Article

Smart cities policies for urban development: Systematic insight into public value creation

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Abstract: Nowadays, urban ecosystems require major transformations aimed at addressing the current challenges of urbanization. In recent decades, policy makers have increasingly turned their attention to the smart city paradigm, recognizing its potential to promote positive changes. The smart city, through the conscious use of technologies and sustainability principles, allows for urban development. The scientific literature on smart cities as catalysts of public value continues to develop rapidly and there is a need to systematize its knowledge structure. Through a three-phase methodological approach, combining bibliometric, network and content analyses, this study provides a systematic review of the scientific literature in this field. The bibliometric results showed that public value is experiencing an evolutionary trend in smart cities, representing a challenging research topic for scholars. Network analysis of keyword co-occurrences identified five different clusters of related topics in the analyzed field. Content analysis revealed a strong focus on stakeholder engagement as a lever to co-create public value and a greater emphasis on social equity over technological innovation and environmental protection. Furthermore, it was observed that although environmental concerns were prioritized during the policy planning phase, their importance steadily decreased as the operational phases progressed.

Keywords: urban ecosystem; public policies; municipal governments; technological development; environmental protection; social equity

1. Introduction

It has been estimated that 66% of the world's population will live in cities by 2050 (United Nations, 2015), which consume about 70% of the world's resources and contribute significantly to greenhouse gas emissions (Bibri and Krogstie, 2017). As a dynamic grouping of people, buildings, infrastructure and resources, cities put huge pressure on urban systems (Bibri, 2013), posing significant economic, environmental and social challenges (overcrowding, degradation, pollution, traffic, social inequality, crime, economic crises, etc.) (Kummitha and Crutzen, 2017). On the other hand, the increasing spread of technology, the growing awareness of environmental protection and the disruption of traditional social practices provide a strong opportunity for cities to evolve into smarter places (Chourabi et al., 2012). To mitigate the negative urbanization effects, an increasing number of cities around the world have initiated a process of urban revolution, embracing the smart city idea (Albino et al., 2015).

The concept of smart city encompasses various emerging interpretations, including "digital city", "intelligent city", "knowledge city", "ubiquitous city", "sustainable city", "resilient city", etc. Each of these terms emphasizes distinct

characteristics of urban development, such as digital technologies, human and social capital, connectivity, sustainability, and risk management (Cocchia, 2014). As cities continue to evolve, the integration of these diverse concepts highlights the multifaceted nature of modern urban development and plays a crucial role in shaping the urban life of future cities.

Smart cities leverage technological opportunities to enhance urban services, improve quality of life, support local governance, and increase governmental efficiency (Marsal-Llacuna et al., 2015). Arising from the doctrine of technological change, the smart city concept dates back to the early 1990s (Gibson et al., 1992). However, it has evolved and gained great notoriety in the past decade due to strong marketing promotion and political support (Masik et al., 2021). Indeed, the smart city idea is prioritized in policy-makers' decisions and related policies have attracted significant attention and funding in recent years (Walravens and Ballon, 2013). Boosting urban development by supporting cities to adopt a smart city approach is one of the main commitments of the European Union (EU) and the United Nations (UN). In addition to their technological and environmental dimensions, smart city policies intersect with broader debates in economic policy. They represent a strategic approach to urban development aimed at stimulating economic growth, fostering innovation and enhancing competitiveness (Neuroni et al., 2019).

In this sense, a smart city is not just a status to be reached, but rather an aspiration for the city's future realized through urban innovation initiatives that continuously transform it (De Jong et al., 2015; Nam and Pardo, 2011). Such initiatives are expected to produce various benefits, leading to public value creation (Meijer, 2015; Neumann et al., 2019). Generating public value should be the main purpose of the city government (Benington and Moore, 2010), emphasizing societal needs and expectations (Cordella and Bonina, 2012; Osborne, 2020). Under this framework, the concept of public value complements the comprehensive approach of smart cities. First, public value emerges as an outcome of innovative urban initiatives within smart cities (Gil-Garcia et al., 2021). Second, the development of a smart city is not only about implementing innovations and sustainability practices, but also acknowledging and fostering a diverse set of public values (Barrutia et al., 2022).

Despite the growing attention paid to smart cities, there remains a need to examine how research addresses their intersections and contributions to public value creation. While previous studies have highlighted the relationship between the smart city and public value, there is a lack of systematic analysis in this domain (Grossi et al., 2020; Pang et al., 2014). This study aims to fill this gap by exploring smart cities as catalysts for public value creation, providing an in-depth view of the state of the art to date, information on how the literature is developing and potential avenues for more robust future research.

In particular, the research aims to answer the following research questions (RQs):
- RQ1. Is public value an evolving trend in the smart city?
- RQ2. How are smart city affecting public value creation?
- RQ3. What is the role of technological innovation, environmental protection and social equity in favoring urban development?

To answer these questions, combined bibliometric, network and content analyses were carried out, aiding to identify the homogeneous areas in the research field (Agnusdei and Coluccia, 2022).

The remainder of this paper is organized as follows. Section 2 provides the major concepts that form the basis of the smart city and public value theory, as well as the nexus between the two concepts. Section 3 describes material and methods. Section 4 presents and discusses the results obtained. Finally, Section 5 concludes, highlighting directions for further research developments.

2. Theoretical background

2.1. The smart city paradigm

The smart city concept has been defined in several ways (Mora et al., 2017) and there is no unanimity regarding what should be done to make a city smart (Meijer and Bolívar, 2016). The scientific literature on smart cities can be considered twofold.

According to the first research trend, the realization of the smart city is enabled by technologies, which play a leading role in the urban transformation process (Ali et al., 2023). Various technologies (Information and Communication Technology, Cloud/Edge computing, Sensory devices, Internet of Things, Big data, Artificial Intelligence, Machine/Deep Learning, Blockchain, etc.) are integrated to enable and support the development of a connected network of devices and entities into running urban environments (Ahad et al., 2020). However, critics of this research strand emphasize the one-sided focus on the technical aspects of smartness and argue that technological solutions alone cannot "save" urban areas (Hollands, 2020). This approach raises significant concerns regarding the inclusivity and accessibility of technologies, leading to marginalization and exacerbating societal inequalities (Caragliu and Del Bo, 2022). Furthermore, numerous scholars question the sustainability of these technological solutions, as well as the ethical implications associated with data collection and usage (Kitchin et al., 2019). Lastly, the governance model often lacks transparency and democratic engagement, with decisions made by technocrats rather than in consultation with citizens (Kitchin, 2018).

According to the second people-driven research trend, technologies are instrumental in addressing local development needs, i.e., are a means to provide personal, social, cultural, economic and environmental well-being (Mora et al., 2019). A city is smart when investments (in human and social capital, traditional and innovative infrastructure) boost sustainable growth and high quality of life through participatory governance (Caragliu et al., 2013), using approaches attentive to social equity and environmental protection (Bifulco et al., 2016). Based on this perspective, the smart city represents urban innovation ideas, practices and projects (Caragliu and Del Bo, 2019). It implies the ambition of the city to improve its performance in different dimensions (i.e., economy, people, governance, mobility, environment and living) (Giffinger et al., 2007), which can be also intended as the purposes for which different actors participate in smart city initiatives (e.g., solving a mobility issue, increasing participation, etc.) (Giffinger and Gudrun, 2010).

Launching smart city initiatives first requires political support. Recent global policy discourses emphasize the need to focus concretely on cities and communities

to bring direct and tangible benefits to people's life (Caragliu and Del Bo, 2019). As a result, several initiatives revolving around the smart city concept have been initiated, also thanks to wide funding opportunities. The commitment of the UN to smart city policies is made explicit in the 2030 Agenda for Sustainable Development and in the New Urban Agenda. Specifically, SDG11 of the 2030 Agenda is aimed at making cities and urban settlements inclusive, safe, resilient and sustainable (Akuraju et al., 2020). Instead, the New Urban Agenda pays special attention to the potential contribution of smart city strategy to urban development and sustainability (United Nation, 2016).

2.2. Public value theory and the nexus with the smart city

The pursuit of public value is increasingly recognized as a central paradigm in public administration, orienting public action (Cordella and Bonina, 2012). However, due its broad and multifaced nature, the literature often lacks a clear consensus on what constitutes public value (Bryson et al., 2017). It has been defined as "the production of what is good for and positively valued by a community" (Moore, 1995) or "what impacts on values concerning the public" (Meynhardt, 2009). Thus, public value arises from benefits produced by governments and their fair distribution, which enable the satisfaction of individual and collective needs (Alford and O'Flynn, 2009; Bozeman, 2007). The concept emphasizes the "individual interests of current users" while also considering "what adds value to the public sphere" (Benington and Moore, 2011). Perception of utility may differ among stakeholders, influenced by their hierarchical position and the specific temporal-spatial context (Bracci et al., 2019). Despite definitional ambiguities, literature has highlighted various forms of public values, such as efficiency, effectiveness, service quality, accountability, transparency, legitimacy, democracy, participation, trust, integrity, fairness, justice, inclusion (Meynhardt, 2009). According to Moore's seminal contribution (1995) public value creation relies on the internal and external-relational capabilities of public managers, who must (i) achieve valuable results for stakeholders; (ii) adopt sustainable and feasible initiatives; and (iii) obtain legitimacy and support. This approach positions public managers as crucial actors in seeking public value, guided by democratic principles (Moore and Hartley, 2010). Indeed, they are instrumental in implementing necessary policy changes and managing public resources effectively (Van Winden and Van den Buuse, 2017).

A promising path for creating public value is the smart city, which concerns innovation in urban spaces to improve cities' performance (Meijer et al., 2016). Indeed, innovation in the public sector is justifiable only when it increases public value (Hartley, 2005). According to this perspective, creating public value is the core mission of municipal governments. It arises through urban innovation initiatives (ideas, practices and projects), which are evaluated according to whether or not they add value (Barrutia et al., 2022). Therefore, public value can be intended as the short-term effects and long-term impacts of urban innovation initiatives (Castelnovo et al., 2016; Dameri and Benevolo, 2016). For instance, waste-related initiatives can reduce waste management costs (efficiency), facilitate waste collection by citizens (effectiveness), reduce pollution caused by litter abandonment (environmental

protection) and guarantee fair collection throughout the urban area (social equity). Although innovation projects may be oriented toward a particular dimension of public value, they have the potential to contribute to several values.

However, innovativeness within smart cities can be hampered by several factors: (i) the high-risk aversion and resistance to change among politicians and public employees; (ii) the lack of competition, economic incentives and venture capital in the public sector; (iii) the long-time horizons of investments and comparatively small available budgets; (iv) the multitude of stakeholders with divergent interests; (v) the pursuit of self-interest by governments; (vi) the lack of innovative ideas, leadership, skills and knowledge; (vii) the wrong selection of partners or mismanagement of relationships (Crosby et al., 2017; Cabral et al., 2019; De Vries et al., 2016). Under this umbrella, where a smart city is shaped by urban innovation initiatives aimed at public value creation, municipal governments may fail in different ways (Nam and Pardo, 2011). Failures are a problem because municipal governments incur high economic and social costs without realizing the expected benefits (Ruhlandt, 2018), wasting resources that could have been used to exploit the potential for public value creation elsewhere.

For these reasons, the public value created by smart city initiatives so far has been questioned by several authors (Kummitha, 2018; Komninos et al., 2021) and systematic knowledge about how a smart city affects the public value creation dynamics is needed.

3. Materials and methods

3.1. Data collection

The database used for document extraction is Scopus. Based on a brainstorming process and through a snowballing approach (Wohlin, 2014), two categories of keywords were selected. Category A involves the keyword "public value", while Category B involves the keywords associated with urban area, including "cit*", "smart cit*" and "urban development". The Boolean operator "OR" links each keyword belonging to the same category, while the Boolean operator "AND" links the two categories of keywords. The query was run on 31st December 2023 and generated a result of 859 documents. Only documents published in journals in English language since 1995, coinciding with the development of Moore's public value theory, were included in the selection process. After removing duplicate documents, citation information, abstract and index keywords were exported for a sample of 483 eligible documents. The latter were included in the sample for the bibliometric and network analyses. Instead, a different selection was made for the content analysis, sampling only articles published in relevant journals. The Italian ANVUR classification provides a reliable proxy for journal quality, based on journal indicators and independent expert assessments for individual articles published in those journals (Cicero and Malgarini, 2020). Only Italian National Agency for the Evaluation of Universities and Research Institutes (ANVUR) grade A journals for the area 13/A (economic and statistical sciences) and 13/B (economic and business sciences) were considered and 114 documents were included in the sample for the content analysis. **Table 1** reports the search string, source type, publication stage, language and period

selected for Scopus extraction. **Figure 1** shows the document selection strategy based on the PRISMA approach (Moher et al., 2009).

Table 1. Research protocol for Scopus database.

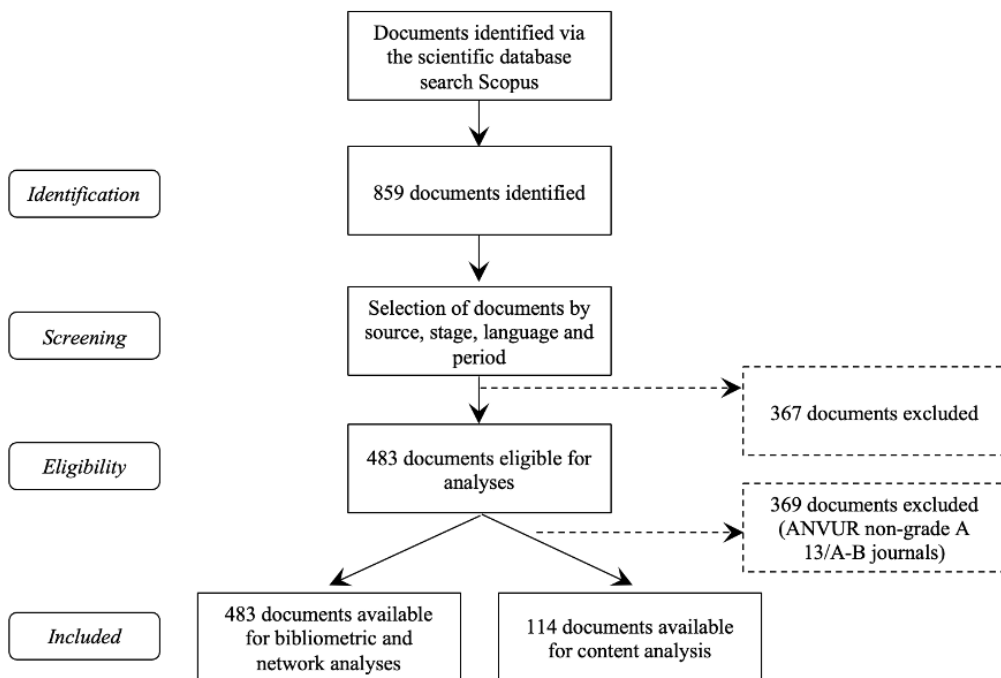| Search string	TITLE-ABS-KEY ("public value") AND ("cit*" OR "smart cit*" OR "urban development")
Source type	Journals
Publication stage	Final
Language	English
Period	1 January 1995–28 November 2023

Figure 1. Document selection strategy.

3.2. Bibliometric, network, and content analyses

Information on the 483 eligible documents was processed to carry out bibliometric and network analyses. Bibliometrics is used in this study to analyze the evolving trends of public value in the smart city, addressing RQ1. Bibliometric analysis techniques employ quantitative approaches to identify, describe and assess published research in a transparent and replicable manner. Adopting these research methods increases the reliability of results and minimizes the subjective bias of literature reviews (Garfield, 1979; Zupic and Čater, 2015). Documents extracted from Scopus in bib format were uploaded to R software, converted into a bibliographic data frame and then analyzed using the Bibliometrix package. The latter allows for a more comprehensive analysis, employing specific functions for both bibliometric and scientometric quantitative research (Crawley, 2012). The analysis provided the main information related to the bibliographic data frame (Aria and Cuccurullo, 2017).

Following, the most pertinent index keywords in the dataset were identified to perform the network analysis, addressing RQ2. It is a useful approach for examining

large amounts of data using appropriate advanced computational techniques, providing a comprehensive overview of research efforts in the analyzed field, mapping publications and anticipating trends and critical points. As in the Scopus index keywords, also known as Keywords-Plus (ID), are defined to aid in the search for articles related to a topic, index keywords co-occurrence analysis was done to identify the most common characteristics in the analyzed research field (Van Eck and Waltman, 2009, 2010). It was conducted using the VOS viewer 1.6.14 software through the full counting method, in which each co-occurrence has equal weight. The correlation of index keywords was established by the number of documents in which they occur together. Among the total 1838 Keywords-Plus (ID), off-topic terms were eliminated and only those with at least 10 occurrences were selected, obtaining a network visualization of 90 index keywords. In the network visualization, the size of circles indicates the weight of the keywords, the lines show how two terms are connected, the thickness of lines indicates the strength of the connection among words and colors denote the various search clusters to which the Keywords-Plus (ID) belong (Waltman et al., 2010). A minimum size of 10 keywords was established for each cluster. The layout was constructed by normalizing the strength of the links between the items using the association strength approach (van Eck and Waltman, 2014).

The content analysis, based on a sample of 114 documents, provides a summary of literature trends and a more thorough knowledge of the reviewed documents, emphasizing the most and least developed (hot and blind spots) topics in the literature (Gaur and Kumar, 2018). As a result, content analysis leads to answers RQ3 and suggests research directions for future studies. Five classification categories were defined, which are representative of key drivers for public value generation and delivery:

- policies and strategies: documents that focus on policy decisions and strategic plans taken by the different government levels to address public issues and achieve specific goals for public value creation in smart cities;
- organizational and managerial capacity: studies that consider public managers' aptitudes in process management and services delivery oriented to public value, considering aspects such as activity planning and monitoring, resource management, accounting, organizational well-being, leadership and skills;
- stakeholder engagement and participation: studies that consider the efforts of city governments in involving different stakeholders to co-create public value within smart cities;
- outsourcing and partnerships: documents that focus on outsourcing choices or partnership contracts with private companies and civil society organizations to implement smart city initiatives, drawing on external resources and expertise to generate value;
- results measurement and evaluation: documents related to results assessment of smart city initiatives in terms of public value, useful for improving accountability and guiding future decision-making.

The documents included in each of the five categories were further classified based on three criteria: (i) technological innovation; (ii) environmental protection; and (iii) social equity. Specifically, each document was associated with a high, medium,

and low level for each criterion of analysis, as shown in **Table 2**. This classification enables us to demonstrate how research on public value creation in smart cities has evolved to include technological innovation and sustainability principles as strategic priorities to promote urban development.

Table 2. Classification criteria for content analysis.

	Technological innovation	**Environmental protection**	**Social equity**
Low	Documents that do not consider innovative technological approaches or solutions	Documents that do not consider approaches or solutions for environmental protection	Documents that show a lack of emphasis on approaches or solutions for social equity
Medium	Documents that consider technological solutions without explicitly referring to them	Documents that consider environmental protection without prioritizing it	Documents that consider social equity without explicitly commit to bridging inequalities
High	Documents that explicitly propose technological approaches or solutions	Documents that prioritize approaches or solutions for environmental protection	Documents that consider approaches or solutions for social equity as a top priority

4. Results and discussion

4.1. Bibliometric analysis

Figure 2 reports the annual scientific production covering the analyzed research field, while **Table 3** illustrates the main bibliometric information of the documents sample. The first study dates back to 1997. Still, the number of published documents was very small until 2009, never reaching 10 papers annually. The year 2022 saw a 59.57% increase in published documents over the previous year, marking the peak of the trend. In contrast, 2023 reversed the trend, recording a slight decrease compared to 2022 (−12%). The results show that the theme of public value in smart cities can be considered an evolving trend for scholars and practitioners. However, the relatively low number of published papers compared to the total scientific output seems to indicate that there are many opportunities for further research.
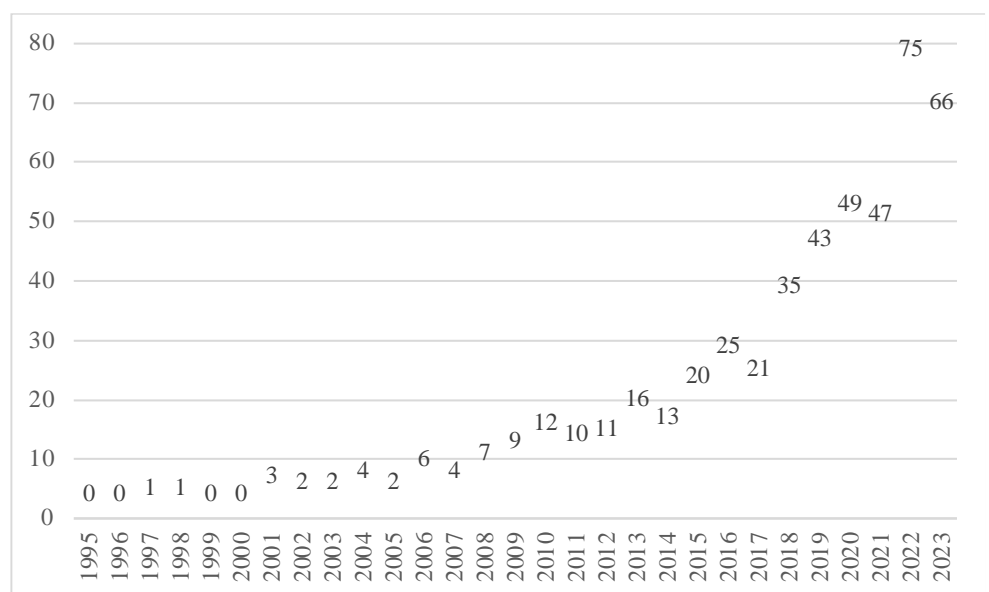

Figure 2. Annual trend in the number of publications covering the research field investigated.

Table 3. As in the Scopus index keywords, also known as Keywords-Plus (ID), are defined to aid in the search for articles related to a topic.

Main information about the data	
Timespan	1995:2023 (years)
Documents	483 (number of documents)
Sources (Journals)	287 (number of journals)
Annual Growth Rate %	17.49 (%)
Document Average Age	5.18 (years)
Average citations per doc	26.9 (number of citations)
References	27732 (number of references)
Document contents	
Keywords Plus (ID)	1838 (number of keywords)
Author's Keywords (DE)	1519 (number of keywords)
Authors	
Authors	1138 (number of authors)
Authors of single-authored	113 (number of authors)
Single-authored docs	118 (number of paper)
Co-Authors per doc	2.64 (number of authors)
International co-authorship	24.59 (%)
Document types	
Article	457 (number of papers)
Conference paper	6 (number of papers)
Editorial	5 (number of papers)
Note	2 (number of papers)
Review	14 (number of papers)

Table 4 shows the top ten leading journals in terms of the number of published documents in the analyzed sample. The three journals with the highest number of published documents are Government Information Quarterly (26 articles), Australian Journal of Public Administration (10 articles) and Sustainability (10 articles). Government Information Quarterly also confirms its position as the most-cited journal (1141 citations), followed by International Review of Administrative Sciences (960 citations) and Public Management Review (923 citations). **Table 4** also reports information on journal quality, including their Impact Factor (IF) as per Clarivate Analytics 2023 for the reference year 2022, best rank in the indexing Scopus categories and ABS (Association of Business Schools) rank. All the top ten leading journals are positioned in the first quartile (Q1) or, at most, in the second quartile (Q2) for certain scientific categories, as per SJR (Scimago Journal Rank). It weighs bibliographic citations according to the journal's importance, making citations from the most relevant journals more valuable than those from less relevant ones (Sicilia et al., 2011). Only two journals among both top ten are not included in the Association of Business Schools (ABS) rank, as per AJG 2021 (Academic Journal Guide). Peer review, editorial and expert opinions on many hundreds of publications and citation statistics

form the basis of the AJG's ratings, concerning Business and Management disciplines (Morris et al., 2019).

Table 4. Top 10 leading journals based on the number of published documents.

Journals	Publishers	Number of documents	Number of total citations	Impact Factor	Best rank	ABS rank	Publication year start
Government Information Quarterly	Elsevier	26	1114	7.8	Q1	3	2014
Australian Journal of Public Administration	Wiley-Blackwell	10	422	2.2	Q1/Q2	2	2001
Sustainability (Switzerland)	MDPI	10	123	3.9	Q1/Q2		2016
Public Administration Review	Wiley-Blackwell	9	451	8.3	Q1	4*	2009
International Journal of Public Administration	Taylor and Francis	9	208	1.8	Q2	2	1997
Transforming Government: People, Process and Policy	Emerald Group	8	165	2.6	Q2	2	2011
Public Money and Management	Routledge	8	61	2.5	Q1/Q2	2	2015
Public Management Review	Taylor and Francis	7	923	4.9	Q1	4	2016
Cities	Elsevier	7	101	6.7	Q1	2	2016
International Review of Administrative Sciences	SAGE Publications	6	960	2.3	Q1	3	2016

Note: 4*: Denotes a journal recognized for its high ranking within its category in the ABS Academic Journal Guide (AJG) 2021, specifically indicating a distinction in terms of impact or prestige compared to others in its field.

Table 5. Top 10 most productive authors based on the number of published documents.

Authors	Affiliations	Number of documents	Number of total citations	H-Index	Publication year start
Muñoz Gielen D.	Radboud Universiteit (Netherlands)	4	115	9	2016
Saxena S.	Graphic Era Deemed to be University (India)	4	63	14	2018
Bolívar M.P.R.	Universidad de Granada (Spain)	3	991	31	2016
Cook M.	State University of New York Albany (U.S.)	3	262	9	2012
Walravens N.	Interuniversity Microelectronics Centre (Belgium)	3	246	10	2012
Deng H.	RMIT University (Australia)	3	143	31	2011
Karunasena K.	RMIT University (Australia)	3	143	7	2011
Menon D.	Edmonton Clinic Health Academy (Canada)	3	106	30	2008
Stafinski T.	Edmonton Clinic Health Academy (Canada)	3	106	24	2008
Bozeman B.	Arizona State University Downtown Phoenix Campus (U.S.)	3	73	53	2010

Tables 5 and **6** show the top ten most productive authors in terms of the number of published documents and total citations obtained. The authors who published the most documents (4) on the analyzed field are Muñoz Gielen D. and Saxena S., while the most cited authors are Meijer A. (1045), Bolívar M.P.R. (991) and Osborne S.P. (590). **Tables 6** and **7** also report the publication year start, the authors' affiliations and their H-index, as per Scopus Author Identifier. The h-index measures the productivity and citation impact of publications, based on the ordered list of the

researcher's most cited papers and the number of citations received in other publications (Simoes and Crespo, 2020).

Table 6. Top 10 most productive authors based on the total citations.

Authors	Affiliations	Number of total citations	Number of documents	H-Index	Publication year start
Meijer A.	Utrecht University School of Governance (Netherlands)	1045	2	42	2015
Bolívar M.P.R.	Universidad de Granada (Spain)	991	3	31	2016
Osborne S.P.	University of Edinburgh Business School (U.K.)	590	2	37	2016
Radnor Z.	University of Law (U.K.)	588	1	31	2016
Strokosch K.	Glasgow Caledonian University (U.K.)	588	1	10	2016
Bovaird T.	Bertelsmann Foundation (U.K.)	397	2	29	2012
Loeffler E.	University of Birmingham (U.K)	397	2	16	2012
Hefetz A.	Data-Graph Research and Statistical Consulting (U.S.)	396	2	15	2004
Warner M.	Cornell University (U.S.)	391	1	41	2004
Misuraca G.	Universidad Politécnica de Madrid (Spain)	383	2	17	2014

Table 7. Top 10 most productive authors based on the total citations.

Countries	Number of documents	Number of total citations	Average number of document citation	Single Country Publications (SCP)	MCP	MCP ratio
United States	112	3022	26.98	100	12	0.1
United Kingdom	65	3155	48.54	47	18	0.28
Netherlands	63	2207	35.03	46	17	0.27
Australia	40	1105	27.63	27	13	0.33
China	39	495	12.69	22	17	0.44
Germany	25	676	27.04	17	8	0.32
Canada	25	586	23.44	16	9	0.36
Italy	23	508	22.09	9	12	0.52
Spain	21	1610	76.67	12	9	0.43
Denmark	16	227	17.31	11	5	0.31

Finally, **Table 7** reports the top ten most productive countries of corresponding authors based on the number of published documents. Most of the studies were published by authors affiliated with universities in the United States (112 articles), United Kingdom (65 articles) and Netherlands (63 articles). **Table 7** also shows the total citations and the average document citation obtained. English authors have been cited most frequently, obtaining 3155 total citations. Considering the average document citation, despite registering more than 80% fewer published documents than the United States, Spain obtains the highest impact per single published document, equal to 76.67. **Table 7** also reports the number of published documents whose authors are all from the same country (Single Country Publications) or different countries

(Multiple Country Publications). The United States, despite being the country with the highest number of published documents within the analyzed research field, registers the lowest ratio of inter-country collaboration (0.1). On the other hand, more than half of documents published by authors affiliated with Italian universities derive from international collaborations. Indeed, Italy registers the highest Multiple Country Publications (MCP) ratio, equal to 0.52.

4.2. Network analysis

Among the total of 1838 Keywords-Plus (ID), 90 index keywords were examined from the document sample and a count was carried out to compute their frequency and establish a ranking. As illustrated in **Table 8**, "public value" and "public values" are the most frequent keywords (116 and 49 occurrences). Both terms were included in the analysis because they take on different meanings. "Public value" mainly refers to the capacity of public managers to achieve collectively valued outcomes (Osborne et al., 2013). Instead, "public values" are those providing normative consensus about (i) the rights, benefits and prerogatives citizens should or should not have; (ii) citizens' obligations to society, the state and each other; and (iii) the principles on which governments and policies should be based (Jørgensen and Bozeman, 2007). The top ten also include "local government", confirming its key role as a producer of public value and guarantor of public values (Benington, 2011). Within the top-ten ranking, many keywords refer to technological innovation ("e-government", "smart city", "open data"), indicating the essential role it plays in facing urban problems and creating public value (Dameri and Rosenthal-Sabroux, 2014). The term "sustainability" is also among the ten most frequent words, denoting the increasing focus of urban policies on environmental and societal concerns (Fotino et al., 2018). Finally, the top ten include "co-production" and "co-creation", highlighting the importance of stakeholder engagement (Bryson et al., 2017).

Table 8. Top 10 most frequent index keywords in the analyzed research field.

Keywords-Plus (ID)	Number of occurrences/frequency
public value	116
public values	49
e-government	37
co-production	19
smart city	17
co-creation	15
open data	12
public value creation	12
sustainability	12
local government	11

Figure 3 illustrates the network visualization of keyword co-occurrence. It uncovered five clusters, each representing diverse research areas interconnected with the theme of public value creation in smart cities. The clusters were named and defined as follows:
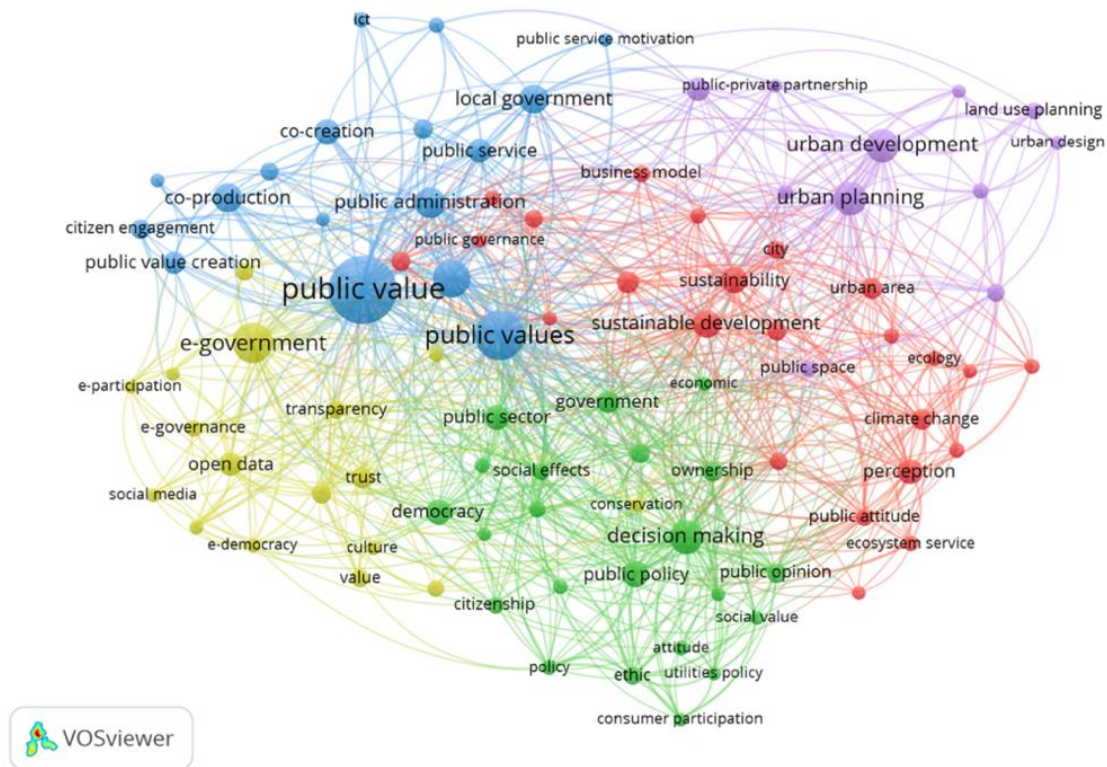
Figure 3. Network visualization of keyword co-occurrence analysis.

1) Public governance and stakeholder engagement (blue): it addresses how decisions are made within public institutions and how they interact with stakeholders. Key terms in this cluster, such as "public governance" and "citizen engagement", indicate a push towards a bottom-up model that values active participation and collaboration. The results emphasize the importance of the integration and interaction of stakeholders for the design of smart city policies that are effectively capable of generating public value, aligning public policies with public expectations. Furthermore, the concepts of "co-production" and "co-creation" imply the definition of a more active role also for citizens, considered not only as users of services but as partners in their design and provision;

2) Digital democracy (yellow): keywords in this cluster ("e-participation", "e-governance", "open data", "social media", "e-democracy", etc.) highlight the importance of digital technologies in improving the accessibility of democratic processes and transparency in government operations, crucial elements in the definition of smart cities. The responsible use of digital tools allows citizens to interact with institutions more directly and have a more influential voice in the political decision-making process through the use of online platforms, website or social media. Furthermore, the availability of open data represents a useful resource for accountability and allows for the monitoring of government performance;

3) Public strategies for social responsibility (green): it focuses on public institutions' role in promoting social responsibility in smart cities, not only to improve quality of life but also to contribute to public policy legitimacy and effectiveness. Nodes

such as "social effects", "social value", and "public opinion" indicate a focus on the impact of public policies on society and public perceptions. Keywords such as "decision-making", "public policy" and "ethics" are interlinked, suggesting that decision-making for policy formulation should be guided by ethical considerations. The terms "democracy" and "citizenship" imply the importance of encouraging civic participation and citizens' empowerment, who should be able to influence decisions that affect their daily lives;

4) Sustainable development (red): it highlights the importance of an integrated and multifaceted approach to the sustainable urban development of smart cities. Words such as "climate change", "ecology", "ecosystem service", "biodiversity" and "urban forestry" highlight the instrumental role of smart cities in facing the main environmental challenges. The presence of keywords such as "business model", "environmental policy", "local participation" and "participatory approach" indicates that smart cities that pursue sustainable development must adopt a holistic approach that not only addresses environmental challenges but also actively engage stakeholders in creating a shared vision and building an urban environment that is resilient, prosperous and fair for all;

5) Urban planning (purple): the terms "urban development", "urban planning", "urban design" and "land use planning" combined with "environmental value", "governance approach" and "public-private partnership" describe the interconnection between the physical structures of a city and the social and ecological fabric that supports them. Urban planning becomes a holistic vision that includes the aesthetics of urban design, functional effectiveness and long-term impact on urban areas. Land management are carefully calibrated to respect the environment, ensuring that infrastructure development not only responds to immediate services, but also promotes sustainability. Public-private partnership is essential in this scheme, as it allows for resource sharing, risk distribution and innovation, combining the best of both sectors to deliver projects that would otherwise be beyond the reach of public or private entities acting alone.

Figure 4, which shows the overlay visualization of keyword co-occurrence, demonstrates that some topics are emerging and scholars have only recently started to investigate them. Indeed, the themes of stakeholder involvement for public value co-creation, digital tools supporting democracy and sustainable urban planning have received greater attention since 2018.
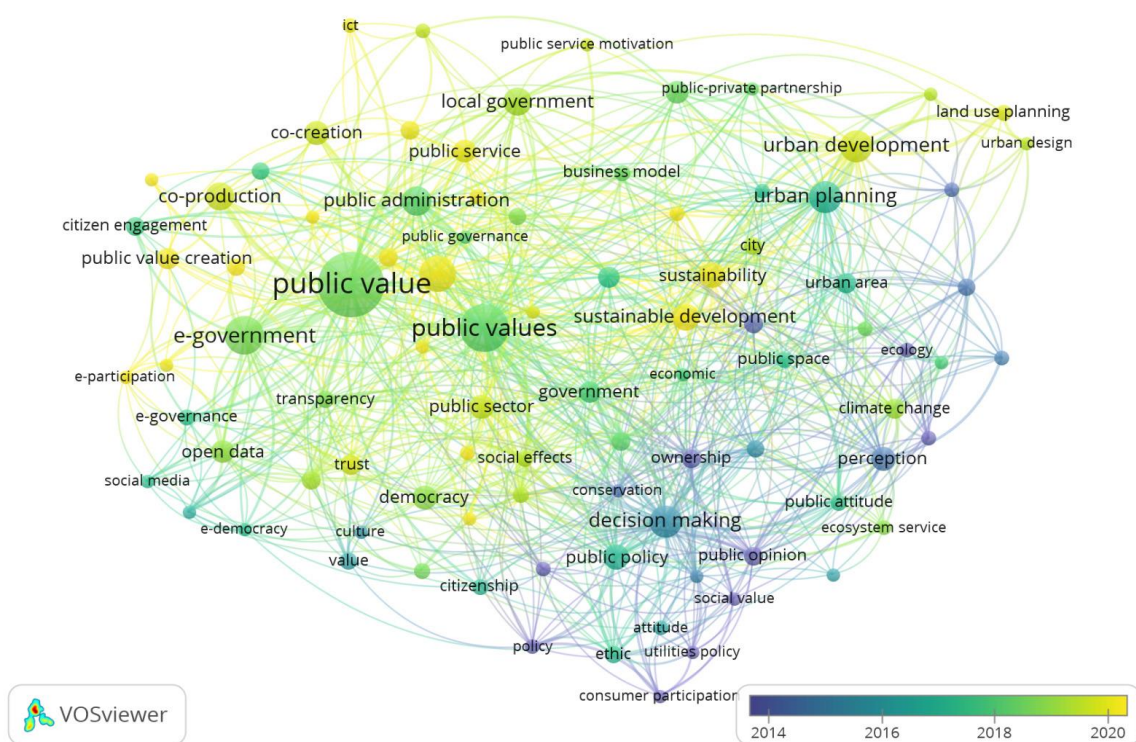
Figure 4. Overlay visualization of keyword co-occurrence analysis.

4.3. Content analysis

The content analysis was carried out for a sample of 114 documents based on the classification criteria specified in Section 3.2. "Stakeholder engagement and participation" was assigned the highest number of documents (31 documents). It focuses on methods, opportunities and constraints of collaborative forms for co-creating public value in smart cities. "Results measurement and evaluation" includes 29 documents, which identify methods and tools for measuring public value generated by smart city initiatives. The categories "Organizational and management capacity" and "Policies and strategies" both include 22 documents. The first concerns leadership, human resources, accounting methods, process management and public service provision. The second refers to institutional logics, values hierarchies and decision-making. The two categories are closely related, as organizational and management capacity allow policies and strategies to be translated into operational actions for public value creation. Finally, less numerous are documents belonging to "Outsourcing and partnership" (10 documents), which focuses on privatization trends and stable collaboration forms between local governments and private companies or non-profit organizations.

4.3.1. Technological innovation

Figure 5 shows the classification of documents based on the level of technological innovation (low, medium or high) adopted or proposed within the studies analyzed. **Table 9** summarizes the main themes covered in documents ranked high in technological innovation per category.
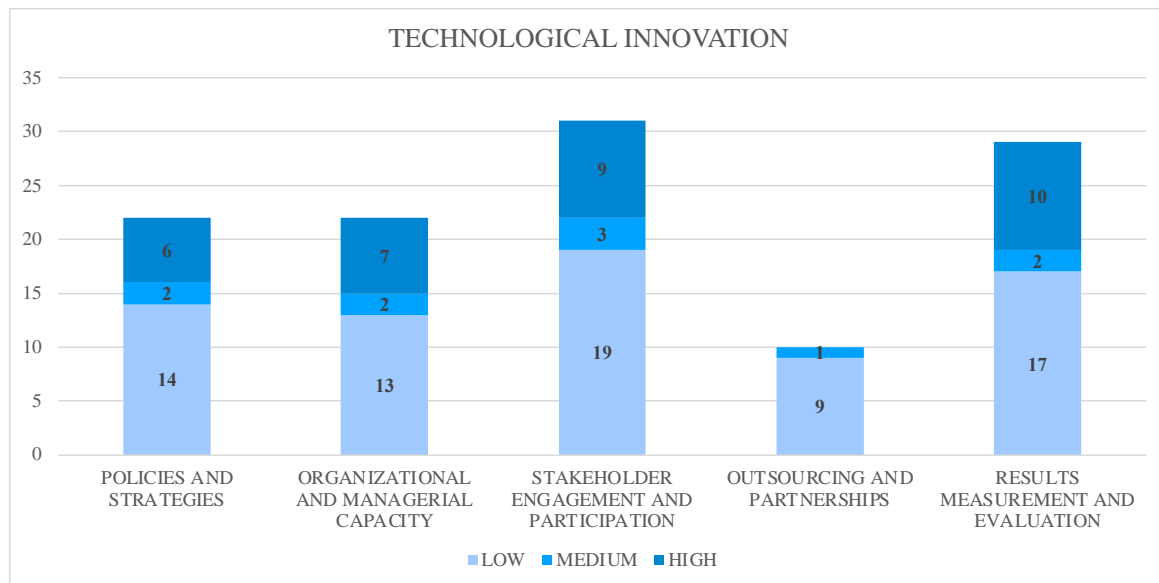
Figure 5. Content analysis results based on the level of technological innovation.

Table 9. Documents ranked high in technological innovation per category.

	Main themes	Documents
Policies and strategies	User values and cybersecurity public policy development for Internet of Things	Smith et al., 2021
	Challenges and opportunities of health data sharing strategies using technologies in healthcare sector	Marelli et al., 2023;
	Conflicting institutional logics in a national program for health information technology	Currie and Guah, 2007
	Advanced algorithms applied to decision making on sustainable urban mobility policies	de Paula and Marins, 2018
	Prescriptive analytics in decision-making for charging infrastructure planning on urban area	Brandt et al., 2021
	Evolution of European Union policies on the adoption of digital technologies	Carlsson and Rönnblom, 2022
Organizational and managerial capacity	Organizational capabilities and barriers to e-government in public administrations	Savoldelli et al., 2014
	Dynamic government capabilities and leadership in the implementation of innovation initiatives	Barrutia et al., 2022
	Role of technology and big data in supporting innovation in public service delivery	Chen et al., 2020; Löfgren and Webster, 2020
	Role of technology in supporting innovation in business process management	Forliano et al., 2020
	Accounting technologies and transformation of public values of tax authority	Closs-Davies et al., 2021
	Role of technology in corporate reporting to improve accountability	Tirado-Valencia et al., 2020
Stakeholder engagement and participation	Open data initiatives to improve transparency and accessibility of information	Ohemeng and Ofosu-Adarkwa, 2015; Schnell, 2018
	E-government and e-participation initiatives on budget transparency	Bisogno et al., 2022
	Urban digital platforms to facilitate governance and stakeholder engagement	Haveri and Anttiroiko, 2023; Van der Graaf and Ballon, 2019; Yu et al., 2019
	Bibliometric analysis of papers on Digital-Era Governance	Cho, 2023
	Barriers for innovation in e-governance	Meijer, 2015
	Controversies for civic engagement in the data-driven smart city	Baibarac-Duignan and de Lange, 2021

Table 9. (*Continued*).

	Main themes	Documents
Outsourcing and partnerships	/	/
Results measurement and evaluation	Impacts and benefits of e-government technologies on public value	MacLean and Titah, 2022; Scott et al., 2016; Grimsley and Meehan, 2007
	Impacts of public sector adoption of AI, robotics, and nanotechnology on public value	Schiff et al., 2022; Wang et al., 2021; Fisher et al., 2010
	Media sentiment assessment to measure acceptance of environmental governance performance	Guan, 2023
	Telegram use assessment to measure citizens' engagement	Ly and Ly, 2023
	Government websites evaluation from the perspective of responsiveness and dialog	Karkin and Janssen, 2014
	Citizens' perceptions evaluation of personalized medicine and public value generated	Bombard et al., 2013

Technological innovation is more emphasized in "Results measurement and evaluation" (34.48% of papers at a high level). These documents focus on assessing the impacts of different technological solutions on public value, as well as on detecting citizens' perceptions through media sentiment analysis to assess certain government performance. Indeed, technology is essential for improving the public action, ensuring that the perceived benefits are in line with citizens' expectations. However, while governments continue to invest in technological systems, scholars still struggle to exactly quantify the benefits (or disadvantages) they generate, as they can be difficult to recognize, take time to emerge and impact citizens both directly and indirectly (Panagiotopoulos et al., 2019).

Documents in "Stakeholder engagement and participation" are distinguished by 29.03% at a high level, showing how the use of technology, combined with effective engagement practices, can lead to meaningful urban transformation. They focus on of e-governance initiatives, also using open data and digital platforms. This result is attributable to the instrumental role of technologies in supporting interactions between governments and stakeholders (Kokkinakos et al., 2012), breaking down structural and cultural barriers against innovation. In this sense, the smart city is understood as a collaborative ecosystem that facilitate innovation to solve urban problems, developing public values of openness, transparency, democracy and trust (Sørensen and Torfing, 2011; Torfing et al., 2019).

Documents in "Organizational and managerial capacity" and in "Policies and strategies" are characterized by 31.82% and 27.27% at a high level, respectively. For a long time, Information Communication Technologies (ICT) deployment has focused mainly on organizational and managerial issues. The literature reviewed emphasizes that technologies play a crucial role in innovating public services and business processes. Barriers to innovation have also been discussed as important to overcome, with particular reference to lack of technological skills, poor information management and organizational resistance to change in public sector. Government capabilities and leadership can help overcome these issues, ensuring the successful implementation of smart city initiatives. Only afterward has the attention shifted to broader institutional and political issues to foster technology adoption. Policies, especially European ones,

have begun to provide solutions to several aspects (i.e., infrastructural problems and operating costs of ICT, lack of integration and interoperability of technological systems, citizens' poor trust in privacy and security, etc.). In particular, documents highlight the importance of balancing security, privacy and ethical considerations in technology policies, adopting users' perspectives to better meet their needs. Furthermore, the use of advanced algorithms is proposed as a solution for complex and multidimensional decision-making problems.

Finally, documents in "Outsourcing and partnership" give little consideration to technological innovation, focusing on the privatization choices, contractual forms of partnerships, the distribution of benefits, costs and risks among the actors involved (Fisher, 2014; Hefetz and Warner, 2004).

4.3.2. Environmental protection

Figure 6 illustrates the classification of documents based on the level of environmental protection (low, medium or high) assigned within the studies analyzed. **Table 10** summarizes the main themes covered in documents ranked high in environmental protection per category.
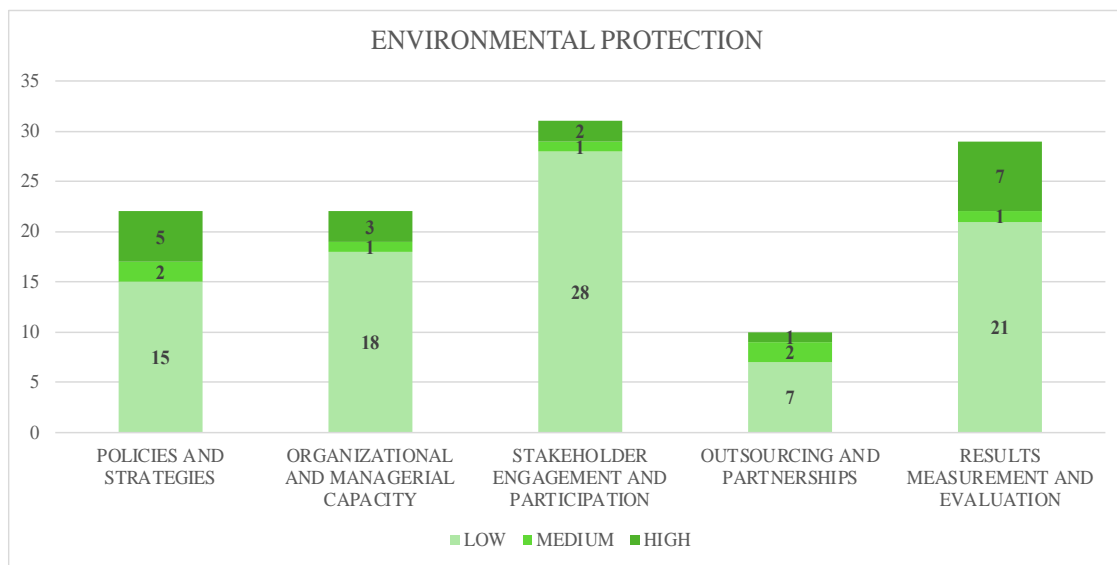

Figure 6. Content analysis results based on the level of environmental protection.

Table 10. Documents ranked high in environmental protection per category.

	Main themes	Documents
Policies and strategies	Discursive planning strategies to integrate environmental protection into urban policies	Pløger, 2001
	Advanced algorithms applied to decision making on urban sustainable mobility policies	de Paula and Marins, 2018
	Prescriptive analytics in decision-making for charging infrastructure planning in urban areas	Brandt et al., 2021
	Conceptual framework to support an ecosystem approach to low-carbon energy transitions	Speich and Ulli-Beer, 2023
	Strategies for climate change adaptation in urban forest management	Barona, 2015

Table 10. (*Continued*).

	Main themes	Documents
Organizational and managerial capacity	Leadership and organizational change in waste management practices for social responsibility	Esposito et al., 2021
	Integrated thinking framework to incorporate environmental sustainability into reporting	Tirado-Valencia et al., 2020
	Alternative framework for corporate social responsibilities integrating social, economic, environmental and psychological dimensions	Meynhardt and Gomez, 2019
Stakeholder engagement and participation	Co-creation as a tool to promote environmental sustainability and green shift in smart cities	Hofstad et al., 2023
	Comparison of governance dynamics on land development in different countries	Gielen et al., 2017
Outsourcing and partnerships	Shift from state dominance to market orientation for urban redevelopment projects	Chen et al., 2022
Results measurement and evaluation	Media sentiment assessment to measure acceptance of environmental governance performance	Guan, 2023
	Public perception evaluation on air pollution, climate change and hydropower	Sergi et al., 2019; Tvinnereim et al., 2017; Venus et al., 2020
	Q study to assess the potential of sustainable forestry	Swedeen, 2006
	Measurement of the value placed by citizens on urban green spaces and urban forest	Backlund et al., 2004; Kwak et al., 2003

"Policies and Strategies" and "Results Measurement and Evaluation" are categories in which more attention is paid to environmental protection (22.73% and 24.14% of documents at a high level). In recent decades, authorities have intensified joint efforts in defining policies and strategies for sustainable urban development to mitigate the impacts of urbanization (Bai et al., 2018). Documents highlight the importance of integrated approaches in smart cities. Discursive planning for urban sustainability policies, advanced algorithms for sustainable decisions, ecosystem-based approaches for energy transition and climate adaptation strategies emerge as key elements to address environmental challenges. Instead, studies in "Results measurement and evaluation" focus on adequate methods to assess the effectiveness of environmental policies with regard to air pollution, climate change, energy transition, etc. Furthermore, stakeholder involvement through innovative methods makes it possible to detect citizens' perceptions of environmental quality and the value they place on the area in which they live. Although integrating public concerns into environmental policies and communicating their benefits are crucial to create public value (Smith and Brown, 2022), the limitations of the measurement tools currently in use are amply demonstrated in the literature (Sharifi and Murayama, 2013; Sharifi, 2019).

Documents in "Organizational and managerial capacity" are characterized by 13.64% at a high level. It is highlighted the role of leadership in urban waste management as a vehicle for social and environmental change. Moreover, documents emphasize the need to incorporates environmental sustainability in the performance reporting of public organizations to increase corporate social responsibilities. Although the importance of organizational and management capabilities to promote sustainability in smart cities is obvious, many challenges remain in integrating environmental concerns into operational practices (Ramirez and Grijalba, 2020).

Finally, documents in "Stakeholder engagement and participation" and in "Outsourcing and partnership" are distinguished by 6.45% and 10%, respectively, at a high level of environmental protection. As cities take responsibility for solving the environmental crisis, studies highlight the importance of citizens' involvement in the co-creation of innovative green solutions, also comparing governance dynamics on land development in different countries. Indeed, the success of environmental initiatives depends on the ability of governments to effectively involve all stakeholders (Meijer et al., 2016), but further investigation needs to be done on this issue. Additionally, local governments are increasingly involving private actors in implementing urban regeneration and redevelopment projects. The aim is to mitigate environmental impacts, reducing at the same time public costs and risks. Indeed, a market-oriented approach can foster sustainable urban development and improve citizens' quality of life.

4.3.3. Social equity

Table 11. Documents ranked high in social equity per category.

	Main themes	Documents
Policies and strategies	Public values in health priorities to integrate diverse social perspectives into an inclusive health policy	Baker et al., 2021
	Challenges and opportunities of health data sharing strategies to provide equitable access to services	Marelli et al., 2023
	Conflicting institutional logics in a national health IT agenda balancing efficiency and social justice	Currie and Guah, 2007
	Discursive planning strategies to address social inequalities and equitable distribution of resources	Pløger, 2001
	Advanced algorithms applied to decision making on urban sustainable mobility policies for accessibility	de Paula and Marins, 2018
	Conceptual framework to support an ecosystem approach to low-carbon energy transitions including social justice considerations	Speich and Ulli-Beer, 2023
	Liberal approach to public policy that promote individual autonomy and social equity	Brettschneider, 2007
	Individual preferences for redistributive policies to reduce socioeconomic inequalities	Corneo and Grüner, 2002
	Evolution of European Union IT policies with their ethical and social implications	Carlsson and Rönnblom, 2022
Organizational and managerial capacity	Transformational leadership in promoting broader normative public values among public employees	Pandey et al., 2016
	Leadership and organizational change in waste management practices for social responsibility	Esposito et al., 2021
	Public value preferences among ethnic minority and white managers in a diverse representation	Stazyk et al., 2017
	Bureaucratic representation, organizational well-being, societal background and life satisfaction of civil servants to promote social equity	Eckhard, 2021; Meynhardt et al., 2020
	Alternative framework for corporate social responsibilities integrating social, economic, environmental and psychological dimensions	Meynhardt and Gomez, 2019
	Integrated thinking framework and new accounting practices for transparency and social equity in public performance reporting	Tirado-Valencia et al., 2020; Bruns et al., 2020

Table 11. (*Continued*).

|	Main themes	Documents
Stakeholder engagement and participation	Participatory processes to identify societal public values and promote equity	Nabatchi, 2012
	Collaborative platforms for public value co-creation and greater inclusion in kindergartens	von Heimburg et al., 2023
	Integration of co-production into the strategic commissioning cycle of equitable public services	Loeffler and Bovaird, 2019
	Value tensions and coping strategies in the co-production of social care services	Jaspers and Steen, 2019
	Changes in governance paradigms and the process of social liquefaction in state-society relations	Brandsen et al., 2017
	Rules in use and local participation to promote more inclusive and equitable public policies	Lowndes et al., 2006
	Two-way risk communication and consensus on public values during the COVID-19 pandemic	Guan et al., 2021
	Social production of invited spaces for citizens' initiatives	Visser et al., 2021
	Public participation and the role of mediating institutions in setting of health priorities	Tenbensel, 2002
Outsourcing and partnerships	/	/
Results measurement and evaluation	Citizens' perceptions of government responses to COVID-19 as to freedom, equality and credibility	Amirkhanyan et al., 2023
	Analysis of charities' contribution in achieving social equity goals in state parks	Gazley et al., 2020
	Analysis of the effect of ethnic representation in the police force on crime reduction	Hong, 2016
	Measuring public value failure of government adoption of AI in terms of equity, transparency and human responsiveness	Schiff et al., 2022
	Government websites evaluation from the perspective of responsiveness and dialog	Karkin and Janssen, 2014
	Quantification of public preferences in setting health priorities to ensure social equity	Schoon et al., 2022; Schoon and Chi, 2022
	Assessing the attractiveness of employers in public, private and nonprofit sectors for better working conditions	Ritz et al., 2023
	Public perception evaluation on hydropower based on acceptance, legitimacy and equity of projects	Venus et al., 2020
	Citizens' perceptions evaluation of personalized medicine and related ethical and social concerns	Bombard et al., 2013
	Measurement framework for social values and impacts	Lindgreen et al., 2021
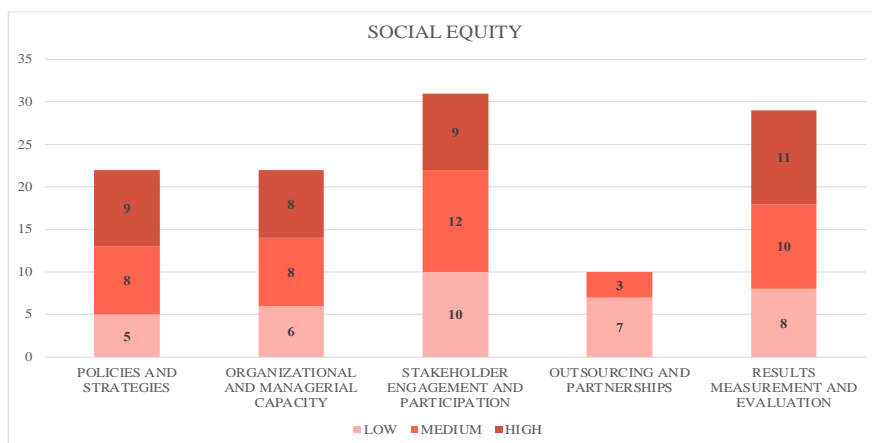
Figure 7. Content analysis results based on the level of social equity.

Figure 7 represents the classification of documents based on the social equity level (low, medium or high) assigned within the studies analyzed. **Table 11** summarizes the main themes covered in documents ranked high in social equity per category.

"Policies and Strategies" and "Measurement and Evaluation of Results" are categories in which greater emphasis is given to social equity (40.91% and 37.93% of documents at a high level). The studies highlight the importance of integrating social equity into urban policies and strategies for creating public value in smart cities. Discursive planning, advanced algorithms for fair decision-making, liberal approach and redistributive policies emerge as drivers to promote social inclusion and reduce inequalities. Indeed, policymakers are faced with the challenge of balancing contrasting needs among stakeholders (Bryson et al., 2014). They have a moral obligation to appeal to a broader set of public values in the exercise of administrative discretion (Adams and Balfour, 2009), which goes beyond the intrinsic values of public action (i.e., efficiency, effectiveness, compliance to rules), including wider social objectives (Witesman and Walters, 2015). On the other hand, the proposed measurement and evaluation approaches are intended to assess the real contribution of public actions in correcting imbalances and ensuring greater benefits for the most disadvantaged (Gooden, 2015). Specifically, documents aim to measure the impacts (positive and negative) of different governmental actions in achieving social goals, in terms of equity, fairness, justice, democracy, transparency, inclusion, ethics. Moreover, studies show that participatory processes aimed at assessing citizens' perceptions are crucial in ensuring the legitimacy of public action, thus promoting public value.

Following, documents in "Organizational and managerial capacity" are characterized by 36.36% at a high level. Scholarly attention is mainly focused on transformational leadership in promoting broader normative public values among public employees and organizational well-being, social background of public managers and civil servants to better represent the diversified needs of the population, new accounting practices for public performance reporting to include social concerns and increase accountability. Such approaches can help to create social equity-oriented public values, ensuring that the benefits of smart city initiatives are distributed fairly across all segments of the population (Tavares et al., 2021).

Documents in "Stakeholder engagement and participation" are distinguished by 29.03% at a high level. They explore the potential of participatory processes, collaborative platforms, strategic co-production and inviting spaces in supporting public managers to identify and understand public values, demonstrating that public participation can be more socially inclusive. Furthermore, rules and institutions that facilitate transparent participation are crucial to ensure that public policies respond to the diverse needs of the community, thus promoting equitable public value in smart cities.

Finally, "Outsourcing and partnership" includes documents by 70% at a low level and 30% at a medium level of social equity. This result demonstrates a gap that requires further analysis in this research field.

4.3.4. Comparison of classification criteria

Figure 8 shows the general classification of the 114 documents based on the three criteria (technological innovation, environmental protection and social equity), with the respective percentages for each level assigned (low, medium, high).
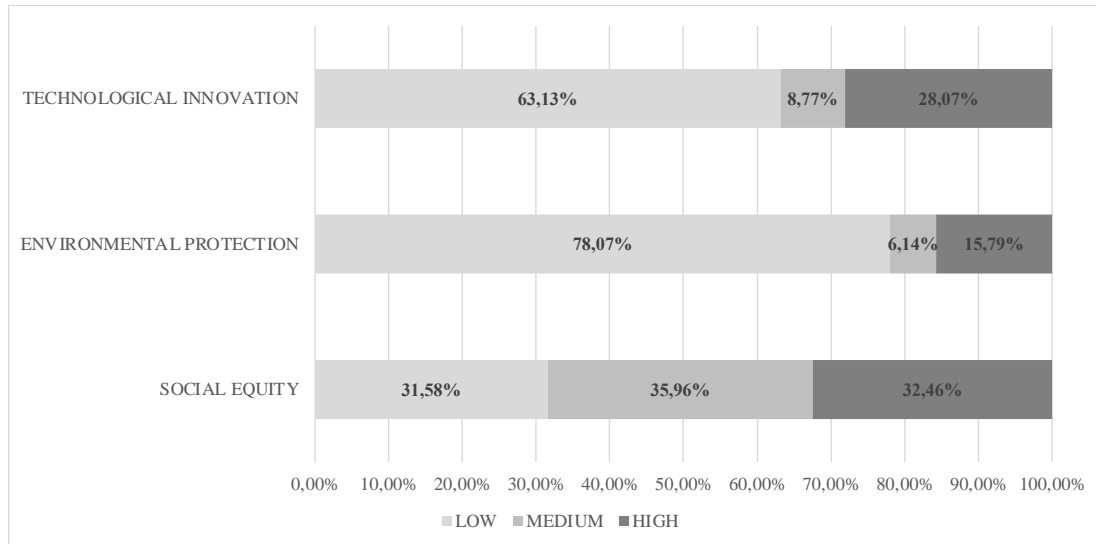

Figure 8. Comparison of the three classification criteria on the overall sampled documents.

Results demonstrate that social equity is the most developed in the analyzed research field, being the only classification criterion for which more than half of the documents have a medium-high level (68.42%). Scientific interest in social equity is stronger and better distributed in all public value classification categories. This finding can be attributed to the inherent social meaning that public value takes on (Bracci et al., 2019). The active commitment of public entities to fairness, justice and equity in policies and strategies, organizational activities, processes and services management, stakeholder engagement and results assessment is an essential choice to create public value in smart cities (Svara and Brunet, 2020).

Following, technological innovation in the analyzed research field takes on a significant role, but it should be further investigated. Indeed, 63.13% of documents are characterized by a low level, not considering any innovative technological approaches or solutions. Nevertheless, results demonstrate that the introduction of technologies in local governments is a key strategy to achieve many public values within smart cities, especially as a tool to engage stakeholders (Yu et al., 2019).

Finally, over time the concept of public value in urban contexts has expanded to include environmental sustainability. However, 78.07% of the reviewed documents do not consider the theme of environmental protection, demonstrating that it is less developed than that of social equity and technological development in the analyzed research field. The results indicate that there is a focus on environmental issues at the policy planning, especially at the supranational level, and outcome evaluation stages, while at the operational and management stage, this focus gradually diminishes. Indeed, the creation of public value, both at the initial stage (in policy and strategy development) and at the final stage (in the measurement and evaluation of results), is crucial. However, in the intermediate operational and management stages of the public

value creation process, there is still plenty of room for progress. These findings suggest that introducing environmental issues into local governments is an essential choice for making cities sustainable and circular (Satterthwaite, 2021), thus contributing to public value in each stage of its creation process.

5. Conclusion

The utopian vision of the smart city remains unfulfilled for many cities around the world and several issues are being debated by scholars and practitioners. Modern technological tools combined with sustainability approaches certainly help meet the dynamic and diverse nature of smart city challenges, ultimately enabling public value creation. Recently, the scientific literature in this field has continued to develop rapidly and there is an urgent need to systematize its knowledge structure.

The bibliometric results showed that the research on public value in smart cities is experiencing an evolving positive trend and is a challenging topic. Despite this, the number of published documents appears to be relatively low compared to the total scientific output, suggesting that there is still large room to explore.

Five different research clusters were identified from the network visualization of keyword co-occurrences, representative of homogeneous research areas linked to each other. The overlay visualization demonstrated that topics related to stakeholder involvement for co-creation process, digital tools supporting democracy, and sustainability practices in urban planning have received greater attention since 2018.

The content analysis revealed a strong focus on stakeholder engagement and participation as a lever to co-create public value and a greater emphasis on social equity over technological innovation and environmental protection. Indeed, social equity, which is inherent to the public value concept, appeared more significant in all the five classification dimensions investigated. Technological innovation was taken into greater consideration in studies on stakeholder involvement, as a tool to support participation, and in those aimed at measuring the results of technology use. Finally, environmental protection was prioritized upstream and downstream of the public value creation process, i.e., in policies and strategies definition and results measurement and evaluation. Instead, the attention on environmental concerns steadily decreased as the operational phases progressed.

In light of these results, several gaps emerged, including (i) the limited integration of sustainability practices in the management of public services and processes; (ii) a lack of tools capable of measuring in an exhaustive and multidisciplinary way all drivers of public value generated through smart city initiatives; and (iii) the difficulty in adopting a holistic analysis perspective of urban development, considering technological innovation, social equity and environmental protection towards the public value. Future research is expected to focus on these perspectives.

The study provides a twofold contribution: conceptual and practical. Conceptually, it seeks to advance the state of the art of knowledge of what constitutes a smart city and how it can concretely contribute to public value generation. Combining the scientific literature on smart cities with that of public value, the study highlights the importance of analyzing the effects of adopting technologies and sustainability approaches by municipalities. This combined approach demonstrates

how these elements can enhance urban development and overall well-being. Practically, the study provides policymakers and city planners with actionable insights for creating public value through smart city initiatives, adopting effective policies and strategies that include technological innovation and sustainability concerns as guiding principles. Given the significant resources and high expectations associated with smart cities, it is essential to understand the conditions and tools necessary for urban innovation to yield tangible community benefits. Specific recommendations include: (i) fostering collaborative governance to enhance stakeholder engagement, ensuring that smart city initiatives address diverse community needs; (ii) developing and implementing comprehensive metrics and tools to evaluate the effectiveness of smart city initiatives in generating public value, encompassing technological, social, and environmental impacts; (iii) integrating sustainability into urban innovation strategies, prioritizing eco-friendly technologies and practices throughout all project development stages; (iv) addressing barriers to access and participation in digital initiatives by implementing programs that enhance digital literacy and provide resources for underrepresented communities; (v) promoting pilot programs to test innovative solutions on a smaller scale prior to broader implementation, facilitating refinement of approaches; and (vi) analyzing successful case studies from cities that have effectively implemented smart city initiatives to extract valuable best practices. For instance, Barcelona exemplifies successful smart city implementation through its use of IoT technologies, particularly in waste management. The city has deployed smart bins that monitor fill levels, allowing for more efficient and effectiveness waste collection. Barcelona also prioritizes citizen engagement thought digital platforms that enable residents to participate in urban planning discussions and co-create urban solutions. In contrast, San Francisco highlights challenges faced by smart city initiatives. The city has encountered significant criticism regarding privacy concerns associated with data collection and surveillance technologies. Although efforts to implement smart traffic management systems were made, public backlash highlighted a lack of transparency and insufficient community involvement in decision-making processes, leading to resistance against these initiatives. These examples demonstrate how outcome of smart city initiatives can vary significantly in achieving public value based on diverse factors, including governance, community engagement, ethical considerations, etc. By addressing these recommendations, policymakers and city planners can better navigate the complexities of smart city initiatives, ultimately enhancing their capacity to generate meaningful public value. The study's contribution is timely as many city governments are currently engaged in urban innovation as part of their smart city programs. This study presents some limitations, including the exclusive reliance on Scopus as the data source, which may not encompass all relevant literature. Additionally, the network analysis method has inherent constraints, as the choice of keywords and the algorithms employed can influence the results, potentially overlooking nuanced connections between research themes. Further studies could benefit from incorporating a wider array of data sources, such as Web of Science, and employing mixed-method approaches to capture a more comprehensive understanding of the smart city landscape.

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