Classification of Smart City Research - a Descriptive Literature Review and Future Research Agenda

Parul Gupta[1] · Sumedha Chauhan[2] · M. P. Jaiswal[3]

Abstract

Smart City (SC) has been a popular area of research and practice during the last decade. An in-depth examination of the existing literature reviews on SCs divulges the scarcity of studies classifying the literature into multiple themes and identifying the popular and less popular themes based on the number of peer reviewed research papers under respective theme. Hence, in this study, a descriptive literature review of 86 peer-reviewed papers on SCs has been conducted to bridge this gap. The findings demonstrate that themes such as SC services design and management, innovation and technology, and citizens' engagement in design and development of SCs have been extensively studied, whereas, themes such as the social impact, governance and policy, and performance indicators and standards have received moderate attention. However, there are also less popular themes such as the implementation barriers and SC strategy. Further, this study provides a reference source to future researchers. It also delivers valuable information to the policymakers and government bodies, which are actively, involved in the SC projects.

Keywords Smart city · Descriptive literature review · Classification of research themes

1 Introduction

Considering the current trend of movement of people to the cities, it is anticipated that approximately 70% of the world population will reside in the cities by 2050 (Dameri 2014). With the increase in the relocation of people to the urban space, there is rise in various urban problems. Smart cities (SCs) are perceived as the winning strategy because these cities are structured for dealing with the critical urban problems related to pollution, traffic, waste treatment, and energy consumption (Benevolo et al. 2016). Smart technologies in SCs can create opportunities for urban development, which in turn can lead to the proliferation of smart projects that are strategized around environmental, economic, and social challenges of the city (Caird 2018). Therefore, the term "Smart city" has gained considerable attention in the academic, business, and government sectors (Kitchin 2014). Despite gaining popularity among the researchers, SC is yet to be a well-defined concept because of different ideas, experiments, projects, visions, and interpretations associated with it (Vanolo 2014; Hollands 2008).

The concept of SC is associated with various other concepts such as intelligent city, ubiquitous city, knowledge city, information city, and digital city. The focus of these concepts is essentially on the application of Information and Communication Technologies (ICTs) for urban management (Lee and Lee 2014) to enhance the transparency, accountability, effectiveness, and efficiency of transactions between the citizens and the government. Earlier, SCs were considered as the networked places, where the deployment of ICTs into different activities could result in enhancing the standard of living by enabling extensive participation from the communities (Eurocities 2007). However, the SC concept is no longer limited to the diffusion of ICTs only; rather it deals with the necessities and requisites of people and the community as a whole (Albino et al. 2015). For example, SC research provides evidences of application of various SC services like smart transportation (Markopoulou et al. 2013; Velosa and Tratz-Ryan 2014 etc.), smart urban planning ((Batty 2013;

✉ Parul Gupta
  parul.gupta@mdi.ac.in

  Sumedha Chauhan
  sumedha.chauhan@iimrohtak.ac.in

  M. P. Jaiswal
  mpjaiswal@iimsambalpur.ac.in

[1] Management Development Institute (MDI), Gurgaon, India

[2] Indian Institute of Management (IIM), Rohtak, India

[3] Indian Institute of Management (IIM), Sambalpur, India

Chiodi 2016; Kumar et al. 2017 etc.), and artificial intelligence (Chatterjee et al. 2018). According to Bakıcı et al. (2013), "Smart city as a high-tech intensive and advanced city that connects people, information and city elements using new technologies in order to create a sustainable, greener city, competitive and innovative commerce, and an increased life quality." Thus, people, technology, and strategic vision are also crucial components of effective SC programs (Dameri and Rosenthal-Sabroux 2014).

The incessant increase in the importance of the SC concept has made it an exciting area for research, and the policy makers look forward to receive inputs from the scholarly research conducted in this domain. The existing literature reviews on SCs are primarily focussed on comprehending the variations in meanings, intentions, and offerings of SCs (Kummitha and Crutzen 2017), providing an overview of diverse approaches for the governance of SCs (Meijer and Bolívar 2016), exploring the development of the concepts of SC and Digital City as well as examining their similarities and differences (Cocchia 2014), addressing the big data challenges in SCs (Chauhan et al. 2016), identifying the fundamental theories, models, and concepts reflecting the SC phenomenon (Anthopoulos 2015), and understanding the concept of 12 city-categories with SC as one of them (De Jong et al. 2015).

After conducting an in-depth analysis of the existing literature on SC, we not only identified the different research themes related to SC but also ascertained the popularity of these themes. Thus, a rigorous and systematic review of the existing research papers in the SC domain has not only helped us in understanding the current state of SC research but also in uncovering the gap prevalent in these studies. The review of the extant literature will also be useful in commencing new avenues of research for future SC researchers, outlining the width of research on a particular topic, and providing answers to practical questions by understanding the existing research on a specific subject.

The purpose of a descriptive literature review is to reveal an interpretable pattern from the existing literature to produce meaningful results. It follows a systematic process of searching, filtering, and classifying research papers, and its outcome is illustrative of the current state of a particular area of research (King and He 2005). Hence, we have conducted the descriptive literature review of the studies on SC with the primary aims of reviewing research papers published in the last decade (i.e., from 2007 to March 2018) by:

- Clustering major research themes and sub-themes, and
- Identifying the popular and less popular research themes among SC researchers(based on the total no. of research papers published under the respective theme)

This study further seeks to explore the research methods employed in the studies on SC along with an overview of the number of studies (with name of the journals) carried out in different geographic locations.

The research paper has been organized as follows: Section 2 provides an overview of the research methodology. Section 3 provides deeper insights about the research themes by highlighting the research subjects (sub-themes) and the major findings of research works produced in that domain. Section 4 analyses the research on SC in the last decade according to the type of research, methodology employed, and geographic distribution of research. Section 5 presents the concluding remarks and the implications for policy makers. Finally, section 6 provides the directions for future research and limitations of the study.

2 Research Methodology

The first step of a literature review study is to locate the relevant literature by targeting some prominent journals and conferences. Generally, this approach is suitable for topics that have been studied for a long period and have become a well-developed research area (Ngai and Wat 2002). However, for the contemporary concept like SC, the relevant literature is collected by searching online database, and it has become an emerging culture among information systems researchers (Hwang and Thorn 1999; Sabherwal et al. 2006; Petter and McLean 2009). Therefore, the Scopus database was used for locating relevant research papers, as the content of Scopus database comes from more than 5000 publishers and covers over 34,500 peer-reviewed journals in several areas. Hence, the database can be useful for searching and locating a substantial proportion of the published peer-reviewed research papers in the SC domain.

2.1 Filtration of Relevant Papers and Data Extraction

Considering the research objective of this study, we applied the steps prescribed by Kitchenham (2004) to filter the relevant research papers for conducting a systematic literature review and for extracting data from those papers. The process included a number of steps such as development of the protocol, filtration of research papers by title, keywords, and abstract, and extraction of data from the filtered papers. This section discusses the step-by-step process followed for the selection of relevant papers and extraction of data from them.

2.1.1 Development of Protocol

The protocol directs the criteria to search the research papers for review. The developed protocol included the following activities:

- To obtain the research papers, we employed the advanced search option available in the Scopus database. The search was restricted to peer-reviewed research papers published in the last 10 years (2007 to March 2018). The search terms "Smart City" and "Smart Cities" were used with the Boolean "or" operator as these terms have been used by the previous researchers. By doing this, we ensured that all the research papers containing the phrase related to "Smart City" in their title, keywords, and abstract were extracted.
- We considered only the published peer-reviewed papers by selecting the option 'Article' from the options given under the Document Type in the Scopus database. It means that the other document types such as note, book, book chapter, editorial, short survey, review, article in press, and conference paper were not considered. The reason for restricting the review to only the peer-reviewed published research papers was to exercise quality control on the selected research papers for this study. The peer-reviewed research papers undergo a review process which serves the purpose of a screen for quality, thus enabling us to filter research papers meeting a certain level of conceptual as well as methodological rigor (David and Han 2004). Further, Light and Pillemer (1984) suggested that restricting the review to published studies can augment the quality control. Majority of the refereed journals impose strict publication requirements; hence, the process mostly helps in better technical outcome.
- From the Scopus database, we considered only the peer-reviewed research papers that were published in English under the subject area of Business, Management, and Accounting.

The entire database search process helped in accumulating a total number of 167 research papers.

2.1.2 Exclusion Decision Based on Title and Keywords

The research papers obtained from the search protocol were further filtered on the basis of their title and keywords. In this stage of selection, we excluded the research papers whose central theme was not directly related to SC. Two researchers excluded the research papers not seeming relevant for this study. This stage helped in reducing the number of papers to 139 for further screening.

2.1.3 Exclusion Decision Based on Abstract

For filtering the irrelevant research papers, two researchers independently read the abstracts of the papers. Both the researchers subsequently took the opinion of the third researcher to validate the exclusion of research papers and resolve the disagreements. The excluded papers were not explicitly focussed on SC; hence, after this stage, the numbers of papers considered for this study were 96.

2.1.4 Final Selection of Research Papers

For further exclusion, two researchers read the full text of the research papers keeping in mind the following criteria:

a) The core research theme of the paper should be SC.
b) The research objective of the paper should be related to SC (for example; to study the development of SC projects (Mosannenzadeh et al. 2017a, b), to present a novel of SC services (Mainetti et al. 2016; Jin et al. 2016 etc), to study the appropriation process of public urban technologies in smart city (Ylipulli et al. 2014)).

Subsequently, third researcher reviewed and verified the papers the excluded papers for achieving consensus. Finally, 86 research papers were finalized for accomplishing the purpose of this study.

Figure 1 depicts the steps for the selection of research papers along with the number of research papers filtered at each step.

2.1.5 Data Extraction

The data extraction form given in Appendix 1 was used to extract the data from the selected research papers. Two researchers extracted the data independently, which was followed by a comparison of data to highlight the mismatches. The researcher sorted out the identified mismatches to reach a consensus.
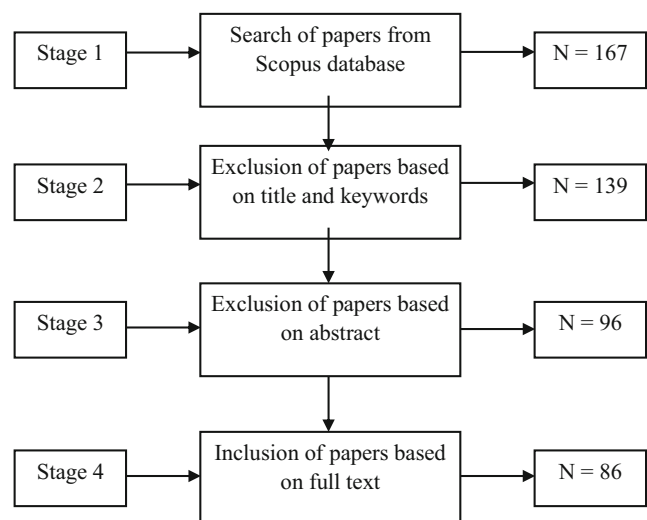

Fig. 1 Selection of research papers

2.2 Research Theme Classification

To systematically provide academic insights on the research themes and their popularity, a classification scheme was developed. Through data extraction, the research objectives and findings of the filtered papers were obtained, which provided the basis of classification of the research themes. A 'bottom-up' approach suggested by grounded theory (Glaser and Strauss 1967) was adopted to categorize the research themes used for this literature analysis. Wolfswinkel et al. (2013) suggested this approach as a rigorous way of reviewing literature. Each research paper was considered under specific sub-themes and then the papers were synthesised under more generic research themes by following the steps mentioned below:

- In the initial step of the process, 86 research papers included in this review study were coded. For this purpose, open coding technique was employed and a wide range of codes were recorded (termed as open codes) to capture the objective of each paper (Strauss and Corbin 1997). For generating open codes, each paper was thoroughly read to understand the research objectives, research problems, conclusions, and results. This step generated 66 open codes.
- In the next step, axial coding was performed to establish the relationship between open codes and to reduced them into 41 sub-themes (Strauss and Corbin 1997). A number of iterations were performed over the open codes to ensure that they represent diversification of the initial coding.
- In the final stage, 41 sub-themes were further grouped under 8 main themes using the affinity analysis. The affinity diagramming (also called as K-J method) informed by Jiro Kawakita was utilized to systematically evaluate and agree on classifications (American_Society_for_Quality 2006). An affinity workshop was conducted to negotiate and agree on the eight main themes of research that were formed by linking the 41 sub-themes under the SC domain. The workshop was attended by two professors from entrepreneurship area, two social entrepreneurs from National Capital Region (NCR) of India and the authors. During this process, some hybrid sub-themes were also found, which could be a part of more than one theme at the same time (e.g. "Stakeholder inclusivity in the development of SCs" sub-theme could be a part "Design and Development of SC and Role of Citizens" and "Role of Governance and Policy in Development of SC" themes). To identify the most appropriate theme for the hybrid sub-themes, the related papers were re-read to get deeper insights and to choose the most appropriate main theme.

The fundamental requirements of each research are reliability and validity. In qualitative research, validity is the sufficient condition for reliability (Lincoln and Guba 1985).

Hence, there is no need to separately test reliability, if the validity of the adopted process is established. This study followed the peer debriefing process for establishing validity. In this process, someone acquainted with the phenomenon assess both the data and research processes (Creswell and Miller 2000; Lincoln and Guba 1985). Therefore, during the filtration of relevant research papers, data extraction, and classification into research themes, we took into consideration the opinion of the third author to ensure the validity of this study.

Figure 2 presents the steps of the classification of research themes in SC domain.

3 Discussion on Main Themes Derived out of Classification Scheme

Table 1 lists the main research themes and sub-themes. The identified main themes are: Innovation and Technology, Citizens' Engagement in Design and Development, Governance and Policy, Service Design and Management, Implementation Barriers, Social Impact, Performance Indicators and Standards, and SC Strategy. The categorization is based on assigning the single most applicable research theme to a group of related sub-themes (e.g., sub-themes 'SC monitoring', 'SC ranking', 'Successful performance of SCs', and 'Modelling the SC performance' were grouped under the main theme 'Performance Indicators and Standards'). As mentioned above, the sub-theme assigned to a research paper was based on its main research focus. It is inevitable that a piece of research may contribute to several sub-themes. However, for maintaining a simplified and structured classification, each research paper was assigned to only one primary sub-theme and main theme.

Thus, 86 reviewed papers were classified under 8 broad themes of research. Figure 3 presents the research themes and the total number of papers grouped under each main theme. This section of the article generates discussion around each main theme that provides insights of research carried under the respective main theme during the last decade.
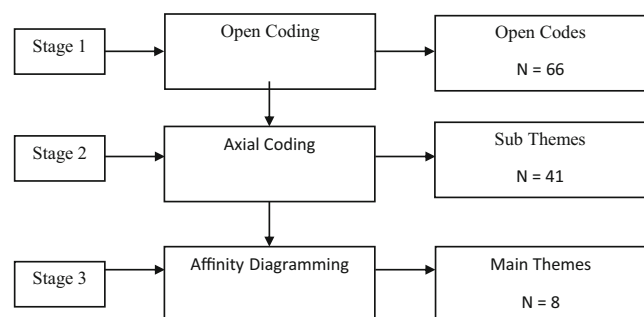

Fig. 2 Extraction of main themes

Table 1 Research themes and sub-themes

| Main theme	Sub-themes
Innovation and technology	Internet of things in SC, ICT for smart urban policy, Role of Big data and data analytics in the growth of SCs, Geo-ICT framework to develop SC, Technical communication, Digital interaction between citizens and smart city services, Smart Energy, Appropriation process of public urban technologies in SCs.
Citizens' engagement in design and development	Stakeholder inclusivity in development of SCs, Citizen engagement in SC planning, Demographics and socioeconomic status of SC citizens, Cultural dynamics.
Governance and policy	Public-private partnerships in SC, SC policy, Infrastructure governance of SCs, Environment and its efficient management on SCs, Urban sustainability in SCs.
Service design and management	Traffic and public transport application in SCs, Smart manufacturing and supply chain designs, SC lighting and parking system, Building creative and inclusive urban space, SC approach in post-disaster environment.
Implementation barriers	Barriers to implementation of SC projects, Challenges of supply of big data, Public perceptions of technology, Trust and surveillance issues in SCs, Challenges posed by policy changes.
Social impact	Entrepreneurial opportunities in SCs, Impact of SC services on small business challenges, Social inclusion and Value creation by SCs, Urban mobility plan in SCs, Nation building by SCs, Knowledge management in SCs.
Performance indicators and standards	SC monitoring, SC ranking, Successful performance of SCs, Modelling the SC performance.
SC strategy	Place branding strategy, SC transformation strategy, public-private alliances in SCs, Intellectual capital management in SCs.

3.1 Innovation and Technology

The papers under this main theme focused on the application of technology breakthroughs like Big data, Internet of things (IoT), Internet, Information and Communication Technology (ICT), Data analytics, and data driven technology, etc., in SC. In the last decade, this theme of research was one of the most popular themes among the SC researchers, as it accounted for 15% of the total research papers reviewed in this study. This theme highlights the role played by innovation and technology in the planning and development of SC, which aims at finding sustainable solution for the existing urban issues by integrating ICTs (Schaffers et al. 2011). However, it is not possible to improve the smartness of the cities through mere assimilation of new technologies into old strategies. SC demands innovation in design thinking, making, and manufacturing. In this context, architectural approaches mostly consider new types of infrastructures, which are effective for the transportation of data, thus allowing cities to perform as living organisms and influence behavior (Markopoulou et al. 2013). The role of technology and innovation in SC planning is one of the most popular research themes in the existing literature.

The development of SC involves the application of numerous technologies and processes (Deakin 2013). The introduction of new forms of cognitive and informational processes such as the Internet-of-Things (IoT), cloud computing, big data management, networks of smart devices and sensors, and embedded systems are leading to a profound revolution in business, government, environment, and transportation (Velosa and Tratz-Ryan 2014). Further, Chatterjee et al. (2018) strongly advocated the combination of IoT with Artificial Intelligence (AI) in 'Smart Machines' for simulating intelligent behavior to arrive at an accurate and reliable decision without human intervention. Crowd-sourcing is a useful and effective tool for innovation in SC (Schuurman et al. 2012). ICTs enable SCs to focus on addressing the critical issues related to traffic, environmental shortcomings, over-development, unavailability of public services, and other forms of inequality (Lee et al. 2014). Some countries which have been actively preparing for the effective promotion of an IoT ecosystem through SC projects include India, China and Singapore. For becoming a proponent in the development of the world's SCs, Singapore is developing the Virtual Singapore project jointly with the French Dassault Systems. The SC projects in India have been considered as a test-bed for IoT technology-based start-ups to test and apply their solutions or services (Choongjae and Youngchul 2018). Smart governance is about roping in the latest technology to extend support for better planning and decision making. Further, smart governance improves the democratic processes and transforms the public service delivery in SCs (Kourtit et al. 2013). SCs offer new high-tech services to their citizens and trigger the identification and development of future technologies for fulfilling the upcoming demands of a city (Lee et al. 2014). However, the overexploitation of technologies has widely been criticized (Haque et al. 2013) because it reduces the role of people as well as their needs and resources (Klimovský et al. 2016).

March (2016) stressed upon the importance of local context in implementing SC by stating that the success of SC implementation revolves around the wider politico-economic context, wherein these technological assemblages are embedded. Therefore, ICT infrastructure though essential, it is not sufficient for SC development (Aina 2017). Participatory service
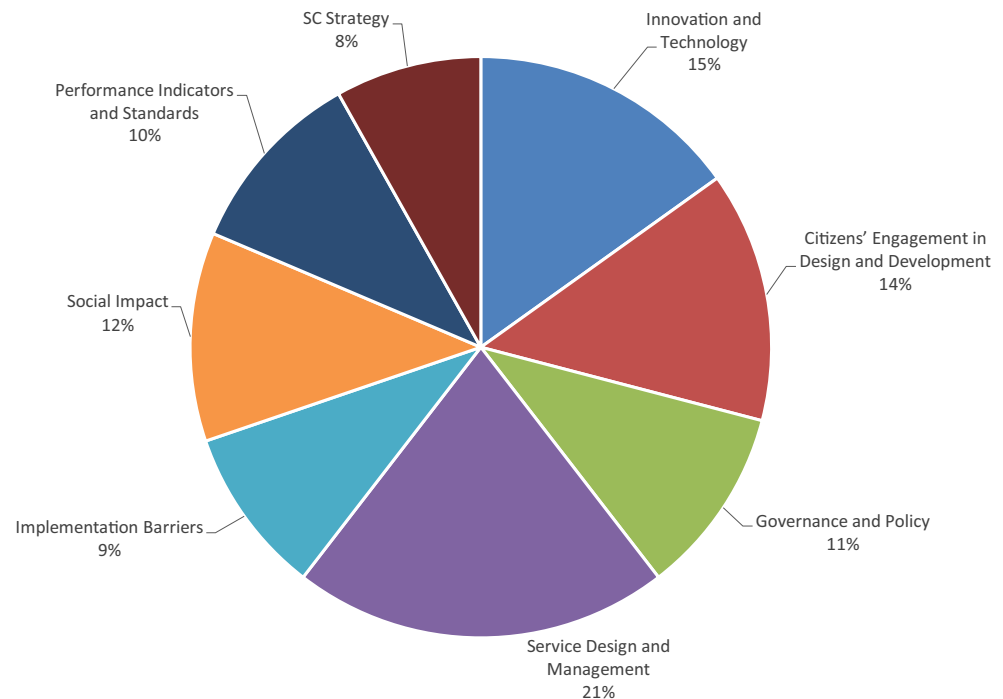
design and open data movement can lead to significantly improvement of civic engagement in the city. However, it is vital to note that the scope and deepness of civic engagement platforms vary according to the human and social capital of the city (Lee et al. 2014). Schiller (2016) argued that a number of physical and social networks scaling phenomena contribute toward urban transition, for example, the income distribution of SC citizens is characterized as a scaling phenomenon that influence the diffusion of technology in the city. The other factor that may influence the technology diffusion in a SC is related to the concern of citizens about data privacy. There should be a strategic balance related to the concern regarding data privacy and the development of open data stimulating application. SC leaders may achieve the strategic balance by conceptualizing a clear direction for public data usage in the cities (Lee et al. 2014).

SCs comprise of the emerging physical infrastructures, ICTs, and institutional settings for innovation and knowledge sharing (Consoli et al. 2017). The semantic web technologies, particularly, Linked Open Data act as enablers for the development of SC applications by facilitating knowledge sharing about the cities on social, technical, and physical systems. The geo-referenced Linked Open Data allows a SC to have a strong economic, technological, social, and ecological impact (Consoli et al. 2017). Scholten et al. (2017) strongly advocated the use of technologically sophisticated, accessible, and user-friendly frameworks such as Geo-ICT to provide valuable information needed for supporting the development of SCs.

The SCs evaluate and demonstrate the value of future internet enabling services, which in turn facilitates open and user-driven innovation (Schaffers et al. 2011). The IoT provides opportunities to cities for capturing huge data from different sensors. The gathered data may be useful to refine the availability and quality of services related to health care, education, and transportation (O'Neill and Peoples 2016). The IoT refers to the application of sensors and new technologies for connecting the virtual world of information technology with the actual world (Scuotto et al. 2016). However, Mital et al. (2017) strongly advocated the need for theoretical extension of the IoT in SCs. The pioneering and imminent internet-based developments related to SCs are equipped with the renewable energies, data management systems, and digital infrastructures. However, SCs also need the industrial ecology for regional innovation, which is presently in place primarily to provide support to the sustainability of city-districts. The probable reason for the same is the lack of cloud computing of an IoT (Deakin and Reid 2016).

The SC projects bring multiple dimensional changes such as business models, institutions, policies, and cultures in urban systems (Komninos et al. 2013; Almirall et al. 2014). Hence, the SC Projects are considered as innovation-niches (Geels 2004; Carvalho 2014). The socio-technical change needs the joint action of actors in urban spaces as a precondition (Healey 1997; Ferraris and Santoro 2014). According to Sandulli et al. (2017), complementarity affects the flow of knowledge among agents participating in the SC Projects. They further stated that compatibility and commitment significantly

influence the joint action of these agents that result in changing the rules and institutions governing the socio-technical change in SCs. Scuotto et al. (2016) suggested that the SC projects should adopt a worldwide open innovation approach, create open innovation units, and delineate specific strategies.

The innovation in SC Policies is not a simple phenomenon of socio-technical change, which is driven by the distributed and amalgamated innovation (Healey 1997; Geels 2004; Yoo et al. 2012). The process of the socio-technical change demands the development of global relationships, which are loosely built in a large number of project networks with heterogeneous partners (Almirall et al. 2014; Saebi and Foss 2015). In fact, the successful implementation of innovative technologies developed for SCs needs reconfiguration of institutions, rules, and practices in the context of volatile networks (Sandulli et al. 2017; Carvalho 2014). Bresciani et al. (2017) asserted that firms in SCs face several challenges and some of these challenges can be excellently addressed via exploratory activity, while other challenges can be dealt with exploitative activity. For ensuring the success of SC projects, private firms must assess three main aspects of partner selection, namely, partner complementarity, commitment, and compatibility (Sandulli et al. 2017).

3.2 Citizens' Engagement in Design and Development

The focus of the role of citizens in the design and development of SC is related to the contributions of citizens. This research domain grabbed the attention of researchers, who wished to explore the engagement of citizens in SC development, their demographics and culture, and the impact of their involvement in the SC development and planning. It is argued that SCs are citizen-centric cities (Lee and Lee 2014), wherein people actively participate in the core activities of city development such as planning, collaborating with multiple stakeholders, integrating new technological applications, and incorporating the multiple urban energy domains. The objective of SCs is to improve the quality of life by optimizing urban energy systems or smart energy city (SEC) for achieving sustainable, rational, and integrated application of new technologies as well as integrating multiple urban energy domains through the collaboration of multiple stakeholders including citizens of SC (Mosannenzadeh et al. 2017a). Similar to other cities, SC also has to work for its inhabitants, i.e., the producers and sellers of goods and services in an SC must cater to the needs of its inhabitants. However, citizens' real desires and aspirations are mostly unknown (Vanolo 2016). Arnstein (1969) attempted to structure the participation of citizens by presenting a ladder of citizen participation comprising of eight rungs: manipulation, therapy, informing, consultation, placation, partnership, delegated power, and citizen control. While explaining the peoples' role in the SC development, Burnes and Towers (2016) articulated that the changes taking place in

the fashion clothing industry clearly indicate how SCs are developing. Though such changes are enabled with the help of technology, they are driven by the requirement to fulfil the needs of the consumers.

Citizen engagement in the development of SC is debatable to garner citizens' opinions so that SCs are designed for meeting the community's needs. Some SCs use social media data analysis for such purpose (Graham 2014). Presently, such debates are relatively absent, and SC literature claims that multinational corporations exercise a lot of control over the current and future development of SCs (Townsend 2013). Though SC projects empower and improve the citizens' lives, the role played by citizens in SC development is often ambiguous. While some visions of the SCs are developed in isolation, active citizens operating as urban sensors guide the other versions (Vanolo 2016). The concerns, interests, and engagement of citizens in the SC projects are gaining gradual importance nowadays. There has been a growing awareness regarding a liveable city that offers sustainable energy supply, good infrastructure, and values citizens' feedback and inputs (Vanolo 2016). However, the feedback from the citizens for active designing of a city is still missing, though it is a crucial way to develop a responsive city (Mueller et al. 2018).

Cardullo et al. (2017) highlighted that the Living Labs (LLs) interventions can effectively deal with the crucial issue of engagement and participation of citizens in SCs development. LLs have been given a key role in the development of SC with the decision of the European Commission to further develop the innovation process in 2006 with users' assistance (Dutilleul et al. 2010). LLs are vital SC strategies for the citizen-centric focus and appeal (Voytenko et al. 2016). LLs approach can facilitate city "ownership," i.e., "an inclusive form of engagement, responsibility, and stewardship" of "what belongs to all" (de Lange and de Wall 2013). Each city generates its informational structure both spatially and architecturally. This informational structure is quite useful in generating a responsive environment, which is configured by the interaction of people, spaces, objects, networks, boundaries, interfaces, and content (Cros 2003). Abella et al. (2017) presented three main actors of the ecosystem of an SC: city as the data provider, citizens as final users of the innovative services deployed in an SC, and agents as the re-users of the data. SC can improve the quality of citizens' life by optimizing and nurturing this ecosystem (Abella et al. 2017).

Recently, researchers have emphasized that citizens' co-production and feedbacks are essential during the planning phase to set the priorities for the development. Citizens' participation in the planning and decision process can enhance the capabilities and functionalities of the government for sustainable development (Kumar et al. 2017). Researchers have argued that rather than concentrating solely on technology or infrastructure, it is important for SC planners to emphasize

more on the needs of people because people's requirements largely impact and shape their environment (de Lange and de Waal 2013; Komninos et al. 2013; Schaffers et al. 2011). Several studies have further supported the view that technology is important, but it merely plays an enabling role (Vlacheas et al. 2013; Yu 2015). Moreover, researchers have highlighted that human capital plays an important role in improving environmental, economic, and social sustainability (Giffinger et al. 2007; Neirotti et al. 2014; Nam and Pardo 2011; Hollands 2008). Angelidou (2014) suggested that technology push and demand pull are the two forces that are shaping the SCs. Technology push factor is usually determined through the utilization of the top-down method as adopted by the corporate entities that treat the cities as their prospective customers. However, demand-pull utilizes the bottom-up approach, which is driven by the needs of the citizens and the city council in the middle. Marek et al. (2017) added to the debate by stating that only the top-down technocratic solutions for the urban problems cannot bring improvement to the quality of life in a SC; rather this approach can misalign the stakeholders' expectations or outcomes.

According to Neirotti et al. (2014), the evolution pattern of a SC is guided by the local factors related to the structural urban variables influencing the digital path of a city and economic development. They further stated that the SC strategy is guided by the geographical location of the city, density of population, and congestion problems associated with it. A high demographic density of large cities can be an important dimension for assessing the SC trends. Further, the large and dense cities offer advantages such as a seamless flow of ideas and knowledge that can be achieved by connecting a large number of people through social interactions (Glaeser and Gottlieb 2006). Demographically, the dense cities have been able to contribute significantly to the development of the local public transportation systems (Jun et al. 2013). In these settings, the cities offer favorable conditions for introducing the SC initiatives. While evaluating the local influences of smart urban characteristics, Caragliu and Del Bo (2012) claimed that cities located in the periphery of Europe as well as some well-positioned urban SCs in the European countries were able to provide higher returns on investment considering the smart urban characteristics. They further stated that the cities equipped with high standards of urban smartness and high level of wealth might even benefit from further investment in smart urban attributes. While studying the impacts of different innovative drivers for city development, Romão et al. (2017) observed that cultural dynamics act as an important determinant of the level of interest shown by new residents of the city. According to Fletcher et al. (2016), the future SC must evolve as a place of truly shared sociality; rather than just being a concentration point for different entertainments or customized convenience.

3.3 Governance and Policy

Many researchers have earlier studied the role of governance and policy in SC development (Marsal-Llacuna and Segal 2016; Tranos and Gertner 2012; Wu et al. 2018). The studies under this theme were primarily concerned about the policy and governance of SCs and covered research areas like the infrastructure governance in SCs, issues related to SC policy and its implementation, and effectiveness of public private partnership among few others. Considering the growing interest of policy makers and business firms in SC development, it is claimed that the idea of SC is a dream of urban planners across the world as well as a subject of research, business initiatives, and policy debates (Borsekova et al. 2018). Urban policies are mostly not drafted after open consultation with citizens and other stakeholders, which results in restriction of public participation (Marsal-Llacuna and Segal 2016). The participation of citizens and other stakeholders is considered lately in policy development. Moreover, citizens and other stakeholders only have the capacity of validating the already framed plans and projects and are generally not given the opportunity to express their opinions and ideas (Marsal-Llacuna and Fabregat-Gesa 2015; Marsal-Llacuna and López-Ibáñez 2014). Marsal-Llacuna and Segal (2016) proposed that citizens must strongly and actively participate in drafting urban policies and regulations to improve the social sustainability of SC plans and projects. They supported the view that it is not possible to formulate and plan government policy for SC in isolation. The SC policy agenda has to be informed and must be addressing the structure of transnational urban networks. Otherwise, the efficiency of such local policies will get adversely affected (Tranos and Gertner 2012). During rapid urbanization, western countries and developing countries face many challenges owing to various urban problems. Some of the problems are related to the irrational conversion of rural land to urban land, loss of lands of the underprivileged groups of farmers, rise in conflicts between the rural and urban areas, escalation of traffic jam, increase in environmental pollution, and intensification of public safety incidents (Bao and Peng 2016; Yu 2015). The United Nations stated in a report that in the developing countries, the government should try to reduce the gaps among people residing in the rural and urban areas by providing quality life and better services in rural areas as it will lead to decrease in the rural-urban migration (UN Habitat 2016). Previous literature further confirms that the global perspective is not taken into consideration in the urban policy arena because the policy-makers tend to neglect the global scale while designing urban policies (Doel and Hubbard 2002; Harvey 1989).

Modern cities face policy issues related to mobility, accessibility, sustainability, and safety. In the context of SC, the concept of smart mobility has increasingly gained importance in the past few years. Mobility policy deals with the supply-

driven as well as customer-oriented issues. Mobility policy facilitates smart connectivity through the digital networks like Internet for virtually connecting people and goods (Kourtit et al. 2017). The smart mobility options are very effective in decreasing stress on valuable city resources as well as in mitigating the consequences of climate change (Cash 2016). Boykova et al. (2016) found that nowadays municipal authorities demonstrate considerably less motivation to modernize the territories for which they are responsible. People further believe that the support mechanisms from regional and federal authorities are not sufficiently effective. The existing system of inter-budgetary relations and the tax system were found to be the primary reasons that result in decreasing the effectiveness of authorities. However, some researchers believe that though government faces challenges such as scarce resources, limited budget, and past problems, it is still capable of converting those challenges into opportunities through the application of new technologies (Wu et al. 2018). ICT infrastructure introduces the smartness in the development process. Therefore, it is necessary to integrate all the public services and municipality functionalities into a city's digital space. For achieving this objective, local government should bring the necessary resources and stakeholders together (Kraus et al. 2015).

The development of SC presents several technical and social challenges to its designers, managers, and citizens. There exists tension between centring the efforts in the provision of services and understanding the role of those services as an orchestrator of organizations' ecosystem that collaborate actively and independently (Almirall et al. 2016). According to Powell et al. (1996), it is essential to have the ability of collaboration in case the required knowledge for solving the problems is complex, growing, and widely diffused. Bifulco et al. (2017) concluded that the LLs are very useful for the development of more inclusive SC projects wherein public actors, private actors, and people can work together in governance and innovation processes to co-create novel services. Snow et al. (2016) emphasized on the need of the leaders for any SC initiative, as the leaders will be able to operationalize a collaborative organizational model in which the city takes the lead to facilitate it's working among stakeholders (businesses, government authorities, academic institutions, and residents). The SC leaders should allow partners of SC venture to operate independently while ensuring that their activities meet the aims of the SC venture (Lee et al. 2012). The SC ventures are capable of bringing political coordination among the different levels of administration as well as in addressing the moral and ethical issues such as transparency, privacy, security, and digital divide (Angelidou 2014). An innovative and integrative perspective for the scientific urban policies can be developed through the application of digital information systems in SCs (Deakin 2013). Though smart urban policies are still evolving, it is certain that such policies are a

prerequisite for managing the large urban agglomerations in an efficient manner (Kourtit et al. 2017).

3.4 Service Design and Management

The researchers examining SCs have thoroughly explored the services offered by SCs to its citizens and even conducted a number of prototype testing experiments in SCs. This theme of research in the SC domain was the most popular in the last decade and included those papers that examined SC services like Traffic application in SCs, Public transport applications in SCs, Supply chain design in SCs, Smart manufacturing, SC lighting system, Smart parking systems, etc. A number of researchers have studied the applications of technology necessary for enhancing the services offered by SCs to the citizens and for overcoming the growing urban problems (Kourtit 2017; Mainetti et al. 2016; Debnath et al. 2014). In the last decade, the rapid growth of urban population has resulted in the growing demand for energy, water, and transportation (UN 2014). The development of SCs was initiated to address these concerns (Hollands 2008). The ICT based tools foster urban development (Caragliu and Del Bo 2012) because they are quite effective in economizing time, making information and services accessible, facilitating citizen participating in urban decision-making processes, improving the mobility of individuals, and saving resources and energy (Kunzmann 2014). With the substantial drop in the proper utilization of the ICT-enabled services in the SCs, the living standards of citizens are also strongly affected (Chatterjee and Kar 2018). The academic literature focusing on the relationship between the SC and SEC usually considers energy as a domain or sub-system or component or an aspect of SC (Nam and Pardo 2011; Lazaroiu and Roscia 2012; Neirotti et al. 2014). Mosannenzadeh et al. (2017a) pointed out that SEC should be considered as a component of SC in relation to the components associated with the economy, government, and community.

The application of IoT in the urban scenario is increasing because it fulfills the government requirement of adopting ICTs in managing public services for the recognition of the SC concept (Zanella et al. 2014). The provision of real-time traffic information and crowd-sourced collective intelligence may enhance the competences of users as well as reframe the meaning of different forms of transportation in the SC (Valdez et al. 2018). Viable mobility attains an efficient and effective transportation system by using the technology (Ilarri et al. 2015; Ali-Vehmas and Casey 2015) and integrating the technological and physical capital with human and societal needs (Garau 2015; Caragliu et al. 2011). Smart mobility refers to the combination of smart future traffic services and smart technology (Chun and Lee 2015). However, the adequate data sharing has still not been realized in the field of mobility (Garau et al. 2016).

The three components of a transportation system supporting each other are sustainability, safety, and smartness. However, sustainability and safety are the indicators of performance not the indicators of smartness of a transportation system (Haque et al. 2013). Some regional studies have benchmarked the cities depending on their smartness in the transportation systems (Giffinger et al. 2007). Giffinger et al. (2010) attempted to rank the medium-sized cities in Europe according to their smartness in mobility along with other dimensions. Debnath et al. (2014) developed an inclusive framework for benchmarking the cities depending on their smartness in the transportation systems and discovered that it is common to provide the real-time traffic and travel related information to travelers in many cities.

Citizen engagement methods in the complex planning and assessment processes exist in many domains, but existence of these methods in the domain of SC transport are rarely reported (Bell et al. 2018). The factor that is crucial and influential in determining the usage of an expanded data landscape is related to the habit of users in using public transportation because it helps in making the public transportation easier and efficient in SC (Farag and Lyons 2012). Further, the citizens' decision of adopting or rejecting technologies is based on their personal needs and earlier experience with similar technologies (Tenhunen 2008). Ylipulli et al. (2014) observed that the adoption of Municipal WiFi and the interactive displays were hampered by their uncertain utility and citizens' apprehension about the interaction with the displays in a public setting.

For enhancing the smartness of a city, the infrastructure including buildings and technology needs to be efficient and user-friendly (Berntzen 2015). The increasing power of SCs can be an enabler in gathering support for 'national' interest projects related to digital infrastructure, sustainable development, SC platforms for interconnected LED street lighting, waste and water management initiatives, smart parking, and other applications (Budde 2015). In the last few years, researchers have shown huge interest in the newly developed revolutionary technologies that add value to the services offered by SCs. In a recent study, Farooq et al. (2017) designed LabVIEW, an application for making the city's traffic services smart. Moreover, Mainetti et al. (2016) presented an innovative IoT-aware smart parking system, which is capable of reducing the traffic congestion. Some researchers have shown their concerns regarding the vulnerable urban transportation systems, particularly the traffic signal control systems (Laszka et al. 2016; Ghena et al. 2014), because it leads to authentication violation and spoofing at both the network and device layers. Li and Shahidehpour (2017) argued that a smart and intelligent regulation of traffic signals at the street intersections causes positive social impact. Further, the networked streetlight system offers opportunities for new SC applications by seamlessly integrating several IoT devices. However, it can also open avenues for cyber-attacks (Jin et al. 2016).

The central concern for most cities in the developing countries is the development of modern infrastructure (Offenhuber and Schechtner 2018). It is a big challenge for local governments to provide sufficient public services to the citizens under the constraints of limited budget and vast spatial and economic inequalities. The review of literature on SC has provided some cases highlighting the digital signage systems as a part of the SC infrastructure. For example, Filipponi et al. (2010) demonstrated the usage of a projection-type signage system as the public alert system in their SC project. Kohno et al. (2011) illustrated the SC solutions by including the signage systems for smart navigation. Takata et al. (2014) established a low-cost "KIT Digital Signage Project", which was easy to introduce in small regional stores around the Kanazawa Institute of Technology (KIT). The researchers claimed that the web-based digital signage system could successfully revitalize the regional shopping districts around KIT. Offenhuber and Schechtner (2018) designed their model of infrastructure governance on the concept of improvisation and concluded that in the placeless and generic rhetoric surrounding, the SC technologies such as sensor networks, data analytics, and drone mapping offer improvisational responses to local conditions.

For making a city smart, the technological application must be employed in smart manufacturing and smart supply chain and logistics. To realize the optimal manufacturing output for meeting the city's demand, the SC production system consisted of logistics, spatially dispersed units, and distributed manufacturing communicate and collaborate over different processes and networks (Kühnle 2010). Kumar et al. (2016) suggested that the SC technologies need to reconfigure the supply chains, as the consolidation of production processes leads to integrated products, which in turn helps in removing the supply chain nodes. The reconfiguration further brings necessary modifications in the supply chain governance because it is essential to have collaboration with supplies (Kumar et al. 2016). Researchers believe that the collection and management of the data, analysis of the data patterns, and optimization of the functioning of the systems are the prerequisites for the successful implementation of SC initiatives (Dirks et al. 2010). The combination of decentralized production networks with the SCs and big data can significantly affect the supply chains/supplier network (Öberg and Graham 2016). The SCs and big data should be combined to bring improvement in the supply chain management processes (Tachizawa et al. 2015).

To ensure the sustainability of SC initiatives, the technological and educational development of the population is very crucial (Majumder and Saha 2014). Further, Majumder and Saha (2014) opined that the conventional education is not enough for fulfilling the requirements of SC. Hence, they stressed upon the next generation educational technology such as active learning to match SC requirements. Though the SC

stakeholders seem to be aware of the opportunities provided by the SC, the widespread implementation of the innovative and advanced SC concepts are kept for future consideration (de Wijs et al. 2016).

3.5 Implementation Barriers

This main theme grouped the research papers which provided an overview of challenges faced by SCs. These papers focused on issues like the barriers for implementing the SC projects, challenges faced by the big data supply, public perceptions of technology, trust and surveillance in SCs, and challenges posed by policy changes, and others. Studies have highlighted that the SC projects encounter challenges pertaining to technology, human, and institution, as these are the core components of the SC concept (Nam and Pardo 2011). The prominent challenges identified in the existing SC literature are related to the optimum use of technology and available data, citizen engagement, trust, surveillance, and financial shortage. These challenges depend on the local political, socio-economical, and environmental attributes of the cities (Frith 2017; Mosannenzadeh et al. 2017b; Klimovský et al. 2016).

Most of the definitions of SC refer to the production of data owing to the application of digital technologies that aim to improve the liveability, efficiency, and safety of cities (Frith 2017). However, certain topics such as citizen engagement have not been considered adequately by SCs of lower socio-economic status. SCs struggle to bring digital economy and advance technology on their priority agenda before attaining a certain level of socio-economic status (Alizadeh 2017). Recently, cities have adopted new role by becoming a data engine for research and management from a data user for urban planning (Batty 2013). SCs have large data centres, where data is collected through the RFID technology, sensors, and legacy data sources, and analyzed using improved analytics (Kourtit 2017). SC projects face serious unforeseen challenges owing to an unprecedented supply of a huge amount of data, and therefore, the smart urban infrastructure development cannot be separated from the big data technologies (Frith 2017). The difficulty in structuring large data sets slows down the growth of SCs. The data projects are generally costly, and many of them are unable for organizing the databases in a suitable way by enabling the accurate data analysis record, which in turn leads to the failure of these projects (Gane et al. 2007). The data gathered are not formatted or organized; hence, organizations need professionals with adequate understandings of metadata and database structure (Söderström et al. 2014). Moreover, at the embryonic stage, the SC projects face challenges in accessing resources, obtaining the license to operate, and developing a socially rich innovation ecosystem (Carvalho and Campos 2013).

An interesting feature of SCs is the collection of location and time aware data from the urban context because these data

enable SCs to offer high-value services to the citizen (Calabrese et al. 2007). However, Calderoni et al. (2012) highlighted the common hurdles in the design of SC applications, which included the problems related to the location-aware and mobile development, infrastructure clustering and security, and spatial data storage. The most noticed barrier in the implementation phase of the SC project is the fragmented ownership of properties. The projects including refurbishment of districts and buildings demonstrate high probability of encountering the problems related to multiple ownerships (Immendoerfer et al. 2014). Mosannenzadeh et al. (2017b) reconfirmed that the limited access to capital, fragmented ownership of properties, cost disincentives, and perception of complicated and expensive interventions with not so positive social or environmental impacts are the most common barriers during the implementation phase of an SC project.

It is essential to understand people's perception of the SC concept, as the local residents participate in the SC projects (Giffinger et al. 2007). However, researchers have further argued that ICT-supported participation is unable to bring significant improvement in the residents' engagement with public affairs (Bannister and Connolly 2012; Ostling 2010). The hurdles impeding the successful implementation of the concept of SCs are primarily the focus on technology rather than the improvement of the services provided, the lack of political leadership, an unclear vision, a dearth of social and economic diversity among stakeholders enhancing the social change in the cities, and an unclear plan (Letaifa 2015).

Further, Klimovský et al. (2016) asserted that people resist usage of the technology beyond the level of their needs and show no interest in using it in the matters of governance, which ultimately prevents the development of SCs. Therefore, to overcome the resistance of people, it is important that the SC planners should be informed about the citizen's needs before developing the SC (Klimovský et al. 2016).

3.6 Social Impact

This research theme included the papers examining and evaluating social impact of SCs. Different sub-themes like the emergence of entrepreneurs in SCs, social inclusion, value creation by SCs, and socio-environmental and politico-economic transformation in SCs, etc. are grouped under this theme. Despite being one of the most relevant areas of research in the SC domain, it could not attract many researchers in the last 10 years. Under this theme, we found only 10 papers out of the total 86 papers reviewed for this study. The goal of SC is to enhance the economic growth and social development via innovations in technology and collaborative dialogues (Sarma and Sunny 2017). However, majority of the smart projects developed in Europe mainly focus on the environment and its management (Manville et al. 2014). However, the overall social impact of these projects needs further

investigation (Beretta 2018). Particularly, it is important to observe whether the SC projects focusing on the environmental issues also lead to socially positive results (Beretta 2018). The SC projects majorly focus on three areas namely environment, mobility, and energy (Beretta 2018). McGibbon et al. (2015) concluded that the basic building blocks of a SC mainly include smart buildings and a segment of an intelligent community, which can play a significant role in achieving environmental objectives such as the reduction of Greenhouse Gas emissions and energy consumption. The benefits of environmental projects in SCs are extended to every social group without any discrimination. However, a true risk of eco-gentrification emerges in the mobility projects. Further, the energy projects do not depict increased access; and therefore, are rarely able to extend the benefits to the poorest (Beretta 2018).

SCs record high productivity, as they carry a relatively high share of knowledge-intensive jobs, output-oriented planning systems, highly educated people, sustainability-oriented initiatives, and creative activities (Torres et al. 2005). Owing to these traits, the SC development significantly affects the society. Furthermore, the SCs particularly demonstrate positive places for class distinction, inclusion or social justice (Hollands 2008). Researchers further differ in their opinion about the objective of technology usage in SCs. Some researchers advocate the usage of technological infrastructure for the economic growth of the city, while others believe that the technological infrastructure should strive to enhance the quality of the public services (Washburn et al. 2010; Anavitarte and Tratz-Ryan 2010). Thus, the ultimate goal of SC is not limited to just economic growth; rather its objective is extended toward the improvement in the quality of life (Mahizhnan 1999).

One of the major goals of SCs is the tackling of youth unemployment (Monzon 2015). During economic crisis, the reinforcement of social cohesion by SC becomes essential for the economy in case the young generation is most affected by the financial disaster (Scarpetta et al. 2010). One of the key features of SCs is increase in new workplace positions, mainly for the youngest generation, who has previously acquired the requisite skills for fitting themselves in these new positions (López-Arranz 2017). The SCs can achieve their goal of offering new work opportunities through the promotion of informal courses in ICTs to increase ICT skills among youth. The availability of ICT infrastructure will always remain a significant part of SCs (Caragliu et al. 2011). Picatoste et al. (2017) observed that the employability in SCs is highly dependent on the computer skills of people. The enhancement of ICTs in SCs needs an entrepreneurial context, which is prepared to face the challenges of required technical knowledge for which there is need of skilled workers. Furthermore, SC plays a crucial role in assisting the avoidance of involuntary migration flows (Visvizi et al. 2017).

The SC services have crucial impact on the operations of the industries operating from its territories. The SC literature confirms that most of the existing studies of SCs concentrated on town planning (Hollands 2008). However, the effective and efficient operations in SCs across different industries is yet to be discussed in details (Allwinkle and Cruickshank 2011; Paroutis et al. 2014).

The top-ranked SC services such as small business support portal, citywide Wi-Fi, open data policies, and e-Governance are capable of addressing the identified small business challenges (Du Plessis and Marnewick 2017). SCs should strongly emphasize on the use of these services for effectively fulfilling the needs of small businesses. The widespread e-participation in urban planning enables the implementation of safer cities through the application of comprehensive planning approach (Chiodi 2016). Operation managers across industries can take the benefit of the incentives available in considering the challenges faced by people and processes as well as the tools and frameworks deployed for strategic and operational decision-making (Li et al. 2016). Cities can match their service offerings with the stakeholders' expectations by adopting an agile development approach (Kakderi 2014). Through the adoption of an agile development approach, a small group of early adopters can test and adopt an incremental development in the city before making these developments functionally available to the people. This approach is helpful for the SC developers in understanding the challenges faced by the stakeholders and in aligning the SC service as per their requirements (Du Plessis and Marnewick 2017).

Moreover, the SC services affect the society by influencing the entrepreneurial activities, as there is a strong relationship between the SC concept and entrepreneurial activities. The favorable conditions and features of SCs help in facilitating entrepreneurial opportunities and niches. These features include the business-led urban development, availability of ICT infrastructure, and presence of creative industries (Richter et al. 2015). Partnerships among the stakeholders are needed for achieving the SC objectives (Sankar and Cumbie 2014). Another value adding and distinctive feature of an SC is the higher-level offering of knowledge resources considering both the quality and quantity as per the requirement of citizens (Salerno et al. 2014). In the context of SC, knowledge management is the core element enabling the development of different application scenarios (Shadbolt et al. 2006).

Proactive communities look toward the comprehensive plans of development of SCs and post-disaster redevelopment (Berke and Campanella 2006). Although numerous benefits are extended through the flow of unilateral external resources from federal agencies and charitable organizations subsequent to a disaster, the communities usually are not benefited, and only the marginal percentage of external resources stay within the communities after the initial influx. Moreover, people

expect an active contribution from SCs during the post-disaster redevelopment phase of a city (Cumbie 2008; Chang 1984).

3.7 Performance Indicators and Standards

Among the SC researchers, the theme performance indicators and standards is a less popular research theme in the last 10 years. It contains 9 papers out of the sample of total 86 papers filtered for review in this study. Under this theme, researchers have studied the SC monitoring systems, SC ranking processes, successful performance of SCs, and modeling of SC performance (Yoo et al. 2016; Marsal-Llacuna et al. 2015; Wang and Xu 2015). For becoming successful, a SC has to comply with several indicators that present a picture of its performance (Kourtit et al. 2012). It is worth noticing that the performance indicators only gauge the end performance and do not prescribe the technical solutions for improvement of the performance (Gibson 1982). Indicators are defined as figures or measures that provide information about a complex phenomenon, which is to be further simplified for comparatively easier understanding and use (International Standardization Organization 2010). Cities are required to have indicators that enable them to set the targets and monitor the progress of their performance (International Standards Organization 2014). The frameworks such as the SCs Wheel and the European SCs Ranking were developed for comparing cities as well as evaluating their development to understand whether it happens in the desired direction (Giffinger et al. 2007). Subsequently, researchers have also presented the assessment systems related to the SC performance for measuring the performance of cities (Lombardi et al. 2012; Lazaroiu and Roscia 2012). The Smart Cities Index is a popular index that provides a framework for ranking cities as per the assessment of the level of services. This Index has a three-tier hierarchy that comprises "Characteristics" at the highest level, "Factors" at the second level, and "Indicators" at the third level. The weight assigned to each indicator depends on the relative importance of that indicator. There are 58 indicators for 6 different characteristics, namely, Living, Economy, People, Governance, Mobility, and Environment (The Smart City Index Study 2018). Researchers have further proposed specific frameworks and indicators to benchmark cities as per the smartness of their transportation systems (Garau et al. 2016; Debnath et al. 2014). Anthopoulos (2017) opined that a city should be able to serve the local needs intelligently because it could then be regarded as smart even without ICTs. Therefore, an efficient service of local needs is a strong performance indicator of SCs.

The use of real-time data for constructing the performance indicators of SC will guarantee the success of the SC initiative (Marsal-Llacuna et al. 2015). Wang and Xu (2015) further stressed upon the collection and analysis of

ampler real-time data to find out a concrete direction for the SC projects. In the era of information excess, there is need for information filters and synthesis; hence, an index summarizing a city's smartness would help in assuring the success of an initiative (Marsal-Llacuna et al. 2015). Though different techniques are available, Marsal-Llacuna et al. (2015) specifically proposed the use of principal component analysis to monitor the SC performance, as Barcelona's LA 21 illustrated its feasibility.

The performance indicators of SC should be measurable, comparable, transferable, and consistent (Kourtit et al. 2012). Kourtit et al. (2012) presented the analysis and ranking of the medium-sized cities in Europe and offered a comparative view on their performance. Their findings were based on six angles, which are social and human capital, competitiveness, transport and ICT, civic participation, quality of life, and natural resources. Furthermore, Giffinger et al. (2007) found the 6 most common SC indicators in their study, which are smart people, smart economy, smart mobility, smart governance, smart living, and smart environment. Lombardi et al. (2012) added to the SC indicators and argued that the main components of a SC are smart governance, smart human capital, smart environment, smart living, and smart economy. Ahvenniemi et al. (2017) corroborated the results of their study with the findings of Monfaredzadeh and Berardi (2015) and stated that the primary focus of SCs is on the human and virtual environment. They observed that in the SC frameworks, there is strong focus on modern technologies and "smartness" instead of a core focus on urban sustainability frameworks. Grossi and Pianezzi (2017) cautioned that emphasis on fancy technological solutions in SC might divert the attention away from the core issues associated with the broad impact of urbanization in cities. Another observation in the study was that the SC frameworks ignore the environmental indicators while taking care of the social and economic aspects. Some of the performance indicators of SCs are their ability to lead the people a high quality of life to people, offer more liveable environment, and provide stronger economic prospects (Camarinha-Matos and Afsarmanesh 2014; Lee et al. 2014). By using the decision tree modelling, Borsekova et al. (2018) identified the size of the city as the most significant indicator that can divide the SCs into size categories with impressive 96.2% correct classification. The SC projects are usually undertaken for the development of new towns; however, attention should also be paid towards implementing projects related to urban regeneration (Yoo et al. 2016). Georgescu et al. (2015) strongly suggested that the cities of emerging countries aspiring to be SCs should give short-term priority to the projects developed for smart economy and smart people, medium-term priority to the projects developed for smart living, smart government, and smart mobility, and long-term priority to the projects developed for smart environment.

3.8 SC Strategy

Under this theme, we considered the papers that examined the strategic aspects of SCs. This theme had only 7 papers published in the last decade and constituted four sub-themes: place branding strategy, SC transformation strategy, public-private alliances in SCs, and intellectual capital management in SCs. Despite a lot of discussion in the past, there is still no agreed definition on SCs. Furthermore, the strategic planning of SCs is still a majorly unexplored field (Hollands 2008; Nam and Pardo 2011). Some researchers have discussed the SC strategies (Paroutis et al. 2014; Kolotouchkina and Seisdedos 2018; Matos et al. 2017) and acknowledged that the SCs are primarily the strategic vision for future, instead of the present reality (Komninos et al. 2013). The strategies studied by the SC researchers include place branding strategy, transformation strategy, public-private strategic alliances, and intellectual capital management strategy.

Picon (2015) found the two most prominent dimensions of smart urban development strategy. One is the intensive usage of ICTs to overcome the challenging issues of urban planning; and the other is the existence of a more holistic scenario with the enhanced inventiveness of citizens, knowledge-based urban development, and collective intelligence of citizens. The SC strategies decide about the ways through which cities would be able to take advantage of technology for developing innovative networks, dynamic economies, and healthy societies (Angelidou 2015). It is believed that cities use ICTs to bring improvement in sustainability, quality, and efficiency of urban services provided by them (Monitor Deloitte 2015). A well-defined strategy behind using technology may provide resolutions to several problems of sustainability and urbanization. The SC strategy of deploying new technologies has become a crucial component for strengthening a positive urban perception (Gonçalves 2016). Paroutis et al. (2014) showcased that SCs can provide strategic option for catering to the corporate needs during recession. Therefore, the SC technology can be reconceptualized as a technical as well as a strategic solution.

The urban spaces have set the priority of being looked as well as considered smart (Townsend 2013). Technology inspired urbanism is gaining importance, and there has been a rising discussion about the role of ICTs in the context of place branding strategies of urban spaces (Govers 2015). Considering the optimum blend of human capital and technology is a crucial strategic issue for SCs that are aiming to be truly vibrant and authentic places (Kolotouchkina and Seisdedos 2018). Both the private and public sectors work together for creating and capturing knowledge, investing in knowledge dissemination and discovering, and creating innovative products and services (Engel 2015). The SC strategies can aim at stimulating knowledge spill over to deal with the challenges of social inequality and digital divide (Kolotouchkina and Seisdedos 2018). Campbell (2012) revealed that the academic circles strongly resist to come out of their urban surface networks in spite of the existence of the national innovation governance. Moreover, many cities have been deployed to foster the interplay between these two factors (Etzkowitz and Leydesdorff 2000). While elaborating the role of the University in the transformation of SC strategy, Grimaldi and Fernandez (2017) matched the innovative services of the SC with the University curricula and revealed that the University under the technological silos faces a big hurdle in equipping the engineers with the skills needed for the implementation of the future services of SCs.

One of the strategic dimensions of SC development is the management of intellectual capital (IC) by SC. IC is one of the crucial components of SC (Nam and Pardo 2011; Neirotti et al. 2014). The governance paradigm capable of empowering the citizens toward contributing to IC can bring sustainability to the city (Ortiz-Fournier et al. 2010). Cities aspiring to be smart have to take certain actions that follow their strategic plans (Nam and Pardo 2011). According to Dameri and Ricciardi (2015), SC being a territorial innovation system shows high compatibility with the idea of another territorial system, i.e., territorial IC, which roots from research, innovation, information, and communication. It is worth noticing that the knowledge-based portfolios of intangible resources produced by the SC initiatives need to be governed by specific managerial tools (Dameri and Ricciardi 2015). Researchers have designed a framework to facilitate the understanding of the process of IC and wealth generation by cities and territorial innovation systems through the utilization of synergies arising from the intelligence that make the cities smarter (Lombardi et al. 2012; Leydesdorff and Deakin 2011). Matos et al. (2017) further supported this argument in their study, wherein they stated that IC and SC are interrelated; and their synergic capability can improve the competitiveness and sustainability of SC. Matos et al. (2017) further argued that SC is an intellectual body owing to two main reasons. First, the SC processes create information about the city by using the data available in the city. Second, SCs are rooted in a system wherein all the leading actors show a rational behavior toward choosing the course of action and pursuing the objectives framed for areas such as transportation, quality of life, economy, and communication. Though Ricciardi and Za (2015) considered SC and IC to be two different communities with different disciplinary backgrounds, yet the views on SC and IC are highly compatible.

Table 2 maps the research themes in SC research domain with their contributors.

Table 2 Mapping research themes with their contributors

Main theme	Contributors
Innovation and development	Aina (2017), Bresciani et al. (2017), Consoli et al. (2017), Mital et al. (2017), Sandulli et al. (2017), Scholten et al. (2017), Deakin and Reid (2016), O'Neill and Peoples (2016), March (2016), Schiller (2016), Scuotto et al. (2016), Lee et al. (2014), Schuurman et al. (2012)
Citizens' engagement in design and development	Mueller et al. (2018), Abella et al. (2017), Cardullo et al. (2017), Kumar et al. (2017), Marek et al. (2017), Romão et al. (2017), Burnes and Towers (2016), Fletcher et al. (2016), Vanolo (2016), Angelidou (2014), Neirotti et al. (2014), Caragliu and Del Bo (2012).
Governance and policy	Wu et al. (2018), Bifulco et al. (2017), Kourtit et al. (2017), Almirall et al. (2016), Boykova et al. (2016), Marsal-Lacuna and Segal (2016), Snow et al. (2016), Kraus et al. (2015), Tranos and Gertner (2012).
Service design and management	Bell et al. (2018), Offenhuber and Schechtner (2018), Valdez et al. (2018), Farooq et al. (2017), Li and Shahidehpour (2017), Mosannenzadeh et al. (2017a), de Wijs et al. (2016), Garau et al. (2016), Jin et al. (2016), Kumar et al. (2016), Mainetti et al. (2016), Öberg and Graham (2016), Budde (2015), Tachizawa et al. (2015), Debnath et al. (2014), Majumder and Saha (2014), Takata et al. (2014), Ylipulli et al. (2014).
Implementation barriers	Alizadeh (2017), Frith (2017), Kourtit (2017), Mosannenzadeh et al. (2017b), Klimovský et al. (2016), Letaifa (2015), Calderoni et al. (2012), McGibbon et al. (2015), Carvalho and Campos (2013).
Social impact	Beretta (2018), Du Plessis and Marnewick (2017), Picatoste et al. (2017), Sankar and Cumbie (2014), Sarma and Sunny (2017), Chiodi (2016), Li et al. (2016), Richter et al. (2015), Salerno et al. (2014).
Performance indicators and standards	Anthopoulos (2017), Ahvenniemi et al. (2017), Grossi and Pianezzi (2017), Yoo et al. (2016), Georgescu et al. (2015), Marsal-Lacuna et al. (2015), Wang and Xu (2015), Lombardi et al. (2012), Kourtit et al. (2012).
SC strategy	Kolotouchkina and Seisdedos (2018), Grimaldi and Fernandez (2017), Angelidou (2015), Dameri and Ricciardi (2015), Matos et al. (2017), Paroutis et al. (2014), Ortiz-Fournier et al. (2010).

4 Analysis of Research in SC Domain in Last Decade

In this section, an overview of the existing state of research in the SC domain, type, and quantity of research papers on SC, and revealed the popular and less popular themes is provided.
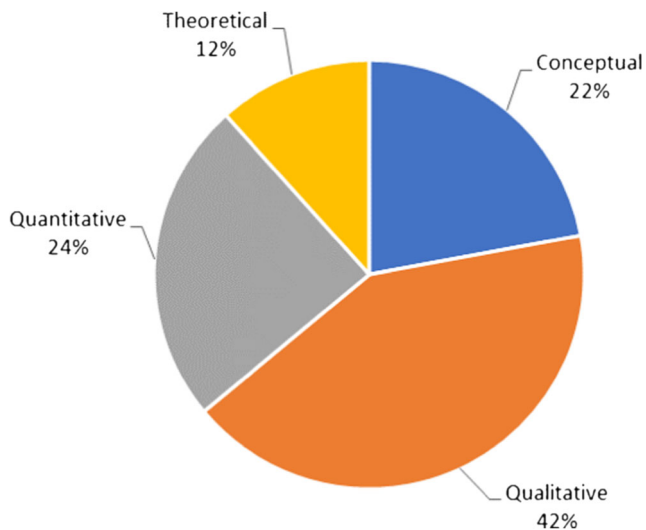
4.1 Type of Research

The reviewed papers were classified as conceptual, theoretical, quantitative, or qualitative. A conceptual paper explains the main points such as key factors, concepts or variables, and presumes the relationships among them (Miles and Huberman 1994). A theoretical paper offers a new positioning of an existing theory (Whetten 1989). A qualitative paper uses the data indicated by texts, images, and behavioral patterns (Nkwi et al. 2001), and a quantitative paper analyses the numeric data with mathematical methods for explaining a phenomenon (Aliaga and Gunderson 2002). From Fig. 4, it is observed that 42% of the total papers reviewed were qualitative in nature. This indicates that majority of the SC researchers have chosen the qualitative research methods such as single and multiple case study, structured interviews, and focus group discussions for their research. It was further observed that the case study method was the most popular methodology among the qualitative researchers, which is followed by focus group studies

and structured interviews. Approximately 70% of the qualitative research employs the case study method, wherein a single case study has been used, whereas in 30% of the studies, the multiple case study method has been employed. Furthermore, 24% of the papers applied the quantitative research methods, wherein researchers have majorly employed mean analysis, structural equation modeling (SEM), and sample t-tests.

4.2 Methodology Level Analysis of Quantitative Papers

Out of total 86 papers reviewed for this study, 21 papers followed the quantitative methodology. Of these papers, there were only 6 papers in which an experiment in SCs was conducted to test the effectiveness of the services offered in SC (e.g., traffic management system, parking systems, street lighting etc) through the technology-enabled prototype developed by them. All of these experiments were reported to be highly successful in improving the quality of life of citizens in SCs. The other popular analytical tool used in 5 quantitative papers was SEM, which measured attractiveness and smartness of SCs depending on the different parameters such as SC services, urban openness, urban smartness, knowledge management, etc. These papers unanimously concluded that urban attractiveness of SCs
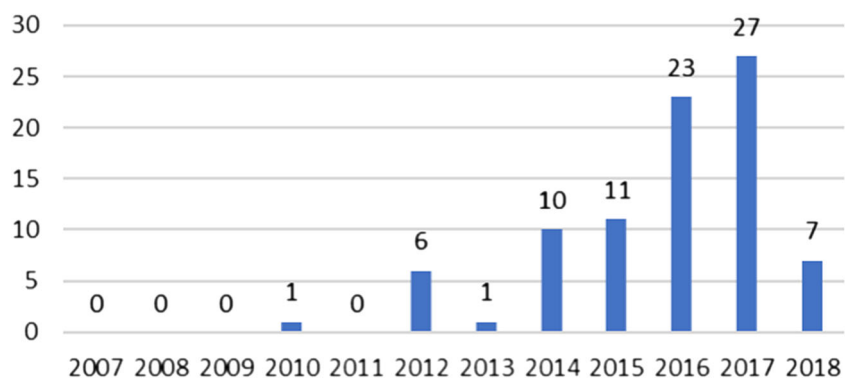
Fig. 4 Type of research paper

growing interest in this field. The papers were further classified based on the distribution of research conducted in different counties as shown in Fig. 6. In the last 10 years, many research studies have collected the data from the European countries. However, multi-continent or multi-country research has produced the second largest number of research papers. The United States of America (USA) has produced the largest number of research papers related to SC, followed by Italy, United Kingdom (UK), and India. Figure 7 presents the distribution of relevant papers for this study in different journals such as "Cities," "Technological Forecasting and Social Change," "Knowledge Management and E-Learning," and "Journal of Cleaner Production".

depends on different factors such as governance in SCs, employability options, technology enabled SC services, etc., and city planners must take note of these factors to improve the quality of life of the citizens. For analyzing the impact of various SC services (e.g. E-government, Employment opportunities, affordable housing, smart mobility etc) on SC performance and urban quality of life, various analytical tools are employed in many quantitative papers. These analytical tools are multi-criteria decision analysis technique, analytical hierarchy process (AHP), Pearson correlation coefficient, principal component analysis, self-organizing map (SOM) analysis, Q methodology, total interpretive structural modelling (TISM), cross-impact matrix, sample t-test, and regression analysis (See Appendix Table 3).

4.3 Distribution of SC Research Papers across the Globe and Journals

In Fig. 5, we provided the year-wise distribution of research papers, which confirms the researchers'

5 Conclusion and Implications

5.1 Conclusion

A descriptive review was conducted to fulfil the objective of this study. The selected research papers were thoroughly analyzed, interpreted, and grouped for identifying the SC research themes and sub-themes. The number of qualitative studies on SC in the last decade has been approximately 42% in comparison to 24% of the quantitative studies. Thus, there exists a gap in the SC literature, which can be bridged by the empirical studies using numeric data and statistical tools to provide interesting insights to the practitioners and academicians.

The researchers exploring SC have shown a keen interest in studying the SC services, innovation and technology, and citizens' engagement in design and development of SC. This is evident from the fact that about 50% of the total papers reviewed in this study focused on these three research themes. Researchers have further explored the governance and policy related issues of SC, implementation barriers, performance

Fig. 5 Number of SC papers published from 2007 – March 2018

Fig. 6 Distribution of research conducted in different countries
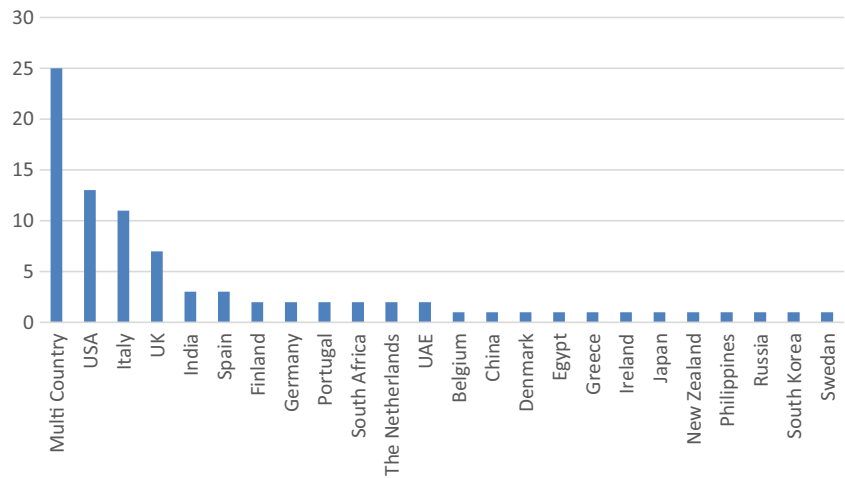
indicators and standards, and social impact of SC development. However, these four research themes have individually accounted for approximately 9%–10% only. The SC strategy as a research theme has been found to be the least popular among the researchers, as only 8% research papers of the sample focused on the SC strategy. This analysis presents the existing state of SC research and further reveals some of the potential areas, particularly the issues related to the SC strategy. The governance and policy related issues, implementation barriers, performance indicators and standards, and social impact of SC development are some other SC research domains in which less number of peer reviewed research work is available than the other domains such as the SC service design and management innovation and technology, and citizens' engagement in design and development.

5.2 Implications for Theory and Practice

We have observed that research interest in the field of SC has gained momentum. From the perspective of theoretical implications, the analysis and discussion presented in this study explains the existing state of research in the SC domain as well as highlighted the most popular and less popular themes of existing SC research on the basis of number of peer reviewed research papers available under respective theme. Thus, this paper provides a quick snapshot of the research conducted in the field of SC in the recent years and focuses on the research gaps to help future researchers in selecting an appropriate theme of research. Further, this study attempts to discover the research methods used by previous researchers and the geographical concentration of data for their research.

The most common research themes in the existing SC papers were SC service design and management, innovation and technology, and citizens' engagement in design and development. However, research themes such as implementation barriers, social impact, SC strategies and performance indicators and standards of SC can be further explored to enrich the literature. The researchers have widely studied the issues related to the role of innovation and technology and citizens' engagement in

Fig. 7 Distribution of papers in the journals publishing at least 2 articles

design and development of SCs. The results of this study may act as a valuable source of information for the future SC researchers, particularly if they want to learn more about the innovations related to services that help in improving smartness of the cities, big data applications in SCs, and ways to ensure stakeholders inclusivity in SC planning. Further, the findings may enable the future SC researchers to find suitable journals for referring and publishing their research papers.

This study offers crucial implications from the practical perspective as well. The findings of this study indicate that various researchers have expressed their serious concerns about the engagement of citizens and stakeholders in the formulation of SC policy, privacy and safety issues in the usage of massive data generated by SCs, and social sustainability of the SC plans. Policymakers must address these issues if the SC initiatives are to produce sustained, appropriate, and relevant outcomes for the citizens and society. The literature review conducted in this study suggest that the government policies should be directed toward mobility and accessibility along with the sustainability and safety issues in SCs (Kourtit et al. 2017). Thus, this study may act as a valuable source of information for the government and policymakers too to identify the thrust areas of government involvement for ensuring the successful performance of SCs.

6 Future Research Directions and Limitations

Figure 3 provides the distribution of research papers based on the main themes and sub-themes, thus revealing the popularity of each research theme. On the basis of the prior discussion, the SC services design and management was the most popular research theme among SC researchers accounting for maximum number of peer reviewed research papers. An in-depth analysis of the papers further uncovers the issues less explored under this research theme too. While SC researchers thoroughly examined the SC services such as smart traffic management, smart parking systems, and smart street lighting; the other SC services such as smart energy management, smart environment management, and smart public service management awaits more attention of SC researchers. The next loaded theme with a significant number of peer reviewed research papers was the role of innovation and technology, and the citizens' engagement in design and development of SC. Some areas that may be further examined by the SC researchers of these domains include the ways of promoting technology adoption by SC citizens, effective citizen engagement in SC planning, and the measurement of citizen's

satisfaction of SC services. Another research theme having good number of peer reviewed papers in last decade was the implementation barriers. However, not many studies compared the barriers encountered faced by the developing and developed countries during implementation stage of SCs. Similarly, a comparative study of the SC citizen demographics and emerging challenges may add relevant and meaningful knowledge to the existing SC literature. Further, research papers highlighting the performance indicators and standards of SCs majorly collected data either from the SCs of Europe or the USA. Thus, future researchers may focus on collecting inputs from SCs of other continents.

Some researchers have shown interest in studying the social impact generated by SC development. However, under this theme, the sub-themes such as social inclusion in SCs, urban polarization, and knowledge management in SCs were covered by a handful of research papers published in last 10 years. Further, not many researchers chose the SC strategy as the primary theme for their studies, and thus, future researchers may contribute to this domain of SC research. Majority of the researchers analyzing the SC strategy have studied SCs in the context of the European countries. Therefore, studies on SCs from other continents can bring a different perspective in this research theme.

Lastly, this study reviewed only the research papers published in the last decade under the SC domain in the Scopus Indexed Journals and falls under Business, Management, and Accounting category. Therefore, major limitation of the present study is that research themes identified may not be collectively exhaustive due to the inclusion criteria adopted for the sample research papers. Further, the research papers published in conference proceedings, articles, and working papers have not been reviewed. Hence, some sub-themes or main research themes might have remained uncovered.

Appendix 1: Data extraction form

- Year of publication of the research paper;
- Name of the Journal in which the research paper was published;
- Bibliographic reference including title, year, author, and source of the research paper;
- Country and continent in which research was conducted;
- Main objective of the research paper;
- Research subject/subjects of the research paper;
- Research methodology; and
- Findings of the research paper.

Appendix 2

Table 3 Methodology level analysis of quantitative papers on SC

Authors	Analytical tools	Study variables
Farooq et al. (2017)	Experimental Study	Performance, Accuracy, Time factor (Working speed), Time estimation for the complete process
Consoli et al. (2017)	Experimental Study	Performance and Accuracy of Prototype
Jin et al. (2016)	Experimental Study	Compromising communication network, Compromising control server, Interrupting service, Information gather/leakage, Vulnerability Assessment
Mainetti et al. (2016)	Experimental Study	Detection system evaluation, Architecture functional validation
Majumder and Saha (2014)	Experimental Study	Effectiveness Performance Assessment Tool, Expectation and Requirement of a SC
Takata et al. (2014)	Experimental Study	Average Watching Time, Audience rate of System, Educational Aspects
Picatoste et al. (2017)	Mean Analysis and Structural Equation Modeling	Computer skills, Employability of youth in SC
Alizadeh (2017)	Mean analysis and descriptive statistics	Geographic distribution, Population size, Population density, Mid-sized cities
Du Plessis and Marnewick (2017)	Multi-Criteria Decision Analysis Technique and Analytical hierarchy process	Regulatory compliance, Government Support, Infrastructure issues, Entrepreneurial support, Workforce issues, Corruption
Klimovský et al. (2016)	Pearson Correlation Coefficient	Use of internet, Attitude of respondents to e-privacy and e-surveillance, Demographic factors (Age, Education, and Employment)
Kourtit et al. (2017)	Principal Component Analysis and Self-Organizing Map Analysis	Advanced Business and Socio-Cultural Attractiveness, Presence of a Broad (public and private) Labour Force and Public Facilities, Presence and Use of Sophisticated E-services, Environmental Sustainability of SC development, Performance
de Wijs et al. (2016)	Q Methodology	Technology, Sustainability, Human and social capital, Governance
Kumar et al. (2017)	Sample t-Tests and Total Interpretive Structural Modeling	Green urban planning, Employment opportunities, Affording opportunities, ICT infrastructure, Citizens co-production and feedback, Affordable housing, Education facilities, Health amenities, Efficient mobility, Shopping facility, Urban quality of life, Sports and entertainment
Schuurman et al. (2012)	t-test, Kolmogorov-Smirnov test	E-government, Housing facility, Mobility, Security, Sport and recreation, Other
Caragliu and Del Bo (2012)	Spatial Autoregressive Local Estimates Models and Spatial Autoregressive Local Estimates - Regression Analysis	Urban smartness, Urban performance
Bresciani et al. (2017)	Structural Equations Modeling	Knowledge management capabilities, Alliance ambidexterity, ICT capabilities
Garau et al. (2016)	Structural Equations Modeling	Measurable indicators (Public transport, Cycle lanes, Bike sharing, Car sharing, Private mobility support system, Public transport support system) and Synthetic indicator (Smart mobility)
Lee et al. (2014)	Structural Equations Modeling	Urban openness, Service innovation, Partnership formation, Urban Proactiveness, SC infrastructure integration, SC governance
Romão et al. (2017)	Structural Equations Modeling	Performance Determinants of Urban Attractiveness, Terms of resident population, International tourism demand, Economy, Research and Development, Cultural interaction, Livability, Environment, Accessibility
Mital et al. (2017)	Structured Equation Modeling	Perceived usefulness, Perceived ease of use, Attitude, Behavioural Intention
Lombardi et al. (2012)	Analytic Network Process	Performance of SCs, Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Living, Smart Governance

References

Abella, A., Ortiz-De-Urbina-Criado, M., & De-Pablos-Heredero, C. (2017). A model for the analysis of data-driven innovation and value generation in smart cities' ecosystems. *Cities, 64*, 47–53.

Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017). What are the differences between sustainable and smart cities? *Cities, 60*, 234–245.

Aina, Y. A. (2017). Achieving smart sustainable cities with GeoICT support: The Saudi evolving smart cities. *Cities, 71*, 49–58.

Albino, V., Berardi, U., & Dangelico, R. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology, 22*(1), 3–21.

Aliaga, M., & Gunderson, B. (2002). *Interactive statistics*. Virginia, America, Pearson Education.

Ali-Vehmas, T., & Casey, T. R. (2015). Examining possible value system transitions: The case of smart mobility services. In *Proceedings of 48th Hawaii International Conference on System Sciences* (pp. 4366–4375). Available at: https://doi.org/10.1109/HICSS.2015.523.

Alizadeh, T. (2017). An investigation of IBM's smarter cites challenge: What do participating cities want? *Cities, 63*, 70–80.

Allwinkle, S., & Cruickshank, P. (2011). Creating smarter cities, an overview. *Journal of Urban Technology, 18*(2), 1–16.

Almirall, E., Lee, M., & Majchrzak, A. (2014). Open innovation requires integrated competition-community ecosystems: Lessons learned from civic open innovation. *Business Horizons, 57*(3), 391–400.

Almirall, E., Wareham, J., Ratti, C., Conesa, P., Bria, F., Gaviria, A., & Edmondson, A. (2016). Smart cities at the crossroads: New tensions in city transformation. *California Management Review, 59*(1), 141–152.

American_Society_for_Quality (2006). Idea Creation Tools - Affinity Diagrams. Available at: http://asq.org/learn-aboutquality/idea-creation-tools/overview/affinity.html.

Anavitarte, L., & Tratz-Ryan, B. (2010). Market insight: 'Smart Cities' in emerging markets. Available at: http://www.gartner.com/id=1468734.

Angelidou, M. (2014). Smart city policies: A spatial approach. *Cities, 41*, S3–S11.

Angelidou, M. (2015). Smart cities: A conjuncture of four forces. *Cities, 47*, 95–106.

Anthopoulos, L. G. (2015). Understanding the smart city domain: A literature review. In *Transforming city governments for successful smart cities* (pp. 9-21). Springer International Publishing.

Anthopoulos, L. (2017). Smart utopia VS smart reality: Learning by experience from 10 smart city cases. *Cities, 63*, 128–148.

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners, 35*(4), 216–224.

Bakıcı, T., Almirall, E., & Wareham, J. (2013). A smart city initiative: The case of Barcelona. *Journal of the Knowledge Economy, 4*(2), 135–148.

Bannister, F., & Connolly, R. (2012). Forward to the past: Lessons for the future of e-government from the story so far. *Information Polity, 17*(3, 4), 211–226.

Bao, H., & Peng, Y. (2016). Effect of land expropriation on land-lost farmers' entrepreneurial action: A case study of Zhejiang Province. *Habitat International, 53*, 342–349.

Batty, M. (2013). *The new science of cities*. Cambridge: MIT Press.

Bell, S., Benatti, F., Edwards, N. R., Laney, R., Morse, D. R., Piccolo, L., & Zanetti, O. (2018). Smart cities and M[3]: Rapid research, meaningful metrics and co-design. *Systemic Practice and Action Research, 31*(1), 27–53.

Benevolo, C., Dameri, R. P., & D'Auria, B. (2016). Smart mobility in smart city. In *Empowering Organizations* (pp. 13-28). Springer international publishing.

Beretta, I. (2018). The social effects of eco-innovations in Italian smart cities. *Cities, 72*, 115–121.

Berke, P. R., & Campanella, T. J. (2006). Planning for postdisaster resiliency. *The Annals of the American Academy of Political and Social Science, 604*(1), 192–207.

Berntzen, L. (2015). Smart Cities, Smart Buildings, Smart Users. Keynote, Digital World 2015, Lisbon, Portugal, 24 February 2015.

Bifulco, F., Tregua, M., & Amitrano, C. C. (2017). Co-governing smart cities through living labs. Top evidences from EU. *Transylvanian Review of Administrative Sciences, 13*(50), 21–37.

Borsekova, K., Koróny, S., Vaňová, A., & Vitálišová, K. (2018). Functionality between the size and indicators of smart cities: A research challenge with policy implications. *Cities, 78*, 17–26.

Boykova, M., Ilina, I., & Salazkin, M. (2016). The Smart City approach as a response to emerging challenges for urban development. *Foresight and STI Governance, 10*(3), 65–75.

Bresciani, S., Ferraris, A., & Del Giudice, M. (2017). The management of organizational ambidexterity through alliances in a new context of analysis: Internet of things (IoT) smart city projects. *Technological Forecasting and Social Change, 136*, 331–338. https://doi.org/10.1016/j.techfore.2017.03.002.

Budde, P. (2015). Nation building now in the hands of cities and communities. *Australian Journal of Telecommunications and the Digital Economy, 3*(2). https://doi.org/10.18080/ajtde.v3n2.9.

Burnes, B., & Towers, N. (2016). Consumers, clothing retailers and production planning and control in the smart city. *Production Planning and Control, 27*(6), 490–499.

Caird, S. (2018). City approaches to Smart City evaluation and reporting: Case studies in the United Kingdom. *Urban Research and Practice, 11*(2), 159–179.

Calabrese, F., Kloeckl, K., & Ratti, C. (2007). Wikicity: Real time urban environments. *IEEE Pervasive Computing, 6*(3), 52–53.

Calderoni, L., Maio, D., & Palmieri, P. (2012). Location-aware mobile services for a smart city: Design, implementation and deployment. *Journal of Theoretical and Applied Electronic Commerce Research, 7*(3), 74–87.

Camarinha-Matos, L., & Afsarmanesh, H. (2014). Collaborative Systems for Smart Environments: Trends and challenges. In *Collaborative Systems for Smart Networked Environments* (pp. 3-15). Springer International Publishing.

Campbell, T. (2012). *Beyond smart cities: How cities network, learn and innovate*. London: Earthscan.

Caragliu, A., & Del Bo, C. (2012). Smartness and European urban performance: Assessing the local impacts of smart urban attributes. *Innovation: The European Journal of Social Science Research, 25*(2), 97–113.

Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. *Journal of urban technology, 18*(2), 65–82.

Cardullo, P., Kitchin, R., & Di Feliciantonio, C. (2017). Living labs and vacancy in the neoliberal city. *Cities, 73*, 44–50.

Carvalho, L. (2014). Smart cities from scratch? A socio-technical perspective. *Cambridge Journal of Regions, Economy and Society, 8*(1), 43–60.

Carvalho, L., & Campos, J. B. (2013). Developing the PlanIT Valley: A view on the governance and societal embedding of u-eco city pilots. *International Journal of Knowledge-Based Development, 4*(2), 109–125.

Cash, C. (2016). Good governance and strong political will: Are they enough for transformation? *Land Use Policy, 58*, 545–556.

Chang, S. (1984). Do disaster areas benefit from disasters? *Growth and Change., 15*(4), 24–31.

Chatterjee, S., & Kar, A. K. (2018). Effects of successful adoption of information technology enabled services in proposed smart cities of India: From user experience perspective. *Journal of Science and Technology Policy Management, 9*(2), 189–209.

Chatterjee, S., Kar, A. K., & Gupta, M. P. (2018). Success of IoT in smart cities of India: An empirical analysis. *Government Information Quarterly, 35*(3), 349–361.

Chauhan, S., Agarwal, N., & Kar, A. K. (2016). Addressing big data challenges in smart cities: A systematic literature review. *Info, 18*(4), 73–90.

Chiodi, S. I. (2016). Crime prevention through urban design and planning in the smart city era: The challenge of disseminating CP-UDP in Italy: Learning from Europe. *Journal of Place Management and Development, 9*(2), 137–152.

Choongjae, C., & Youngchul, S. (2018). The 4th industrial revolution strategy and cooperation in China, India and Singapore. *World Economy Brief, 8*(14), 1–4.

Chun, B. T., & Lee, S. H. (2015). Review on ITS in smart city. *Advanced Science and Technology Letters, 98*, 52–54.

Cocchia, A. (2014). Smart and digital city: A systematic literature review. In *Smart city* (pp. 13-43). Springer International Publishing.

Consoli, S., Presutti, V., Recupero, D. R., Nuzzolese, A. G., Peroni, S., & Gangemi, A. (2017). Producing linked data for smart cities: The case of Catania. *Big Data Research, 7*, 1–15.

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory Into Practice, 39*(3), 124–130.

Cros, S. (2003). The Metapolis dictionary of advanced architecture: City, technology and society in the Information Age, *Actar*.

Cumbie, B. A. (2008). The role of information technology in effective recovery and aiding sustainability of coastal regions after a disaster. (doctoral dissertation), available from dissertations and theses: Full text database. (UMI no. 3317306).

Dameri, R. P. (2014). Comparing smart and Digital City: Initiatives and strategies in Amsterdam and Genoa. Are they digital and/or smart? In *Smart city* (pp. 45-88). Springer International Publishing.

Dameri, R. P., & Ricciardi, F. (2015). Smart city intellectual capital: An emerging view of territorial systems innovation management. *Journal of Intellectual Capital, 16*(4), 860–887.

Dameri, R. P., & Rosenthal-Sabroux, C. (2014). Smart City and value creation. In *Smart City* (pp. 1-12). Springer International Publishing.

David, R. J., & Han, S. K. (2004). A systematic assessment of the empirical support for transaction cost economics. *Strategic Management Journal, 25*(1), 39–58.

De Jong, M., Joss, S., Schraven, D., Zhan, C., & Weijnen, M. (2015). Sustainable–smart–resilient–low carbon–eco–knowledge cities; making sense of a multitude of concepts promoting sustainable urbanization. *Journal of Cleaner Production, 109*, 25–38.

de Lange, M., & de Wall, M. (2013). Owning the city: New media and citizen engagement in urban design. *First Monday, 18*(11). Available at: http://firstmonday.org/ojs/index.php/fm/article/view/4954/3786.

de Wijs, L., Witte, P., & Geertman, S. (2016). How smart is smart? Theoretical and empirical considerations on implementing smart city objectives–a case study of Dutch railway station areas. *Innovation: The European Journal of Social Science Research, 29*(4), 424–441.

Deakin, M. (2013). *Smart cities: Governing, modelling and analysing the transition*. London: Routledge.

Deakin, M., & Reid, A. (2016). Smart cities: Under-gridding the sustainability of city-districts as energy efficient-low carbon zones. *Journal of Cleaner Production, 173*, 39–48.

Debnath, A. K., Chin, H. C., Haque, M. M., & Yuen, B. (2014). A methodological framework for benchmarking smart transport cities. *Cities, 37*, 47–56.

Dirks, S., Gurdgiev, C., & Keeling, M. (2010). Smarter cities for smarter growth: How cities can optimize their Systems for the Talent-based Economy. IBM Global Business Services, Somers, NY. Available at: https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=GBE03348USEN.

Doel, M., & Hubbard, P. (2002). Taking world cities literally: Marketing the city in a global space of flows. *City, 6*(3), 351–368.

Du Plessis, H., & Marnewick, A. L. (2017). A roadmap for smart city services to address challenges faced by small businesses in South Africa. *South African Journal of Economic and Management Sciences, 20*(1), 1–18.

Dutilleul, B., Birrer, F. A., & Mensink, W. (2010). Unpacking European living labs, Analysing innovation's social dimensions. *Central European Journal of Public Policy, 4*(1), 60–85.

Engel, J. S. (2015). Global clusters of innovation: Lessons from Silicon Valley. *California Management Review, 57*(2), 36–65.

Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From National Systems and "mode 2" to a triple Helix of university–industry–government relations. *Research Policy, 29*(2), 109–123.

Eurocities (2007). Knowledge society. Available at: www.eurocities.org/main.php.

Farag, S., & Lyons, G. (2012). To use or not to use? An empirical study of pre-trip public transport information for business and leisure trips and comparison with car travel. *Transport Policy, 20*, 82–92.

Farooq, A., Alhalabi, W., & Alahmadi, S. M. (2017). Traffic systems in smart cities using LabVIEW. *Journal of Science and Technology Policy Management, 9*, 242–255. https://doi.org/10.1108/JSTPM-05-2017-0015.

Ferraris, A., & Santoro, G. (2014). Come dovrebbero essere sviluppati i progetti di Social Innovation nelle Smart City? Un'analisi Comparativa. *Impresa Progetto-Electronic Journal of Management, 4*(1), 1–15.

Filipponi, L., Vitaletti, A., Landi, G., Memeo, V., Laura, G., & Pucci, P. (2010). Smart city: An event driven architecture for monitoring public spaces with heterogeneous sensors. In *Proceeding of 4th International Conference on Sensor Technologies and Applications* (pp. 281-286), Venice, Italy.

Fletcher, G., Greenhill, A., Griffiths, M., Holmes, K., & McLean, R. (2016). Creatively prototyping the future high street. *Production Planning and Control, 27*(6), 477–489.

Frith, J. (2017). Big data, technical communication, and the Smart City. *Journal of Business and Technical Communication, 31*(2), 168–187.

Gane, N., Venn, C., & Hand, M. (2007). Ubiquitous surveillance: Interview with Katherine Hayles. *Theory, Culture and Society, 24*(7–8), 349–358.

Garau, C. (2015). Perspectives on cultural and sustainable rural tourism in a smart region: The case study of Marmilla in Sardinia (Italy). *Sustainability, 7*(6), 6412–6434.

Garau, C., Masala, F., & Pinna, F. (2016). Cagliari and smart urban mobility: Analysis and comparison. *Cities, 56*, 35–46.

Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research Policy, 33*(6–7), 897–920.

Georgescu, M., Păvăloaia, V. D., Popescul, D., & ugui, A. (2015). The race for making up the list of emergent smart cities. An eastern European country's approach. *Transformations in Business and Economics, 14*(2A), 42–59.

Ghena, B., Beyer, W., Hillaker, A., Pevarnek, J., & Halderman, J. A. (2014). Green lights forever: Analyzing the security of traffic infrastructure. In *Proceedings of the 8th USENIX conference on Offensive Technologies* (pp. 7-7). USENIX association.

Gibson, E. J. (1982). *Working with the performance approach in building*, Rotterdam: International Council for Research and Innovation in Building and Construction. Report No. 64.

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N., & Meijers, E., (2007). Smart cities: Ranking of European medium-sized cities. Vienna: Centre of Regional Science. Available at: http://www.smart-cities.eu/download/smart_cities_final_report.pdf. Accessed on 2 April 2011.

Giffinger, R., Haindlmaier, G., & Kramar, H. (2010). The role of rankings in growing City competition. *Urban Research and Practice, 3*(3), 299–312.

Glaeser, E., & Gottlieb, J. D. (2006). Urban resurgence and the consumer city. *Urban Studies, 43*(8), 1275–1299.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine.

Gonçalves, C. S. (2016). Information, communication and the digital city. In G. Amayo Caldwell, C. H. Smith, & E. M. Clift (Eds.), *Digital Futures and the city of today. New Technologies and Physical Spaces*. Bristol/Chicago: Intellect.

Govers, R. (2015). Rethinking virtual and online place branding. In *Rethinking place branding: Comprehensive brand development for cities and regions* (pp. 73-83). Springer International Publishing.

Graham, M. (2014). Government communication in the digital age: Social media's effect on local government public relations. *Public Relations Inquiry, 3*(3), 361–376.

Grimaldi, D., & Fernandez, V. (2017). The alignment of university curricula with the building of a Smart City: A case study from Barcelona. *Technological Forecasting and Social Change, 123*, 298–306.

Grossi, G., & Pianezzi, D. (2017). Smart cities: Utopia or neoliberal ideology? *Cities, 69*, 79–85.

Haque, M. M., Chin, H. C., & Debnath, A. K. (2013). Sustainable, safe, smart—Three key elements of Singapore's evolving transport policies. *Transport Policy, 27*, 20–31.

Harvey, D. (1989). From managerialism to entrepreneurialism: The transformation in urban governance in late capitalism. *Geografiska Annaler: Series B, Human Geography, 71*(1), 3–17.

Healey, P. (1997). *Collaborative planning: Shaping places in fragmented societies*. London: Macmillan.

Hollands, R. G. (2008). Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? *City, 12*(3), 303–320.

Hwang, M. I., & Thorn, R. G. (1999). The effect of user engagement on system success: A meta-analytical integration of research findings. *Information & Management, 35*(4), 229–236.

Ilarri, S., Stojanovic, D., & Ray, C. (2015). Semantic management of moving objects: A vision towards smart mobility. *Expert Systems with Applications, 42*(3), 1418–1435.

Immendoerfer, A., Winkelmann, M., & Stelzer, V. (2014). Energy solutions for smart cities and communities recommendations for policy makers. *European Union*. https://doi.org/10.2833/17772.

International Standardization Organization (2010). ISO 21929:2010-Building construction – Sustainability in building construction – Sustainability indicators. Part 1 - Framework for the development of indicators for buildings and core indicators.

International Standards Organization (2014). ISO 37120:2014-Sustainable development of communities - Indicators for city services and quality of life.

Jin, D., Hannon, C., Li, Z., Cortes, P., Ramaraju, S., Burgess, P., Buch, N., & Shahidehpour, M. (2016). Smart street lighting system: A platform for innovative smart city applications and a new frontier for cyber-security. *The Electricity Journal, 29*(10), 28–35.

Jun, M. J., Kim, J. I., Kwon, J. H., & Jeong, J. E. (2013). The effects of high-density suburban development on commuter mode choices in Seoul, Korea. *Cities, 31*, 230–238.

Kakderi, C., (2014). Birmingham's smart city roadmap, urban and regional innovation research. Available at: http://www.urenio.org/2014/03/04/birminghams-smart-city-roadmap/.

King, W. R., & He, J. (2005). Understanding the role and methods of meta-analysis in IS research. *Communications of the Association for Information Systems, 16*(1), 664–686.

Kitchenham, B. A. (2004). *Procedures for Performing Systematic Reviews*. Joint technical report, computer science department, Keele University (TR/SE0401) and National ICT Australia ltd. (0400011T.1). Available at: http://www.ifs.tuwien.ac.at/~weippl/systemicReviewsSoftwareEngineering.pdf. Accessed on 11 February 2018.

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal, 79*(1), 1–14.

Klimovský, D., Pinterič, U., & Šaparnienė, D. (2016). Human limitations to introduction of smart cities: Comparative analysis from two CEE cities. *Transylvanian Review of Administrative Sciences, 12*(47), 80–96.

Kohno, M., Masuyama, Y., Kato, N., & Tobe, A. (2011). Hitachi's smart city solutions for new era of urban development. *Hitachi Review., 60*(2), 79–88.

Kolotouchkina, O., & Seisdedos, G. (2018). Place branding strategies in the context of new smart cities: Songdo IBD, Masdar and Skolkovo. *Place Branding and Public Diplomacy, 14*(2), 115–124.

Komninos, N., Pallot, M., & Schaffers, H. (2013). Special issue on smart cities and the future internet in Europe. *Journal of the Knowledge Economy, 4*(2), 119–134.

Kourtit, K. (2017). Towards a sustainable i-city: Intelligent transition management of digital places. *Quality Innovation Prosperity, 21*(1), 151–164.

Kourtit, K., Nijkamp, P., & Arribas, D. (2012). Smart cities in perspective–a comparative European study by means of self-organizing maps. *Innovation: The European Journal of Social Science Research, 25*(2), 229–246.

Kourtit, K., Deakin, M., Caragliu, A., Del Bo, C., Nijkamp, P., Lombardi, P., & Giordano, S. (2013). *An advanced triple helix network framework for smart cities performance* (*Smart cities: Governing, modelling and analysing the transition*) (pp. 196–216). New York: Routledge.

Kourtit, K., Nijkamp, P., & Steenbruggen, J. (2017). The significance of digital data systems for smart city policy. *Socio-Economic Planning Sciences, 58*, 13–21.

Kraus, S., Richter, C., Papagiannidis, S., & Durst, S. (2015). Innovating and exploiting entrepreneurial opportunities in smart cities: Evidence from Germany. *Creativity and Innovation Management, 24*(4), 601–616.

Kühnle, H. (2010). *Distributed manufacturing: Paradigm, concepts, solutions and examples*. London: Springer Verlag.

Kumar, M., Graham, G., Hennelly, P., & Srai, J. (2016). How will smart city production systems transform supply chain design: A product-level investigation. *International Journal of Production Research, 54*(23), 7181–7192.

Kumar, H., Singh, M. K., Gupta, M. P., & Madaan, J. (2017). Smart neighbourhood: A TISM approach to reduce urban polarization for the sustainable development of smart cities. *Journal of Science and Technology Policy Management, 9*, 210–226. https://doi.org/10.1108/JSTPM-04-2017-0009.

Kummitha, R. K. R., & Crutzen, N. (2017). How do we understand smart cities? An evolutionary perspective. *Cities, 67*, 43–52.

Kunzmann, K. R. (2014). Smart cities: a new paradigm of urban development. *Crios, 1*, 9–20.

Laszka, A., Potteiger, B., Vorobeychik, Y., Amin, S., & Koutsoukos, X. (2016). Vulnerability of transportation networks to traffic-signal tampering. In *Proceedings of the 7th International Conference on Cyber-Physical Systems*, Vienna, Austria.

Lazaroiu, G., & Roscia, M. (2012). Definition methodology for the smart cities model. *Energy, 47*(1), 326–332.

Lee, J., & Lee, H. (2014). Developing and validating a citizen-centric typology for smart city services. *Government Information Quarterly, 31*, S93–S105.

Lee, M., Bakici, T., Almirall, E., & Wareham, J. (2012). New governance models towards an open internet ecosystem for smart connected European cities and regions. In *Open innovation, directorate-general for the information society and media, European commission* (pp. 91-93).

Lee, J. H., Hancock, M. G., & Hu, M. C. (2014). Towards an effective framework for building smart cities: Lessons from Seoul and San Francisco. *Technological Forecasting and Social Change, 89*, 80–99.

Letaifa, S. B. (2015). How to strategize SMART cities: Revealing the SMART model. *Journal of Business Research, 68*(7), 1414–1419.

Leydesdorff, L., & Deakin, M. (2011). The triple helix model and the meta-stabilization of urban technologies in smart cities. *Journal of Urban Technology, 18*(2), 53–63.

Li, Z., & Shahidehpour, M. (2017). Deployment of cybersecurity for managing traffic efficiency and safety in smart cities. *The Electricity Journal, 30*(4), 52–61.

Li, F., Nucciarelli, A., Roden, S., & Graham, G. (2016). How smart cities transform operations models: A new research agenda for operations management in the digital economy. *Production Planning and Control, 27*(6), 514–528.

Light, R. J., & Pillemer, D. B. (1984). *Summing up: The science of reviewing research*. Cambridge: Harvard University Press.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills: Sage.

Lombardi, P., Giordano, S., Farouh, H., & Yousef, W. (2012). Modelling the smart city performance. *Innovation: The European Journal of Social Science Research, 25*(2), 137–149.

López-Arranz, M.A. (2017). The role corporate social responsibility has in the smart city project in Spain. *Handbook of Research on Entrepreneurial Development and Innovation within Smart Cities*. IGI Global, 439–458.

Mahizhnan, A. (1999). Smart cities: The Singapore case. *Cities, 16*(1), 13–18.

Mainetti, L., Marasovic, I., Patrono, L., Solic, P., Stefanizzi, M. L., & Vergallo, R. (2016). A novel IoT-aware smart parking system based on the integration of RFID and WSN technologies. *International Journal of RF Technologies, 7*(4), 175–199.

Majumder, M., & Saha, S. K. (2014). Automatic selection of informative sentences: The sentences that can generate multiple choice questions. *Knowledge Management and E-Learning, 6*(4), 377–391.

Manville, C., Cochrane, G., Cave, J., Millard, J., Pederson, J. K., Thaarup, R. K., Liebe, A., Wissner, M., Massink, R., & Kotterink, B. (2014). Mapping smart cities in the EU. Available at: http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf.

March, H. (2016). The smart city and other ICT-led techno-imaginaries: Any room for dialogue with degrowth? *Journal of Cleaner Production, 197*, 1694–1703. https://doi.org/10.1016/j.jclepro.2016.09.154.

Marek, L., Campbell, M., & Bui, L. (2017). Shaking for innovation: The (re) building of a (smart) city in a post disaster environment. *Cities, 63*, 41–50.

Markopoulou, A., Rubio, R., Laarman, J., Jokic, S., Novikov, P., & Ladera, T. D. (2013). Information smart living architecture. *SAJ Serbian Architectural Journal,* 132–159.

Marsal-Llacuna, M. L., & Fabregat-Gesa, R. (2015). Modeling citizens' urban time-use using adaptive hypermedia surveys to obtain an urban planning, citizen-centric, methodological reinvention. *Time & Society, 25*(2), 272–294.

Marsal-Llacuna, M. L., & López-Ibáñez, B. (2014). The smart urban planning method, designing urban land use from urban time use. *Journal of Urban Technology, 21*(1), 39–54.

Marsal-Llacuna, M. L., & Segal, M. E. (2016). The Intelligenter method (I) for making "smarter" city projects and plans. *Cities, 55*, 127–138.

Marsal-Llacuna, M. L., Colomer-Llinàs, J., & Meléndez-Frigola, J. (2015). Lessons in urban monitoring taken from sustainable and livable cities to better address the smart cities initiative. *Technological Forecasting and Social Change, 90*, 611–622.

Matos, F., Vairinhos, V. M., Dameri, R. P., & Durst, S. (2017). Increasing smart city competitiveness and sustainability through managing structural capital. *Journal of Intellectual Capital, 18*(3), 693–707.

McGibbon, C., Ophoff, J., & Van Belle, J. P. (2015). Our building is smarter than your building: The use of competitive rivalry to reduce energy consumption and linked carbon footprint. *Knowledge Management & E-Learning: An International Journal, 6*(4), 464–471.

Meijer, A., & Bolívar, M. P. R. (2016). Governing the smart city: A review of the literature on smart urban governance. *International Review of Administrative Sciences, 82*(2), 392–408.

Miles, M. B., & Huberman, M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks: Sage Publications.

Mital, M., Chang, V., Choudhary, P., Papa, A., & Pani, A. K. (2017). Adoption of internet of things in India: A test of competing models using a structured equation modeling approach. *Technological Forecasting and Social Change.* https://doi.org/10.1016/j.techfore.2017.03.001.

Monfaredzadeh, T., & Berardi, U. (2015). Beneath the smart city, dichotomy between sustainability and competitiveness. *International Journal of Sustainable Building Technology and Urban Development, 6*(3), 140–156.

Monitor Deloitte (2015). Smart cities… Not just the sum of its parts. Available at: https://www2.deloitte.com/content/dam/Deloitte/xe/Documents/strategy/me_deloitte-monitor_smart-cities.pdf. Accessed on 17 January 2018.

Monzon, A. (2015). Smart cities concept and challenges: Bases for the assessment of smart city projects. In *Smart cities, green technologies, and intelligent transport systems* (pp. 17-31). Springer International Publishing.

Mosannenzadeh, F., Bisello, A., Vaccaro, R., D'Alonzo, V., Hunter, G. W., & Vettorato, D. (2017a). Smart energy city development: A story told by urban planners. *Cities, 64*, 54–65.

Mosannenzadeh, F., Bisello, A., Diamantini, C., Stellin, G., & Vettorato, D. (2017b). A case-based learning methodology to predict barriers to implementation of smart and sustainable urban energy projects. *Cities, 60*, 28–36.

Mueller, J., Lu, H., Chirkin, A., Klein, B., & Schmitt, G. (2018). Citizen design science: A strategy for crowd-creative urban design. *Cities, 72*, 181–188.

Nam, T., & Pardo, T. A. (2011). Conceptualizing smart city with dimensions of technology, people, and institutions. In *Proceedings of the 12th annual international digital government research conference on digital government innovation in challenging times* (pp. 282–291). New York: ACM.

Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in Smart City initiatives: Some stylised facts. *Cities, 38*, 25–36.

Ngai, E. W., & Wat, F. K. T. (2002). A literature review and classification of electronic commerce research. *Information & Management, 39*(5), 415–429.

Nkwi, P. N., Nyamongo, I. K., & Ryan, G. W. (2001). *Field research into socio-cultural issues: Methodological guidelines*. Yaoundé, Cameroon: International Center for Applied Social Sciences, Research, and Training.

Öberg, C., & Graham, G. (2016). How smart cities will change supply chain management: A technical viewpoint. *Production Planning and Control, 27*(6), 529–538.

Offenhuber, D., & Schechtner, K. (2018). Improstructure-an improvisational perspective on smart infrastructure governance. *Cities, 72*, 329–338.

O'Neill, D., & Peoples, C. (2016). Using IT to monitor well-being and city experiences. *IEEE Potentials, 35*(6), 29–34.

Ortiz-Fournier, L. V., Márquez, E., Flores, F. R., Rivera-Vázquez, J. C., & Colon, P. A. (2010). Integrating educational institutions to produce

intellectual capital for sustainability in Caguas, Puerto Rico. *Knowledge Management Research and Practice, 8*(3), 203–215.

Ostling, A. (2010). ICT in politics, from peaks of inflated expectations to voids of disillusionment. *European Journal of ePractice, 9*, 1–8.

Paroutis, S., Bennett, M., & Heracleous, L. (2014). A strategic view on smart city technology: The case of IBM smarter cities during a recession. *Technological Forecasting and Social Change, 89*, 262–272.

Petter, S., & McLean, E. R. (2009). A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level. *Information & Management, 46*(3), 159–166.

Picatoste, J., Pérez-Ortiz, L., Ruesga-Benito, S. M., & Novo-Corti, I. (2017). Smart cities for wellbeing: Youth employment and their skills on computers. *Journal of Science and Technology Policy Management, 9*, 227–241. https://doi.org/10.1108/JSTPM-04-2017-0014.

Picon, A. (2015). *Smart cities: A spatialised intelligence*. Chichester: John Wiley and Sons.

Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly, 41*(1), 116–145.

Ricciardi, F., & Za, S. (2015). Smart city research as an interdisciplinary crossroads: A challenge for management and organization studies. In *From Information to Smart Society* (pp. 163-171). Springer International Publishing.

Richter, C., Kraus, S., & Syrjä, P. (2015). The Smart City as an opportunity for entrepreneurship. *International Journal of Entrepreneurial Venturing, 7*(3), 211–226.

Romão, J., Kourtit, K., Neuts, B., & Nijkamp, P. (2017). The smart city as a common place for tourists and residents: A structural analysis of the determinants of urban attractiveness. *Cities, 78*, 67–75. https://doi.org/10.1016/j.cities.2017.11.007.

Sabherwal, R., Jeyaraj, A., & Chowa, C. (2006). Information system success: Individual and organizational determinants. *Management Science, 52*(12), 1849–1864.

Saebi, T., & Foss, N. J. (2015). Business models for open innovation: Matching heterogeneous open innovation strategies with business model dimensions. *European Management Journal, 33*(3), 201–213.

Salerno, S., Nunziante, A., & Santoro, G. (2014). Competences and knowledge: Key-factors in the smart city of the future. *Knowledge Management & E-Learning, 6*(4), 356–376.

Sandulli, F. D., Ferraris, A., & Bresciani, S. (2017). How to select the right public partner in smart city projects. *R&D Management, 47*(4), 607–619.

Sankar, C. S., & Cumbie, B. A. (2014). Co-creating value: Student contributions to smart cities. *Knowledge Management & E-Learning, 6*(4), 392–409.

Sarma, S., & Sunny, S. A. (2017). Civic entrepreneurial ecosystems: Smart city emergence in Kansas City. *Business Horizons, 60*(6), 843–853.

Scarpetta, S., Sonnet, A., & Manfredi, T. (2010). Rising youth unemployment during the crisis, how to prevent negative long-term consequences on a generation? In *OECD Social, Employment and Migration Working Papers, No. 106*. OECD Publishing, Paris.

Schaffers, H., Komninos, N., Pallot, M., Trousse, B., Nilsson, M., & Oliveira, A. (2011). Smart cities and the future internet: Towards cooperation frameworks for open innovation. In *The future internet assembly* (pp. 431–446). Springer, Berlin, Heidelberg.

Schiller, F. (2016). Urban transitions: Scaling complex cities down to human size. *Journal of Cleaner Production, 112*, 4273–4282.

Scholten, H., Fruijtier, S., Dias, E., Hettinga, S., Opmeer, M., van Leeuwen, W. S., Linde, M., Bos, S., Vaughan, R., van Kaam, H., van Manen, N., & Fruijtier, C. (2017). Geocraft as a means to

support the development of smart cities, getting the people of the place involved-youth included. *Quality Innovation Prosperity, 21*(1), 119–115.

Schuurman, D., Baccarne, B., De Marez, L., & Mechant, P. (2012). Smart ideas for smart cities: Investigating crowdsourcing for generating and selecting ideas for ICT innovation in a city context. *Journal of Theoretical and Applied Electronic Commerce Research, 7*(3), 49–62.

Scuotto, V., Ferraris, A., & Bresciani, S. (2016). Internet of things: Applications and challenges in smart cities: A case study of IBM smart city projects. *Business Process Management Journal, 22*(2), 357–367.

Shadbolt, N., Berners-Lee, T., & Hall, W. (2006). The semantic web revisited. *IEEE Intelligent Systems, 21*(3), 96–101.

Smart Cities Index - A Tool for Evaluating Cities (2018). ISB & SHAKTI Sustainable Energy Foundation. Available at: http://shaktifoundation.in/wp-content/uploads/2014/02/Smart-Cities-Index.pdf.

Snow, C. C., Håkonsson, D. D., & Obel, B. (2016). A smart city is a collaborative community: Lessons from smart Aarhus. *California Management Review, 59*(1), 92–108.

Söderström, O., Paasche, T., & Klauser, F. (2014). Smart cities as corporate storytelling. *City, 18*(3), 307–320.

Strauss, A., & Corbin, J. (1997). *Grounded theory in practice*. Thousand Oaks: Sage.

Tachizawa, E. M., Alvarez-Gil, M. J., & Montes-Sancho, M. J. (2015). How "smart cities" will change supply chain management. *Supply Chain Management: An International Journal, 20*(3), 237–248.

Takata, S., Hayashi, K., Tamatsu, K., Yamagishi, Y., & Nagase, H. (2014). Development and use of a digital signage system for revitalizing regional shopping districts. *Knowledge Management & E-Learning, 6*(4), 426–439.

Tenhunen, S. (2008). Mobile technology in the village: ICTs, culture, and social logistics in India. *Journal of the Royal Anthropological Institute, 14*(3), 515–534.

Torres, L., Pina, V., & Acerete, B. (2005). E-government developments on delivering public services among EU cities. *Government Information Quarterly, 22*(2), 217–238.

Townsend, A. (2013). *Smart cities: Big data, civic hackers, and the quest for a new utopia*. New York: W.W. Norton & Co..

Tranos, E., & Gertner, D. (2012). Smart networked cities? *Innovation: The European Journal of Social Science Research, 25*(2), 175–190.

UN Habitat (2016). Urbanization and development: emerging futures. *World cities report 2016, United Nations Human Settlements Programme*, Nairobi, 2016.

Valdez, A. M., Cook, M., Langendahl, P. A., Roby, H., & Potter, S. (2018). Prototyping sustainable mobility practices: User-generated data in the smart city. *Technology Analysis & Strategic Management, 30*(2), 144–157.

Vanolo, A. (2014). Smartmentality: The smart city as disciplinary strategy. *Urban Studies, 51*(5), 883–898.

Vanolo, A. (2016). Is there anybody out there? The place and role of citizens in tomorrow's smart cities. *Futures, 82*, 26–36.

Velosa, A., & Tratz-Ryan, B. (2014). *Hype cycle for smart city technologies and solutions*. Stamford: Gartners Inc..

Visvizi, A., Mazzucelli, C., & Lytras, M. (2017). Irregular migratory flows, towards an ICTs' enabled integrated framework for resilient urban system. *Journal of Science and Technology Policy Management, 8*(2), 227–242.

Vlacheas, P., Giaffreda, R., Stavroulaki, V., Kelaidonis, D., Foteinos, V., Poulios, G., Demestichas, P., Somov, A., Biswas, A. R., & Moessner, K. (2013). Enabling smart cities through a cognitive management framework for the internet of things. *IEEE Communications Magazine, 51*(6), 102–111.

Voytenko, Y., McCormick, K., Evans, J., & Schliwa, G. (2016). Urban living labs for sustainability and low carbon cities in Europe:

Towards a research agenda. *Journal of Cleaner Production, 123*, 45–54.

Wang, Z., & Xu, Z. (2015). On transformation from industrial city to smart city: A case study on Shijingshan District of Beijing. *International Journal of Information and Decision Sciences, 7*(3), 255–264.

Washburn, D., Sindhu, U., Balaouras, S., Dines, R. A., Hayes, N. M., & Nelson, L. E. (2010). *Helping CIOs understand "Smart City" initiatives, defining the Smart City, its drivers, and the role of the CIO*. Cambridge: Forrester Research, Inc..

Whetten, D. A. (1989). What constitutes a theoretical contribution? *Academy of Management Review, 14*(4), 490–495.

Wolfswinkel, J. F., Furtmueller, E., & Wilderom, C. P. (2013). Using grounded theory as a method for rigorously reviewing literature. *European Journal of Information Systems, 22*(1), 45–55.

Wu, Y., Zhang, W., Shen, J., Mo, Z., & Peng, Y. (2018). Smart city with Chinese characteristics against the background of big data: Idea, action and risk. *Journal of Cleaner Production, 173*, 60–66.

Ylipulli, J., Suopajärvi, T., Ojala, T., Kostakos, V., & Kukka, H. (2014). Municipal WiFi and interactive displays: Appropriation of new technologies in public urban spaces. *Technological Forecasting and Social Change, 89*, 145–160.

Yoo, Y., Boland, R. J., Jr., Lyytinen, K., & Majchrzak, A. (2012). Organizing for innovation in the digitized world. *Organization Science, 23*(5), 1398–1408.

Yoo, Y., Kim, K., & Han, J. (2016). Comparative analysis of smart city projects - implications for U-city. *International Journal of Applied Business and Economic Research, 14*(5), 2913–2929.

Yu, W. (2015). The effect of it-enabled supply chain integration on performance. *Production Planning and Control, 26*(12), 945–957.

Zanella, A., Bui, N., Castellani, A., Vangelista, L., & Zorzi, M. (2014). Internet of things for smart cities. *IEEE Internet of Things Journal, 1*(1), 22–32.

Parul Gupta is an Assistant Professor in the area of Public Policy and Governance at Management Development Institute Gurgaon, India. Her research interest include, social entrepreneurship ecosystem, higher education policy, smart city initiatives, e-govt services, gender equality at workplace and export import policy. She has authored four books and published research papers in reputed journals such as Journal of World Business and International Business Review and also case studies in Ivey Publishing.

Sumedha Chauhan is an Assistant Professor in the area of Management Information Systems at Indian Institute of Management Rohtak, India. Her research interests include e-commerce, e-learning, and smart cities. She has published research papers in reputed journals such as Computers & Education, The International Journal of Management Education, Information Systems Management, and Journal of Enterprise Information Management etc.

Mahadeo Jaiswal is currently Professor of Information System and Director at Indian Institute of Management (IIM) Sambalpur, India. His qualifications include EPGM from MIT Sloan School of Management, PhD in Computer Science from Delhi University and Sr. Fulbright Fellow at Carnegie Mellon University. His area of research includes IT Strategy and Enterprise Systems Contract, Digital Innovation and Platform Ecosystems, Social Entrepreneurship. He has published more than 50 research papers and 7 books in Information Systems, ERP and Business Process Management. He is member of several expert committees of Government and Industry. He has executed several funded projects on ERP, e-Government and e-Commerce for many large organizations such as European Union, Asian Development Bank, Coal India Ltd., Steel Authority of India Ltd, etc.