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Abstract

Purpose – This research aims to satisfy a clear gap in the main field of Open innovation research whereabouts a very little scholarship try to analyse the mechanisms of Innovative milieu down smart cities environments by applying through innovative projects that seem to support efficiently the entry of private firms and citizens in public collaborations.

Design/methodology/approach – The research performed an exploratory and qualitative evaluation based on the case study method built on the evaluation of organizational behaviour and urban boosting innovation through Smart City initiatives. In doing so, after a literature review in smart city as well in lean methodology fields, the case of Turin Smart City follows.

Findings – As acknowledged by international literature, the paper shows how a lean approach enables local government to define and realize smart projects and initiatives in a faster and more effective way. Particularly, the government in one of the main cities in Italy, id est Turin combines a lean methodology with the job to be done approach, according a new concept of smart initiatives involving a start-up mentality for the lead users which enables interesting predictions relating the human aspects of open collaborations.

Research limitations/implications – The specificity of this inquiry highlights valuable insights from double-gate Smart Cities' innovation, social and urban as well. The research is largely interpretative and exploratory and while this provides a solid scientific foundation for further research it does not, itself, subject any hypothesis to statistical testing and validation.

Originality/value – Since the city approached the smart city subject in a lean way, it was able to realize some projects in a faster way. Through specific initiatives, the city acquires the ability to involve more and better all its stakeholders such as citizens, companies, and public employees, among others. In this regard, the paper invigorates managerial debates concerning the urban and social aspects of open innovation ecosystems which represents in our minds a superior level of open innovation, testbeds of positive knowledge and stimulus of knowledge dissemination process around the city.

Key Words: open innovation**,** job-to-be done, lean methodology, smart city, external knowledge, citizens' engagement.

JEL Classification H83 · L20 · 032 · M10· L17·L86

Introduction

These days, the rules of the business environment and innovation are continuously inclining to change, supported by a process of technological revolution that is leading to the redefinition of the competition patterns of the game by managers; such managers are at one and the same time constrained to reconsider the fundamentals of the business

model, and conversely to re-plan and reassert the boundaries of business organizations in order to innovate and develop durable and renewable competitive advantages within a "open space" ecosystem (Adler and Know, 2002; Pisano *et al.*, 2015; Vrontis *et al.*, 2016). Innovation business models progressively assume that the discovery of novel products and processes goes through a crossover exchange of knowledge and capabilities outside-in and inside-out the firm, supported by external and internal relationships with various innovator stakeholders who are involved in various ways in the industrial and technological discovery-driven process, accentuating the need for the firm to drain, acquire, and combine knowledge from its context (Caetano and Amaral, 2011; Carayannis, 2011; Del Giudice and Della Peruta, 2013). This challenge not only constantly engages firms in business competitions and dynamics in unpredictable ways, requiring them to revisit their mindsets and practices, but also to build on and significantly intensify their stock and flow of intellectual capital within their organizations over time (Kale *et al.*, 2000; Murray *et al.*, 2016).

The importance of both current and new resources and competencies thus dictates that innovative firms have to maintain their adaptiveness by exploiting their current knowledge and exploring new knowledge (Chesbrough *et al.*, 2007; Floyd and Lane 2000; Levinthal and March 1993). Once privately owned, such knowledge and technologies have become increasingly absorbed further in public contexts accessible to individuals, governments, and research institutions, making acquisition feasible at both the individual and organizational levels (Del Giudice *et al.*, 2012). In this context, external sources of knowledge represent a crucial aspect for open innovation development, which can support, screen, and assimilate external inputs to be used and combine entrepreneurially in order to sustain knowledge-based innovation processes along the ecosystem (Del Giudice and Della Peruta, 2016).

In this theoretical arrangement, the smart city can be considered an open platform of external knowledge, available in a codified, but especially a tacit manner, thus intensifying the requirement to support and develop exchange and relationship processes among actors in order to build and diffuse a knowledge-based society and a technological arena of competition (Del Giudice *et al.*, 2013; Mital *et al.*, 2017; Nonaka and Takeouchi, 1995).

With this is mind, this study aimed to redefine and reconsider not only the sources of knowledge, but also the boundaries of innovation gates, which lead to consideration not only of a shift from *labor-oriented* activities to leisure and pleasurable engagements for human resources, according to a new *milieu* for open innovation in which new technological issues and ideas evolve from bottom-up long-run collaborations among various stakeholders (private or public), and include urban dynamics to cloud systems of innovation (Etzkowitz and Leydesdorff, 2000; Du Plessis, 2007) .

By applying a new interpretative framework based on lean thinking (Arnheiter and Maleyeff, 2005), and the job-to-be-done approach (Johnson *et al.*, 2008), the concept of the smart city is reinterpreted according to the challenges specifically related to the entrepreneurial and leadership dynamics of various private–public collaborations, unpacking urban ecosystems. Through an exploratory case study, the research explored the concept of the lean smart city (LSC) as an environment of open and user-driven innovation, experimenting in and enabling technological and Internet-based services. Based on the concept of the quadruple and quintuple helix of innovation (Carayannis *et al.*, 2014), the analysis of the current landscape of the smart city program in Turin aimed to investigate the purpose of instituting local urban innovation ecosystems to provide neighborhoods of sustainable society-driven open innovation partnerships, and foster cooperation strategies among private and public stakeholders.

The literature has not addressed the meaning of smartness in this way, but there is general agreement that a smart city is always characterized by a pervasive use of information communication technology (ICT), which, in various urban domains, helps cities make better use of their resources (Neirotti *et al.*, 2014). In recent years, there has been a shift from a vision of a smart city as being more technology-driven to one that is more citizen-driven. At the same time, there has been the spread of many smart city pilots rarely able to scale up and grow efficiently and rapidly. Thus, there is a need for smart cities to involve all their stakeholders, particularly citizens and local companies, more optimally and to a greater extent on the one hand, and to convert pilots into workable innovative products on the other (Cautela *et al.*, 2014).

Based on the case of Turin, this research fills the aforementioned gap in knowledge. In particular, the paper shows how open innovation can be implemented in practice by applying the right methodology in developing innovative smart projects. The remainder of the article comprises five sections. The next section reviews the literature review to identify the research gap, taking several different research streams into consideration: the smart city literature, and the lean methodology and job-to-be-done literature. The methodology section identifies the method and its rationale, then presents the case analysis (Turin Smart City). The discussion of its implications follows. Finally, the paper ends with conclusions, along with limitations and future research perspectives.

Theoretical background

Several studies (Lee *et al.*, 2012a; Nam and Pardo, 2011; Paskaleva, 2011; Scuotto *et al.*, 2016; Wolfram 2012) have analyzed the enhancing of smart city patterns, debating the effects of an open social environment on innovation from a management perspective. At a glance, these researchers underline the complex challenges that underlie a city "going smart," especially regarding socio-economic development (Lee *et al.*, 2012b), innovation breakthrough (Del Giudice and Straub, 2011), and the quality of social welfare (Almirall *et al.*, 2014).

Studies on smart cities have become an emerging research trend in both knowledge and technological streams of research, closing the gap concerning certain aspects of business competitiveness, such as innovation, entrepreneurship, urbanization, organization, governance, construction, and social communities. A very limited body of work has previously discussed in a holistic manner the phenomenon, neglecting two key drivers of management smart city management, namely the value of the innovation climate and the business identity of smarter organizations (Angelidou, 2015). In general, it can be assumed that smart city initiatives produce a "*dominus effect*" that leads to a favorable and positive organizational climate among stakeholders, which in turn transmutes into a proactive involvement of citizens in the innovation process, converting once again into urban wellness and development capable of imprinting and leveraging innovativeness and responsiveness around the environment (Teece, 2007; Thrassou and Vrontis, 2008). In particular, organizational climate is frequently discussed as an important precondition for the success of smart city innovation (Soto-Acosta *et al.*, 2015).

In this context, in accordance with the principle of the organizational innovative *milieu* (Harrison et al., 1996; Maillat, 1995) and human resources in the innovation climate (Popa *et al.*, 2017), some best practices related to the adoption of smart cities are useful in understanding such open innovation tools, unboxed for urban and public organizations. Within the scope of smart cities, citizens, firms, and public organizations tend to cooperate to develop knowledge and technological innovations (Dyer and Noneoka, 2000; Pinegar, 2006). Despite significant advances in innovation management studies, the effects of human engagement in the open innovation context have scarcely been investigated, especially concerning smart city adoption (Choi *et al.*, 2008; Tseng,

2008). Thus, there is a clear research gap in terms of understanding how and under what circumstances human initiatives lead to better results.

Based on these points, this research aims to contribute to the literature on open innovation by shedding light on whether and how a complete adoption of open and lean collaboration in smart city initiatives can facilitate a greater circulation of knowledge and enhance innovative capacities among public actors and firms, also involving in greater depth the capacities and feelings of citizens as lead users in co-creation projects.

The literature review in this study aims to explore and analyze the basis of smart cities' engagement with a view to providing an integrative framework that can be used to examine how citizens and local governments envision smart city initiatives. The review is organized in two stages. First, the main features of smart cities are compared, then conceptual building blocks are reconstructed and evaluated comparing different points of view for clarity and theoretical coherence. The second stage, which compares the concepts of lean management and the job-to-be-done perspective related to smart cities, is mainly a consequence of the way of interpreting innovation as an open paradigm predominantly focused on a user-centric approach that involves citizens and civil society (i.e., the customers) in smart projects in terms of a technologically driven climate and external sources of knowledge.

Smart city concepts and open innovation environments

Across the borders of multidimensional streams of research, the innovation management literature strongly agrees that urban cities act as relevant stakeholders in sustaining and accelerating innovation processes through the dissemination of external sources of knowledge (Laursen and Salter, 2014; West and Bogers, 2014). The "smart city" idea came up in the 2000s, thanks to IBM and Cisco (Cisco, 2010a, 2010b). At the core of this concept is a kind of perfect city with high levels of automation due to the extensive use of ICT tools. The phrase was then successfully adopted by technology companies, such as Siemens, for the application of complex information systems aiming to integrate the operation of urban infrastructure and services, such as transportation, electrical and water distribution, buildings, and public safety. The smartness of a city is composed of several dimensions. Early on, Giffinger (2007) identified six different dimensions of smart cities, namely smart mobility, smart environment, smart people, smart living, smart governance, and smart economy.

In recent years, many scholars have investigated this phenomenon, generating many definitions as a result. Lee *et al.* (2012, 2014) define a smart city with respect to the convergence of IT services within an urban space. In this space, citizens can access smart services, and this will consequently increase the city's competitiveness and its citizens' quality of life. The adjective "smart" also refers to the government of a city and its capacity to generate innovation in the ways that services and communication are delivered to the local population (González and Rossi, 2011). A smart city can also be seen as a conceptual urban development model based on the utilization of human, collective, and technological capital for the development of urban agglomerations (Angelidou, 2015). Again, Nam and Pardo (2011) conceptualize a "smart city" as an interplay between technological innovation, organizational innovation, and policy innovation, so that a smart city becomes an inherently "complex socio-technical system of systems" (Curry *et al.*, 2016).

Based on our knowledge, and in line with the principles of open innovation, we recognize that smart cities represent a locus of innovative milieu in which knowledge circulates around the neighborhood, and stakeholders are constantly interacting to foster technological advances, urban facilities, and local business circuits according the principles of co-creation, co-development, and co-evolution of innovation (Alves, 2013;

Carayannis and Alexander, 1999; Chesbrough *et al.*, 2014; Dezi *et al.*, 2006; Nicotra *et al.*, 2014).

In this regard, smart city projects are recognized as a necessary process in sustaining and maintaining competitive advantage within knowledge-intensive urban contexts, appreciating integrative perspectives that consider both internal and external sources of knowledge in order to cope with open environments, and to exploit technological and commercial opportunities (Del Giudice and Maggioni, 2014; Grant and Baden-Fuller, 2004).

In accordance with Lichtenthaler and Lichtenthaler (2009), we also note the need to construct a framework for managing innovation within smart cities. Here, it is necessary to consider knowledge exploration, retention, and exploitation, especially outside organizational boundaries, as a proxy of the interconnection capacity for both the public and private partners to retain knowledge in interfirm relationships (Kale and Singh, 2007).

As a consequence, cities require a rethinking of strategies in order to achieve success in a smart manner, by exploiting efficiency and affordability, which are often underestimated by the public side. In addition, the relevance of open innovation is highly salient considering the growing interest in smart programs. Partnership in innovation involves the engagement and stimulation of civil society to support the process of knowledge and innovation creation proactively, thus emphasizing the human aspects of city value co-creation. Giving originality to this work, smart city projects have become the focus of a particular debate on the entrepreneurial and cooperative roles associated with citizens.

Currently, what seems more interesting is that the smart city aspires to the democratization and reorientation of innovation processes, mostly through easy access to technology by lead users—the citizens–as the new experts of bottom-up driven innovation (Campbell, 2013).

According to the quadruple and quintuple model of innovation (Carayannis and Rakhmatullin, 2014), what enables innovation in democratic smart contexts is properly the "democracy of knowledge," which highlights and underscores comparable processes of exchange and the trading of knowledge flows in public and political pluralism, favoring the reduction of innovation heterogeneity within society and boosting competitiveness between enterprises. Our theoretical assumptions are based on the management of knowledge and human capital (Stewart, 1997) in an urban open innovation ecosystem, namely the city, in which government and firms aim to gain access to internal and external resources, and to have sources of knowledge in place to create new products and services in common.

Smart city projects thereby suggest new forms of interactions and collaborations, boosting new innovation models and processes coming contemporaneously from different market-based partners, such as competitors, suppliers, universities, and urban society (Carayannis *et al.*, 1998; Santoro *et al.*, 2016; Wang *et al.*, 2015).

Clearly, an open innovation participatory ecosystem plays a huge role in facilitating this balance, encompassing the distance from the stakeholders at the bottom (i.e., civil society) to the top level (i.e., government), sustaining a circular flow of ideas, information, knowledge, and technology solutions, and fostering relationships with financial investors. In this regard, smart environments can qualify as a positive and favorable business crossroads, a place of meetings for policy making, technology exchange, and for firms and institutions to interact directly and reciprocally with citizens as urban users in order to sustain the diffusion of a fresh innovation climate for knowledge (Popa *et al.*, 2017).

Under these conditions, the openness of smart city projects can also be explained in

terms of the propensity to collaborate and the intensity of collaboration between firms and local external partners (Lee *et al.*, 2012). Hence, in summary, this study sketches an alternative "democratic" concept as a building block for smart city concepts that appear more in line with visions of human participation as well as urban development. Table I summarizes the definitions found in the literature.

[Insert Table I about here]

The smart city concept has to be distinguished from other similar ideas, such as the digital city, because it focuses on factors such as human capital and education as drivers of urban growth, rather than highlighting the role of ICT infrastructure (Hollande, 2008).

The flexibility of modern ICTs can foster knowledge inventiveness, knowledge absorption, knowledge transformation, and knowledge connection, by encouraging customers to become more proactive and more interconnected, thus stimulating business creativity (Del Giudice and Della Peruta, 2016; Guerteen, 1998). Human capital and citizens' involvement is one of the most problematic points with respect to smart city development. As Guest (2001) noted, even if technology is a prerequisite of any smart city, it is not possible to define a city as smart when there is no real engagement and cooperation between citizens and other stakeholders, such as public institutions and private organizations. Scholars agree that the primary objective of a smart city is to improve the quality of the city and quality of life in the city. Indeed, the ultimate goal of a smart city is to create sustainable value for citizens, employees, shareholders, and other stakeholders (Lee *et al.*, 2014).

Given an efficient ICT infrastructure, to become smart, a city needs appropriate and balanced citizens' involvement, together with an appropriate and balanced model of governance (Rufin *et al.*, 2012). Concerning the first point, some scholars have focused on the role of human capital in improving a city's "liveability." Ultimately, smart city initiatives can also include human capital investments, aimed at fostering a city's capacity for learning and innovation by supporting and motivating the local population to engage in education, improve their own lives, and attract and retain other valuable inputs from outside, i.e., investors and entrepreneurs (Del Giudice *et al.*, 2013; Ries, 2011). Concerning the second point, there is a growing central role of the government, especially on the local side, exercising a decisive pull for the smart city discourse (Wolfram, 2012). Thus, the ICT system of a smart city is complementary to human and organizational capital, and its usage is shaped by political choices and by the urban ecosystem of the citizens, technology vendors, and local authorities, depending on the city's needs and habits (Kale and Singh, 2009; Moller *et al.*, 2005).

Finally, there are two main positions in the debate on how a smart city should be. On the one hand, smart cities are seen as factories for life, and hence the focus is on a broad use of ICT that enables central planning and an integrated view of the processes characterizing urban operations. As a consequence of this approach, the emphasis is on the production and the distribution of energy, transportation, logistics, and waste management and pollution control, and it looks at the ways in which ICT can harness information processing in these fields.

On the other hand, smart cities are characterized more by bottom-up approaches, providing access to big data and allowing citizens to make their own decisions. Consequently, the focus is on the importance of investments in urban living domains, wherein ICT plays a more limited role in enabling sustainability and handling "transactions," thus being related to welfare and social inclusion policies, culture, and education (Neirotti *et al.*, 2014).

According to Kang *et al.* (2007), current research on smart city projects can be used strategically to support relational archetypes in external alliances, mainly focused on five areas, as identified in Table II.

[Insert Table II about here]

With respect to the final point, in order to deliver the applications and services needed for urban management, many cities are engaging in an open innovation model to increase the participation of citizens and organizations in citizen-led innovation. In particular, the alignment and explicit connection between open data policies with open innovation aspects of smart cities are increasingly becoming stronger (Curry *et al.*, 2016).

In general, as pointed out by Harrison and Donnelly (2011), smart cities comprise a field in want of a good theoretical base. Specifically, they represent a multidisciplinary field, constantly shaped by advancements in technology and urban development (Angelidou, 2015). Thus, many themes are to be considered in greater depth. The most important ones concern: the definition of a smart city, to be shared and useful in clarifying which initiatives are included in a smart city strategy; smart city goals and the measures needed to evaluate its success or failure; the collection of best practices, the repeatability of prototypes, and the financial sustainability of smart initiatives (Dameri and Rosenthal-Sabroux, 2014); also strategic planning in this field is still largely unexplored (Hollands, 2008; Komninos, 2011a; Wolfram, 2012). Finally, albeit planning, monitoring, and managing crowds of people are fundamental tasks in city management, the topic of crowd management has also received little attention within the smart city domain (Curry *et al.*, 2016).

Furthermore, another interesting result of this analysis involves the firm side of partnerships, establishing that flexibility and lower formalization facilitate openness and the expansion of boundaries in smart city projects, which encourages new ideas and positive organizational behaviors (Damanpour, 1991; Komninos *et al.*, 2011).

More generally, there is a need for more case studies of smart city deployments, including retrospective analyses of successful and unsuccessful smart city developments, to increase understanding of what it takes to deliver impact within a smart city, as well as to provide insights into the challenges, techniques, and lessons learned (Komninos *et al.*, 2013). This is probably due to the high uncertainty linked to technological volatility, the randomness in the bargaining of knowledge between actors, the complexity of dynamics and content for performance appraisal and performance compensation (Campanella *et al.*, 2017; Inkpen and Beamish, 1997; Kang *et al.*, 2007). Table III summarizes the current research and research gaps.

Lean methodology and job-to-be-done approaches for smart city development

The degree of openness and depth of collaboration depend on mechanisms that allow faster and more dynamic interaction between the various stakeholders engaged in the innovation process. In arranging this, the capacity to create and reproduce a captive smart city is particularly related to knowledge circulation (Chesbrough, 2003).

[Insert Table III about here]

With this in mind, in accordance with Scuotto *et al.* (2016), this study adopts a particular concept of the inbound open innovation model, whereby the degree of openness to smart collaborations is strictly tied to the ability to integrate more informally users' commitment to the innovation process. Informal inbound open innovation is

considered the beginning of an approach to external actors to mitigate risks related to the asymmetry of information, as well as to strengthen the marketability of new technologies addressing urban needs. In the long run, this approach could ensure smart city strategies do not proceed with a "trial and error" approach, but more properly by adopting a common and well-planned process shared by all players in the urban context. To this end, this research aims to reconsider and extend the theoretical background by considering lean methodology and the job-to-be-done approach in order to provide a better explanation based on the relationship with the Quadruple and Quintuple helix of innovation.

Originally, the term "lean" described Toyota's business during the late 1980s, and the characteristics of a lean organization and supply chain were subsequently described by Womack and Dan Jone (2003). Although the lean concept is directly linked to the production strategies of Toyota, it is not only suited to manufacturing but also applies to every business and every process. It represents a way of thinking and acting for an entire organization. The core idea of lean methodology is to create greater value for customers with fewer resources. This means that a lean organization should understand customer value and focus its key processes on continuously increasing it. To achieve this objective, lean thinking changes the focus of management from optimizing separate technologies, assets, and vertical departments to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, assets, and departments to customers. Specifically, the Lean Enterprise Institute recommends five steps to be followed in implementing lean techniques (Shook and Marchwinski, 2014), namely: specify value from the standpoint of the end customer by product family; identify all the steps in the value stream for each product family; ensure the value-creating steps occur in a tight sequence so the product will flow smoothly toward the customer; as flow is introduced, let customers pull value from the next upstream activity; as value is specified, value streams are identified, wasted steps are removed, and flow and pull are introduced; begin the process again and continue it until a state of perfection is reached in which perfect value is created with no waste.

Building around these ideas, Ulwick (2005) developed outcome-driven methodology, based on the job-to-be-done theory. Here, the focus is on customer needs: Companies must shift their attention from the product and focus their requirement-gathering efforts on the execution of the job that the product or service is intended to perform, i.e., giving customers a fair hearing (Ulwick and Bettencourt, 2008). The job-to-be done theory has at its core job mapping, which entails breaking down a job that customers want done into discrete steps, and then brainstorming ways to make the steps easier, faster, or unnecessary. For example, when cleaning clothes, people do not notice stubborn stains until they have taken the clothes from a dryer and started folding them. If they find a stain, they must repeat the job. A washer that detects persistent stains and takes appropriate action before consumers execute the rest of the job would have huge appeal, i.e., employing a customer-centered innovation map (Bettencourt and Ulwick, 2008). All jobs have a universal structure. That structure, regardless of the customer, includes the following process steps: defining what the job requires; identifying and locating needed inputs; preparing the components and the physical environment; confirming that everything is ready; executing the task; monitoring the results and the environment; making modifications; concluding the job. Because problems can occur at many points in the process, nearly all jobs also require a problem resolution step.

Finally, Ries (2011), further developing the lean concept, provided a method that is instructional on how to drive a startup (how to steer, when to turn, and when to persevere), and grow a business with maximum acceleration. It provides a scientific approach to creating and managing startups, and getting a desired product into customers'

hands faster. A core component of lean startup methodology is the build–measure–learn feedback loop. The first step is figuring out the problem that needs to be solved and then developing a minimum viable product (MVP, a product with just enough features to gather validated learning about the product and its continued development) to begin the process of learning as quickly as possible. Once the MVP is established, a startup can work on tuning the engine. This will involve measurement and learning, and must include actionable metrics that can demonstrate cause and effect. It is worth noting that not only can all businesses in all industries and services adopt these principles, but also governments.

Methodology and research question

Research context

Due to the lack of case studies regarding smart city deployments, this research first aims to fill that gap by collecting best practices in order to better inform theory. More precisely, the main research question is as follows:

> *RQ: How could a smart city develop smart projects in a faster and more efficient manner, and simultaneously involve its citizens more optimally and to a greater extent?*

The growth in smart city initiatives among European countries involves transversally not only large but also small and medium-sized cities in launching innovative business projects that promote the development and technological conversion of urban centers. However, the territorial specificities of both the countries and the cities inextricably and idiosyncratically bind the development of smart city projects within their environments. Therefore, at least in an initial exploratory phase, this empirical research is focused on qualitative exploration (Eisenhardt, 1989; Gomm *et al.*, 2000; Yin, 2003).

To attain the goal of this research, a qualitative case study analysis of a smart city project in the city of Turin was adopted. The method is particularly appropriate when the research is formulated in the form of a "how" question. A case study confers reliability in terms of the discussion, representing an essential complementary part of the chosen methodology, as it enables the presentation of situational explanations of the problem under investigation, together with vivid illustrations of the reality of organizations and projects, and insights into cause–effect relations beyond what can be achieved through quantitative analysis. The focus in case studies is to produce descriptions of meanings and relations, and to understand how reality is "constructed" from the appearance and unfolding of events (Gephart, 2004). The case study follows well-accepted approaches of design and execution of case studies involving, according to Yin (2003): a criterion sampling strategy, data collection through multiple sources of evidence, an analytic strategy that aims to provide the greatest possible completeness of the targeted information through a sequential and cumulative analysis of the whole case population. In particular, to achieve the theory-building goal, a single-case design has been adopted.

Research design

Building on the theoretical background provided above, and with the research question in mind, the empirical assessment was performed in two stages. Based on the main research question, the methodology focused on two sub-dimensions: a) the concept of the Turin smart city; b) the implementation of smart project initiatives.

The rationale underlying the methodological choice is related to the exploratory nature of this research: the Turin smart city is employed as revelatory case, in which the single-case study design choice is due to the capability of this method to provide a rich

description of the existence of a phenomenon (Siggelkow, 2007). Turin is ranked third in the *EY Italy Smart City Index* (2016); furthermore, very recently the city government decided to approach its smart city project by adopting lean principles. Thus, it represents a unique opportunity to observe how an innovative project can be developed by applying a different methodology.

The target sample of the study consisted of 15 employees and 5 executives of the Innovation and Smart City Department of the Turin municipality, who had participated in simplification and learning programs, and pilot projects launched to sustain smart conversations in the town. The participants were selected because they were in charge of the development of the innovations chosen through a convenience sampling procedure. They were asked to participate based on an "ad-hoc" task force composed of specialists in engineering, management, and computer science, following the strategic planning of smart initiatives in Turin under the guidance of the Councilor for Innovation and the Turin Smart City Program. All participation was voluntary and each survey was independently collected within four weeks of distribution. With regard to the demographic distribution, 48% were male and 52% were female, and the majority of the respondents were in their 30–40s (70%), and had less than 10 years of tenure in the organization (54%).

Data gathering and participant observation lasted six months, between July 2016 and January 2017, and was elaborated over another three months, leading to the definition of a roadmap of values with the theoretical framework presented in Figure 1. Overall, the empirical research lasted almost a year. Data were collected through focus group interviews and brainstorming activities, documentary analysis, and reviews of internal and external information sources, especially city government documentation, Internet sources, and publicly available studies and reports, and meetings with the mayor and the Councilor. These were enriched by participant observation of the activities of the Turin Innovation Team in charge of the project. All information was initially addressed face to face, directly participating in meetings and at round tables convened by the government of Turin and then via Skype or through mail (Cami).

The results presented in this survey provide the first empirical data on the screening of feasibility studies and impacts on the city. After data collection, the results were discussed by proposing a conceptual framework of the citizens' engagement in the Turin smart city, and investigating the specific smart initiatives in order to highlight successful best practices.

Results and discussion

The Turin Smart City Program

The Turin Smart City Program is implemented by an Innovation Team within the local government. The aim of the program is to create a more liveable city: citizen oriented, able to listen, and involving, communicating and collaborating inside and outside with citizens, government, public and private companies, universities, and research institutes (Du Chatenier *et al.*, 2007). In particular, the Turin Smart City aims to become a successful "startup," driven by the following values:

1. Assuring citizens' quality of life.
2. Providing clear information exchange and communication between citizens and institutions.
3. Simplifying city services.
4. Developing an ecosystem as a platform for matching supply with demand for innovation.
5. Developing and employing skills within the public domain.
6. Assuring workers' quality of life.

Directly linked to these values, there are some specific objectives:

1. Putting citizens and districts at the center of innovation processes in order to define activities and needs, and develop customized and simple services.
2. Improving communication, collaboration, and transparency in the relationship between citizens and the municipality.
3. Attracting innovative companies.
4. Developing innovation demand.
5. Creating collaboration between different public and private actors, working on innovation also through partnership with other local administrations.
6. Supporting active projects in the experimentation, development, growth, and communication phases.
7. Creating a unique ecosystem to develop human capital, namely a "smart open-brain city," by increasing the skills of city government, attracting new talent, enjoining new actors, and developing smart projects that use specific city areas, particularly suburban areas, as an experimentation laboratory able to sustain and generate value for the community.

The city is concretely reaching these objectives by adopting a lean approach in developing its smart projects. As briefly shown in the literature review, companies adopt the lean approach to create customer value. With the same aim, Turin's city government has been adopting the lean approach, applying its principles to citizens. Thanks to the lean approach, starting from the job-to-be-done method, the Turin Smart City is able to identify not just the citizens' needs, but also the activities that citizens do and want to do. The city government then recreates the service around these activities. Generally, each project consists of three phases: a) citizens' need identification based on the job-to-be-done methodology; b) building the minimum viable prototype, that is a demonstrator; finally c) scaling up, namely the extension of the minimum viable prototype previously realized into a minimum viable product. Each aspect receives feedback from the citizens, triggering crowd processes. In particular, the reconstruction of citizens' services based on the job-to-be-done methodology occurs through the following steps: i) identification of citizens' activities; ii) the division of city services into processes; iii) the analysis of services in terms of satisfaction level and the number of citizens involved in the services (it is thus possible to give priority to certain services over others). Drawing on the universal job map recommended by Drayton (2002), the public administration generally defines citizens' needs, assessing entrepreneurially the way to solve these through a process, as shown in Figure 1.

[Insert Figure 1 about here]

The lean approach, combined to the job-to-be-done methodology, is enabling the city to develop an internal startup mentality. This is possible, in particular, due to the following initiatives: the Startup in Residence (STIR) project; the "Citizen Saturday" initiative, the Innova.To project, and the establishment of a public competition awarding the best technology-driven service solution.

Innovative projects and initiatives

The Startup in Residence (STIR) project. In collaboration with the city of San Francisco, this project aims to solve Turin's city government problems and challenges based on collaboration with local startups. The final objective is to create products as well as better services able to solve citizens' critical needs. Furthermore, through this project and the

partnership with the NASDAQ Entrepreneurial Center, Turin will be part of a network of around 100 cities in the next five years. This is a great opportunity for the city to make its digital transformation effective in an efficient and faster way. At the core of the project there is the possibility of sharing value among two different actors usually not connected: startups and the public administration. On the one hand, the local administration will learn a faster, agile, lean, and cross-sectional way of working that is typical of entrepreneurs. On the other hand, startups will develop a deeper understanding of the public administration's needs. Due to more traditional bureaucratic mechanisms, startups usually face big challenges in collaborating with the public sector. Thus, a new economic development will be enabled by the reduction of entry barriers to the city government for startups.

This project surely represents a first step towards a new economic development, offering many advantages to the public government, such as the opportunity to solve a complex problem and obtain for about 16 weeks new skilled human resources within the city government.

In greater detail, each local government department will identify one or two city challenges/problems. The list of challenges will be published. Then startups can submit their projects to solve those challenges and problems. The startups selected will work for 16 weeks within the public administration to develop the proposed project. During the 16 weeks, the startups will work within the city government and will be followed by an external company in charge of driving the prototype process creation in an agile way. Every four weeks, each startup will show a prototype for the problem solution. At the end of the 16 weeks, the startups and public administration employees will be able to gain access to the European Innovation Academy, where the prototype will be accelerated until the product is almost finished.

The Citizens' Saturday. Each Saturday the public administration meets citizens with an innovative idea to propose. Then, if the idea is feasible, the city government helps the proponent implement it. Through the following open call, the public government's Innovation Team invited all citizens to participate:

> "*Saturday, January 28, 2017, between 9.00 am and 1.00 pm, in a public meeting, citizens can present their innovative projects to the Turin Innovation Team. If you have an innovative idea, send us an e-mail by Sunday, January 22, 2017 with: i) a brief description of your project (1000 characters); ii) the need it resolves; iii) required activities for implementing it; iv) the business model. Those selected have the opportunity to present the project in 10 minutes at the Civic Palace. We are awaiting all the city's innovators!"*

The first meeting was completely dedicated to 15 projects in terms of their viability, and being in the culture and health domains, all proposed by citizens. These citizens proposed to the city government solutions for improving the quality of city life. For some proposed projects, the Innovation Team hypothesized an interaction with ongoing technological city projects (i.e., Big Data and WiFi), or other city divisions (such as a security project or support for city requalification projects). For other projects, the team defined main problems and possible solutions. Finally, other projects were already in the prototype phase, and the team discussed with citizens how to improve on the prototypes and test them on the city. Thus, Turin is becoming an open testing and development laboratory in which prototypes can be improved on through users' experience.

Innova.To. This project is a virtuous competition between the public employees of the municipality of Turin aimed at developing innovative ideas for improving the

performance of public administration through the reduction of waste and increased value of available resources. Innova.To was specifically proposed to transform ideas into new services, products, and solutions that would create both social and economic benefits for the local authority and the urban community.

As a result, in 2015 it started implementation of its winning projects, also through the direct involvement of employees and sectors interested in the ideas. The winning project concerned the allocation of a 5x1000 tax donation for the development of specific projects selected by the local community. In this manner, the citizens of Turin can concretely see what they are financing through the donation of 5x1000 of their individual income tax, promoting the transparency of public action and better participation on the part of the local community. The winning ideas, selected from among 71 projects, were acknowledged in a public ceremony. The winners were awarded a special certificate and several prizes offered by all the partners of the initiative (i.e., two electric bikes offered by Enel, eight smartphones by Huawei, etc.).

Generally, Innova.To's main objective is to innovate through training, learning, and encouraging all public employees to propose new solutions to the city's problems. The core idea is that public employees know the city's problems on two grounds: as public employees and as citizens. Thus, this two-sided vision can enable employees to find the right solution to the city's problems.

In particular, special training for employees is addressed at: i) creating a startup/entrepreneurial mentality; ii) supporting individuals in developing a methodology for evolving innovative projects; iii) supporting individuals in developing a lean approach to projects; iv) supporting individuals in developing a lean "zero defect" approach. Objectives (i) and (ii) can be achieved through collaboration with the European Innovation Academy, together with the continuous openness of the Innova.To contest, while objectives (iii) and (iv) can be attained through the careful selection of "mentors," working together with defined teams within the city government's innovation projects.

Public award for the best technology-driven solution. This is not a fully-developed project, but an ongoing initiative. The main idea is to offer a competition through a call in which citizens are asked to submit government service delivery solutions. Specifically, any type of government service delivery solution provided via a mobile phone is eligible, from smartphone apps to web solutions to automated text messages. Following similar ideas developed in other smart cities, the award will recognize innovation in eight categories: health, education, environment, social affairs, safety and security, tourism, economy and commerce, and transportation and infrastructure. The entries are assessed using three criteria: efficiency and effectiveness (40 percent), ease of use (40 percent), and innovation (20 percent). In addition, the solutions must be related to a core government service offered to external customers, whether consumers or businesses. This excludes government-to-government services. While improvements in this area are important to the country, the award aims to generate citizen- and business-focused solutions (Gassmann and Enkel, 2004). This public award represents another attempt to involve people in city matters in order to find better solutions to the city's problems.

Conclusions, implications and future perspectives

In conclusion**,** from this exploratory research, the study deems that smart city projects could be developed taking into consideration different factors, such as social and stakeholder engagement, citizens' startup mentality, firms' commitment, and strategic public control (Bresciani *et al.*, 2017). This approach serves as forerunner for the construction of a new conceptual and practical framework, which will rebuild the smart city based on social entrepreneurial intensity (Morris, 1998).

This research aims to understand how disruptive innovation could circulate within complex local systems, encompassing open innovation mechanisms and practices, and furthering the ways in which the opening of technological gates to urban smart networks can spread external sources of knowledge (Lhuillery and Pfister, 2009; Pisano *et al.*, 2014).

Considering the status of the knowledge-intensive economy, the realization of smart cities has become a real opportunity to redefine competitive and urban development, which is significantly affected by technological progress and collaborations between economic and non-economic players at different stages. In this context, the adoption of job-to-be-done practices offers cities new opportunities to improve their knowledge management practices and increase knowledge flow through advanced high-intensive open innovation collaborations also with citizens (Del Giudice *et al.*, 2016; Malhotra, 2000). Despite this, few studies have attempted to investigate the role played by the social aspects of open innovation. Hence, it is necessary to unpack the boundaries of smart cities in terms of internal and external sources of knowledge fostering efficacy and innovativeness (Vrontis *et al.*, 2016).

To really understand if an identified need can be solved by the chosen technological solution, it is necessary to develop several prototypes: The quicker prototypes can be developed, the more it is possible to experiment and develop distinctive skills. To achieve this goal, one must be able to identify needs, develop prototypes, and attain an entrepreneurial mentality, which means acting as a startup. Last but not least, it is necessary to create an open organization able to capture opportunities, discover external talents, and inspire and motivate people (Barbuto, 2005). The Turin Smart City identifies citizens' needs by adopting the job-to-be-done methodology, developing prototypes and fostering a startup mentality due to the STIR and Innova.To projects, creating an open organization through the "Citizens' Saturday" initiative, and ensuring continuous collaboration among different institutions (Vigoda, 2002). Finally, the city is also trying to optimize technological solutions by activating a public competition aimed at awarding the best technological solution proposed. The aims of and subjects involved in each smart project are summarized in Table IV.

[Insert Table IV about here]

As shown, all these initiatives contribute substantially to creating a virtuous ecosystem, in which the public actor combines a lean approach with the job-to-be-done methodology, together with a startup mentality, collaborating with companies and citizens (Johnson *et al.*, 2008; Ries, 2011; Zadnor *et al.*, 2006). Specifically, lean methodology linked to the minimum viable product concept enables the startup approach, wherein the main output is the ability to develop smart projects more rapidly. Furthermore, thanks to these specific projects, the city is increasingly able to involve all its stakeholders—citizens, companies, public employees, and other institutions—to a greater extent and more optimally, highlighting the relevance of responsible public leadership in a global stakeholder society that aims to contribute to building social capital. This can be done within smart cities, ultimately leading to sustainable and efficient business as a precondition of urban development (Maak, 2007).

Managerial implications

From a managerial viewpoint, the approach advocated here is not exactly intended as a best practice model for smart cities, but rather aims to emphasize the integrated nature of different perspectives, and the possibility of combining an entrepreneurial approach, a kind of startup mentality, with the public sector to facilitate the development of

innovative smart projects. Despite the various interpretations of smart cities, the study aims to contribute to civil engagement in open innovation in smart cities, which is still scarce in the literature but promises widespread impact (Portney, 2005). This because a culture of innovation and a climate encompassing citizens has not yet been well developed; in such an environment, firms share the risks and responsibilities for the development and implementation of new technology or service projects with other public and private actors based on compensation benefits shared with managerial authority and a high degree of operational involvement by political players (Kivliece and Quelin, 2012). One of the interviewees stated that *"when the aim of the partnership is exploiting new services within the city, firms with different competencies become involved with the project."*

Our multiple project case study has shown that citizens' networking capabilities and the external organizational climate are closely intertwined. Indeed, all smart city projects stress that citizens are critical for an innovative growth path, mostly because local governments often do not have the knowledge and management capabilities necessary in the new and complex context the smart city requires. Thus, the degree of smartness depends in part on the ability of the regulators to develop internal routines and processes to mobilize, coordinate, and integrate interorganizational partnerships strategically at all levels of the smart city (Boselie *et al.*, 2001; Jansen *et al.*, 2009). Moreover, the fundamental role played by citizens in transposing and disseminating tactically innovative and tacit knowledge also emerges, i.e., the nexus of absorptive capacity of the smart Shumpeterian environment (Giarratana *et al.*, 2007).

Theoretical implications

From the theoretical perspective, the existing literature does not satisfactorily investigate the contingent factors regulating the lean management of smart factories (Santoro *et al.*, 2017). Accordingly, this study finds that the open innovation literature provides greater scope in unpacking the boundaries of smart cities, by addressing several organizational situations and strategic resolutions for public industry as well as for firms' competitiveness in general (Giffenger *et al.*, 2007).

Following the quadruple and quintuple helix innovation model of Carayannis and Campbell (2012), and subject to the study assumptions, the job-to-be-done approach emphasizes the need for the government and public institutions to develop open innovation projects that can be implemented through bottom-up methods, and employing metrics that will help to achieve the right timing in the market in terms of meeting citizens' expectations (Lo and Jim, 2012), and ensuring efficiency and effectiveness in the implementation of top-down smart city projects (Bakıcı *et al.*, 2013; Ferraris and Santoro, 2014; Paskaleva, 2011).

In this regard, the adoption of job-to-be-done practices delimits the boundaries of entrepreneurial activities for public and private partners, complementing the disruptive nature of smart projects, which at their core are relate to the competitiveness responsible for the growth of innovative performance strategies (Schaffers *et al.*, 2011). Moreover, job-to-be-done practices enhance the human side of open innovation because governments and firms are able to know more about users (i.e., citizens), and thus enable redirection in terms of what they are to accomplish when the project is taking a wrong turn (Radnor *et al.*, 2006).

Indeed, the continuous monitoring and analysis of data, and provision of feedback and information can help to uncover unpredictable events, thus enabling the search for the best alternative. Therefore, the focus on acquiring knowledge concerning users by collecting enormous volumes of customer information could help speed up analysis and enable sophisticated analyses of customer needs, helping to develop innovation projects

structurally and with care through calculating and mitigating the risks related to the innovations process (Choi *et al.*, 2008; Tseng, 2008). From the outside, the application of this paradigm is complementary to a disruptive innovative strategy for firms; at its core, it is about competitive responses to innovation by helping predict the behavior of citizens, who pose the greatest threat of failure.

Thus, the job-to-be-done approach aids in understanding to how to create products and services that citizens want to acquire, thence transforming understanding of open innovation projects to a causal customer-driven purchase (Johnson *et al.*, 2008). Accordingly, the new perspective could change the rules of competition in private–public alliances by allowing partners to differentiate offerings competitively through successful innovations that help users resolve problems by being involved in: a) decision-making processes, b) pushing progress, and c) addressing powerful and emotional social ownership useful for improving social welfare and redressing imbalance.

Identifying and unpacking the boundaries of smart city projects through the job-to-be-done approach is only the first step in converting open innovation techniques from a technology to a customer-centered logic. Also, it indicates essential ways of integrating a dataset of experiences and insights that are often hard to see, but profoundly mark the need for the fulfilment of goals and the achievement of results in open innovation entrepreneurship (Chaston and Scott, 2012).

Limitations and future research perspectives

Despite its achievements, the study presents some limitations due to its exploratory nature. The main limitation is certainly the use of a single-case design: while it has generated a considerable amount of data, it lacks the capability to generalize the results. The second limitation is related to the lack of empirical development, which makes it difficult and to replicate the findings and renders the implications less reliable. Finally, while the originality of the research gap represents a strong point for the study, it also makes the research theoretically vulnerable, as there is no clear pathway in terms of literature concerning the subject.

Thus, starting from the results related to the case proposed, further investigation could strengthen the insights presented here by investigating more cases, particularly through a multiple-case design using data from a wider sample of cases. Furthermore, the case of Turin could be followed over a longer period to enhance or validate the research findings. Not only could a longitudinal perspective be adopted, but also a comparative analysis could be undertaken involving new smart cities' experiences. Moreover, smart evolution, such as the concepts of smart factories and the digital industry, could be supported by being combined with the smart city concept, enhancing productivity. In addition, it would be interesting to investigate empirically through the use of powerful quantitative methods within a specific industry context the variables and relationships affecting open innovation engagement by firms in smart city projects, thus generating valuable scholarly and managerial insights. Naturally, the relevance of the research topic also demands further investigation from multiple perspectives to provide a complete empirical validation of the findings herein.

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APPENDIX: TABLES AND FIGURES

Table I.
Definitions of smart city building blocks

Definition of a smart city	**Author(s)/year**
A kind of perfect city with a high level of automation due to the considerable use of ICT tools	IBM, CISCO (2000)
An interplay between technological innovation, organizational innovation, and policy innovation	Nam and Pardo (2011)
A city where the adjective "smart" also refers to the governance of a city, and its capacity to generate innovation in the ways that services and communication are delivered to the local population	González and Rossi (2011)
Relates to the convergence of IT services within an urban space. In this space, citizens can access smart services, and this will consequently increase the city's competitiveness and its citizens' quality of life	Lee *et al.* (2012)
Characterized by a pervasive use of ICT, which, in various urban domains, helps cities make better use of their resources	Neirotti *et al.* (2014)
A conceptual urban development model based on the utilization of human, collective, and technological capital for the development of urban agglomerations	Angelidou (2015)
An inherently "complex socio-technical system of systems"	Curry *et al.* (2016)

Source: Authors' own elaboration

Table II.
Equipment in smart city development

Dimensions	Key elements
Requirements for smart cities	To investigate the evolving needs of infrastructure requirements Next-generation smart city solutions
Architectures and paradigms for smart cities	To study theoretical foundations of architectures City-as-a-platform Cloud computing for smart cities
Infrastructures for smart cities	Design and implementation infrastructure services Internet of things platforms and middleware analytics Sensor and connectivity infrastructures
City information management	Urban information models Interdependent work structures Urban analytics and Big Data
Service innovation and design for smart cities	Promote trust through socialization programs Smart architecture and building Smart urbanism

Source: Authors' own elaboration

Table III.
Research foci and gaps concerning smart cities

Current research focus	Main gaps and needs
Production and distribution of energy, transportation and logistics, waste management and pollution control, and the ways in which ICT can harness information processing in these fields	Theoretical studies of smart cities and the definition of a smart city useful for clarifying which initiatives are included in a smart city strategy, together with a collection of best practices to better inform theory
Investments in urban living domains wherein ICT plays a more limited role in enabling sustainability, which is thus related to welfare and social inclusion policies, culture, and education	Smart city goals and the measures needed to evaluate success or failure; the repeatability of prototypes and the financial sustainability of smart initiatives
Evolving needs of infrastructure requirements for next-generation smart city solutions, and the theoretical foundations of architectures for smart cities	Studies focused on strategic planning in smart city projects and an exploration of the crowd management topic within the smart city domain
Design and implementation of infrastructure services for smart cities; city information management, and service innovation and design for smart cities	Case studies of smart city deployments, including retrospective analyses of successful and unsuccessful smart city development

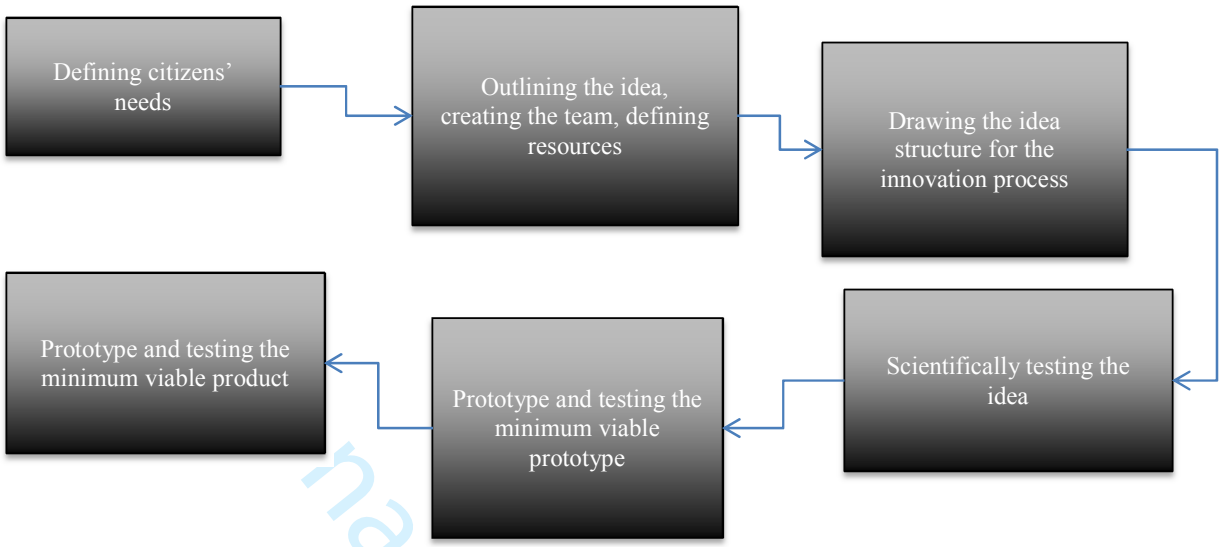
Source: Authors' own elaboration

Table IV.
Turin Smart City projects

Project	Aims and expected results	Subjects involved
STIR	Creating a virtuous smart city network Solving Turin's city government problems and challenges through collaboration with local startups Creating products and better services able to solve citizens' critical needs	Startups The San Francisco municipality NASDAQ Entrepreneurial Center
Citizens' Saturday	Involving citizens Finding innovative solutions to citizens' needs	All citizens
Innova.To	Innovating through training, learning, and encouraging all public employees to propose new solutions to the city's problems Acquiring a startup mentality, as well as a lean approach to projects	Public government's employees
Public competition	Involving citizens Finding innovative solutions to improve city life through new technologies	All citizens

Source: Authors' own elaboration

Figure 1. Defining citizens' needs – The framework



Source: Authors' own elaboration