PREFACE

Decoding The Smart City

Introduction

Investment in smart city initiatives and research is growing, presenting new opportunities to analyse their impacts. The operations of smart cities, especially consumption and mobility, are well documented. Smart systems monitor resource use and environmental conditions, such as air, water quality, energy consumption, heating and cooling. Sensors, personal devices, payment and other systems allow governments and vendors to follow traffic patterns, understand how individuals and vehicles move, use public transit, bike share programs, parking and more. Other forms of surveillance trace personal activity and most recently, the spread of COVID-19. These systems have been useful in optimising operations, but little has been done to assess if and how smart cities have changed behaviours and quality of life. At the same time, there may be opportunities to use data generated by these systems to evaluate how smart city projects respond to the goals and needs of a variety of stakeholders.

Smart city is a movement rather than a rigid academic domain, having different viewpoints and being interdisciplinary. The term is often (mis)used for self-congratulatory marketing purposes – which city does not want to label itself as a smart city? Furthermore, the concept has been dynamically developing over time, in line with developments in urban infrastructure. Within the last two decades, the instrumental goal of smart cities was to digitalise analogue processes of city governments ("digital city"), which is largely achieved now, similar to the process of moving from phones to smartphones. This was followed by a concept of "internet of things city" where not only databases but also different urban devices can exchange data in real time. This has not been achieved fully due to business interests and data privacy related challenges. The third wave, currently mainstream in Europe, puts a focus on sustainability with digital solutions helping to attain climate-neutrality in urban environments ("net-zero city"). However, from a societal perspective, citizen perspectives and participation are becoming more central in smart city research, combining technology-related studies with the aim of increasing the wellbeing of urban residents. This fourth wave, still hypothetical, could be labelled as "happy city," or a "people first" vision where design research with different participatory methods and a human-centric approach could have a bigger role.

The dynamics of the smart city as a concept are also reflected in the research methods applied. In more rigid smart city research papers, classical methods have been used, being either qualitative or quantitative. In the case of qualitative methods, interviews with different urban stakeholders have been proven to be a valuable source of data collection. The quantitative methods range from simple surveys to complex machine-learning methods of analysing big data. However, even in the case of very advanced quantitative methods, they are still largely based on statistics with the application of correlation and regression analysis. In any case, data analysis and issues around data privacy and security, has been central to smart city research. There are

plenty of papers published without application of classical (qualitative or quantitative) research methods, which often focus on conceptualisation of smart cities (e.g. based on literature review) and often introduce unique use cases.

New research methods are emerging that balance qualitative and quantitative data, employing human-centred approaches and innovative technologies with the potential to shed light on the social impacts of smart cities. However, many challenges on how to define and evaluate social impacts in smart cities remain. Common challenges include a lack of concrete and comparable performance measures, particularly when social impacts are unexpected or intangible, and a lack of consensus on when, how and from whom to collect data. This is further complicated when addressing issues of inclusion and representation.

Researchers mix methods to achieve a more human-centred focus and to reflect the specific contexts in which the evaluation of smart city projects takes place. Combining smart city technologies and digital engagement tools with approaches based on design research could lead to new understandings of behaviours, values, and quality of life. In addition, innovative methods of collecting data could promote new sustainable urban development.

Overview of the Special Issue

We invited smart city researchers to discuss methods and processes of defining and evaluating social impacts of smart city projects and to reflect on the influence of technological solutions in social dynamics and everyday life. It is important to understand who are the smart city stakeholders and how their roles are defined in the given context. In addition, in this issue, we seek insights on methods of data collection, analysis and impact assessment in smart city projects as well as novel methods for understanding the short and long-term social impacts of smart city projects. By reflecting on these topics, we gain a better understanding of what kind of research and urban challenges are faced in smart city projects, which also point to future research directions.

The three full papers of this special issue cover philosophical considerations of human experiences in smart cities as well as the autonomy and comfortability of smart home co-living inhabitants. In addition, the papers outline frameworks and practical tools for online engagement of citizens and a more-than-human centred design approach.

In the first paper, Eirene Keh, Madalynne Lawrence, Rosanne Sauz, Nastaran Dadashi and Nazanin Homayounfar employ qualitative methods to evaluate of The Ethical Smart City Framework and Toolkit (ETC) developed for the co-design of smart city projects in Canada. The authors discuss the development of the online public engagement tool and its execution, the workshop. The framework outlined in the paper highlights the community's values and considerations in the design, planning, and implementation of smart city projects. The key findings emphasise the importance of equitable inclusion of participants, open participation engagement and consensus building.

Nils Ehnberg and Turkka Keinonen continue in the second paper with human experiences in smart homes, in particular through a qualitative case study of co-living services in apartment hotels. They extend the definition of the smart city into private

and communal domestic spaces, considering not only technology but also the social and economic systems that shape human behaviour in smart homes. They examine tenant experiences through a protection-appreciation space model and discuss the comfortability of the housing service and the autonomy of the residents in a Nordic context. They also identify policy development needs related to smart home technologies in co-living.

A more-than-human perspective in smart cities is discussed by Martin Tomitsch, Joel Fredericks, Dan Vo, Jessica Frawley and Marcus Foth in the third paper. They argue that we need to reconsider human-centred ICT solutions more broadly, recognizing that urban environments are inseparable from nature and taking into account the impacts of digital design projects on local flora and fauna. They describe a framework and principles for developing and employing non-human personas in participatory design processes, using a middle-out collaboration process to increase representation of stakeholders. The method is illustrated through a case study of smart urban furniture in Australia as well as two hypothetical applications to existing smart city projects.

Conclusion

This special issue focuses on the broader understanding of social impacts in a smart city context. The papers outline the complexity of the phenomenon, but also provide models for tackling those challenges both in smart city design processes and the evaluation of their effects on a diversity of stakeholders. The three papers of this issue provide different understandings and experiences of social impact beyond existing smart city indicators.

Recent research highlights connections between environmental and social sustainability in smart cities (Timeus et al. 2020; Trivellato, 2017; Beretta, 2018). By evaluating social impacts, developing assessment methods and tools and, finally, acknowledging the value of assessment in smart city development, we are already on our way to creating more sustainable, smart cities. With this special issue, we want to open up discussion to the variety of approaches to these domains.

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