



The role of universities in the Smart City innovation: Multistakeholder integration and engagement perspectives

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ABSTRACT

During the past decades cities may have finally shaped the demand for “smart” and sustainable innovations calling for deep stakeholders' integration and engagement within Smart City Projects (SCPs). In this context, Universities are often involved with different tasks, but their stakeholder engagement and integrator role is still unclear. This paper aims to fulfill this gap on the role of Universities in SCPs utilising bottom-up collected quantitative and qualitative data. We found positive trend in University integrator role applying a mixed two-step methodology based on online survey of University students and interviews with decision-making stakeholders involved in SCPs (business, state, entrepreneurs and academia) in Italy and Russia. Our findings suggest significant new insights useful to reapply the mediating role of Universities and to highlight some newly arising opportunities in stakeholder engagement. At the same time, we propose related practical implications in the field of entrepreneurship and innovation defining further directions under the lens of multistakeholder management.

1. Introduction

While the innovations arise from different types of organizations, the multistakeholder relationship brings us to the call for sustainable co-development (Belyaeva, 2016). Sustainable innovation can simultaneously bring benefits for the natural environment, and a wider community of stakeholders, including customers/citizens, as well as creating market and non-market opportunities that lead organizations to long-term competitiveness (Porter, Donthu, MacElroy, & Wydra, 2011; Ferraris, Bresciani, & Del Giudice, 2016; Watson, Wilson, Smart, & Macdonald, 2018). In line with the main idea of Gupta, Czinkota, and Melewar (2013), cities can build a strong “smart” brand incorporating and embedding sustainability for creating a differentiation (with regard to other cities) in a competitive market. According to this, a strong innovation ecosystem composed by different stakeholders and their networks of relationships has a leading role in fostering innovation within the so-called Smart City (Ferraris & Grieco, 2015).

Smart City is a city that aims at connecting the physical, IT, social and business infrastructures to leverage the collective intelligence of the city (Hollands, 2008). This growing phenomenon emerged from the pervasive use of Information and Communication Technologies (ICTs) in the Urban space (Schaffers et al., 2011; Scuotto, Ferraris, & Bresciani,

2016). In this context, the role of the various actors (firms, public governments, universities, research centres) within the city ecosystem is crucial in the development of new services and products with the final aim to satisfy citizens' needs (Letaifa, 2015). So, the recent trend of smart innovations within global city ecosystem is yet to be adjusted from the multistakeholder theory view.

While the ‘Triple Helix’ and subsequent models of innovation in ecosystems in the last decade (Carayannis & Campbell, 2010; Etzkowitz & Leydesdorff, 2000; Ranga & Etzkowitz, 2013) explicitly addressed the role of Universities as a key actor in developing sustainable innovation, very few studies analyzed their role in the smart city ecosystem (one notable and recent exception is Ardito, Ferraris, Petruzzelli, Bresciani, & Del Giudice, 2018). This is quite unusual also because the literature on sustainable innovation in ecosystems has widely addressed a crucial role of Universities in multistakeholder knowledge-based innovation systems where diverse public and private actors are involved and cooperate among each other, like in smart cities (Scuotto et al., 2016).

Traditionally, Universities' primary role is to teach to conduct basic research and, from an ecosystem perspective, to create and share knowledge with the ecosystem's stakeholders (Rothaermel, Agung, & Jiang, 2007). However, the emerging opportunities arising from the use of ICT in Smart Cities and the peculiarities of Smart City projects (SCPs)

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force to rethink and to adapt the role of Universities in this new context, in particular with regard to the complex engagement dynamics of many and different stakeholders (Ardito et al., 2018; Bresciani, Ferraris, & Del Giudice, 2018). Another growing trend shows an increasing appetite of Universities for new forms of entrepreneurial activity, including start-ups around a university-developed technology or licensing new technologies to small private firms showing innovative results (Powers & McDougall, 2005). Thus, this paper investigates the role of Universities in Smart Cities as a key actor in the development of sustainable innovation, with a particular focus on the engagement of different partners in multistakeholder alliances. We achieved our objectives through an innovative two-steps mixed analysis in Italy and Russia: first, we investigated the students' perception on Smart Cities and the role of Universities in SCPs through a tailored survey grounded on mainstream literature; second, we employed 27 semi-structured interviews of different members belonging to firms, public governments and Universities involved in SCPs in order to reveal the role of Universities, focusing the attention on stakeholders' integration and engagement. Results of our analysis show significant differences between Italy and Russia as well as two sets of roles covered by Universities, some of them are more classical and traditional but adapted to the peculiarities of Smart Cities while others are new roles explicitly related to the city's stakeholder management and engagement.

This represents an important contribution for at least three reasons. First, previous studies on Smart Cities focused on different perspective of analysis, such as the technological innovation or the single city (Kourtis, Nijkamp, & Arribas, 2012) or on other stakeholders such as private firms (Ferraris, Erhardt, & Bresciani, 2017; Sandulli, Ferraris, & Bresciani, 2017) or public government (Meijer & Bolívar, 2016). Likewise, while the roles played by governments, firms, and the civil society have mostly been defined (e.g. Bakici, Almirall, & Wareham, 2013; Sandulli et al., 2017; Yigitcanlar, Velibeyoglu, & Martinez-Fernandez, 2008), no specific indication can be identified about universities. This is one of the first studies aimed at filling this gap. Second, it adds to the literature on innovation ecosystem proposing new tasks and key roles of Universities in the integration of diverse stakeholders in sustainable innovations within Smart City ecosystems (Paskaleva, 2011; Schaffers et al., 2011). Third, we explicitly contribute to the stakeholders' management and engagement stream of literature. In fact, we found that Universities may activate or enable stakeholder relationships and bring the missing knowledge as a key requisite for successful stakeholder co-creation (Prahald & Ramaswamy, 2013; Vrontis, Thrassou, Santoro, & Papa, 2017).

The paper is organized as follows: a theoretical overview of the academic literature on smart cities and multistakeholder networks in SCPs, along with a focus on Universities traditional tasks in innovation ecosystems is outlined in the first sections. Afterwards, the main research questions and the methodology used in the paper are presented. Then, main results of the analysis alongside with relevant implications for top managers of Universities, policy makers, local government and firms are discussed. Finally, conclusions and future research avenues are proposed.

2. Literature backbone

2.1. Sustainable innovation in Smart cities

The “Smart City” context is still emerging and the work of defining and conceptualizing is in progress. A Smart City connects human and social capital along with ICT infrastructures in order to address public issues and to achieve a sustainable development aiming at delivering new and innovative urban services and increasing the quality of life of its citizens (Hollands, 2008).

Smart City is a concentration of people and devices, and most of the data is generated by people/citizens and process/machine. The European Union recognizes that the concept of *smart city* means smarter

urban transport networks, upgraded water supply and waste disposal facilities, and more efficient ways to light and heat buildings. And it also encompasses a more interactive and responsive city administration, safer public spaces and meeting the needs of an ageing population.¹

In the last years, many cities have undertaken innovative “smart” projects and more and more citizens, advanced companies and local government act in order to promote urban change making the city innovative and sustainable: these are called Smart City Projects (SCPs). SCPs are setting of open, user-driven and sustainable innovation for testing and demonstrating the value of ICT enabling service (Schaffers et al., 2011). Making city smart is realized by advanced ICT infrastructure such as mobile devices, the semantic web, cloud computing, and the internet of things (IoT).

The smart city development involves technical, social and political processes. Some of the most promising solutions involve sustainable large-scale changes in the infrastructure and in the sub-systems that currently sustain urban life (Sandulli et al., 2017; Santoro, Vrontis, Thrassou, & Dezi, 2018). As shown by Carvalho (2014), their adoption is unlikely to evolve in a linear way (from development to implementation) because there are many social dimensions that have to simultaneously co-evolve to match new solutions to the existing world, such as user's preferences, legal rules, the planning needs and social practices.

Despite difficulties in defining this fuzzy concept, empirical evidence shows that a dynamic number of stakeholders collaborate in the city's innovation ecosystem in order to exploit Smart City opportunities. This is also confirmed by very recent studies on the role of the firms (Ferraris et al., 2017; Sandulli et al., 2017) and public governments (Meijer & Bolívar, 2016). Thus, smart cities embrace socio-technical system as Future Internet coupled up with the physical environment and human behaviour, becoming an open innovation platforms (Carvalho, 2014) that requires managing multistakeholders relationships.

2.2. Multistakeholder networks in SCPs

A famous landmark in the multistakeholder innovation is the Triple Helix Model developed by Etzkowitz and Leydesdorff (2000) in order to explain how innovation emerges from the interaction of different parties by analyzing the existing dynamics between three helices: state, academia, and industry. Leydesdorff and Deakin (2011) have shown that the Triple Helix model allows studying the knowledge base of an urban economy in terms of civil society's support for the evolution of cities as key components of innovation systems. In this context, the three relevant components of the city (government, university and firm) create a phenomenon that makes it possible to advance the technology of the innovation ecosystem.

Thus, Smart City can be conceived as an innovation platform, that integrates different participants and different SCPs (Eisenmann, Parker, & Van Alstyne, 2009) whose interactions are subject to network effects, along with one or more intermediaries who organize the platform facilitating users' interactions. This makes critical the organization and coordination of the complex direct and indirect relationships between independent actors that should co-create, co-deliver and capture value in open platform environments (Eisenmann et al., 2009; Scholten & Scholten, 2012). Multistakeholder analysis is a process of systematically gathering and analyzing qualitative information to determine whose interests should be taken into account when developing and implementing a policy, a program or a project (Bryson, 2004). In fact, SCPs typically engage multi-partner network alliances involving several partners, both public and private where platform promoter facilitates interactions between participants for the development of new

¹ <https://ec.europa.eu/digital-single-market/about-smart-cities>

technologies and not seldom the development of new technological standards (Scuotto et al., 2016; Steinmo & Rasmussen, 2016).

The common objective of multistakeholder networks is to find a participative approach to an issue that is too complex to be addressed effectively without collaboration (Corus & Ozanne, 2012; Roloff, 2008), resulting in a form of platforms for deliberative democracy (Hajer & Wagenaar, 2003) of stakeholder management. Contemporary approach to the stakeholder mapping supports different strategies towards internal and external stakeholder management tactics to co-create value. For example, Maglio and Spohrer (2008) argue that value co-creation is defined as a configuration of people, technologies, organizations and shared information that are able to create and deliver value to the interested entities through service. Interaction becomes the driver of value (Polese, 2009) which develops a joint process of value creation in SCPs taking into account human and social aspects (Thrassou, Vrontis, & Bresciani, 2018a; Thrassou, Vrontis, & Bresciani, 2018b). Therefore, value co-creation in the multi-stakeholder analysis can create competitive advantage by improving role division and relationship management scheme among stakeholders related to Universities.

In smart cities, usually the initiative to start a smart city project (SCP) is driven and guided by public governments or Multinational Enterprises (MNEs), while the coordination is often multistakeholder driven and followed by University teams' engagement. Thus, multi-stakeholder engagement and management in such networks is crucial in enabling organizations to address complex problems and challenges in cooperation with stakeholders (Roloff, 2008). Here, in order to recognize, create and enhance sustainable innovations it becomes relevant to understand the “cause and consequence of stakeholder relationships and interactions in a network, as a stakeholder causal scope” (Shams, 2016, p. 676).

3. The role of universities in multistakeholders networks

In a knowledge society and in Smart Cities, the potential for innovation and economic development lies in a more prominent role of the University and in the hybridization of elements from different city's stakeholders (universities, industries and the government) to generate new institutional and social formats for the production, transfer and application of knowledge (Ardito et al., 2018; Ranga & Etzkowitz, 2013). It is widely accepted that University combines the three missions: education, research and social, while recent studies outline that the fourth strategic mission, reflected in the economic effects arising from the location and operation of the campus in the city (Belyaeva, Scagnelli, Thomas, & Cisi, 2018).

So, the University can act both as an obvious economic actor (the employer, the owner of the property, the taxpayer, etc.), as well as a generator of indirect, “spontaneous” economic and innovative effects (Marginson, 2007). The directly achieved effects may include: knowledge transfer to/from local businesses in order to generate a new source of income (university as an employer or as an investor), incubation of start-ups, specialized knowledge-intensive services and co-creation of innovative scientific and educational clusters (Allen & Allen, 1988; Etzkowitz & Leydesdorff, 2000) and partnerships (Franco & Haase, 2017). Social capital theory provides fundamental bases of utilising knowledge resources via stakeholders' engagement and it is well documented to shape organizational behaviour and effectiveness of organizations integration (Kwon & Adler, 2014). In the context of multistakeholder networks, with the aim to integrate social, technological and knowledge innovations within smart ecosystem, the University role in social capital transfer might be particular important, as it requires comprehensive collaboration over time (Steinmo & Rasmussen, 2018).

Allen and Allen (1988) argued that universities have long - if implicitly - pioneered the use of stakeholder management - both internally and externally - as a way of handling their ambiguous purposes, to suppress open conflict between different constituencies (Benneworth &

Jongbloed, 2010). University success has always depended on the capacity to secure resources to achieve their core missions (Ernste, 2007). An important element of this is the creation of ‘useful knowledge’ embedded in people, technologies, books and networks (Marginson, 2007). The value of that knowledge is defined by universities' key stakeholders through terms such as its quality, utility and relevance. In a multistakeholder environment, this value becomes the key decisive factor of trust and knowledge transfer for sustainable innovation.

Looking at University capacity in stakeholder management while resources become increasingly dependent on market decisions and metric allocations rather than block grants, universities face an increasingly complicated choice of which stakeholders' interests to prioritise and how to reconcile contradictory interests (Greenwood, 2007). Stakeholder management is a means to that end, as university stakeholders place demands or conditions on the university in return for their resources. But just as not all company shareholders are equal, some stakeholders' interests are more influential than others (Benneworth & Jongbloed, 2010). The identification of the most important stakeholder groups is not straightforward. Stakeholder theory classifies stakeholders according to their relative importance or *salience* (cf. Mitchell, Agle, & Wood, 1997), and allows us to explore the impact of differential salience on influence over universities. However, Myllykangas, Kujala, and Lehtimäki (2010) argued that is not sufficient for understanding business value creation because it does not address the complex “dynamics” among stakeholders' relationships.

Thus, University can play an enhanced role in innovation in smart cities and in increasingly knowledge-based societies, acting not only as technology and knowledge transfer favouring the economic development but also operating as an intermediary and facilitator between the other components of the ecosystem in multi- and inter-disciplinary ways (Del Giudice, Carayannis, & Maggioni, 2017). The multi-stakeholder approach to the smart ecosystem may bring up entrepreneurial effects via knowledge transfer, networking and engaging both individual and institutional stakeholders (Ranga & Etzkowitz, 2013). This may lead to strengthening local suppliers, stimulating domestic and international demand for the domestic/goods and services, creation of new businesses. The Quadruple Helix adds up important components (Campanella, Della Peruta, Bresciani, & Dezi, 2017; Carayannis & Campbell, 2010), but the level of University internal stakeholders (professors, administrators, students) perception and awareness in SCP should be better explored to understand the future role of University in such context. This opens the space for the engagement and integration of external stakeholders that reside within the city's ecosystem, improving the potential impact of sustainable innovation in SCPs. So, besides the classical role of education, training and basic research, the Universities need to evolve and adapt to the changes in the today knowledge society. This is the main motivation that moves our research and leads us to develop the following research questions:

RQs: What is the role of University in smart cities? How do Universities engage city's stakeholders to enable sustainable innovation in Smart City Projects?

4. Methodology

This research adopted an innovative and explorative two-step level methodology (mixed method) to summarize different SCPs stakeholders' perspectives. In the first step, a questionnaire entitled “The Role of Universities in Smart Cities” was developed in English and pilot tested on students who studied in Italy and Russia, enrolled in English-taught international programs with Management and Economics majors. The questionnaire consisted of 25 questions developed following selected literature on smart cities (e.g. Paskaleva, 2011) and on the role of Universities in innovation ecosystems (e.g. Ranga & Etzkowitz, 2013) from a multistakeholder perspective (e.g. Scuotto et al., 2016). After some pilot adjustments the survey was distributed to via online Google

Table 1
Descriptive statistics of 1st step methodology.

Descriptive statistics	Countries	
	Russia (123)	Italy (108)
Gender	Female – 41,46; Male – 58,44	Female – 47,93; Male – 52,07
Age	«30+» - 2,4; «20–25» - 90,2; «25–30» - 2,4; «less 20» - 4,9	«30+» - 5,3; «20–25» - 89,1; «25–30» - 2,1; «less 20» - 3,5
Education degree	Bachelor - 85,4; Master - 4,9; PhD - 9,8;	Bachelor - 84,3; Master - 9,5; PhD - 6,2;

forms to 350 students (from Sverdlovsk region in Russia and from Piedmont region in Italy) during the period November 2017 – February 2018. We have received 231 valid and fully filled in forms.

In this context, little has been mentioned about the power and legitimacy of students as the key stakeholders, although in the perspective of Tripe Helix and its further developments as well as in the smart city literature, students (and citizens) might later on take a deeper role in connecting Universities with other stakeholders. Thus, the first part aimed at evaluating the perceptions of the students (e.g. [Lois, Tabouratzi, & Makrygiannakis, 2017](#)), an important stakeholder in smart city development as they are the citizens of today and in particular of the future, making them suitable for understanding the actual and future role of Universities in this new field.

The descriptive statistics of the sample is provided in [Table 1](#).

In the second step, 27 interviews with key informants and documentary analysis served for data collection. An exploratory and qualitative methodology was applied to conduct in-depth semi-structured interviews lasting no more than 2 h with relevant stakeholders in smart city projects both in Russia and Italy. The multiple case study method may be useful in showing an effective illustration of multi-actors management in an innovation city's ecosystem. Following [Eisenhardt \(1989\)](#) and [Yin \(2003\)](#), this is not meant to be generalizable, but it is utilized to inform about the theoretical development of the different roles and tasks of Universities in Smart Cities. This methodology enables the researcher to maintain the complexities and contextual contingencies in which the organizations and the phenomena under study are embedded ([Yin, 2003](#)). The multiple case study approach is useful in such exploratory modes of research and can provide detailed understanding of particular situations which may be useful to improve theory.

To study the comparative characteristics we have circled out 16 Italian and 11 Russian organizations, which are involved in various Smart city projects. We have received positive replies for interviews from 8 MNEs' managers, 4 SMEs' managers, 7 professors, 5 Universities' top managers and 3 city public managers.

Due to the different nature and character of the stakeholders' relation to the smart city projects we have used disproportionate stratified random sampling ([Thompson, 2002](#)). This aimed at deepen our understanding on the role of Universities by involving key direct stakeholders in smart city initiative such as firms managers (MNEs and SMEs), Universities' personnel (Top Managers as well as Professors involved in these projects) and city officials (municipalities). The choice of the respondents was adjusted to approve the direct and indirect effect of developing the smart ecosystem in various organizational multi-stakeholder environments. Thus, we obtained data from diverse respondents within different SCPs ([Tiwana, 2008](#)). We conducted interviews in different projects that would maximize similarities with respect to external influences but maximize variation and allow comparisons with respect to dimensions of interest. The projects examined included projects such as: Big Data analytics on public service monitoring, Smart roads and drainage infrastructure, Electrical and thermal

energy control system, Subway control room, Smart transportation systems, Waste management and parking systems, Intelligent street lighting, Smart Regional Infrastructure, IoT in banking. On the average, three interviews have been performed per each project. The interviews gathered information related to the role and tasks of University within these projects, with a particular focus on understanding their role in the stakeholder management and/or engagement. We asked the respondents to support their different arguments with at least one specific example describing that argumentation. Also, primary and secondary sourced documents were content analyzed.

5. Main findings

5.1. First step – Students perceptions on Smart cities and university role in SCPs

Analyzing the answers of the students, we noted that 31.7% of respondents are not aware of the term “smart city”. In Italy, this percentage is lower than in Russia, which indicates their greater awareness. In fact, 43.9% of respondents from Russia are not able to cite a single example of project in smart city. However, it should also be noted that 10% of respondents (18% among Italians) believe that Amsterdam is the most promising smart city. Around 10% indicated other cities as Barcelona, Vienna, Turin, Singapore, Dubai, Rio de Janeiro. However, 1 out 3 of the students is not familiar with the concept of “smart city” despite: a) their great spread in studies/research in different disciplines; b) the huge attention of new and traditional media; c) their young age that should lead to a higher interest on the topic. When asked on the most relevant aspects of smart cities, Russian respondents mentioned technology and the development of several infrastructures of cities, while respondents from Italy gave more importance on the role of social and human capital, interactivity and citizens' involvement in solving the city's problems. These results below highlight the different perceptions of Russian (more focus on hard technological assets) and Italian students (more focus on soft and social assets) on the key components of SCPs.

Both countries primary choose business as integrator and developer of SCP. Italian respondents think that business and Universities are equal partners, while businesses outperform Universities in this role according to the students' perception in Russia. Regarding the main obstacles for the successful “smart initiatives”, Italian students believed that the main problem in developing SCPs is the cooperation between private and state partners, as well as the development of a successful and sustainable business model. On the other side, Russian respondents considered as key difficulty the achievement of citizen involvement and, in line with Italian respondents, the development of a sustainable business model. Thus, [Figs. 1 and 2](#) showed that respondents from Russia among the main participants in the development of smart cities allocate business (i.e. firms). As a key stakeholder-integrator, Russian respondents mentioned firms while the Italians equally vote for business, university and state. According to respondents from both countries, the implementation of SCPs is beneficial more for communities. Moreover, the respondents from Italy believe that University is the key stakeholder in the promotion of SCPs (while it is firms for Russian). This is a very important results along with a good score also as “stakeholder as a developer and integrator” that highlight the perception on key main roles of Universities in smart cities. However, from these answers, it seems that the role of Universities in the stakeholders' engagement in SCPs is prominent only for Italian respondents because firms are the key stakeholder individuated from the Russian students.

Regarding stakeholder engagement, respondents from both countries identified financial and non-financial motives and incentives among the key factors of success in managing and motivating stakeholders. [Fig. 3](#) shows that respondents consider also very important to have an innovative-oriented approach in involving citizens in the development of “smart cities” while organizational commitment and

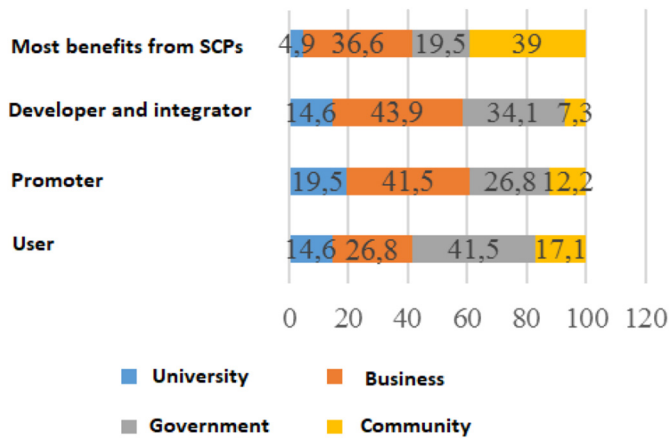


Fig. 1. Perceptions on the roles of different stakeholders in SCPs (Russian respondents).

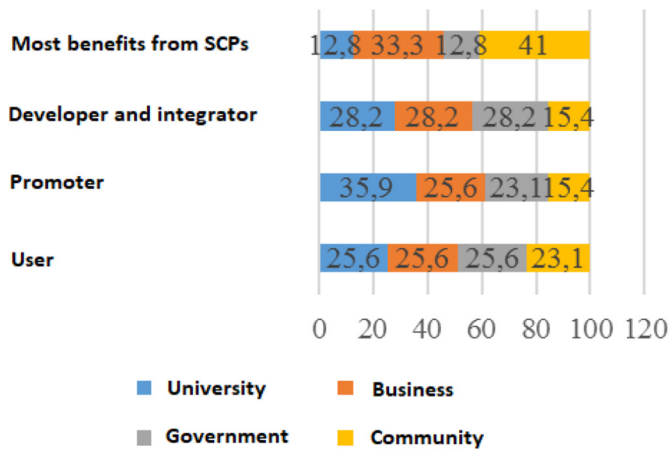


Fig. 2. Perceptions on the roles of different stakeholders in SCPs (Italian respondents).

cultural aspects achieved lower scores.

Regarding the future role of Universities in smart cities, main

discrepancy on the perception of respondents is that Russian students imagine the university as mediator and intermediary among city's stakeholders in the development of smart cities (64%) while Italian students have different opinions, voting more for a role of knowledge provider (56%). Instead, the contradiction result has been scored in "society involvement" by less than 20% of all the students involved in this research. This highlights the need to increase their awareness, and Universities as well as public entities should be the mainly promoters.

Based on our findings, Russian students indicated that the key tasks regarding the involvement of the universities are the development of "short thematic roundtable discussions", as well as the "sharing of resources and facilities" with other stakeholders, as more than 60% of respondents addressed them as very important factors. As for Italy, the score is high in all areas (in particular the promotion of specific workshops, seminars and conferences on the topic) which indicates the great awareness of the respondents to involve the university in developing a system of "smart" cities. Finally, we highlight that the most important contribution addressed by the University is as "main supplier of ideas and resources" for SCPs (Russian students). Conversely, for Italian students, the "training and special disciplines on the topic" can be identified because considered important to disseminate the main concepts and technologies for building a smart city.

5.2. Second step (a) – The role of universities in SCPs – A multistakeholder perspective

From a multistakeholder perspective, our respondents highlight various roles of Universities in Smart Cities depending on their employment. However, as for mainly of Russian respondents, at this stage of the University's development, it does not make a significant contribution to the development of a system of "smart cities". In the opinion of Russian stakeholders we interviewed, University acts mainly as a source of knowledge, but respondents expect that the University of the Future will have mainly the function of an intermediary in public-private partnerships. Needless to say that University representative in Russia assured that "the future has already come".

Mainly in Italy, our organizational-level interviews showed how University may play an active role in Smart City projects. From our results it is possible to identify or cluster two main areas/roles in which Universities can contribute in Smart Cities: 1. Classical Roles, adapted to the peculiarities of the smart city context; 2. New roles, regarding

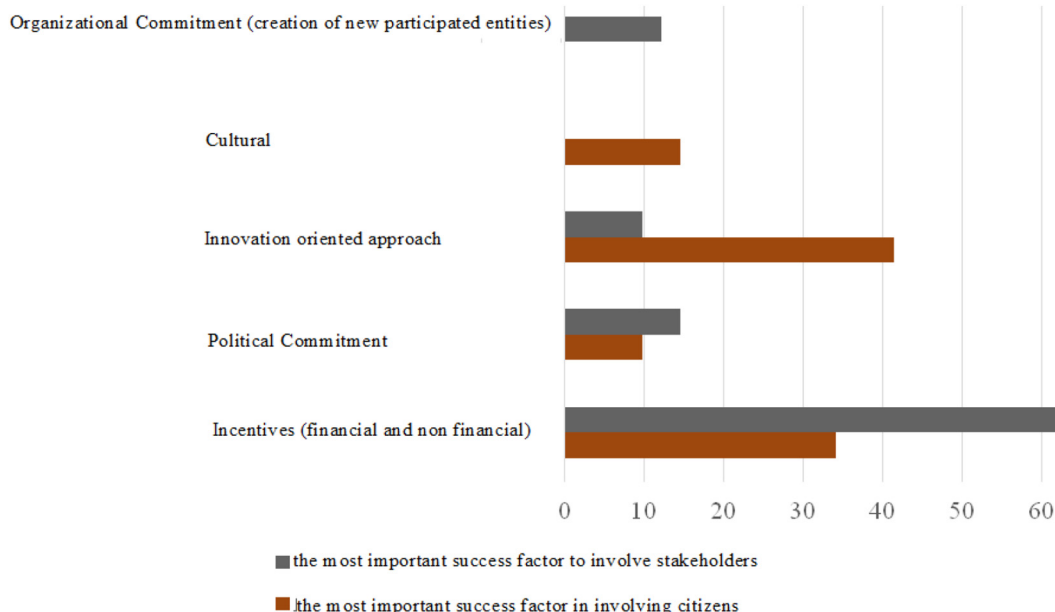


Fig. 3. Key success factors in stakeholder engagement in SCPs.

mainly the engagement of heterogeneous city's stakeholders. The first one typically refers to the knowledge/technology creation and transfer as well as knowledge brokerage among SCPs while the second one refers to the social/societal involvement and ecosystem facilitator/networking.

From our interviews, we classified the classical university's role in the development of the “smart cities” ecosystem:

1. Source of knowledge (knowledge bank) - Provision and development of training programs that meet the standards of education of the “smart” city; interactive learning, accessibility of scientific literature in the mode of remote access;
2. Supplier of qualified personnel - Training of specialists able to carry out innovative, managerial activities in the field of solving problems of an “intelligent” city;
3. Developer - Providing opportunities for scientific and innovative activities, developing new business ideas, projects, technologies, for example, in the field of “Internet of Things”;
4. Educational environment - Promoting the culture of the “creative class”, the formation of new cultural values;
5. Financial Mediation - Financing of the projects through helping in the presentation of smart city research proposals to national or supranational funds.

More specifically, the main role emerged in our interviews is the knowledge/technology creation and transfer, where Universities may have different tasks in SCPs. Some real examples highlighted that Universities brought new scientific and technological knowledge within the project, such as competencies, hard and soft skills. This emerges clearly in the University of Trento and the Polytechnic of Turin that operate in this way in each Smart City projects they entered. In some cases in Russia, instead, Universities help SMEs in order to better understand the business opportunities arising from these projects because too much often they do not understand how they can operate and how the return on investments happen. In fact, Universities are an important part of the innovation hub/ecosystem providing many complementary assets to the projects with specialized competencies in different fields, such as IT and project management skills. The leading Universities in Italy and Russia work towards combining innovative and multidisciplinary scientific research with practical solutions exploiting and combining their high tech and human capabilities with technological innovations that have high societal impacts. Some Italian technological Universities in our sample evaluate and manage huge amount of data coming from sensors, cameras and other devices that are distributed throughout the cities.

From the interviews, it emerged also that Universities (such as in Milan and in Moscow) cover an important role in accessing to national or European funds both in Italy and Russia. They are key actor in the multistakeholder alliances in the presentation of these proposals and in finding the right partners to include into the project. This role reduces one of the most important problem in these kind of project: the financing; because public governments have always less resources and firms are less incline to invest in the first explorative stage of the project because the new solution is very far from the market and from positive returns on investments.

5.3. Second step (b) – The role of universities in SCPs –a stakeholder engagement perspective

One of the main original results of this study rely on the role clearly directed towards the engagement of: a) society (e.g. citizens); b) different city's stakeholders such as firms, governmental authorities and research centres within and outside the city (achieved through the Universities' networks).

Regarding the society involvement, our study highlights that Universities may have different tasks. First, Universities may cover the

role of social influencer, disseminating the culture and the key concepts around Smart Cities. All the projects analyzed showed that Universities have already organized many initiatives such as conferences and research seminars in order to influence political commitment (city governments) and citizens' perception as well as to engage multiple city's stakeholders. More specifically, Universities in Russia have as final aim to stimulate students to become the first adaptors of Smart Solutions influencing at the same time the society of today and of tomorrow.

Second, some Universities are creating “contests” of smart ideas in order to exploit the innovation potential that resides in the students. These contests arise with framing an emergent citizens/societal problem in which there are not already solutions, give some suggestions and insights to the students under the supervision of professors and city's governments/firms managers allowing them to create innovative solutions to these problems. Thus, engagement of students represents an important source of managerial innovation. This is related also to the technology commercialization's role of many Universities that are developing/adapting their capabilities to catch new citizens' needs, getting feedback from primarily stakeholders to co-develop new services and to subsequently increase start up creation and academic spinoff. Almost all the heterogeneous groups of interviewed highlighted the role of the students' engagement in order to: a) individuate new citizens' needs, b) add an important source of knowledge in the co-development innovation process, c) favor the start-up creation or universities spinoff, and d) create “contests” of ideas, e) follow socially responsible strategy of Smart City.

Regarding the engagement of different stakeholders, most of the Universities in our sample act as knowledge intermediaries between private and public partners and help in the management of knowledge flows. This happens very often in our cases, in particular when there is a high knowledge distance between the public and the private actors involved in Smart City projects. Universities are thus crucial in the management of knowledge flows between different partners allowing cross fertilization of ideas within hybrid partnerships. Furthermore, our respondents clearly stated that University have an important role in the management of Intellectual Property Rights balancing open and close approach of different public and private partners involved in the projects. In order to reduce cooperation failures between them, Universities can successfully manage, transfer and convert knowledge that flows within the smart city projects, solving at the same time some managerial failures.

Moreover, around half of the Universities in our sample act as intermediary and/or coordinator between the different components of the city's ecosystem in ways multi- and inter-disciplinary. This is the case of the University of Trento (Italy) in partnership with TrentoRise and the University of Milan in two of the projects analyzed while Ural Federal University (Russia) is coordinating regional SCPs. Here, one of the key roles emerged in our study is the engagement of different stakeholders within the city's ecosystem looking for different actors depending on the necessity and on the characteristics of each specific SCP. This is due mainly because Universities can exploit their unique institutional positions above the parts to dialogue and network (as highlighted by [Ernste, 2007](#)) with several different private and public stakeholders as well as the citizens and students. So, Universities in our sample are becoming social agents stimulating sustainability involvement of other key-organizations resulting in a truly ecosystem facilitator.

Finally, our interviews showed that Universities act also in some cases as network coordinator between different cities allowing for an effective knowledge pooling, repositories and sharing of experiences. Universities research efforts in this sense is now collected and possible in Italy in the Urban Europe Research Alliance (UERA), a network of interactions and exchanges of experience between research institutions and Universities created in order to build a strategic European vision of interventions in urban areas, encouraging the exchange between operators in the sector. This is closely connected with the Joint Programming Initiative Urban Europe, a European organization with a

similar aim, highlighting how the engagement of different stakeholders through the development of relationships and networks are fundamental for the implementation of SCPs.

6. Discussion, implications and conclusions

6.1. Discussion of the results

Smart cities become a “hot topic” in several streams of literature that refers to management, computer science, ecosystems, sustainability, etc. This paper aims at understanding the relevance of the Universities in the smart city ecosystem giving the fact that in the real world, among all the stakeholders, they cover an important role and can contribute in different ways in the development of Smart City project. Results of our analysis show that there are different and heterogeneous perception on University's role in smart cities but that Universities may actively play different tasks, such as knowledge/technology creation and transfer among SCPs as well as education, help in finding financial resources for these projects and related research activities. Moreover, our results document new and emergent University roles that refer mainly to the engagement of city's stakeholders directed to society involvement and ecosystem's partners' co-creation through networking and integration.

These results propose the main areas in which the University may contribute to the building of a “smarter city” highlighting the need to partially rethink and refocus the role of Universities. On one side, the classical tasks of research, education and knowledge and human providers need to be updated, adapted and rethought to the challenge imposed by smart cities, highlighting students as a key stakeholder in this process. Thus, more students' awareness and involvement should be promoted in order to improve the success of sustainable innovation in SCPs. On the other side, Universities need to strategically engage stakeholders seeking a coordinated response across wide geographical areas like city-regions, and across sectors like housing, transport, health and the environment. To be successful in this, all the key stakeholders need to understand complex economic, social and environmental trends, building consensus in a wide range of city's actors and developing long-term plans in conditions of uncertainty. In previous research (e.g. [Mayangsari & Novani, 2015](#)), Universities have been classified only as knowledge provider in innovative projects within smart cities, while individual researchers presented as innovators within SCPs. [Mayangsari and Novani \(2015\)](#), in their single case study of the city of Bandung, considered that the role of the enabler aimed at the creation of a common vision, the strategic leadership, and the networking promotion should be carry on by the city major and public government. Our research found preliminary empirical evidences of a support role of Universities that can act as an enabler engaging different stakeholder in smart city innovation. However, a recent study carried out by [Ardito et al. \(2018\)](#) showed that Universities are deemed to be responsible for smart city projects, deeply influencing the competitiveness and superiority of knowledge-based ecosystems.

6.2. Theoretical and practical implications

This paper represents an important contribution for at least three reasons. First, this study adds to the literature on smart cities an important contribution on an under investigated actor that play a crucial role in smart city innovation: the University, while previous studies focused on different perspectives of analysis or other key actors ([Ferraris et al., 2017](#); [Kourtiti et al., 2012](#); [Meijer & Bolívar, 2016](#); [Sandulli et al., 2017](#)). Second, it contributes to the literature on innovation ecosystem proposing new tasks and key integrator and engagement roles of Universities in the co-development of innovations within Smart City ecosystems adapting and upgrading traditional roles of Universities to the new characteristics of these projects ([Ardito et al., 2018](#); [Paskaleva, 2011](#); [Schaffers et al., 2011](#)). Third, Universities

engage their stakeholders in “open innovation” approach ([Del Giudice, Della Peruta, & Carayannis, 2013](#); [Ferraris, Santoro, & Papa, 2018](#); [Schaffers et al., 2011](#)) as a fundamental task to build entrepreneurial startups. Although theories of entrepreneurship focus mostly on specific characters and people, University moves it on the next level of systemic value co-creation with internal and external stakeholders pushing to co-develop smart infrastructure for smart people, businesses and governments as yet another innovative business opportunity. Some researchers have realized that cities that use a “Smart City approach” are more entrepreneurial than others ([Richter, Kraus, & Syrjä, 2015](#)), but they did not go deep in understanding the dynamics and the characteristics accounting for this higher entrepreneurial activity. We provide new insights into the role of University perception and positioning in smart city in the innovative projects going beyond technology transfer adding up multiple stakeholder dimensions ([Carayannis, Del Giudice, & Rosaria Della Peruta, 2014](#)). Our study shows that although University changes roles in such projects it is mostly seen as an integrator for future key stakeholders (also students). Moreover, we add to the knowledge on the outcomes of such smart ecosystem collaboration by studying different types of directly and indirectly involved stakeholders, both institutional and individual relationships among different dimensions of social capital. Thus, by studying SCPs from different perspectives, we add a dynamic understanding of University-Industry-State Helix. Thus, Universities could stimulate the relations between stakeholder engagement and innovative entrepreneurial opportunity identification as proposed by [Burns, Barney, Angus, and Herrick \(2014\)](#). In fact, there is still scarce resource on “how” organizations leverage networks competence ([Yu, Hao, Ahlstrom, Si, & Liang, 2014](#)) in order to plan and implement proactive win-win open innovation strategies for entrepreneurial development, in association of the key stakeholders ([Ferraris et al., 2017](#)) along the development of knowledge management systems ([An, Deng, Chao, & Bai, 2014](#); [Santoro et al., 2018](#); [Yigitcanlar et al., 2008](#)).

This paper offers also several practical implications for different stakeholders such as policy makers, Universities top managers and firms. Implications for policy makers imply the change of consumer behaviour because most of the consumers do not understand why they need smart solutions, which imply bigger costs for state, business and consumers themselves. Policy makers need to simplify and facilitate the cooperation among all the stakeholders and in particular give more freedom to the Universities in order to play an active facilitating, disseminating and coordinator role. So, they should reduce bureaucracy and favor a more innovative mentality in their employees investing more on IT skills and related knowledge capabilities. With this regard, Universities may also help in creating new skills and in understanding how Smart City solutions may improve public services offered to the citizens, or may achieve better level of efficiency of public spending. Moreover, there is also an urgent need for a huge financial platform (design incentives and new financial mechanisms) and for legal changes (legal frameworks should be aligned with peculiarities of Smart Cities).

Implications for top managers of Universities refer to reposition the management strategy of Universities in smart city innovation ecosystems with the concrete possibility to play an active role. Moreover, and in line with a recent contribution of [Grimaldi and Fernandez \(2017\)](#), Universities need to rethink their academic programs because they are not aligned with the implementation of innovative Smart Cities' initiatives. The Smart City implementation needs to cross Universities' silos and re-organize the University by business application and citizens' needs making people more in line with the future cities ([Naveed Baqir & Kathawala, 2004](#)).

Implications for firms may be several. Regarding SMEs, Universities may help in understanding the opportunities around Smart City initiatives because too often there is still opacity on the projects and on the return of investments. Regarding MNEs, Universities may help in dealing with public governments and local stakeholders (public and private) acting as intermediary. Despite there are evidences of a

number of problems of interaction between state and private partners and universities (Campbell, 2013), our results open the space for a “gatekeeper role” of Universities in SCPs in the management of knowledge flows between private and public partners (in line with Arditto et al., 2018).

6.3. Conclusions

Smart City projects typically involves explorative and exploitative alliances comprehending several partners, both public and private, which develop uncertain technologies, services or business models with the final aim at satisfying citizens' needs (Sandulli et al., 2017). This paper instead addressed to better examine the role of the Universities in SCP stakeholders engagement and management processes.

Universities and research centres learn “smart governance” to outline their pivotal role in realizing a successful smart city (Etzkowitz, 2008). However, it is not easy to do since it involves engagement of diverse city's external and internal stakeholders (Watson et al., 2018) and these interactions should be developed and carefully orchestrated in order to extract value for all the organizations involved and ultimately for the society (Perks, Kowalkowski, Witell, & Gustafsson, 2017).

Consequently, various possible solutions to the relationship between the institutional spheres of the university, industry and government can help in creating alternative strategies for economic growth and social transformation. We learnt from two countries stakeholders the perception of University as integrator in SCPs and its perception as a possible better stakeholder's engagement centre. Due to the fact the University is even more an important player in the knowledge society (Carayannis & Campbell, 2010; Etzkowitz & Leydesdorff, 2000; Ranga & Etzkowitz, 2013) the revolution brought by the ICT had a strong impact on the tasks the Universities should do to co-create value within the territory (city).

The research has some limitations due to sample design, but attempts to set a novel understanding of the mutually adjusting smart city system. Our sample has some bias since the Smart city projects in which the Universities are involved are different that is why the disproportionate stratified random sampling was suggested. In fact, the kind of partners and the dimension and type of the projects differ among the projects analyzed. However, our objective was to highlight main possible roles of Universities from a multistakeholder perspective. This open space for future research in at least two different directions: a) to conduct a large-scale survey to statistically test the relationships that emerged from this study, including more heterogeneous Universities; b) to explore more in deep the role played by other stakeholders of the ecosystem in the assessment of the tasks of Universities. A further limitation is that we observed successful SCPs mostly, next steps would be to embed the role of Universities in managing stakeholders in SCPs with different outcomes.

Moreover, the Universities involved in our study are the leading University in this field of research, with some specific and unique (at the moment) characteristics, resources and objectives. This may make difficult to generalize the results and to extend these findings to all the other public (in particular) and private Universities. This is also relate to a limitation of our methodology that lacks of be generalizable but it is usually utilized to inform about the theoretical development of the different roles and tasks (in this research) of Universities in Smart Cities. One of our most important objective was to create awareness on this topic because sooner or later in a more or less prominent way Universities will need to face this trend, adapting in some way their approaches and organizations to “smarter” cities and citizens. So, the choice of the respondents was adjusted to approve the direct and indirect effect of developing the smart ecosystem in various organizational multistakeholder environments. Thus, we obtained data from diverse respondents within different SCPs (Tiwana, 2008). We conducted interviews in different projects that would maximize similarities

with respect to external influences but maximize variation and allow comparisons with respect to dimensions of interest. The projects examined included projects such as: Big Data analytics on public.

So, through our research, we hope to inspire additional managerial accounts as well as further scholarly study in this exciting domain. Nowadays, for example, several Smart City projects still have very low performances and success due to: a) private actors' incapacity of managing alliance or developing Smart City alliances routines with public partners; b) scarce commitment and compatibility of public actors or public organizations' lack of knowledge and managerial skills; c) Universities' scarce involvement in the project due to the bureaucratic issues or limited incentives. As a result, we encourage successful examples to be documented, involving both successful and failure experiences of Universities' involvement with heterogeneous partners in such projects.

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