICT for improved resource efficiency, an issue-centred, rather than a departmental approach of policy making, and co-creative, interactive governance forms. Our findings suggest that Smart Cities may be perceived as a flexible process approach, applicable to achieving objectives in diverse fields, which all concern the optimization of daily life in cities. Thus, they may provide an appropriate framework to bundle several current economic and societal evolutions towards a resource-efficient, connected, participation- and exchange-oriented, modern city concept that strives towards continuous renewal and creativity.

### Discussion

The objective of this final section is to critically review the findings presented above and to reflect on the implications of these perspectives on urban living and culture. Again, the discussion is structured around the three perspectives outlined above.

To recall, the first perspective is based on the premise that, due to the multiplication of services and mutual dependencies, modern urban life is getting increasingly complex. The use of artificial intelligence is suggested for handling this complexity. This perspective is therefore focused on the use of ICT and its ability to coordinate and optimize urban infrastructure. Smart technologies are supposed to manage the dysfunctions and disorder provoked by human interaction. However, as observed by Steiner and Veel (2014),

[t]his way of thinking takes for granted that there exists something like a common goal of optimization which would benefit the larger whole of the city and which would make purposeness and meaning come together in the built environment. It thus propagates a rhetoric that echoes modernist visions from the early twentieth century of betterment of culture through technology. (p 289)

Current tendencies in the personal use of technologies (e.g. smartphones, social networks) might point to a widespread willingness to implement and make use of ICT-based systems wherever possible. However, in parallel, scepticism begins to emerge concerning the risks linked to the disclosure of private data. Recently, the NSA (National Security Agency, USA) scandal confirmed more or less subliminal fears of surveillance and misuse of private data. In a world where the performance of urban service infrastructures depends on the disclosure of private data, the preconditions for systematic surveillance and control, or other more subtle forms of manipulation are created. Algorithms and the categorization of data, which enable companies and public institutions to anticipate our actions and unfold our personal preferences, remain largely invisible and abstract for citizens and easily escape their awareness and control. Certainly, these "calm technologies"2 (Weiser & Brown, 1996) can, to a certain extent, improve citizens' lives. However, by the same token, they lay the foundations for the "transparent citizen", for a situation where the "disappearance of disappearance" (Haggerty & Ericson, 2000, p. 619) becomes a real risk and where it is "no longer possible to be off the radar" (Steiner & Veel, 2014, p. 298). This is a scenario, which is less likely when data security is assured, but which still involves a large potential for abuse.

In addition, the postulated optimization of city infrastructure through interconnected, real-time data management systems increases the dependency on information technology and makes cities more vulnerable in case of an accidental breakdown or an attack of the system.

Moreover, the desirability of efficiency and optimization at all cost can be seriously questioned. Does an efficient city correspond to people's representations of "good" urban life? Broken down to different potential application fields, we can ask ourselves if, for instance, efficient medical care may not favour standardized, impersonal and time-constrained treatments instead of individual examinations taking into account patients' history and individual situation. What impact might the focus on efficiency have on urban culture and city ambiance (Steiner & Veel, 2014)? Is an efficient city one that citizens can identify with? Or is it rather "spontaneity, creativity, individuality" (Steiner & Veel, 2014, p. 295) that citizens strive for and that give urban life its special flavour? These questions, which are insufficiently addressed by the proponents of Smart Cities, illustrate the limitations of this optimization-centred vision for a city of tomorrow.

The point of departure for the second, administrative perspective is the claim that the current departmental split of city administrations is suboptimal as it hinders comprehensive, long-term development plans. To overcome these shortcomings a new management style is suggested, based on transversal, systemic action and quality assurance. In this context, the term "silo structures" is used as a keyword for illustrating the current situation. However, the idea of silo structures hindering efficient management processes has long been a management issue (see Ensor, 1988), independently from the discussion on Smart Cities. Given this background, one may argue that the Smart City concept is old wine in new bottles and merely picks up well-known arguments from the management domain, without explicitly clarifying in what sense the Smart City can provide an added value (when it comes to the implementation).

More generally, trans- and interdisciplinary working groups often face problems of efficiency, as the participants bring in different belief sets, different procedures and traditions of dealing with problems and speak different "languages". Under these conditions it is far from trivial for those teams to create outcomes that exceed lowest common denominator solutions. Thus, assuming that post-silo working structures will automatically create better outcomes is quite optimistic and there might be many situations where a classical division of labour between city departments will generate more satisfactory solutions.

When it comes to the third, i.e. the governance perspective, a central question is whether the creative, interactive and liveable city as promoted by the Smart City concept can be encouraged in a top-down process. The reality of urban transformations is mostly a complex, very localized intertwining of bottom-up and top-down processes, leading to sometimes unpredicted changes beyond the exclusive control of city administrations. Recently, "grassroots initiatives" (see also Seyfang & Smith, 2007; Seyfang, Park & Smith, 2013) such as transition towns or small scale neighbourhood initiatives such as community gardens have multiplied in many places of Europe, mostly independent from local governments. In this sense, the Smart City concept is paradoxical as it postulates bottom-up innovation but is promoted by European economic and political elites, while the real bottom-up dynamics are occurring without any links to these incumbent actors.

Furthermore, in its aspiration for a "new kind of urbanity" (Steiner & Veel 2014, 290), the Smart City holds characteristics of a utopia. The governance perspective builds on the premise

<sup>2.</sup> Weiser and Brown define a technology as "calm" if it functions at the periphery of attention.

that citizens' (interests and) willingness to contribute to participatory and "co-creative" forms of transformation processes is a given asset which only needs to be activated. However, experience shows that it is mostly well-educated, green and connected segments of society, which respond to these alternative modes of governance. Thus, the social inequalities prevalent in today's cities might be exacerbated, since new forms of participation might not appeal to everyone - particularly not to those with low levels of education, social and cultural capital. Leaving this potential democratic deficit aside, participatory forms of governance are certainly also limited by people's efforts of organizing everyday lives. These time constraints, in turn, concern in particular the well-educated, wealthy and very active social segments with diverse interests and extended social networks. Overall, it might hence be somehow naïve to suppose that citizens are motivated to actively engage in transformation processes and/or dispose of the necessary capabilities to do so.

Finally, transformation processes are essentially political processes, involving veto powers, nested interests and power plays, and requiring very often coalition building and negotiations between different local stakeholders (Meadowcroft, 2009; Shove & Walker, 2007). The Smart City approach with its focus on co-creative, participatory, multi-stakeholder processes appears to be largely ignorant towards these challenges and draws a rather harmonic, uncontroversial picture of urban adaptation processes. Again, this dimension of Smart Cities has much of a utopia, which, in principle, is certainly approved by the vast majority of citizens, but which still needs to go through the litmus test of real life.

# Conclusion

As stated in the introduction to this section, Smart Cities join previous city concepts, which aim to reorganize urban life towards sustainable, low carbon cities. Our analysis revealed that the Smart City concept, as compared to other city concepts, lacks a clearly specified content core. This means that Smart Cities are not limited to a certain sector, but can be applied to diverse fields. The particularity of the concept seems to lie in its conceptualization of change processes. Based on our data, we propose three process-related perspectives: the instrumental perspective (ICT-based data management), the administrative perspective (rules and procedures for transversal city development) and the governance perspective (reorganizing the patterns of interaction between city stakeholders). Thus, the added value of Smart Cities may be the frame they provide for re-thinking the processes of urban transitions. However, as outlined in the discussion, this hypothesis needs to be critically assessed. The relevance and practicability of this concept for real life in cities still needs to be tested.

Our study provided first insights into the perception of Smart Cities and proposed a three-dimensional definition of this city concept. However, the data used for this analysis was quite limited and, in addition, might miss more recent developments. Therefore, an update of the data used for this analysis might yield a more fine-grained understanding of the concept. Furthermore, our study focused on the analysis of experts' perceptions. In the meantime, a first series of cities has started to experiment with Smart City implementations. Further research could thus complement our results by assessing citizens' and other relevant actors' appreciation of Smart Cities and their impact on daily lives.

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