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Digital social entrepreneurs as bridges in public-private partnerships

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Abstract: Developing innovative projects towards the achievement of the socio-economic impact of a technology is a challenge for the researchers, industry, and policymakers. This research develops a new model to identify the key roles in the innovation process by analysing ten projects developed and managed by public-private partnerships. This research describes the role of people (i.e. innovation managers, lead-users, embedded lead-users, social entrepreneurs, technology-reflective individuals and online community leaders) in the social innovation process. The social entrepreneur is the key role acting as a bridge between innovation managers and technology-reflective individuals. Furthermore, reflective people such as young couples with kids, elderly or Millennials are fundamental for the impact creation.

Keywords: public-private partnerships; technology-based innovation; social entrepreneurs; social innovation; user engagement.

Biography: Dr. Sandro Battisti is program manager in the ICT Center at Fondazione Bruno Kessler (FBK) in Italy. He has over 20 years of experience in research, development and innovation management of ICT solutions for social impact in Brazil, Italy, Finland, the UK, the US, Germany, and France. His research in the field of innovation and entrepreneurship has been published in relevant international journals such as Journal of Social Entrepreneurship, International Journal of Services, Technology and Management, International Journal of Innovation and Technology Management, and International Journal of Technology Marketing. His specific research interests are focused on innovation platforms, social entrepreneurship, business ecosystems, data-driven innovation and user innovation. He holds a PhD in innovation management from Polytechnic of Milan in Italy.

1 Introduction

Recent studies (e.g., Hajli 2014; Schweitzer et al. 2015; Igarashi and Okada, 2015; Bhatt et al. 2016; van der Linden et al., 2017) suggest that new research can explore the relationship among people inside the innovation process, towards the reshaping of technology to cope with emerging social issues, and the creation of socio-economic impact.

In particular, research on the social aspects of innovation explains that new services, products or models to deal with social issues are also able to create new business opportunities (e.g. Nicolopoulou et al. 2016). Following this line of thought Archibugi (2017) explains the need for new research in social innovation facilitated by the availability of technology, such as the “sharing economy” where people exchange, for example, homes and automobiles, by the use of information and communication technology (ICT). Furthermore, Tracey and Stott (2017) argue with the growing value of digital technology in society, new avenues of research can be explored to contribute to the understanding of innovation that generates social and business impact, as well as supported by Winter et al. (2018).

Traditional models of technology-based service innovation (i.e. here defined as “digital innovations”) are mainly based on the openness of organisational structures to develop innovation for business purposes, however, not effective to develop innovation for socio-economic impact. This suggests that the open innovation paradigm must be reinterpreted by organisations to develop service innovations that can cope with social problems, in particular, those enabled by ICT. Moreover, this research explores Edwards-Schachter and Wallace (2017) definition of social innovation (SI) enabled by technology, which is “SI was used to name the development of products, processes, and services mediated by technologies or closely linked to technological innovations with social purposes”.

The current mainstream of open innovation (e.g., Chesbrough and Di Minin, 2014) is lacking in a new organisational model for the development of innovation that addresses social and business needs. From here, Öberg (2010) suggests focusing on customer’s roles that can change the innovation process. Furthermore, the success of social innovation depends on the way innovation managers organise the process, the team structure, the relationship between companies, the role and level of involvement of different kinds of users, and the role of local governments. In particular, understanding customer’s interactions during the customisation of innovation projects is a key success factor, as suggested by Schaarschmidt et al. (2015).

From a new approach to the development of technology-enabled social innovation, considering both the business and social perspectives, Battisti (2012) suggests an alternative framework that takes into consideration the inclusion of socially relevant groups in the innovation process. In particular, he analyses the problem of vehicle and people security (i.e., the issue of robbery of cars and trucks, as well as the kidnappings of VIPs), which was an unsolved issue using current service innovation solutions already in the market, which were not well addressed by private companies, not-for profits, or public-private partnerships (PPP). This new model was structured to produce systematic changes in the quality of life of citizens, and it was organised at three different process levels (i.e., internal, open and social). This approach is supported by Djellal and Gallouj (2012), who suggest that social innovation requires openness and interaction between several actors.

When building the social innovation process, PPP seems to be the most appropriate organisational form to cope with social process and social outcomes, towards

the combination of the economic and the social aspects embedded in the innovation (e.g., Howaldt and Kopp, 2012; George et al. 2012). In particular, the development of technology-enabled social innovation inside PPP can be the most appropriate way to study the anatomy of the innovation process, where the integration of different kinds of people is crucial to the success of innovation towards coping with business and social requirements.

This research aims at exploring technology-enabled social innovation to contribute towards extending research on public-private partnerships for social innovation and entrepreneurship. In this way, this research extends the work of Hurnonen et al. (2016), who argue about the need to address new research to understand the different phases of innovation projects. Thus, the research question is: *How are public-private partnerships organizing innovation process to engage key people towards the socio-economic impact of technology-enabled projects?*

This paper is organised as follows: First, the theoretical framework regarding the role of people in technology-enabled social innovation projects is presented. Second, the research design is discussed, describing the combined methodology of multiple-case studies and clinical inquiry. Third, the data analysis focuses on understanding the innovation projects. Furthermore, the findings presented a model with the key role of people in social innovation projects. Finally, the article presents the discussion and conclusions.

2 Theoretical Framework

Technology-based innovation seems to be more effective than other kinds of innovation on addressing specific needs of citizens when engaging specific kinds of users and developing it in collaboration within PPPs. Recent research on topics related to innovation based on technology (e.g., Hajli, 2014; Schweitzer et al. 2015; Altuna et al. 2015; Igarashi and Okada, 2015; Phillips et al. 2015; Lubberink et al. 2018) suggest that a potential approach to address this challenge can be to organise the whole innovation process to address economic and social aspects.

From this perspective, this research takes as reference the following definition of social innovation by Mulgan (2012:35), as supported by Nicholls et al. (2015): “innovations that are social both in their ends and in their means. In other words: it covers new ideas (products, services, and models) that simultaneously meet socially recognized social needs (more effectively than alternatives) and create new social relationships or collaborations, that are both good for society and enhance society’s capacity to act.”

New models organization models must be designed to cope with social problems where traditional innovation models have been unsuccessful in introducing systemic changes. Thus, Seebode et al. (2012) argue that to cope with the increasing social problems, organisations must embrace massive changes within the innovation process, which can lead to high impact creation in terms of business and social aspects. Furthermore, Phills et al. (2008) argue that social innovation can distribute financial and social values throughout the society. This argument is supported by Emerson (2003), who argues for the need of creation of a blended value that embeds financial and social returns on investment.

The support of not-for-profit organisations and local governments for the open social innovation process is also explored by Chesbrough and Di Minin (2014). In their study, they extend the line of thought on the open process through establishing the new concept of open social innovation, which means to encompass the work of individuals, as well as groups and organizations, creating potential solutions for a specific social

change as the ultimate goal. Thus, PPPs can create value for the whole society when organising structures to treat innovation as both processes and outcomes.

The exploration of the process in which PPPs are organised to enable different interactions between several actors in social innovation enabled by ICT is a challenge, as described by Gallouj et al. (2013), and Archibugi (2017) extends the argument by explaining this kind of social innovation opens new opportunities for both profit and non-profit organization. Recent research on technology-enabled social innovation in public-private partnerships (e.g., Hou and Han, 2015) suggests the importance of leverage on new technology tools to increase the efficiency on delivering new businesses based on service innovations. In addition, the involvement of users is fundamental to the success of technology-enabled social innovation inside PPPs (Battisti, 2014).

The development of social innovation requires an active and intensive collaboration among several kinds of people, to enable the achievement of the economic and social impact. Furthermore, the different roles that people assume within the innovation process are crucial for organisations to understand, develop, and manage social innovation.

The analysis of user-based innovation involves complex social processes that are embedded in conflict situations and misunderstandings in communication, as suggested by Sundbo and Toivonen (2011). In particular, fast-moving environments force companies to define new ways of organising teams towards delivering results that achieve real customer needs, as proposed by Edmondson (2012). From this perspective, companies are forced to establish strong partnerships with public organisations to address the most pressing issues of potential customers. This seems to be a required condition for PPP to develop new mechanisms to deal more adequately with social problems provided by people via the use of ICT.

2.1 The process of technology-enabled social innovation

The development of social innovation based on technology requires flexible and structured processes, as well as new organisational forms enabling the interaction with very different kinds of stakeholders. This includes the participation of people with different roles in the social innovation process, aimed at addressing specific needs. In this way, Harrisson (2012) argues that social innovation is a collective process among several kinds of stakeholders, and this process can be structured into three levels (i.e., Battisti, 2012), which are internal, open, and social.

At the “*internal level*”, social innovation is designed by a multidisciplinary team of people working in close collaboration, and by sharing tasks among organisations and inside PPPs. By forming a PPP, the internal level of innovation processes can be increasingly reinvented given the need for new business opportunities and pressing social needs. In private companies, the sharing of information can be supported by specific kinds of internal employees, such as innovation managers (e.g., West and Boger, 2014) and lead-users inside PPP.

This research considers the term “embedded lead-users” as employees who are lead-users of their employing firm’s products or services as defined by Schweisfurth and Raasch (2015). Furthermore, embedded lead users in large corporations are the key people to exchange knowledge with other people outside the organisations; they are also socially embedded in the company they work in, being exposed to corporate culture and rules as argued by Schweisfurth and Raasch (2015). In this direction, Wellner and Herstatt (2014) suggest that these lead-users hold in-depth technical expertise and are capable of creating a huge value towards the success of the open process of innovation. And the

users can be even more powerful when they are experienced people (e.g., life experience in coping with situations by solving real social problems); thus, they bring more information about specific needs and requirements when compared with the classical technological lead-users in the literature of innovation (e.g., Bilgram et al. 2008).

In order to enable flexibility and technology integration, as well as strong collaboration among the key people at the internal level, innovation managers follow stage-gate processes. In this way, Cooper (2008) argues that service development can be organised using reinvented stage-gate process, which is based on a series of interconnected phases in which companies develop internal innovation process. Furthermore, in technology-based projects, innovation managers of PPP require intensive actions towards technology integration from several sources, as well as huge efforts to search for the most appropriate technologies inside the partner organisations (i.e., private or public).

Following this line of thought, Eslami and Lakemond (2016) argue the importance of internal process integration, which influences the ability of companies to achieve effective inter-firm integration. This process is supported by Hurmonen et al. (2016), who define knowledge integration as the utilisation and combination of existing and specialised knowledge. Thus, the effort of PPP in this phase is to put a lot of emphasis on finding the best-fit technology and integrating such technology with current service innovations, towards a more effective overall service solution, thereby fully internalizing external technology (e.g., West and Bogers, 2014) inside the PPP.

At the “*open level*”, innovations are developed by PPP together with social entrepreneurs and lead-users, where each organisation owns their original resources that they put in collaboration, and the output of the collaborative effort is the process’ key element of success. From this perspective, PPPs bring economic and social values for people needs by enabling the participation of active lead-users and social entrepreneurs in the innovation process. In particular, this level plays a crucial role in supporting PPP towards shaping social innovation that meets business and social needs, as also supported by the research of Nicolopoulou et al. (2016). Moreover, flexible routines of collaboration among people are crucial for the innovation success, in particular, to enable the contribution of the two main actors (i.e., social entrepreneurs and lead-users) in the whole innovation process. Furthermore, social entrepreneurs play a crucial role, as Chesbrough and Di Minin (2014) argue that open innovation is very relevant for social entrepreneurs who work to provide socially relevant products or services to people, when compared with standalone business approaches that are not able to cope with social needs, or at least it is not a priority for companies.

At this level, there is no need for a full acquisition of technology by the PPP, as it usually occurs at the internal level. An example is the research of Perks et al. (2012), which found that small-medium enterprises (SMEs) are likely to be flexible in routines of engagement towards innovation. SMEs can be engaged within public-private partnership via open innovation mechanisms, following appropriate agreements such as public procurements via the governments’ side, as well as business contracts for collaborative innovation development. The social entrepreneur (e.g., board member or co-founder of SMEs) plays a fundamental role at this level.

For the success of the integration of economic and social aspects in the final solution, Emerson (2003) and McMullen and Warnick (2016) suggest that organisations need to address the creation of a “blended value”, which means satisfying different stakeholders in terms of social and business needs. Additionally, Battilana et al. (2012) argue that social entrepreneurs are powerful sources to drive business through less dependence on public funding or donations; thus, social entrepreneurs play a central role

in creating a hybrid value (i.e., business and social) combining aspects of non-profits and for-profits. Furthermore, Battilana et al. (2012) found that social entrepreneurs are the most suitable profile to manage the integration of social and commercial activities in a sustainable way. In addition, Zahra and Wright (2015) argue that social entrepreneurs are more capable of articulating social needs, and creating blended value supported by several kinds of stakeholders to deliver new products and services addressing commercial and social goals.

Similarly, Mahr et al. (2014) suggest that lead-users (e.g., von Hippel, 1986; Schreier and Prögl, 2008) can produce novel and very relevant knowledge during the co-creation process of innovation to expand the possibility of commercialization of innovation. Additionally, Kratzer et al. (2016) suggest the importance of the role of lead-users in bridging product development with other users in on-line communities. Furthermore, this level is powerful for social entrepreneurs to have fresh insight into social needs from committed people, and thus drive product development in the market's direction.

Social entrepreneurs act as a bridge between innovation managers (i.e., the key role at the internal level) and the technology-reflective individuals (i.e., key role at the social level). Likewise, Nicolopoulou et al. (2016) argue that social entrepreneurs work on building relationships and networking with several stakeholders around social innovation. It is a powerful role, keeping in mind all involved people and the need to deliver a social innovation that encompasses economic and social needs.

At the “*social level*”, the in-depth understanding of social problems and the high commitment to the creation of novel solutions to addressing the pressing issues of society are the main concerns for social innovation (e.g., Harrison, 2012; Moulaert et al. 2013). From this point of view, key people (i.e., technology-reflective individuals and on-line community managers) can support social entrepreneurs to obtain real-time information about customer needs, in order to improve the innovation assertiveness towards a combined business-social output. In particular, certain individuals can play a fundamental role at this level; they are the technology-reflective individuals (i.e., Schweitzer et al. 2015). Thus, companies that have interest in leveraging their business strategy to create a positive societal impact (i.e., Schweitzer et al. 2015), and thus create a business value (i.e. making profits), can effectively structure the innovation process, including back and forward feedback of the technology-reflective individuals to improve the value created at this level for the final innovation solution.

Involving technology-reflective individuals can increase the likelihood of an innovation to be created for social impact, as suggested Schweitzer et al. (2015), where they define that this kind of individuals have the tendency to design and develop products and services by considering the impact of these products and services on the other users, and society in general. Additionally, Schweitzer et al. (2015) and Bhatt et al. (2016) suggest that such people bring powerful value for high impact creation in innovation throughout society, in the same way, Kwon et al. (2017) argue companies must be aware of the potential negative impact of not involving people in the social innovation process, especially when the innovation is based on disruptive technologies. People are fundamental because they can analyse the past effects of technological products on society, and reflect based on that towards finding new solutions for emerging social problems.

Reflective people play a key role in supporting companies for advanced understanding of the relationship among the several actors towards the creation of business and social impact, as argued by Schweitzer et al. (2015). This is also supported by the research of Bijker (2010) and Edwards-Schachter et al. (2012). In particular,

reflective people such as young couples with kids, teenagers, elderly or Millennials are fundamental for social innovation enabled by technology. Moreover, the group of elderly people, who usually face more critical social issues than other people, can provide more potent information directly connected to well-being and quality of life.

On-line community leaders are powerful in supporting the creation of large-scale groups of people who can support social innovation development. In this regard, Hajli (2014) suggests that such users create content leveraging social technologies' contact peers, exchanging interests and ideas, and expressing intentions and emerging social needs directly to community managers. Additionally, Droge et al. (2010) argue that users inside on-line communities (e.g., bloggers or community managers) can be a strong resource in getting information on several kinds of needs of users. It is also supported by Cammack and Byrne (2012) who explain that on-line tools can enable scaling-up of social innovation, to move processes from an individual model perspective to a network highly diffused model of collaboration.

Moreover, Haiji (2014) argues that the experience of people using on-line environments brings a value in terms of new business creation; thus, community leaders can influence the development of new products and services that can influence the behaviour of people as final consumers.

From this perspective, the role of key people is summarized in Table 1. It was used as a research construct, and guided the whole data collection process, as well as the data analysis.

Table 1. The role of people in technology-enabled social innovation

	Role of people	Description	References
Internal Level	Innovation managers	People responsible to manage internal innovation process inside public-private partnerships among large private companies, and local public institutions, national and international public institutions.	Cooper et al. (2008); West and Bogers (2014); Chesbrough and Di Minin (2014)
	Embedded lead-users	People interested in developing innovation for their career growth and sustainability of the organisation where they work. They are key to the integration of technological and human resources inside public-private partnerships.	Wellner and Herstatt (2014); Schweisfurth and Raasch (2015); Eslami and Lakemond (2016); Hurnonen et al. (2016).
Open Level	Social entrepreneurs	People focusing on making money while solving social needs through entrepreneurial actions. They are flexible people who capture the needs of customers and implement new features in the final innovation solution. They are the most relevant people to create blended value.	Perks et al. (2012); Battilana et al. (2012); Zahra and Wright (2015); Nicolopoulou et al. (2016).
	Lead-users	People committed to co-develop innovation for their own use and following their own needs.	von Hippel (1986); Schreier and Prügl (2008); Mahr et al. (2014); Kratzer et al. (2016).
Social Level	Technology-reflective individuals	People committed to seeing the role of technology in changing the lives of people. They are self-empowered people for the in-depth understanding of hidden needs of potential customers, to collaborate with companies.	Bijker (2010); Edwards-Schachter et al. (2012); Battisti (2014); Schweitzer et al. (2015); Bhatt et al. (2016)
	On-line community leaders	People in charge of acting in a central role in on-line communities. They manage authorization of posting of contributions from the participants in the community by empowering groups of people to contribute.	Droge et al. (2010); Cammack and Byrne (2012); Hajli (2014).

3 Research Design

The research applies a combined qualitative method, which is based on multiple-case studies (e.g., Yin, 2009) and clinical inquiry (e.g., Schein, 2008) that prove to be more appropriate than other research methods for the analysis of people engagement in technology-enabled social innovation.

The data collection period was from January-2013 to December-2017. The data collected is based on eight types of sources of evidence, presented as follows:

- *Official documents*: Yearbooks and performance reporting of five organisations; the general description of ten innovative projects; information available on the organisation's website and on the websites of the projects; general policy documents; innovation guidelines for PPPs, and regional laws enabling innovative projects.
- *Internal documents*: The full descriptions of ten innovative projects; working plans of some projects; quarterly reports of the projects; final reporting of the end of the year of some projects, and the strategic innovation guidelines of the 5 organisations.
- *Artefacts*: The software applications delivered by ten innovative projects (i.e., mobile apps, web service platforms, electronic devices of the end-user physical products, end-to-end software solutions for the customers, and socio-technical platforms).
- *Face to face interviews*: Four in-depth semi-structured interviews with innovation managers/director (i.e., twenty interviews in total) in each organisation involved in the PPPs. Each interview lasted around one hour and was recorded and transcribed.
- *Direct observations*: Participation of the researcher in monthly meetings of the organisations for project discussion and the results' presentation to the directors of the organisations.
- *Participatory observations*: Participation of the researcher in weekly decision-making meetings regarding the development of social innovation in certain innovative projects.
- *Clinical inquiry*: data collection and observation of the dynamics of the organization during the full-time research; participating in active roles in some of the projects.

The combined qualitative methods particularly enabled the researcher to carry out a rigorous (e.g., Gibbert et al. 2008) in-depth research in the empirical field. The project level was the unit of analysis. The projects were analysed taking into consideration they were led by innovation managers from PPPs. Five organisations constituted the PPPs, presented as follows:

Organisation ALFA: It is an Italian local public government divided into 217 municipalities with approximately 530.000 inhabitants. In terms of legislation power, ALFA is the highest-level of the public authority of an autonomous territory, which has the right to write and enforce regional laws. ALFA is also the organisation responsible for fostering the ecosystem of social innovation enabled by ICTs. ALFA is responsible for delivering the laws, creating statutes, and financing the innovation ecosystem to establish promising entrepreneurs from all over Europe, and in particular, projects out of Europe. ALFA has special departments for innovation, which support several companies (i.e., from start-ups to large corporations) of developing service innovation towards solving social issues and improving the quality of life of citizens.

Organisation BETA: It is the European network of organisations responsible for leading entrepreneurial actions, innovative projects, and education program (i.e., fostering entrepreneurial digital talents) around the main topic of ICT. BETA provides coaching, technology transfers, management models to foster innovative services all over Europe. The partners of this network strongly collaborate to share intensive knowledge, licensing technology, and together bring about service innovations (i.e., considering business and societal impact) to new markets, improve sales, keep the sustainable advantage, and finally to improve the quality of life of the people in Europe. BETA was founded in 2009 and has seven centres of excellence in Europe (i.e., Italy, Germany, UK, The Netherland, Finland, Stockholm, and France). BETA provided all technical, financial and organisational resources to support more than 130 Top European organisations to create new products and services for European citizens.

Organisation GAMMA: It is an innovation centre for excellence in ICT and is focused on the management of innovative projects to improve the quality of life of people and at the same time, support entrepreneurial initiatives (start-ups and SMEs). GAMMA is responsible for business modelling, launching of start-ups, entrepreneurial education, as well as managing of service e innovation based on ICT. GAMMA specialises in developing and managing PPP focusing on service innovation areas such as health and well-being, sustainable environment, tourism management, cultural heritage, and smart energy systems.

Organisation DELTA: It is a large Italian telecommunication company that employs more than 50.000 people. It is very active in collaboration inside PPPs. In particular, inside the PPPs analysed in this research, the company provides specialised services in three main areas: network structures based on the optical fibre, as well as software development, and special environments for testing technology and applications. They also focus on the development of software solutions to bridge the collaboration between the academic research in ICT and industrial innovation. The commercialisation of the innovation occurs throughout the large domestic and media channels of DELTA at the national and international levels.

Organisation EPSILON: It is an international player in the Information Technology domain and is a large Italian Company in software and services, standing among the top ten European ICT groups. It employs more than 8.000 people in Italy, Belgium, Norway, USA, Brazil, and Argentina. The company holds an integrated offering of ICT services across the entire value chain of software solutions for companies: consulting, systems and business integration, outsourcing services, products and industry solutions. EPSILON is focusing on bringing to market technology-based solutions for providing innovative services in tourism and cultural heritage domains throughout several collaborations with other large companies, SMEs, local and public national governments.

There are several reasons for selecting these PPP, and the projects managed and developed by them, which are: ALFA is responsible for governing one of the best territories in Italy in terms of innovative projects and collective actions to increase the quality of life of citizens. ALFA is well-known for supporting (e.g., organising, managing and funding) the development of social innovation projects. ALFA holds special innovation departments that organise the ecosystem of innovation by priorities in terms of innovation. ALFA supports other local public institutions to provide fundamental services for citizens, thus creating a virtuous ecosystem of innovation.

Another important reason is the strong relationship between ALFA and BETA, in terms of proximity and very tight collaboration towards social innovation. Thereby, the core operations of BETA are physically located in the autonomous region governed by ALFA in Italy. This enables the necessary flexibility of PPP to develop technology-

enabled social innovation in strong collaboration with several kinds of people. This is a strong landmark of people in this specific autonomous territory, where the quality of life here is one of the best in Italy, and people are strongly committed to developing new solutions corresponding to their needs.

The relationship between PPPs and SMEs is a differential in the mind-set of openness of the selected organisations. In particular, the autonomous territory is a strong enabler of partnerships for social innovation, given that GAMMA supports SMEs in the development and the commercialisation of highly innovative service applications. Moreover, the innovative services are first customised for the citizens in the autonomous territory, and then co-created with these citizens, and afterwards, SMEs involved to commercialise the service innovations in new markets.

In order to guarantee the rigorous process of carrying out qualitative methods, the article addresses the four criteria of a rigorous research method originally proposed in positivism traditional studies (e.g., Campbell and Stanley, 1963) and further adapt them to be used in qualitative studies. These criteria were proposed by Gibbert et al. (2008) and aim at testing the internal validity, construct validity, external validity, and reliability of the combined research method. This research explains, as follows, the way in which the rigorous process has been carried out.

The internal validity was achieved in terms of building a solid research framework based on relevant literature from open innovation, service innovation, and user innovation. In addition, the internal validity is achieved by the realisation of pattern matching among the literature reviews, and also theory triangulation from different lenses and bodies of literature. Moreover, the article addresses the criteria of construct validity, considering the data triangulation process from various data sources.

The reliability of the research was guaranteed, since it has been carried out first based on a multiple-case study protocol, and secondly, on a structured database that contains the records and the transcriptions of the interviews. Moreover, the external validity has been fully achieved in terms of the rationale for case selection and details of the case context. Thus, the article follows the academic research rigour in accordance with the advice for qualitative studies as proposed by Gibbert et al. (2008) and Yin (2009). In addition, as suggested by Gibbert et al. (2008), the comparison of at least four cases can support an analytical generalisation.

The qualitative methods aided in carrying out an in-depth study through a continuous interaction between the researcher and the interviewed innovation managers of the PPPs. Moreover, the analytical generalisation of the results presented in this research was made possible by the cross-case analysis of the innovation projects. This cross-case analysis has been crucial in increasing the external validity and the overall strengths of the findings.

The innovative projects analysed in the next section have been selected taking into consideration the definition of social innovation by Mulgan (2012) already been presented in the literature review. In addition, the definition of project complexity presented by Baccarini (1996) was also used as reference, based on the argument that a project could be considered complex when existing many varied interconnected sub-tasks that can be operationalized in terms of differentiation and interdependency.

4 Data analysis

This research focused on analysing technology-enabled social innovations at the project level, focusing on the anatomy of the innovation process at three levels (i.e., internal, open and social). The analysed projects leveraged the traditional models of developing

service innovation (i.e., mainly exploring the business needs), and introduced new alternative models of innovation to correspond to the social issues. In addition, it was observed that the development of social innovation models that support organisations in coping with complex projects was really a new challenge for organisations, as found by Schaarschmidt et al. (2015) in recent studies of service innovation.

The context of innovation in complex projects requires alternative forms of organisation, and the collaborative teamwork among employees (i.e., both from the public and private organisations), while a different kind of users seems to guarantee the required flexibility for the development of social innovation. Thus, this research studied the dynamics among several people during the development of technology-enabled social innovations in complex projects. It was observed that the high technology-based projects are more beneficial for companies in dynamic, rather than those in a stable condition, as proposed by Schweitzer et al. (2011).

The projects have been categorised based on their level of complexity. It was observed that the development of innovation in complex projects is a challenge, considering the rapid changes, the complexity of technology, ambiguity in task definition and integration, as well as unpredictability in the social and business needs. In this way, the models are applied to innovation projects in which the presence of complexity is evident, following the previously presented definition of Baccarini (1996).

In order to understand the role of each person at the right level of innovation projects, novel ways to combine entrepreneurial activities and people roles are crucial. In particular, this research observed that complex projects require new management models, following the work of Williams (1999) and (Ghallab et al. 2016), which supports the argument that structural uncertainty (i.e., the number of elements and the interdependence among this elements) must be taken into account as a critical factor for project development.

The preliminary analysis of innovative projects is presented accordingly with the theoretical framework, as described below:

Project 1: A living lab project environment based on a networked socio-technical platform for the involvement of people in regular everyday life activities. It provides a user-centred design and testing environment for serving the purpose and needs of innovative projects of the network of partners of BETA around Europe. It is a long-term and permanent lab that enables to perform testing of the health and well-being services for regular everyday life. The social needs addressed in this lab are the tele monitoring and telecare for the elderly living in their own homes and the management of stress of people at workplaces.

Project 2: A living lab project environment based on a socio-technical community of around 300 people who are active participants and are available for participation in user-experience research activities and participatory design activities. Citizen's participation is rewarded on the basis of their commitment, to ensure long term commitment and community building. The social needs addressed in this lab are simple everyday life problems regarding the quality of life, that are shared with a large crowd of citizens, who use smartphones and are active participants in tasks proposed through crowdsourcing techniques.

Project 3: A living lab project environment to foster mobile phone related research activities with citizens, which involves a community of about 140 committed people, and it is aimed at creating a continuous and active people base to aid in addressing specific needs from social relevant groups. The social needs addressed in this lab are the problems faced by young couples, with at least one child, during everyday life activities. The lab investigates the effects of children on their parents' behaviours, such as working

hours versus time spent at home with the family, and also the measurement of mood and levels of stress of parents.

Project 4: A living lab project environment that creates a social and technological environment to aid in the co-creation of services, with and for the people. In addition, this brings-forth a social and technical environment for collaborative service design. This platform is an open lab model of a smart city (i.e. integration of several stakeholders from the public, private, non-profit organisations and citizens). It is focused on the development of innovative services to address the urgent needs and quality of life of people (e.g. mobile application for managing 100% of recycling and reuse of waste). The social needs addressed by this lab include social problems of people, as well as specific issues of researchers. The close relationship among, researchers, citizens and public authorities (i.e. local public officers and civil servants) are the key factors for pushing researchers to develop services for the emerging need of citizens.

Project 5: An ICT platform for enhanced tourist experience management. It aims to deliver innovative services to people, such as tourists, tourist operators, and local citizens. These services aim to establish and maintain an interactive and continuous link with people in three different phases of the tourist journey, which are: before, during and after their stay in long-term vacations. The challenge of ever enhancing the quality of life of people by exploring the role that people play in service innovations, enabled by the platform, is the main driver of the whole process of innovation.

Project 6: A mobile app developed and customised to be used by all kinds of people during winter sports competitions. It enables a set of services integrated with social networks, where people can share their own needs using consolidated social channels. They can comment, express own interests, such as “likes” or “loves”, and publish additional contents to help innovation managers of PPPs to understand and appropriately address people’s needs. The App focuses on features that increase the quality of life for citizens and tourists who participate in sports activities. The service solutions are developed in collaboration with public and private organisations, and with people engagement. The co-creation process for the development of innovative services is centred on the improvement of the quality of life of the people. The project also creates a technological infrastructure to support the growth of SMEs that work in strong collaboration with the project. The services were developed in collaboration with more than fifteen public and private organisations.

Project 7: An interactive multimedia indoor guide, built to accompany people in its tour route to a cultural space indoors (e.g., a Science Museum). The objective is to ensure a very innovative visitor experience. The guide is provided to the visitor on an iPad when they start the indoor tour. The well-being of people is the main driver in the innovation process. It provides highly innovative and personalised services for cultural enjoyment and cultural heritage. It addresses social interaction based on the capability of adapting to each single user's needs and context, as well to the emotional status to improve the quality of life of citizens.

Project 8: An ICT system that integrates the management and communication of large events for specific purposes, such as sports competition; it manages the activities of the athletes who participate in several different disciplines, and provides services to the event organizers. The event organizers can provide useful services to the athletes in collaboration with public and private organizations. The addressed social needs in this project are the support to athletes such that they can obtain all information about the event and then for the athletes to be relaxed and less stressed for the competitions. For instance, the services are based on mobile apps, which can be used by the Athletes as well as by

their families. Thus, the health and well-being of people are fully addressed during the use of this innovative service.

Project 9: It is a high impact initiative. It was created to support small-medium shops to survive against the intense competition from e-commerce giants. The retail sector is experiencing dramatic changes under pressure from on-line commerce, and small-medium retailers are struggling to keep alive brick and mortar stores and retain people. The project focuses on the understanding of hidden needs of people who are a crucial factor for retailers. These needs can potentially be addressed for the achievement of societal impact in Europe, and in particular, through the autonomous territory governed by ALFA. This project puts together large companies, research centres, SMEs and other stakeholders to build software solutions to cope with people needs by bringing disruptive innovations to help them live better. Its focus is on solving simple problems that impact the quality of life of the potential customer, while they save time and find the right products that they are looking for. The social outcome is to create powerful customer experiences inside shops. It enables the creation of new jobs (i.e., sales assistants to support customers) and increases the sales assistant quality of life and work-life balance, at the same time reduce the stress at the working place.

Project 10: It is a high impact initiative. It was designed to focus on monitoring the physical health of professional drivers of cars and trucks in Europe. The project focuses on helping drivers improve their health and prevent back pain, obesity, cardiovascular diseases, sleep deprivation, and stress. These problems affect the performance of the drivers and in particular, it leads to incidents that can cause huge problems for the driver, as well as the company's employer or government employers. ICT systems embedded in the vehicles provide information to employers as well as to the drivers. The main software solution enables drivers to exchange information in real-time to increase performance and reduce costs for companies. It is an interesting opportunity for the development of PPPs, considering the huge number of professional drivers in Europe. The social innovation here is to improve the health of drivers and save money from enhanced driving efficiency.

The overall analysis of the projects suggested that the emerging social problems can be of different types (e.g., hidden, small, narrow or domain focused), and can occur in specific locations where the policies of local governments might not be taken into consideration. This can specifically occur because of the dynamic nature of organisations as well as the complexity of the analysed projects.

These projects addressed specific needs of people that were not properly managed by local governments due to lack of resources to develop innovations with people involvement. The lack of resources (i.e., financial, technological, and human) for developing and maintaining technology-enabled social innovations requires the involvement of different profiles of people who assume different roles, enabling innovation managers and the social entrepreneurs to bring to market innovations within short-time intervals. Thus, the appearance of increasing social needs and business opportunities was based on the high speed of technology life cycles and speed of changes in market requirements.

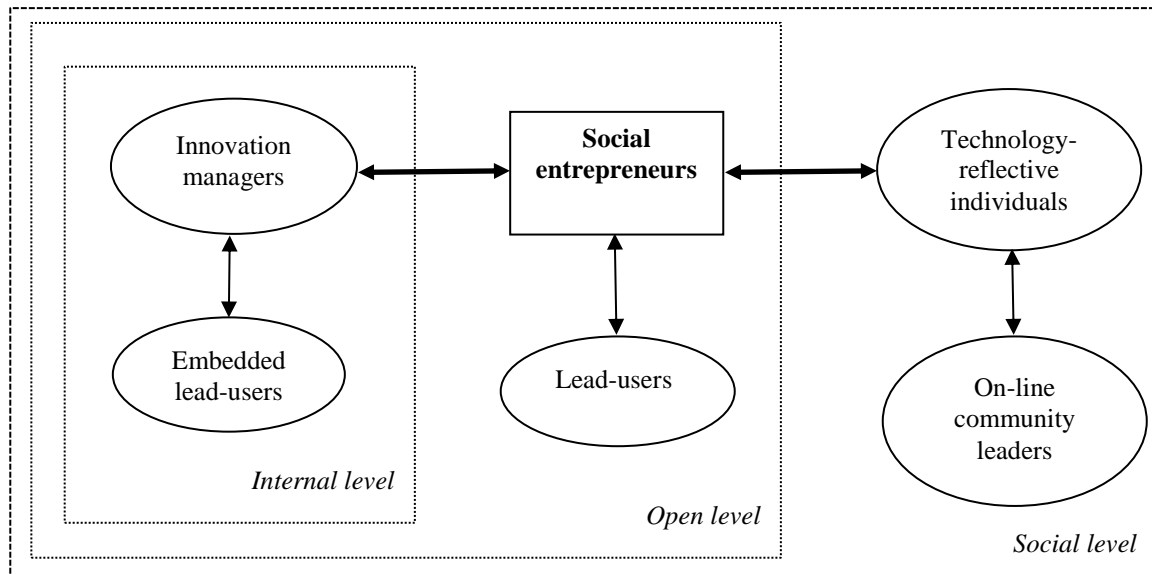
The sources of evidence confirms that a possible approach to cope with the different kinds of social problems is the formation of PPPs and their collaboration with SMEs (i.e., via the role of the social entrepreneur). PPPs can support SMEs in several ways, such as financial resources, organisation resources, human resources, and market access. This process of participation of SMEs in the co-designing and co-development of the innovation with PPPs is fundamental to speed-up the development of new services that cope with social needs. Innovations such as mobile applications for smartphones or

more complex web services applications are adequately powerful to support the involvement of people when they are working, practising sports, or during their leisure hours at home, for example.

5 Findings

From the data analysis of the innovation projects, a model of people engagement in technology-enabled social innovation is presented as follows, focusing on understanding the key role of people in the innovation process, as shown in Figure 1.

Figure 1. Social entrepreneurs as bridges in technology-enabled social innovations



At the “*internal level*”, PPP holds specific internal structures (i.e., both from private and public) to foster collaborative and dynamic co-working. It is focused on the modelling of innovation flexibility through a constant exchange of knowledge between innovation managers within the organisation, a concept supported by Eslami and Lakemond (2016). The innovation department of the government produces rich information that enables delivery of innovative services to citizens, and at the same time, provides new opportunities for development of services by private companies. From the local government perspective, the need is the public-private exchange of knowledge. This argument is at the core of the success of PPPs, where people can share their needs through a strong channel institutionalized by the internal processes of companies and public organisations, and vital to the success of PPPs are large private companies that can define new business models for collaboration with SMEs and local governments.

The importance of exploring the orchestration of technological resources as a fundamental priority at this level was observed; it was core to organising the projects analysed in this research. Additionally, innovation managers leverage the exchange of knowledge among them, based on skills of core people, to deliver to the market new products and services in a shared way and create blended value solutions, as proposed by Zahra and Wright (2015). At this level, hybrid organizational structures are capable of dealing with people’s needs by addressing tight business opportunities, and building structures to deal with the need of embedded new features in products and services to cope with social needs; concurrently, private organizations have the need to continue commercializing mainstream standardized products. Thus, to develop social innovations,

PPPs organise their ambidexterity capacity to bring blended solutions to the market, following the line of thought proposed by Gottberg et al. (2016).

From this perspective, organisational ambidexterity was identified to be a core element for PPP in collaboration with social entrepreneurs to drive the development of social innovation. Therefore, organizational ambidexterity at this level was observed to be the capability of an organisation to master concurrent allocation of resources to develop different activities; in particular, managing the trade-off between exploration (e.g., experimentation; discovery and innovation) and exploitation (e.g., refinement; efficiency; implementation), as suggests March (1991). In particular, at this level, successful PPPs were capable of maintaining a balance between exploration and exploitation, especially when developing social innovation as a process and output of complex projects.

Organisational ambidexterity was analysed in this research throughout the work carried out by Gibson and Birkinshaw (2004), which presented that ambidexterity is based on a more complex orchestration of skills and capabilities at the unit level within organisations. In particular, the organisational design concept defined by Tushman and O'Reilly (1996) has been identified as fundamental to companies that can drive high impact. Additionally, the concept of ambidexterity has been identified by companies as the ability to develop traditional services and deal with the exploration of disruptive ones (e.g., Cantarello et al. 2012). Moreover, Li et al. (2008) support this line of thought by arguing that exploitation and exploration can be analysed from the perspective of the innovation process.

The core reason for companies to explore ambidexterity at this level was the innovation manager's ability to deal with exploration and exploitation. Ambidexterity at this level means that innovation managers share human resources, who are able to develop exploratory and exploitative activities at the same time. In particular, innovation managers can allocate team members to work part-time on one project and part-time on another, where the boundaries of time allocation of each project can be self-defined by the team member. This enables higher levels of flexibility in the internal process, aiding in coping with project complexity. Furthermore, the collaboration between innovation managers in different projects was fundamental to the sharing of best practices as well as to increase the rate of innovation success. Moreover, PPPs that structure ambidexterity capability as a driver of innovation at the internal process level (i.e. both operational and managerial) can more likely to support "embedded lead users" in the joint construction of social innovation.

At the "*open level*", the key role is the social entrepreneur. They act as a bridge between the other two levels of the innovation process. In particular, social entrepreneurs can support the development of the innovation getting in strong contact with the innovation managers. Moreover, the role of social entrepreneurs at this level guarantees this integration to create a strong tie between innovation managers and technology-reflective individuals.

Thereby, PPPs can support social entrepreneurs of SMEs who then can develop specific agreements with large companies to commercialise innovations through the communication channels of these large companies around Europe. This process enables SMEs to have a group of lead-users working together on the development and commercialisation of technology-based applications in European markets. In addition, local governments play the role of supporting the development of social innovations within the local territory, creating a virtuous ecosystem where lead-users and social entrepreneurs can trust each other.

This view was also supported by the research of Altuna et al. (2015), where they apply the same principals of open innovation and ambidexterity to develop social innovation inside social innovation projects in the private sector. Taking into consideration that social entrepreneurs act as a bridge at this level, they fully leverage their personal ability to support the development of ambidextrous capacity in innovation managers and technology-reflective individuals.

From this perspective, the need for exploitation and exploration are not only recognized within companies but is also used in wider networks, which can be understood in this research as the involvement of several kinds of users, supported by Dittrich and Duysters (2007). Furthermore, the creation of high impact takes into consideration an in-depth nature of collaboration between social entrepreneurs and lead-users, in particular, due to the complexity involved in the development of the social innovation based on technology. Especially, previous research leveraging ambidexterity for the integration of external and internal knowledge, based on different kinds of alliances, confirm that this process is a key success factor (e.g. Lavie and Rosenkopf, 2006).

Organisational ambidexterity can guarantee openness for the participation of several SMEs, considering that Bahemia and Squire (2010) suggest that ambidexterity enables an agile way of collaboration among new relationships, as well as more longstanding collaborations. In this way, it was observed that the analysed PPPs create the proper conditions to enable SMEs engagement in the innovation process and commercialisation. At this level, organisational ambidexterity capability was achieved when employees worked on different projects for different organisations, with the freedom to manage their own time and priorities. This increases the flexibility of PPP to adapt the product development to achieve customer needs. Moreover, PPPs that structure ambidexterity capability as a mechanism of involving new partners (i.e., SMEs) are more likely to motivate active participation of lead-users.

At the “*social level*”, technology-reflective individuals and on-line community leaders can work together to create a kind of “radar” capable of understanding and prioritizing the social needs of people. It can facilitate the achievement of business and social goals of PPPs and SMEs, by bringing technology-enabled social innovation to the market. At this level, technology-reflective people (e.g., young couples, elderly, and poor people) are involved in the co-creating of the innovation, exchanging information about their priorities. The priorities emerge from the different groups of people, where for example, young couples with kids present different priorities than other groups in terms of social needs to be addressed. Thus, social entrepreneurs here are continuously informed by the technology-reflective people towards delivering the most appropriate ICT-based social innovation into a target market.

The organisational ambidexterity capacity of SMEs guarantees openness for technology-reflective individuals and on-line community managers at this level, once the projects can hold mechanisms that enable all kinds of people to participate in the innovation process. For example, at this level, young couples with at least one kid can be considered the most proper profile of family to participate in the development of innovative services based on ICT, which improves their quality of life. Furthermore, elderly people can support innovation development to reduce mental diseases by actively interacting with teenagers and children.

At this level, citizens are working to improve the project outcomes and they allocate part of their free time because they believe it will improve their quality of life. Moreover, PPPs that structure ambidexterity capability as a mechanism of involving technology-reflective users are more likely to jointly deliver social innovation to cope with business and social needs.

Moreover, to better understand the project complexity throughout the whole social innovation process (i.e., internal, open and social levels) this research follows the work of Iansiti (1995), who argues that the process of technology integration is crucial for the success of innovation in dynamic environments characterized by frequent changes. Furthermore, this research confirms the work of Edmondson (2012), who proposes that due to the speed of change of technology developments and unpredictability of customer needs, companies must be flexible to organise more efficient teams, coming from different places (e.g., different culture where the PPP can obtain new knowledge), and from different external companies (e.g., SMEs with specific resources, such as new technologies, strong brands, strong business channels, or even local mind-set to understand local cultures).

It was observed the management of multidisciplinary teams in complex projects requires the profile of people with a more holistic view, rather than having teams formed by a strong ICT background only. This factor was considered fundamental in the selection of innovation managers to be given charge of each project. Additionally, this hybrid profile was fundamental in supporting innovation managers to act as effective integrators of social and business needs in complex innovation projects.

Furthermore, organising teams of people with complementary skill inside PPPs, as well as the people outside the PPP with the proper experience was very relevant for the innovation process, at all the three levels studied in this research. It is particularly relevant when the business goals force companies to make money to attain competitive advantage, and at the same time, the social goals force PPPs to address the more emerging social needs of citizens. From this perspective, the understanding of the social values of the target groups within the society is a key task to be included in every level of the innovation process. Finally, it enables a PPP to fully embed specific solutions for specific needs in the final release of the technology-enabled social innovation to be commercialised.

6 Conclusions

This research contributes with an in-depth analysis of the engagement of different actors in the social innovation process by presenting a model with the role of social entrepreneurs in technology-enabled social innovation (i.e. digital social innovation), thus extending the literature on social entrepreneurship (e.g. Lubberink et al. 2018; van der Have and & Rubalcaba, 2016, Avelino et al. 2017). Furthermore, this research extends the work of Öberg (2010) by understanding and structuring the temporary roles of people at each single phase of the process of social innovations enabled by ICT.

By structuring and explaining the whole social innovation process, this research extends the work of Nicolopoulou et al. (2016), which puts together the role of users, public and private organisations, and takes into consideration the complexity of achieving both economic and social needs. Furthermore, this research extends the work of Schaarschmidt et al. (2015) by describing the anatomy of user interactions on complex projects based on technology, in particular, analysing innovations that deliver social and business outcomes.

The findings contribute to the literature on technology-based innovation, considering the in-depth analysis of the social interactions within the innovation process (i.e., empower the people to understand what are the social needs that enable companies to explore business opportunities). Additionally, this research contributes to the research of Schweitzer et al. (2015), bringing value for the discussion on technology-reflective

individuals, which are a powerful source of technology-enabled social innovation. In particular, the research found that these individuals are crucial for the success of social innovation, due to the huge amount, as well as the high quality of information they provide for business purposes.

Three levels were studied to understand the social innovation process (i.e. internal, open and social), where the role of key people was identified, and classified into the model. The model takes into consideration the involvement technology-reflective individuals, which provided information about social values, updated norms, and rules, in which they can express needs of use certain application, build for specific needs.

The innovative model can be very useful for PPPs, considering that many social needs are not well addressed by public policies, or at least not addressed in a way required by the target set by people's needs (i.e., business opportunities for companies and public policy issues for governments). Thus, the model can support PPPs in situations where they have currently not taken into consideration organisational ambidexterity and project complexity, to appropriately categorise social innovation for government purposes. It was also found that the organisational ambidexterity capability at each level was crucial in fostering social and business needs in the innovation process as a whole, thus extending the research of Gottberg et al. (2016).

Innovation managers can explore the model, in order to achieve a better understanding on how PPPs organise processes to enable ever-increasing people engagement, as well as to overcome resource constraints due to project complexity. From the innovation manager's perspective, the model enables companies to explore the most relevant actors within the innovation processes. Thus, they can be flexible in managing the complex interactions with all internal and external stakeholders. Additionally, they can use the model to maintain a continuous cycle of interactions between the companies and people, even after the market launch of the innovation, which is also supported by the research of Schweitzer et al. (2015).

Local governments can be very interested in using the model for policy-making, as well as stakeholder involvement. It occurs since they are pressing to find new ways to deal with social problems, and because they have direct contact with citizens who demand new solutions on a daily basis. In the same way, because social innovation is political and socially constructed through society and the results of such innovation have a direct impact on people (i.e. in solving hidden social problems or in the well-being of people during everyday activities). More so because PPPs are more trustworthy for people than standalone companies towards obtaining information from people about their specific needs.

Social entrepreneurs could be very interested in using the findings since they can initiate new business models to increase the growing capacity and competitive advantage of their ventures. In particular, social entrepreneurs can use the model to choose the most appropriate territory for establishing the headquarters of start-ups, considering that the ecosystem of PPPs in these territories can support innovation management as a whole (i.e., ideation, development, testing, adoption, and commercialisation). It can also support SMEs to create a wider business portfolio, in terms of availability of social innovation solutions based on technology.

The main limitations encountered during this research include the findings obtained from the narrow context of technology-enabled social innovation managed by PPPs. The main reason for this is that the researchers made this choice to explore the empirical field through the direct access to innovation managers of the PPPs. In particular, the researchers focused on in-depth empirical data collection, once they had the opportunity to strongly collaborate on a full-time basis with innovation managers.

Further research can measure the social and business impact of the innovations by using quantitative data analysis, in particular focusing on understanding the conflicts of interest over the innovation process. It is an important challenge because the innovation managers seem to have a need to manage the trade-off between the priorities, in terms of economic and social needs, established by innovation managers. Furthermore, understanding the relationship between social entrepreneurs and technology-reflective individuals on capturing social issues is a key topic towards supporting social entrepreneurs to redefine their business models to increase innovation success.

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