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Smart and Creative City (SCC): Analysis of an Experience in Brazil

Cidade Inteligente e Criativa (CIC): Análise de uma Experiência no Brasil
Ciudad Inteligente y Creativa (CIC): Análisis de una Experiencia en Brasil

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Resumo

Objetivo da pesquisa: O estudo tem como objetivo descrever os elementos significativos que permitem classificar uma cidade como inteligente e criativa.
Enquadramento teórico: O estudo se enquadra na teoria das redes sociais, por intermédio dos conceitos de força dos laços, buracos estruturais e imersão estrutural. Esses tópicos permitem compreender a rede social de inteligência coletiva que pauta a CIC.
Metodologia: A pesquisa é de natureza qualitativa com o uso de análise de documentos e realização de entrevistas em profundidade com atores pertencentes à hélice quádrupla de uma cidade do Brasil. A análise das entrevistas seguiu a técnica de análise de conteúdo.
Resultados: Os resultados evidenciam a importância de considerar as peculiaridades de cada espaço por meio da criatividade e de serem incluídos digitalmente e socialmente todos os atores sociais.
Originalidade: Em relação às cidades inteligentes, são percebidas lacunas conceituais e empíricas, porque elas se tornam polarizadas no que tange a aspectos econômicos e divididas socialmente, culturalmente e espacialmente. Já as cidades criativas tornam alguns recursos privilegiados no que concerne a determinados grupos sociais, enquanto outros não dispõem de acesso aos espaços culturais e criativos. Diante dessas lacunas, a cidade inteligente e criativa agrega a tecnologia e a criatividade por intermédio da sociedade que desenvolve, por meio da inteligência coletiva, tecnologias que contribuem para a melhoria da qualidade de vida e geração de uma cidade inclusiva para seus cidadãos e visitantes.
Contribuições teóricas e práticas: No que diz respeito às contribuições teóricas, existem avanços com respeito a estudos urbanos, de economia criativa, de políticas públicas e de redes sociais. Nas contribuições práticas, evidenciam-se impactos em termos de subsídios para os gestores públicos desenvolverem intervenções em busca de melhoria da qualidade de vida da cidade. Além disso, podem ser observados impactos no setor privado, à medida que as decisões dos gestores passam a ser fundamentadas em uma nova concepção urbana.
Palavras-chave: Cidade Inteligente e Criativa, Hélice Quádrupla, Criatividade, Inovação.

Abstract

Research objective: This study aims to describe the important elements that allow classifying a city as smart and creative.

Theoretical framework: The study is framed within the theory of social networks, through the concepts of strength of bonds, structural holes, and structural construction. These topics enable understanding the social network of collective intelligence that guides the SCC.
Methodology: The research is qualitative in nature using document analysis and in-depth interviews with actors belonging to the quadruple helix of a city in Brazil. The analysis of the interviews followed the content analysis technique.
Results: They highlight the importance of considering the specific results of each space through creativity and of digitally and socially including all social actors.
Originality: In relation to smart cities, conceptual and empirical gaps are perceived, as they become polarized in terms of economic aspects and divided socially, culturally, and spatially. Creative cities, on the other hand, provide some privileged resources that do not concern certain social groups, while others do not provide access to cultural and creative spaces. Faced with these gaps, a smart and creative city brings together technology and creativity through society that develops, through collective intelligence, technologies that stand out for improving the quality of life and generating an inclusive city for its citizens and visitors. .
Theoretical and practical contributions: Regarding theoretical contributions, there are advances in terms of urban studies, creative economy, public policies, and social networks. In practical contributions, impacts in terms of subsidies for public managers to develop interventions in search of improving the city's quality of life stand out. Furthermore, impacts can be observed in the private sector, as managers' decisions become based on a new urban conception.
Keywords: Smart and Creative City, Quadruple Helix, Creativity, Innovation.

Resumen

Objetivo de la investigación: El estudio pretende describir los elementos importantes que permiten crear una ciudad tan inteligente como creativa.
Marco teórico: El estudio se enmarca dentro de la teoría de las redes sociales, a través de los conceptos de fuerza de vínculos, agujeros estructurales y construcción estructural. Estos temas permiten comprender la red social de inteligencia colectiva que guía a la CIC.
Metodología: La investigación es de carácter cualitativo mediante análisis de documentos y entrevistas en profundidad con actores pertenecientes a la cuádruple hélice de una ciudad de Brasil. El análisis de las entrevistas siguió la técnica del análisis de contenido.
Resultados: Destacan la importancia de considerar los resultados específicos de cada espacio a través de la creatividad y de incluir digital y socialmente a todos los actores sociales.
Originalidad: En relación a las ciudades inteligentes se perciben brechas conceptuales y empíricas, porque se polarizan en términos de aspectos económicos y se dividen social, cultural y espacialmente. Las ciudades creativas, por otro lado, proporcionan algunos recursos privilegiados que no conciernen a ciertos grupos sociales, mientras que otras no brindan acceso a espacios culturales y creativos. Frente a estas brechas, una ciudad inteligente y creativa aúna tecnología y creatividad a través de una sociedad que desarrolla, a través de la inteligencia colectiva, tecnologías que destacan por mejorar la calidad de vida y generar una ciudad inclusiva para sus ciudadanos y visitantes.
Aportes teóricos y prácticos: En cuanto a los aportes teóricos, hay avances respecto a estudios urbanos, economía creativa, políticas públicas y redes sociales. En aportes prácticos, destacamos impactos en términos de subsidios para que los gestores públicos desarrollen intervenciones en busca de mejorar la calidad de vida de la ciudad. Además, se pueden observar impactos en el sector privado, ya que las decisiones de los administradores se basan en una nueva concepción urbana.
Palabras clave: Ciudad Inteligente y Creativa, Cuádruple Hélice, Creatividad, Innovación.

1. Introduction

Cities constitute a significant locus of contemporary society, enabling the fulfillment of inhabitants' desires (Ashton, 2018), despite facing substantial challenges. The existence of urban agglomerations reveals both positive and negative aspects of urbanization. On one hand, accelerated and unplanned urban growth generates problems related to infrastructure, sanitation, water distribution, waste management, resource scarcity, air pollution, access to basic health services, and maintenance of life, in addition to congestion and traffic inadequacy (Chourabi et al., 2012; UN, 2014a; 2014b). On the other hand, significant advances in terms of intelligence and creativity emerge.

Regarding intelligence, the application of technologies contributes to the emergence of smart cities, as technology serves as a means to mitigate the problems caused by urban agglomeration. Although such advances are recognized, it is important to note that smart city leadership faces criticism as these spaces can become economically polarized and socially, culturally, and spatially divided (Hollands, 2008; Kummitha & Crutzen, 2017).

Additionally, there is a movement to apply principles and behaviors linked to creativity within cities in an effort to recreate parts of urban spaces and transform them through creativity-based urbanization formats such as creative cities and territories, creative economy hubs, and creative districts (Drumm, Silveira, & Brandt, 2018). In the case of creative cities, the focus falls on art and creativity-related actions (Paz e Silva & Muzzio, 2021), which make certain resources privileged to specific social groups, such as the concentration of cultural and creative spaces in restricted areas of cities. Thus, the Smart and Creative City (SCC) combines technology and creativity through a society that, using collective intelligence, develops technologies that contribute to improving the quality of life and creating an inclusive city for its citizens and occasional visitors.

This study highlights the relevance of analyzing cities through the lenses of both intelligence and creativity. The rationale lies in the fact that these city models overcome the limitations present in their isolated conceptions when viewed together. Therefore, it is relevant to understand the defining elements of smart and creative cities to facilitate and make decisions related to this context more effective. In this sense, the discussion aims to describe the significant elements that allow the classification of a city as intelligent and creative. To do so, it conducts an empirical analysis in a Brazilian city based on the perception of actors belonging to the quadruple helix.

The achievement of the proposed objective was made possible through a study using document analysis and in-depth interviews with actors from the quadruple helix residing in the Recife Metropolitan Region (RMR), in the state of Pernambuco, located in the Northeast region of Brazil. The choice of RMR is justified by the actions conducted at Porto Digital and its urban intelligence mechanisms. Regarding this, the Connected Smart Cities Ranking (Urban Systems, 2024) ranks Recife in the fifth position in the Northeast region in the entrepreneurship and urban intelligence axis.

2. Social Networks and Smart and Creative Cities (SCC)

Social network analysis provides a theoretical lens to help understand the webs that shape cities. Granovetter (1973) discusses how network analysis can demonstrate the existence of macro phenomena such as diffusion, social mobility, political organization, and social cohesion. Therefore, bonds represent the relationships existing in social networks and are configured as either strong or weak. The strength of a bond is related to the combination of time spent, emotional intensity, intimacy, and reciprocal services. Hence, a strong bond is associated with frequent contact and closeness between individuals in terms of ideas, knowledge, and purposes, while a weak bond is linked to less frequent contact and greater diversity of ideas, knowledge, and purposes.

The idea of structural embeddedness conceived by Granovetter (1985) suggests that behaviors and institutions are driven by ongoing social relationships, as they cannot be understood as independent phenomena. This means that part of human behavior is immersed in networks of interpersonal relationships, avoiding under- or over-socialized views concerning social actors and their relationships (Granovetter, 2007).

Structural holes are understood as conflicts between two social actors that may create advantages for a third stakeholder who manages to dialogue with both (Burt, 1992). As a counterpoint to the existence of such structural holes, Smith-Doerr and Powell (2005) consider bridges as elements that span the structural hole through social networks. With these insights regarding social networks established, intersections are made between the presented concepts of social networks and the elements of smart and creative cities.

Smart city concepts often grant a certain protagonism to technology at the expense of human potential. However, some smart city schools of thought, as defended by Kummitha and Crutzen (2017) — such as the reflexive and rationalist schools — recommend changes in their intellectual positions. The rationalist school argues that human beings should assume a central role, and with expertise and support from ICTs, innovative solutions can be

developed to solve urban problems. Thus, scholars from this school of thought consider the paradigm of the Smart and Human City, which is based on the quadruple helix concept, composed by actors from the government, university, private sector, and civil society (Carayannis & Campbell, 2012). This idea allows the emergence of so-called "social connectivity" as an element of the SCC, which involves connecting actors from different city domains based on their participation in a particular social network. Furthermore, the emergence of weak bonds, as indicated by Granovetter (1973), can be perceived within this social connectivity, as the social network includes actors from various fields dialoguing about city challenges mediated by technology, thus expanding the conception of ideas and development of solutions for urban settings.

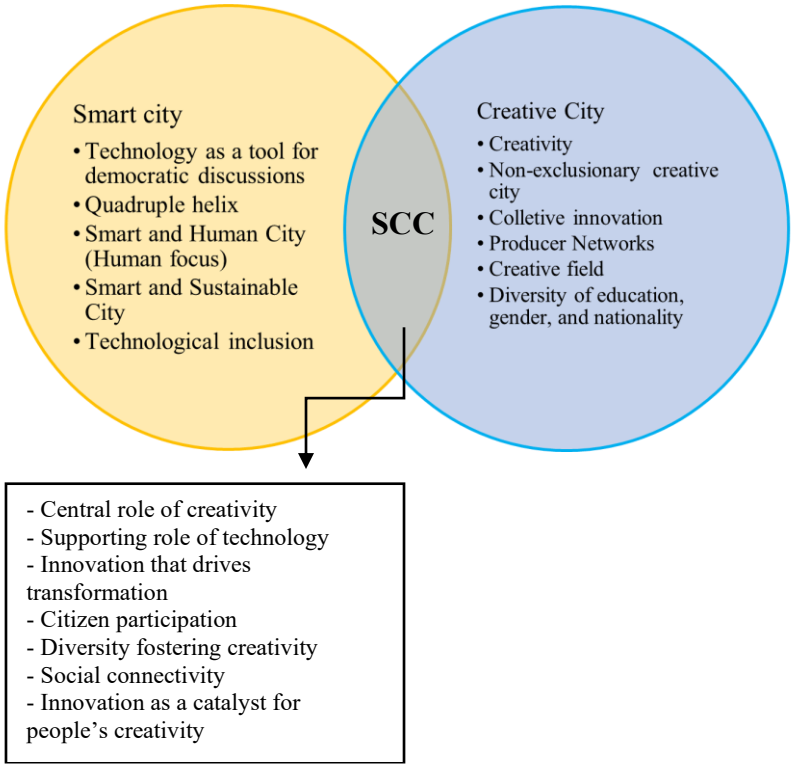
Regarding "social connectivity" and the social network, the concept of structural embeddedness helps explain that the SCC can only be understood by understanding the social networks present in a given city. Therefore, the SCC can only be understood by recognizing the existence and mode of operation of the protagonists of its social networks, as community participation plays a crucial role in ensuring fair and sustainable growth in metropolitan centers (Vafaeva et al., 2024).

Autrán (2014) argues that creatives are not just artists or those working with new social media, designers, or university researchers, but also public policy makers. Thus, the perception of the SCC surpasses the restrictive notion of a creative class proposed by Florida (2011), which classifies individuals based on creative professions and hyper-creative centers.

The discussion regarding creative cities highlights the prevalence of the human factor and of spaces directed toward their development. This includes the preconditions of a creative city, such as: managing the capacity of actors, encouraging creativity among the majority of individuals, contributions from immigrants, participation, the use of events and catalytic organizations, and the development of creative spaces (Landry & Bianchini, 1995); the people who think of solutions for city problems (Bradford, 2004); and the view that the government should promote collaboration platforms between management and the population through sharing technologies such as co-creation, co-design, and co-production (Anttiroiko, Valkáma, & Bailey, 2014). This observation is associated with the SCC element "innovation that generates transformation" as innovation stems from social creativity applied to urban services that serve broad social sectors and improve quality of life, leading to a more inclusive city. This aligns with the view of Reis and Kageyama (2009) on the use by public administration of imagination, social innovation, and creativity in public services.

The SCC's concept regarding technological aspects states that technology alone is not capable of transforming urban contexts into inclusive spaces with quality of life and cultural appreciation. The uniqueness lies in the effort to combine human intelligence in a social network with the technological support of governance platforms and tools to expand the creative possibilities of the stakeholders. Therefore, this argument leads to the visualization of three SCC elements, with some of their respective sources: "central use of creativity" (adapted from Landry & Bianchini, 1995), "supportive role of technology" (adapted from Kummitha & Crutzen, 2017), and "citizen participation" (adapted from Anttiroiko, Valkáma, & Bailey, 2014). Based on these discussions, Paz e Silva and Muzzio (2021) propose a configuration composed of seven formative elements of the SCC (see Figure 1).

Figure 1. Configuration of the Smart and Creative City (SCC) and its source categories



Source: Paz e Silva e Muzzio (2021).

Having outlined the categories from the smart city and creative city literature that contribute to the understanding of the SCC, the next section presents the study's methodology.

3. Methodology

The research was based on widely accepted principles and tenets in the field of social science. Ontologically, the study aligns with a subjectivist perspective and epistemologically with an interpretivist approach to knowledge (Cunliffe, 2010). In terms of nature, it is classified as qualitative.

Regarding research instruments, the study triangulated document analysis and in-depth interviews. For the documents, theoretical-empirical analyses were conducted concerning indices related to smart and creative cities, as listed in Table 1.

Table 1. Documents used regarding smart and creative cities

Documents related to smart cities	**Sources**
Mapping smart cities em EU	European Parliament (2014)
Brasil 2030: Indicadores brasileiros para cidades inteligentes e humanas	RBCIH (2017)
Ranking Connected Smart Cities	Urban Systems (2019)
Smart Cities Index Portugal	Selada (2016)
Cidades Americanas do Futuro	FDI Intelligence (2017)
Documents related to creative cities	**Sources**
Creative Communities Index	Cultural Initiatives Silicon Valley (2003)
Cultural life índex	Picard, Grönlund, e Toivonen (2003)
Hong Kong Creativity Index	Hui, Chun-Hung, e Mok (2005)
European Creativity Index, Design, Creativity and Innovation scoreboard	Hollanders e Van Cruysen (2009)
Índice de criatividade das cidades	Fecomércio São Paulo (2012)
Índice Global de Criatividade e Índice Gay	Florida, Mellender, e King (2015)
Creative City Index (CCI-CCI)	Hartley, Potts, e McDonald (2012)
Potenciality of Creative Industries Index	Castro-Higueras e Aguilera-Moyano (2018)

The interviews were conducted with 30 participants from the four axes of the quadruple helix: public sector, private sector, universities, and civil society. The criteria for inclusion were: belonging to one or more of the quadruple helix axes, participation in mapped social networks, and involvement in sectors related to intelligence and/or creativity in the city, such as cultural space managers. These interviews were conducted both in person and remotely, depending on the participants' preferences.

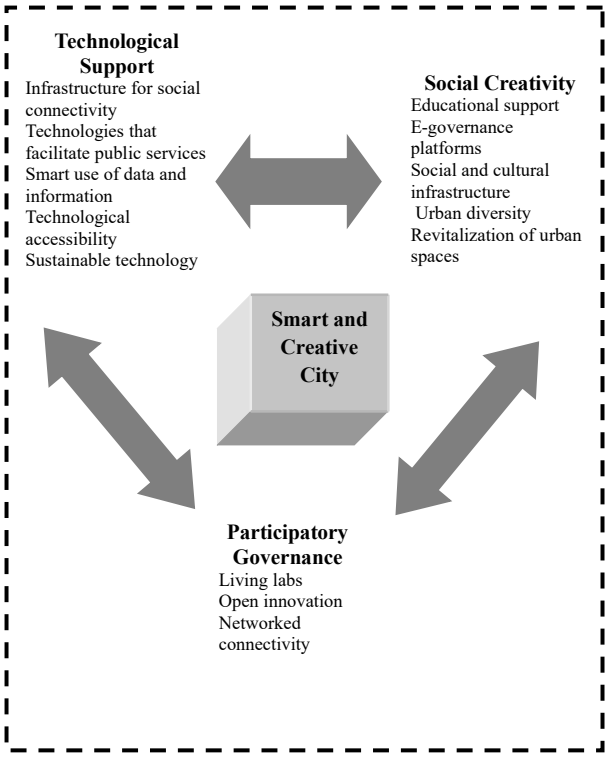
Regarding the interviewees' characteristics, their ages ranged from 27 to 68 years, which provided a diversified perspective on the integration of technology and creativity into urban contexts. As for their professional backgrounds, there was a mixture of fields, reflecting the four axes of society. Notable areas included Engineering, Applied Social Sciences, Humanities, and Linguistics, Language, and Literature, and Arts.

In terms of occupations, the sample included teaching, traditional and social entrepreneurship, consulting, and public service. Regarding sex, although this was not the focus of the researchers, there was a prevalence of male participants, with 22 interviews conducted with men and 8 with women. The purpose of the research was explained to all participants, and all signed an Informed Consent Form, ensuring their anonymity. The interviews were manually transcribed to enable the pre-analysis process, after which content analysis was applied (Bardin, 2016).

4. Smart and Creative City Framework and Intersection with Empirical Evidence

Paz e Silva and Muzzio (2021) propose a framework related to the Smart and Creative City (SCC) (see Figure 2), allowing the concept to be operationalized and providing theoretical support for future empirical studies.

Figure 2. SCC Framework



Source: Paz e Silva and Muzzio (2021).

The three dimensions are presented separately for educational purposes, but in practice, they occur simultaneously and operate in a complementary manner. Therefore, what enhances creativity in the context of the SCC involves the joint and coordinated use of the dimensions of technological support, social creativity, and participatory governance. As such, local realities, regional specificities, or cultural conditions may contribute to the absence or inapplicability of certain factors; however, other elements may be sufficient or significant for the purposes of the SCC (Paz e Silva & Muzzio, 2021). This perspective aligns with the notion that each city presents factors related to its own geographic, ecological, historical, and cultural characteristics. It is, therefore, a complex system in which simple replication of solutions is not possible, as the relevance of variables used to assess urban conditions regarding intelligence and creativity in one city may not be applicable to another (Câmara, Pinto, Carvalho, & Souza, 2019). This framework provided the foundation for an empirical study conducted in the Recife Metropolitan Region (RMR), detailed in Section 5.

After the document analysis process, the framework was refined to include four final dimensions and their respective subdimensions: technological support, social creativity, participatory governance, and economy and business (see Table 2).

Table 2. Dimensions and subdimensions of the analysis

Dimension	Subdimensions/ Codes from Document Analysis	Subdimensions reinterpreted drom the analysis of findings
Technological Support	Smart mobility	Smart and creative mobility
	Technology	Technology and creativity
	Smart environment Natural resources	Smart and creative environment
	Smart living	Smart and creative living
	Urban planning Urbanism	Reframing urban planning
Social creativity	Smart people Human capital	Smart and creative people
	Social capital	Social capital
	Cultural capital	Cultural capital
	Innovation	Innovation
	Creative industries	Creative economy
	Creative classes	Human Creativity
	Tolerance	Diversity
Participatory governance	Smart governance	Smart and creative governance
	Social cohesion	Social cohesion
	Social connectivity	Social connectivity
Economy and business	Smart economy Economy	Smart and creative economy
	Entrepreneurship	Entrepreneurship

The dimensions of “technological support,” “social creativity,” and “participatory governance” had been previously established through the literature review. However, the “Economy and Business” dimension emerged from the document analysis process, based on the smart city and creative city indices that were examined. Within each of these dimensions, subcategories were discussed through the transcribed interviews, and some of them underwent modifications in the context of the SCC.

For the subcategories that were modified, several conceptual clarifications are made within the SCC, such as:

- Smart and creative mobility: Mobility is not only based on technology, but also driven by local demands and citizen participation;
- Technology and creativity: Technology and creativity complement each other, overcoming the isolated approach seen in the smart city and creative city models;
- Smart and creative environment: A sustainable environment depends on the joint presence of creativity and technology;
- Smart and creative living: Public services become more appropriate and effective due to the integration of technology and creativity;
- Reframing urban planning: The city is understood as already existing, but with the possibility of improvement based on what currently exists;
- Smart and creative people: People are able to appropriately use technology and creativity due to improvements in the educational context;
- Social capital: Arises from connections between actors, such as those formed during events;
- Cultural capital: Refers to the decentralization of access to culture within the city;
- Innovation: Application of solutions developed through networks;

- Creative economy: Composed of organizations that use creativity as a key input;
- Human creativity: Moves beyond the concept of the "creative class" and sees creativity as something innate to all human beings;
- Diversity: Respect for and openness to the development of creativity;
- Smart and creative governance: Collective participation can be facilitated by technology and the integration of creativity;
- Social cohesion: Represents the extent to which the city can include people and embrace diversity;
- Social connectivity: Presence of physical and digital spaces that connect people;
- Smart economy and creativity: Technology and creativity should be embedded in jobs and public spaces;
- Entrepreneurship: Incubators and businesses should align with the local vocation.

4.1 Technological Support

The "technological support" dimension refers to the fact that technology provides support for individuals in developing and implementing solutions aimed at solving problems that afflict society (Paz e Silva & Muzzio, 2021). Within this dimension and regarding mobility, interviewees highlighted the importance of apps such as Waze and Google Maps, which facilitate and provide flexibility for urban travel. Furthermore, these apps uncover alternative routes, which can generate user-based data and provide a foundation for "rethinking" traffic flows, ultimately reflecting on urban quality of life by enabling more fluid traffic. This is a self-reinforcing process driven by data generated within apps. Given the user's immersion in the social context — termed "structural embeddedness" by Granovetter (1985) — the travel subject reinterprets the pattern imposed by technology, reinforcing the "central use of creativity" as emphasized in creative city literature (Landry & Bianchini, 1995; Bradford, 2004).

In line with the direction of technologies influenced by social experiences, the term "social technology" emerged from the interviews, as it appears to be present in city agendas, as for instance, in the co-creation process of the Creative Tourism Plan in Recife. This initiative highlighted the relevance of creative tourism and showcased how social technology can drive the development of public policies, social innovation, and urban transformation. However, there remains a lack of investment in digital technologies that foster connectivity among social actors. Some actors are still digitally and socially excluded, facing challenges in participating in co-creative processes. For instance, interviewee 10 mentioned that during the pandemic, some members of RECRIA (National Network of Creative Tourism Experiences), such as residents of the Bomba do Hemetério neighborhood, could not attend network meetings since they lacked mobile phones or internet access, rendering their needs invisible. In social network literature, this phenomenon is associated with structural holes (Burt, 1992).

To overcome digital and social exclusion, shared responsibility may represent a more inclusive mechanism. Interviewee 4 suggested that the provision of digital technologies should not be the State's responsibility alone but should also involve companies that can organize and facilitate access. This shared responsibility allows for technological solutions focused on improving public spaces, such as access points that, according to Nam and Pardo (2011), are part of a social connectivity infrastructure. However, such access should be geographically distributed across the city to avoid creating islands of connectivity.

The SCC model emphasizes the need for a balance among sustainability dimensions — economic, natural, and sociocultural — in the urban environment. Yet, interviewees noted a strong focus on the natural dimension, while the sociocultural aspect lacks presence in ongoing actions. Interviewee 6 cited a social technology initiative during the Carnival in Olinda, where aluminum cans were collected, registered, and sold through negotiations with the industry. This initiative addressed the three dimensions of sustainability simultaneously and illustrates the bridge role (Smith-Doerr & Powell, 2005) played by the Municipality of Olinda, facilitating such actions through social networks. Regarding digital technologies, significant progress has been made in healthcare services, especially in response to demands stemming from the COVID-19 pandemic. For example, the "Atende em Casa" (Home Care) app allowed medical appointments via the internet, while "Conecta Recife" enabled users to schedule vaccine appointments, reducing crowding at vaccination sites. In education, the pandemic prompted a rapid shift to remote

learning, revolutionizing teaching and learning processes. However, digital exclusion remained a problem for individuals without internet access.

These advancements were not accessible to all due to persistent social and digital exclusion in urban contexts (Hollands, 2008; Kummitha & Crutzen, 2017). This supports the argument for shared responsibility, while also highlighting the emergence of open innovation mechanisms (Schaffers et al., 2011).

The prominence of social technology, socially networked processes, and collective creativity in SCCs shows that standardized solutions are ineffective across diverse urban contexts. Each place expresses its own uniqueness, history, and resident needs, reinforcing the perspectives of Câmara et al. (2019) and Paz e Silva & Muzzio (2021), especially regarding the supportive role of technology and citizen participation.

A summary table was developed to clarify the category "Technological Support", considering the factors of smart and creative cities identified in the SCC framework shown in Figure 2, analyzed together with the elements that shape the configuration of an SCC, as presented in Figure 1. Accordingly, the last column (see Table 3) highlights the elements from the literature that were confirmed in relation to the SCC. In addition, it includes new components that emerged from the interviewees' statements and, finally, the elements considered essential to enhance the development of the SCC. Following this reasoning, additional summary tables (see Tables 3, 4, 5, and 6) were created to clarify other categories related to the configuration of an SCC.

Table 3. Intersection Between Theoretical Constructs and Field-Derived Elements for the Category "Technological Support"

Subcategory	Smart city	Creative city	Smart and creative city
Smart and creative mobility	Technology as access to democratic discussions; Technologies that facilitate public services.	Creativity	Central use of creativity in the development of technologies appropriate to the reality of each city.
Technology and creativity	Infrastructure for social connectivity; Technological accessibility.	Creativity; Non-exclusionary creative city.	Social technology aimed at enabling the transformation of urban spaces; Urban spaces that are more inclusive both technologically and socially.
Smart and creative environment	Sustainable technology; Smart and sustainable city	Non-exclusionary creative city.	Urban spaces that are economically, socially, and environmentally sustainable.
Smart and creative living	Public service enabling technologies; Intelligent use of data and information; Quadruple helix	Non-exclusionary creative city.	Citizen participation through social networks present in the development and enjoyment of public policies.
Reframing urban planning	Quadruple helix	Revitalization of urban spaces; Creativity	Social networks can provide solutions suited to local realities through collective creativity.

The debate on the "technological support" dimension highlights that technologies function as mechanisms designed to ensure improved access to the use of public services and spaces for public participation. However, on their own, they are not sufficient to provide improvements in quality of life and social inclusion, as they assume a "supporting role" (Paz e Silva & Muzzio, 2021). Therefore, it is necessary to ensure the participation of key actors,

bringing their creativity collectively within a technology-mediated social network, so that innovations can result from these connections and the reality of each city can be considered.

4.2 Social Creativity

The "social creativity" dimension considers creativity as originating from individuals in different sectors, aimed at generating solutions to urban problems and implementing them through innovative processes operating across public, private, social, and academic spheres (Paz e Silva & Muzzio, 2021).

The creative citizen must be aware of their own creativity and that of others, including those with differing perspectives, while also being conscious of their social role. In the SCC context, social capital is built through contributions from both resident actors and those from external environments (Landry & Bianchini, 1995). These contributions occur through intersubjective processes and weak bonds (Granovetter, 1973), which may become sources of collective creativity for urban solution development. This has two implications: social capital encourages diversity, and this diversity makes urban contexts more inclusive and attractive to investment, especially by individuals seeking cities aligned with these values. Interviewee 27 supported this view by comparing the cities of Caruaru (Pernambuco) and Campina Grande (Paraíba), which are equally distant from their state capitals yet show significant cultural differences due to market demand. For example, in the 1960s, Campina Grande had PhDs in engineering and individuals with international experience, unlike Caruaru.

Access to culture should be bound to creativity in a way that transforms tourist visits and experiences in cultural spaces, as well as in educational activities. For example, visiting a museum could become an interactive experience where visitors not only observe but also engage creatively — such as drawing interpretations of exhibited works.

It is imperative to ensure the distribution of cultural facilities across neighborhoods, fostering a sense of belonging and appreciation among residents, who will see their community's unique characteristics reflected. Interviewee 3 highlighted this issue using São Paulo as an example, where museums are concentrated in central areas, leaving culturally rich neighborhoods underserved. The same can be observed in the Recife Metropolitan Region, where museums cluster around Recife Antigo, despite other neighborhoods' historical contributions. This supports Granovetter's (1985) structural embeddedness concept, as people feel more connected to their histories and social relations.

Innovative processes are crucial not only in public service and cultural institutions but also at the social level through social innovations (Reis & Kageyama, 2009). These innovations can be facilitated by social technologies and co-creation and co-production processes, enabling the implementation of creative ideas within the social sphere. Interviewee 10 discussed governance in Bomba do Hemetério, Recife, which supports community-based and creative tourism. This aligns with Granovetter's (1973) view, in which weak bonds can foster creative effort through the connectivity of key actors within collective projects. It also shows how social innovation can stimulate individual creativity within the SCC framework.

The human creativity perspective rejects the notion that creativity is the exclusive domain of a particular social class, as argued by Florida (2011). Creativity must be nurtured through education to form creative citizens, but it also arises from social relationships marked by interculturalism (Landry & Bianchini, 1995). This phenomenon occurs when city residents are open to embracing cultural diversity. Creativity should also be embedded in the social network so that, through social connectivity, social innovations can emerge. Interviewee 8 recognized Recife's cultural diversity as a major attraction for visitors and new residents. These considerations led to the creation of a summary table (Table 4) for the second SCC category: Social Creativity.

Table 4. Intersection between elements from the literature and those emerging from the field for the category "Social Creativity"

Subcategory	SC	CC	SCC
Smart and creative people	Technologies that facilitate public services; Educational support	Creativity	The use of creativity in education can transform citizens.
Social capital	Quadruple helix	Creativity; Non-exclusionary creative city	Creativity through the network allows for the design of more inclusive public policies.
Cultural capital	Absent	Non-exclusionary creative city; Social and cultural infrastructure	Cultural facilities should use creativity to engage and raise awareness among visitors of these spaces.
Innovation	Quadruple helix	Non-exclusionary creative city	Social technology enables the creation of a more inclusive city, where innovation is conceived collectively.
Creative economy	Quadruple helix; Social connectivity	Non-exclusionary creative city; Creativity; Social and cultural infrastructure	Decentralized creativity spaces enabled through the network's social connectivity.
Human creativity	Smart and Human City (Human Focus)	Diversity in education, gender, and nationality; Social and cultural infrastructure	Citizens' creativity must be reclaimed to enhance civic participation.
Diversity	Smart and Human City (Human Focus)	Diversity in education, gender, and nationality; Social and cultural infrastructure	Diversity in the city fosters creativity.

The category of "social creativity" reveals the central role that creativity plays both in transforming an individual's life on a micro level and in shaping collective experiences at macro and social levels. This factor holds a certain prominence in the literature on creative cities, as seen in the works of Landry and Bianchini (1995) and Bradford (2004). However, the Smart and Creative City (SCC) can be seen as a distinctive model when combined with technology, as creativity helps customize technologies to better suit the specific needs of each city. Moreover, well-distributed public spaces — such as squares and parks — should be made available and aligned with the daily realities of residents.

4.3 Participatory Governance

The "Participatory Governance" dimension emphasizes the prominence of social networks and citizen participation in addressing urban issues (Paz e Silva & Muzzio, 2021). Within this dimension, it becomes evident that public policy councils, as institutional mechanisms, often fail in their implementation. Some councils tend to cater to specific group interests to the detriment of the collective. For them to function effectively, they need to be supported by weak bonds (Granovetter, 1973) rather than strong ones; require educational support for forming creative citizens; draw upon learning from private councils; and reflect upon past mistakes experienced in public policy councils. For example, interviewee 19 highlighted the PDMC (Porto Digital Management Center) council as a reference.

Another aspect addressed in the study concerns partnerships experienced by interviewees involving stakeholders from the private sector, public sector, civil society, and universities. One example is the representativeness of RECRIA, which achieved notable results in the field of creative tourism. Through weak bonds (Granovetter, 1973) and interactive co-creation processes, RECRIA developed Recife's creative tourism plan, considered pioneering in the sector.

Coworking spaces, in addition to their economic role for entrepreneurs, reduce urban commuting and benefit the natural sustainability dimension. They also foster weak bonds among stakeholders, amplifying collective demands and functioning as catalytic spaces (Landry & Bianchini, 1995). For example, individuals in such spaces may participate in public councils, lead community causes, or act as institutional bridges (Smith-Doerr & Powell, 2005), helping elevate issues to the political agenda.

Regarding platforms that support social connectivity, interviewees cited Colab, used in the Recife Metropolitan Region, which influences public service agendas. However, it requires periodic revisions since public authorities often fail to respond to citizen requests. This reinforces the point made in the "technological support" dimension: data generated from app usage serve as sources of intelligence to reinterpret technological patterns.

Discussing the aspects related to participatory governance, Table 5 was developed to define the third category of SCC.

Table 5. Intersection between elements from the literature and those emerging from the field for the category "Participatory Governance"

SubcategorY	SC	CC	SCC
Smart and creative governance	Educational support; Quadruple helix	Creativity; Creative field; Inclusive creative city; Diversity of education, gender, and nationality	Educational support promotes public participation in councils, ensuring they become effective.
Social cohesion	Quadruple Helix; Partnerships	Inclusive creative city; Diversity in education, gender, and nationality	Social networks serve as mechanisms of social connectivity, which break down due to socio-historical imbalances.
Social connectivity	Technology as support for democratic discussions; E-governance; Smart and Sustainable City	Creativity; Creative field; Diversity in education, gender, and nationality	Coworking spaces have both economic and social impact, as they foster creativity through diversity; E-governance tools can be useful for social connectivity, but need to reformulate their role within the SCC.

Discussions regarding the "Participatory Governance" category highlight the need for a reform in the functioning of public policy councils, so that they fulfill the objectives for which they were created — namely, to provide conditions for the implementation of institutional governance mechanisms. As for partnerships among actors of the quadruple helix, weak bonds and connections that foster social cohesion and mitigate structural gaps are evident. However, the initiatives appear fragmented and require stronger coordination among the actors of the quadruple helix. Lastly, electronic governance remains incipient in terms of systems and applications.

4.4 Economy and Business

The "Economy and Business" dimension addresses the economic and social impacts of technology parks, changes in employment profiles in contemporary times, the role of incubators in urban contexts, and the effects of launching new businesses in cities (Paz e Silva, 2022).

Current jobs are undergoing transformations under the influence of technology and creativity. The findings demystify the notion that creativity is limited to a particular class, as suggested by Florida (2011), and expand the discussion to include the creative potential of public managers, academia, and citizens in general. These individuals, living urban challenges daily, can contribute to inclusive political processes and solutions to the population's needs. This supports Anttiroiko et al.'s (2014) argument for promoting citizen participation in co-creation processes within the city.

It is also important to consider the role of technology protagonists in contemporary professional life, such as app-based drivers who face precarious work conditions, high service fees, and a lack of labor rights — the phenomenon known as "uberization". However, within the context of social networks, these drivers may unite to create their own platform. Interviewee 11 noted that in a city such as Recife, with its many tech companies, building a community-driven app would be more viable than relying on a massified platform. One driver alone could not create and launch the solution, but a collective effort would enable the development of such a shared service platform.

The role of a technology park also stands out as a catalytic institution (Landry & Bianchini, 1995) and a promoter of collective creativity. For instance, Porto Digital in Recife plays a bridging role (Smith-Doerr & Powell, 2005) by connecting various social actors and encouraging project development through a social network of collective intelligence, which also fosters creativity. Social impacts are also observed as Porto Digital helps regenerate historic areas and preserve heritage in Recife Antigo, Santo Antônio, and Santo Amaro neighborhoods. However, it is necessary to avoid centralizing resources in specific areas, as previously discussed under technological support and social creativity.

Another urban endeavor discussed in this study is the incubator for new ventures. This mechanism supports entrepreneurial activity, particularly for startups. Despite its importance, some incubators are inefficient, producing entrepreneurs who remain dependent on guidance and are unprepared upon exiting the program.

Incubator leaders must learn from successful cases and, in their roles as managers, consultants, or policy council members, reflect on past failures to continuously improve entrepreneurial support tools. Additionally, in the SCC model, incubators should reflect the economic vocation of their location. Interviewee 5 emphasized the need for incubators that include multiple sectors, while interviewee 10 highlighted the importance of incubators supporting social businesses.

The role of businesspeople in a city has both economic impacts — such as employment and income generation — and social impacts, particularly regarding individual dignity. This reflects the idea of shared responsibility, in which the private sector helps reduce the State's burden of providing social assistance.

Having considered the changing employment landscape and the presence of new businesses in the city, a summary table (Table 6) was created for the fourth SCC category: Economy and Business.

Table 6. Intersection between elements from the literature and those emerging from the field related to the "Economy and Business" category

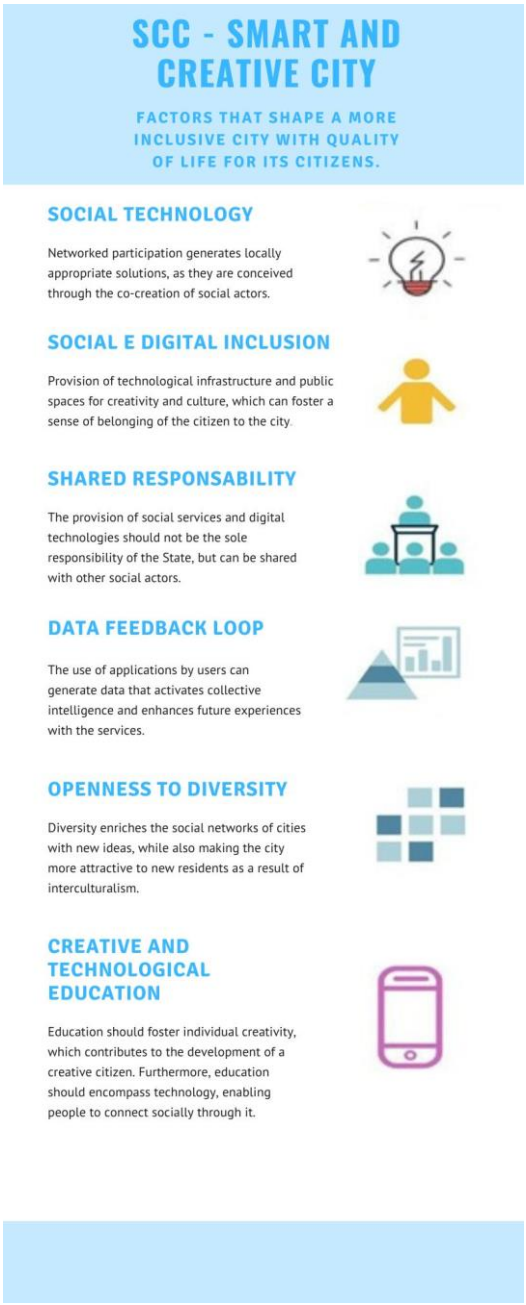
Subcategory	SC	CC	SCC
Smart and creative economy	Partnerships	Creativity; Diversity in education, gender, and nationality	Creativity should be present in professions and in bridging organizations, such as technology parks, which promote social connectivity.
Entrepreneurship	Partnerships	Creativity; Creative field; Inclusive creative city; Diversity in education, gender, and nationality	Incubators should present diverse vocations and review their modes of operation, contributing to new businesses. These should have both economic and social impacts in the SCC.

In terms of discussions related to the "Economy and Business" category, creativity takes on a certain centrality, especially regarding professions and within the context of technology parks. However, it is necessary to ensure that access to creativity is distributed equitably. Regarding entrepreneurship, the aspect of rethinking the role of incubators and the role of new businesses in the effort to ensure shared responsibility becomes particularly relevant.

5.5 Formative Factors of the SCC

Based on the discussions surrounding the four dimensions of the Smart and Creative City (SCC), a new integrative framework emerges (see Figure 3), which outlines the main factors that shape this city concept according to the empirical research. These factors intersect across the dimensions of the SCC and are therefore not exclusive to any single dimension. These factors may be subject to reformulation when applied in other urban contexts, with their respective peculiarities and characteristics of collective intelligence and creativity, which reinforces the non-generality of the SCC model.

Figure 3. SCC – Smart and Creative City: formative factors based on the empirical study



6. Final considerations

This study discussed elements and conditions of smart and creative cities. The proposed objective was to "describe the significant elements that allow a city to be classified as smart and creative." This was achieved through four dimensions: technological support, social creativity, participatory governance, and economy and business. The findings complement existing literature by including an integrative perspective of cities that are simultaneously smart and creative, differing from prevailing literature, which typically analyzes smart cities and creative cities separately.

The evidence highlighted the need to include citizens through access to digital technologies, cultural spaces, and creative spaces, enabling them to feel part of the social context and thus contribute to the development of efforts aimed at enhancing collective creativity. Moreover, this inclusion mechanism extends not only to those who are part of the city but also to individuals from outside, attracted by the openness generated and who can contribute to the urban context with their ideas and experiences.

Another important point regarding technology lies in the fact that the studied context possesses digital technologies that provide infrastructure to ensure access to public services and to those directed at generating social connectivity. However, the leading role of technology shifts to the set of social devices, as they allow the generation of solutions through co-creation, making the city more responsive to the demands of its residents.

When viewed separately, smart and creative cities display their strengths toward the use of digital technologies in the automation and control of urban services, and in the appreciation of cultural and social aspects, respectively. The Smart and Creative City (SCC), in turn, aggregates these contributions but emphasizes the importance of considering the peculiarities of each space through creativity and digital and social inclusion, by providing access to digital technologies and cultural and public spaces across different parts of the urban context.

The main contributions of this study lie in highlighting the effects of urban studies based on the idea of a city that includes its stakeholders through social networks and governance instruments, such as RECRIA, a pioneering creative tourism entity established in the city of Recife. Thus, studies in creative economy broaden discussions over creative cities and reinforce the importance of demystifying the concept of the creative class; in public policy studies, by encouraging public managers to reflect on participatory governance, developed through mechanisms such as councils or digital governance platforms such as Colab, which highlights possibilities regarding the decentralization of responsibilities in the provision of public services; and in social network studies, as the discussion includes the network within the macro context of the city and reveals the extent to which it can influence democratic processes in public policymaking.

At the social level, the analysis of the urban context as an SCC impacts society by providing a proposal that supports public managers in intervention programs aimed at improving quality of life, such as decentralizing technological and social resources to neighborhoods, given that these are still concentrated in the downtown area of the Recife Metropolitan Region (RMR). Such resources can grant access to the population to cultural activities, potentially encouraging the arrival of new residents, and fostering people's creativity through the use of more playful space formats. In managerial terms, it is possible to foresee impacts on the private sector when managers make decisions based on the integrated concept of the SCC, regarding which types of businesses best suit the local vocation. This can occur not only due to the influence of networks but also due to democratic access both to technological services that enhance business activities and to the supply of qualified labor, which tends to be attracted by quality-of-life-enabling infrastructure present in the SCC context.

Regarding limitations, the study analyzed the SCC from the perspective of stakeholders based in Pernambuco. Other social realities with different conditions may present different results; therefore, similar studies in other national and international contexts are recommended for comparison purposes.

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