Intelligent cities dealing with technology for sustainability

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Abstract

As drivers of economic and social growth, and engines of innovation, cities are developing urban intelligence as a key source to advance future development and to ensure high quality of life, and to improve processes and services by using the potential of information and communication technology (ICT), promoting practices of sustainable consumption for urban development. Smart cities and smart communities help to build urban intelligence within cities which aim to proceed towards urban sustainability and knowledge creation. Cities identify smart and intelligent solutions to facing and solving urban problems in order to drive innovative processes and proceed towards sustainable urban growth and consumption too. The use of information technology helps cities to rediscover the meaning of collaboration within urban spaces in order to transform the community in a significant way. Intelligent cities as communities promote technological innovation and encourage people to work for achieving urban sustainability, and rediscovering a pathway for growth and knowledge, innovation and value creation.

1. Introduction

Sustainable urban development relies on cities which are evolving as communities by rediscovering the importance of urban intelligence as a key source to advance processes that enable value creation, innovation and sustainable

consumption in order to improve the wellbeing of people and ensure high quality of life to citizens living within urban environments. Intelligent cities identify a virtuous pathway for advancing sustainability within urban environments, by developing social, organizational, community and technological capabilities. 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 elucidate how cities rediscover the urban intelligence and identify a pathway to drive the city to proceed towards sustainable urban future, promoting social and economic growth. The study relies on literature analysis regarding the main articles concerning the smart city vision as a source for urban development and the smart community as drivers of urban growth and innovation. Cities of tomorrow are using the potential of information technology in order to promote urban economic growth and development, sustaining value creation and innovation within society, and improving the quality of life. Cities follow a smart city view for driving social and economic development of urban areas in order to achieve successful issues by sustaining processes of innovation and knowledge creation over time [2] [3].

Rethinking cities as smart communities helps to shape the city as a better place for wellbeing of people living within urban spaces. Smart cities and communities are promoting sustainable wellbeing for people within the city as a better place for life and work [4]. They design digital platforms and services in order to support business and facilitate public life [5].

Reinventing the city as a sustainable city is the key to a sustainable, renewable resource-based economies [6]. Cities contribute to urban sustainability transitions that refer to changes in production and consumption patterns. [7].

Cities are considered as engines of innovation and technology-enabled communities. An intelligent city is both a territorial innovation system [8] and a thinking community designing frameworks to achieve solutions [9], developing cooperative processes [10]. Today, intelligent cities drive the city as smart and sustainable community promoting collaboration as a source for growth [11].

The paper is organized as follows. After introduction, the literature review about intelligent cities is presented. In the third paragraph, driving urban intelligence within cities dealing with technology relies on promoting smart cities for urban services and innovation, and developing communities developing processes for urban sustainability. Finally, discussion and conclusions are outlined.

2. Intelligent cities

City is an intelligent organism which is able to provide adequate inputs to people, groups and businesses, promoting sustainable consumption and production of services and benefits for users and consumers. The intelligent city is able to provide high-quality services, support urban competitiveness and sustainability, promoting a social and cultural milieu within urban spaces. An intelligent city develops a territorial innovation system, combining knowledge, cooperation and

digital communication [8]. Intelligent cities contribute to building a shared governance relying on participation, dialogue and open debate among all the stakeholders for urban policy options [11]. Intelligent cities embed information and communication technologies within urban environments, bringing together technology and people for innovation, learning, knowledge and problem solving [12]. The city's intelligence develops through collaborative frameworks that enable citizens, companies and public authorities to work for innovation through digital spaces [1]. An intelligent city develops organizational capacity, institutional leadership and creativity to drive competitiveness and increase urban sustainability. Intelligent cities use the potential of information technology, promoting economic development, social and territorial cohesion, people's involvement and mobilization [13]. The intelligent city is a connected and long-term horizon-oriented community which develops a sustainable vision to urban development [1]. Information and digital technology helps to reinvent the city as a community constructing opportunities for developing innovation and collective intelligence [14]. An intelligent city is able to provide high quality of services to citizens and business, employing the potential offered by technological innovation. Intelligent cities provide digital collaborative spaces and support the community or promote a network of organizations and companies [15]. In particular, the use of information technology helps to empower the citizen for more intelligent and informed behavior [16].

Cities contribute to improving the quality of life by driving urban innovation and sustainability, identifying a smart vision to strengthen local capacity and development [17]. Intelligent cities contribute to developing urban sustainability [10] and building environments for innovation as a source for urban development, value creation and generation of knowledge [15]. Today, intelligent cities are becoming smart and sustainable communities, developing collaboration among organisations within community, promoting innovative solutions to make both more efficient cities and more competitive urban innovation ecosystems [11]. Cities promote a smart vision dealing with intelligence as a source for future urban growth [18]. Cities empower communities driving human, social, collective and technological sources, following a long-term horizon [19].

3. Cities and urban intelligence between information technology and sustainability

Technology enables cities to become smart urban communities, going sustainable by bringing together technological, human, organizational, knowledge and social aspects. The use of information technology helps to rediscover the city as a smart and intelligent community and co-producer of value by involving all the relevant stakeholders for participatory, interactive and information-based urban environments. In particular, the smart city view is emerging as a vision to ensure high urban quality of life and innovation. The smart community concept helps to shape the city as a community promoting sustainable urban development and consumption. Smartness and sustainability are drivers of new forms of urban intelligence.

3.1. Promoting smart cities to ensure high urban quality of life and innovation

Smart cities perform better than normal cities. Smart cities contribute to advancing urban sustainability. Cities are developing as intelligent, smart, sustainable and inclusive communities, improving cognitive skills for continuous change, learning and innovation [11]. Cities of the future will be smart communities, adopting a smart urban development strategy in order to improve urban managerial efficiency and ensure high quality of life [2]. Smart cities contribute to open innovation in terms of co-production and co-delivery of services and policies as well [3]. A smart city is a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants and business. A smart city refers to a community which uses technology to ensure service for high quality of life and wellbeing of it citizens [20]. The use of information technology helps the city to support the development of an urban community in a significant way. The 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 [21]. Smart city initiatives contribute to fostering the aspects that reinforce the urban community [22]. Sustaining smart growth relies on smart cities and communities encouraging multi-level and sector interactions for co-design and co-implementation of innovative solutions [23]. Cities invest in smart solutions in order to achieve sustainable development in urban spaces, by managing efficient use of resources [24]. As a smart community the city enables public and private organizations, and citizens to connect each other and advance collective skills [25], by involving the civil society, industry, universities and local government to collaborate and develop expertise in urban planning, participation and development. Smart city initiatives enable cities to improve citizen-oriented services and support the community development, ensuring high quality of life and improving city's performances and quality of services to citizens [26]. Smarter cities facilitate collaborative processes, strengthening the capacities and needs of communities [27].

3.2. Developing smart urban communities for sustainable development and consumption

In an information age, cities evolve as smart and sustainable communities, by developing urban intelligent growth. Smart and livable cities shape a productive and accessible community which is able to advance towards sustainable urban development and extend the wealth of citizens [28].The future of sustainable urban development is about change within urban areas and requires that cities evolve as sustainable communities which promote conditions for enabling value creation processes, by mobilizing the urban community as an organizational framework that develops organizational, social and technological capabilities. Cities are the main drivers and *influencers* of responsible behaviors that open up to sustainable consumption and high quality of life [29].

A smart city supports both job growth and increased quality of life. A smart city goes beyond the use of digital technologies for better resource use and less emissions. It means a more interactive and responsive city administration, safer public spaces, meeting the needs of an ageing population. Cities are in transitioning to be smart, inclusive and sustainable communities for life, work and business [11].

Cities become smart and intelligent communities which encourage behavior changes in urban consumption, mobilizing citizens to behave as aware and responsible consumers who pay attention to common wealth and help to spread sustainability patterns. Cities are engines of economic and social development. Cities play a key role in planning urban development as related to industrial and sustainable development of businesses and economic activities. Today, the challenge is to make the city as a driver of sustainable development. As sustainable communities, cities have to meet human needs, considering development's environmental and ecological implications. The city as an organization space has been built to be a healthy place for life and work which is able to avoid disproportionate populations' consumption and enterprises' production on local and global resourceInformation [30]. Today, the role of cities is central about advancing sustainable urban transformation on consumption. Sustainable urban transformation implies that cities have to plan a long-term horizon for urban development Cities re-engineer the urban spaces to become more sustainable and resilient communities where citizens act as energy producers as well as consumers. Analyzing different consumption patterns helps to identify possibilities for developing sustainable consumption patterns [31].

4. Discussion and conclusions

Cities of tomorrow are becoming smart communities advancing towards sustainable consumption and development, engendering new forms of urban intelligence. In the knowledge-driven and technology-enabled societies, cities are engines of social and economic growth, and contribute to shaping collective and social intelligence. Intelligent cities contribute to developing knowledge, sustainability and innovation as assets that lead cities as communities living in the future and promoting urban development. Cities rediscover and enhance the concept of community, by using information technology. Information technology helps cities to modernize processes and services in order to achieve urban sustainability over time. Information technology helps support urban intelligence creation within cities and communities. *Smart* is a label, both a vision and means to drive the city into the future. Cities are proceeding in order to invest in innovation processes, knowledge sources and new advanced technology in order to identify new forms of intelligence that enhance the urban development.Intelligent cities are redesigning the city as smart and sustainable community in order to shape urban intelligence and support sustainable urban development. Technology enables cities to develop urban intelligence. While technology in itself contributes to improving and creating services for users and consumers, intelligence serves as a driver for innovation in processes, behaviours and culture. Smart cities use the potential of

information technology to enable the citizens as users and consumers of new services. Smart communities use information technology in order to promote cooperative processes among all urban stakeholders for urban value creation and engendering sustainable consumption and behaviours. As engines of innovation, cities as smart communities proceed towards urban intelligence by developing the intelligent urban community which rediscovers sources for inclusive and sustainable development and growth, and creates knowledge for innovation and value creation. Cities are investing in collaborative processes, employing human and technological resources to support sustainable urban development and achieve urban value creation by. Urban social sustainability helps cities developing a collaborative framework for intelligent solutions to urban development and inclusion. There are some limitations. The study provides only a theoretical analysis. No case studies and empirical research are presented. Further research implies to investigate how Italian cities are developing urban intelligence for long-term sustainability within urban spaces.

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