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Rediscovering intelligent cities by technology

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Abstract. As engines of social and economic growth cities develop urban intelligence using information and communication technology in order to improve quality of life, rediscover the city as a community and support urban innovation. Smart cities and smart communities develop as intelligent cities and spaces of urban innovation in order to advance towards sustainable urban growth.

Keywords: smart cities, smart communities, intelligent cities, urban innovation.

1. Introduction

Cities are using information technology in order to enable people and communities to develop urban intelligence. Information technology offers cities a means to make the city as an intelligent urban community employing human, community and technological sources for engendering virtuous processes of urban value creation. As intelligent urban communities, cities develop a smart-enabled vision to urban design. As engines of innovation and knowledge, technology-enabled cities shape a pathway that leads to cities as intelligent urban communities. Intelligent cities emerge as interactive environments where information and communication technology (ICT) contributes to creating interactive spaces, bringing together digital, technological, physical and human entities [1]. The aim of this study is to identify how cities become intelligent communities driving urban innovation for urban social and economic growth. The study relies on literature analysis with regards to the concepts of smart city and smart community as drivers of urban innovation. Cities of tomorrow use ICT to sustain value creation within society, improving the quality of life, following a smart city view for driving social and economic urban development [2, 3, 4]. Cities develop and apply knowledge [5], reinforcing knowledge assets and intellectual infrastructures [6], using technology in everyday urban life to enhance smart urban activities and environments to achieve social, economic and environmental issues [7].

An intelligent city is a territorial innovation system combining knowledge, cooperation and digital communication to improve the problem-solving capability [8]. As communities adopting a smart vision to urban development, cities enable all the urban stakeholders to transform the urban community in a significant way and enhance the

social and economic performance of a city. Developing urban intelligence helps social cohesion and development. Today, intelligent cities drive the city as smart and sustainable community promoting urban innovation as a source for growth [9]. The use of information technology helps cities as smart and intelligent communities strengthening the collaboration among local public institutions, business and citizens for urban innovation and growth [10]. Urban innovation relies on city's intelligence that implies collaboration and involvement of citizens, companies and public authorities [1]. As platforms of innovation, cities drive collaborative innovation [11], strengthening information technology and building innovative collaboration, enabling urban stakeholders to promote community development for growth [12].

Information technology helps to support smart urban innovation that relies on cooperative and collaborative processes within urban community [13]. Stakeholder collaboration is a source to drive urban innovation in services and to improve the wellbeing of the city [14]. Cities adopt a human-centred vision to smart city innovation and growth, developing collaborative processes [15, 16], building collaborative platforms relying on the potential of human, organizational and technological capital emerging within cities and communities [17]. Post-anthropocentric and human-centred cities [18] develop smartness as a source for urban innovation by enhancing the potential of multi-actor collaboration as a key driver of innovation and intelligent solutions to urban problems [19].

The paper is organized as follows. After introduction and methodological section, the relationship between intelligent cities and information technology is presented. In the fourth paragraph, driving intelligent cities dealing with technology relies on cities able to adopt a community-driven view to smart city vision and to promote innovation, strengthening collaborative processes through smart communities. Finally, discussion and conclusions are outlined.

2. Methodological section

The study analyses how cities are building urban intelligence becoming smart cities and communities as drivers of innovation and development within urban spaces. By adopting a smart strategy, cities identify a pathway that enables the city to develop as an innovation-oriented community. The study is theoretical and relies on a review of contributions that refer to understanding the concept of smart city and smart community as drivers of urban innovation and intelligence. Smartness and community help cities to develop innovation and rethink how to drive urban development by embracing information technology. Basically, the concept of smart city is evolving from techno-centric to human-centred vision that enhances collaborative and cooperative aspects focusing on social dimensions that make smarter the city. The selected journals stress the relationship between smart cities and communities, urban innovation and collaborative approach as a vision to urban development and growth. The literature review and analysis elucidate that urban intelligence relies on cities using technological, social and organizational sources. Smart city, community and collaboration drive the city to become an intelligent city able to promote sustainable urban development. Referred journal articles were selected from *Google Scholar* as the main web source and database. The reported articles were selected with regard to the concepts

of smart city and smart community as drivers of urban innovation as a source that makes the city as innovation-oriented community. The selected contributions are analyzed and interpreted in a narrative synthesis in order to accommodate the differences between questions, research design and the context. They will also contribute to providing a description of data and elucidating new perspectives and advancing theoretical frameworks on emerging issues [20, 21].

3. Intelligent cities dealing with information technology

Intelligent cities provide high-quality services, promote social and cultural milieus and develop a pathway for shaping urban communities as inclusive, safe, resilient and sustainable cities coherently with the aims of the *2030 Agenda for Sustainable Development*. Intelligent cities embed information and communication technology in social and community infrastructure to develop organizational and institutional capabilities in order to enhance urban competitiveness and innovation, knowledge, learning and problem solving within urban landscapes [22].

Innovation-oriented and technology-led cities develop intelligent communities and contribute to urban sustainability, promoting economic development, social and territorial cohesion, people's involvement and mobilization [23]. As connected communities the intelligent cities develop knowledge, learning and collective intelligence following a long-term vision to urban development [1]. ICT helps to reinvent the city as a community constructing opportunities for developing innovation and collective intelligence [24]. Intelligent cities provide digital collaborative spaces and support collective intelligence through a community or network of organizations and companies [25]. In particular, information technology helps empower the citizen for more intelligent and informed behavior [26].

An intelligent city is able to provide high quality of services to citizens and business, by employing the potential offered by technological innovation in an efficient way [27]. Cities contribute to improving the quality of life by driving urban innovation and sustainability identifying a smart vision relying on ICT-intelligence, strengthen urban local capacity and development [28]. Intelligent cities contribute to developing urban sustainability [29] and building environments for innovation for urban development, value creation and generation of knowledge [25]. Cities are rethinking a pathway to urban future, promoting a smart vision dealing with intelligence [30]. Today, intelligent cities follow an innovation-oriented pathway becoming smart and sustainable communities, promoting synergies and teamwork between technologies, knowledge and skills, developing collaborative processes within community that enable innovative solutions, making more efficient cities and more competitive urban innovation ecosystems [9]. Technology helps cities to empower urban communities to drive urban innovation, development and growth. Smart cities support collective learning processes and contribute to shaping urban intelligence that enables urban change and innovation coherently with a long-term horizon for urban growth [22]. Cities shape intelligent urban communities of the future, by employing human and cultural resources to enable environments that contribute to improving cognitive skills for learning and innovation [8]. Cities evolve as smart, intelligent and inclusive communities in order to achieve sustainability and drive continuous change. Urban inno-

vation relies on city's intelligence which develops as a collaborative framework that enables citizens, companies and public authorities to work for innovation through digital spaces [1].

4. How to drive intelligent cities dealing with technology

Information technology helps to rediscover the city as intelligent community and co-producer of urban value by involving all the relevant stakeholders for participatory, interactive and information-based urban environments. In particular, smart city and smart community concepts drive urban intelligence. As engines of innovation and technology-enabled communities, cities contribute to shaping collective intelligence by developing collaborative processes and supporting social and knowledge exchanges [29]. While an intelligent city is a thinking community to achieve solutions, a smart city refers to the ways by which to use some devices and implement processes [27].

4.1 Intelligent cities as smart and community-led cities

Smart cities contribute to future sustainable urban development and growth, and improve the quality of life. Intelligent cities adopt a smart vision to urban development. Intelligent cities identify a smart and community-led pathway to urban growth. In an information age, intelligent and smart cities support citizen and community engagement and mobilize organisational and human energies to drive urban intelligent growth. Cities will be smart, inclusive and sustainable communities for life, work and business, supporting participation, dialogue and open debate among all the stakeholders for urban policy options [9]. The use of information technology helps to build smart and intelligent urban communities for participatory, interactive and information-based urban environments [10]. The sustainable urban future relies on cities as smart communities able to foster knowledge-based processes and infrastructures to drive social and economic development urban ecosystems [30]. Smart city utilizes technology in everyday urban life to improve city performance and quality of urban services [31]. Information technology helps cities to rediscover and enhance the concept of community. Smart cities enable cities as intelligent communities [32]. Community, technology and policy drive smart city as sustainable, livable, productive and accessible cities [33]. Smart city helps the city to drive urban sustainability and improve the quality of life, and support smart solutions and human, technological and social capital to support urban innovation-led economy [34, 35]. Cities of the future as smart communities in the knowledge-based economies play a central role for urban competitiveness [36]. Sustaining smart growth relies on smart cities and communities which are able to promote innovation, encouraging multi-level and sector interactions between private and public organizations for co-creation, co-design and co-implementation of innovative solutions [37, 38]. Cities as smart communities contribute to sustainable wellbeing for people [39], empowering citizens as co-designers and co-producers of public services [40]. A smart city refers to a community which uses technology to ensure service for high quality of life and wellbeing of its citizens [41]. Smart cities foster co-production of services and policies becoming nodes for open innovation, and driving collaboration between the stakeholders, leading change in the

way cities grow smart [3]. City is a smart community in which local government, business, education and citizens understand the potential of information technology as a source to transform the community in significant ways through collaboration [42]. A smart city refers to collaboration among local government officials, citizens and other stakeholders to make the city a better place for life [43]. Cities as smart communities help to advance collective skills [44], strengthening the urban community involved in urban value creation (civil society, industry, universities, government) [45] in order to develop innovative services that benefit citizens and improve the quality of life and urban innovation for sustainability of cities [46]. As smart communities, cities design digital platforms and services to enable data sharing and processing, information and knowledge, involving citizens to solve problem, to support business and facilitate public life [47]. A smart city helps enhance human, collective, and technological capital for increasing urban sustainability [48]. Cities support innovation and facilitate quality of life, promoting technology-enabled services, infrastructures and digital platforms [49].

4.2 Intelligent cities as smart innovative and collaborative communities

Intelligent cities contribute to innovation and web-based collaborative spaces and systems, by integrating physical, institutional and digital dimension [31]. As engines and drivers of social and economic change, cities of tomorrow as smart communities use ICTs driving economic and social growth and developing continuous innovation [50]. Smart cities contribute to open innovation in terms of co-production and co-delivery of services and policies as well [3]. Smart city supports community development and innovation [31]. Urban innovation relies on city's intelligence that implies collaboration and involvement of citizens, companies and public authorities [1]. Information technology helps to support smart urban innovation that relies on cooperative and collaborative processes within urban community [13], by fostering the stakeholder collaboration as a source to drive innovation in urban services and improve the wellbeing of the city [14]. As platforms of innovation, cities drive collaborative innovation to improve everyday life [11], strengthening information technology to enable urban stakeholders and innovative collaboration, driving community development for growth [12]. Building collaborative platforms for innovation relies on both a human, organizational and technological capital emerging within cities and communities [17]. Cities develop a smart approach, by rethinking the future of urban innovation systems and city design [51], fostering collaborative and organizational models that refer to citizens, business, knowledge institutions and municipal agencies to better improve the quality of urban life [52], by taking into account the stakeholders' opinion [53], and relying on a «collaborative approach to innovation ecosystems based on sustainable partnerships among the main stakeholders from business, research, policy and citizen groups» [54]. Cities adopt a human-centred, smart-driven and collaborative-oriented vision to smart city development to drive urban innovation, promoting smartness by mobilizing the human capital in multi-actor collaborations through the use of ICT [15, 16, 19], providing web-based platforms that enable collaboration and social exchange [55]. Cities as spaces of innovation employ information technology combining knowledge in management, governance and policy for value creation [2]. Smart city vision helps make cities as smart and inclusive communities by empowering citizens to promote innovations and technological advance-

ments and fostering community entrepreneurship and development [56]. Urban spaces open up to possibilities of multi-actor collaboration (private and public actors, civil society and citizens) as a key driver of innovation and source of urban value creation [57]. Smart cities initiatives contribute to developing urban innovation for competitiveness and quality of life of urban communities [58]. Cities behave as more innovative urban communities developing smart city policies for urban innovation ecosystems, driving the city into a sustainable future [16]. Smart cities improve services by developing both technological and social innovation, strengthening effective stakeholder engagement, organizational and management capabilities [14]. Smart city development relies on embracing a socio-technical view that enhances human, social and economic factors fostering the stakeholder engagement and civil society's participation [59]. As proactive actors and platforms of open innovation, cities are driving collaborative processes for urban value creation and entrepreneurialism by technology [60], following a shared vision for long-term development of smart cities and growth in urban communities [61].

5. Discussion and conclusions

Intelligent cities are innovation-oriented and smart-driven communities which build collaborative processes and spaces to enable urban actors and stakeholders to drive innovation and contribute to urban value creation. Intelligent cities contribute to urban development, sustainability and innovation driving urban communities into the future. Information technology helps support urban intelligence creation within cities and communities. Smart is a vision and means to drive the city into the future. Smart urban community is transitioning from using technology to improve infrastructures and urban quality of life to developing urban innovation systems and processes by helping the city as an engine of sustainable urban innovation and development. Intelligent cities are investing in spaces for innovation and technological infrastructures to drive urban development. As shown in the Figure 1, a framework of analysis is proposed in order to identify a pathway leading to intelligent cities and communities. Intelligent cities drive innovation by adopting a smart community view to urban growth, supporting collaborative processes, and involving the urban community in urban value creation.

Figure 1 – Towards intelligent cities and communities: a framework

smart view	community view	
Smart Cities	Innovation-oriented Cities	from urban actors
Smart Communities	Intelligent Cities drive innovation	to community
from technology	to collaboration	

The future urban development relies on cities as engines and drivers of continuous innovation. As a smart community city shapes urban innovation systems. Cities develop smartness as a vision that enables the city to drive urban innovation by enhancing the collaboration as a source that supports urban development. Rediscovering the city as a community going smart helps to transit the city towards a community investing in collaborative processes as an organizational framework that enhances innovation processes that involve urban stakeholders to work together and identify urban collaborative spaces that benefit the urban development. Intelligent cities are becoming urban communities developing human, organizational, technological and social capabilities to strengthen the potential of the community, promoting collaboration as a way for creating urban value, using smart solutions in order to adopt an innovation view to urban social and economic growth of urban, leading to sustainable cities and communities. Cities adopt an innovation view using the potential of information technology to identify collaborative spaces for urban innovation design. As becoming a community, cities develop and integrate social, organizational, human and technological capabilities in order to support innovation and collaborative processes to enhance urban communities. Information technology helps cities to develop services and promote innovation. Smart city vision is leading to smart and sustainable urban development. Technology enables cities to develop and experiment new forms of urban intelligence. While technologies contribute to improving services, innovation relates to intelligence as an issue. Smart cities and communities use the potential of information technology to enable a platform for involving all urban stakeholders to develop cooperative processes for urban value creation. As engines of innovation, cities as smart communities develop the city as intelligent urban community which rediscovers sources for inclusive and sustainable development and growth, and creates knowledge for innovation and value creation.

The study has organizational, social and managerial implications. Cities employ human and technological resources to enable urban value creation by investing in collaborative processes. All the urban stakeholders are involved in urban development design, searching for intelligent solutions that enable the city to proceed towards sustainability. Rethinking cities as smart and innovation-oriented communities asks for managerial competences and opens up to public-private partnerships and participatory and democracy-driven mechanisms of governance. There are some limitations. The study provides only a theoretical analysis. There are no case studies and empirical research. Further research implies to investigate how Italian cities are developing urban intelligence and sustainability by employing the potential offered by information technology.

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