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Social Innovation And Social Entrepreneurship Through Big Data: Developing A Reseach Agenda

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SOCIAL INNOVATION AND SOCIAL ENTREPRENEURSHIP THROUGH BIG DATA: DEVELOPING A RESEARCH AGENDA

*Research full-length paper
Track 01*

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Abstract

The power of big data and their applications are evident through the enormous attention they have received over the past few years, with the majority of the research focusing on solving technical and business problems. However, the challenge remains on how to harness the potential of big data in order to come up with innovative solutions on various societal problems. Big data have the potential to change the way that entrepreneurs as well as the other stakeholders of a social ecosystem take decisions, and develop new paths to create social innovation by taking data-driven decisions. Nonetheless, there is limited understanding on how social ecosystems need to change to embrace the advancement that big data entail. There is a need to institutionalize innovation through big data and social entrepreneurship, and examine how to successfully exploit big data towards achieving social good and sustainable change. We suggest building on the current state of the art, and go beyond it by merging and extending the findings with insights from the different stakeholders involved in the social innovation process. Further, we propose developing and testing a framework of best practices, that will be used as a roadmap by interested parties to successfully employ big data for social innovation, through the development of prototype applications which will clearly showcase the impact of big data on addressing societal challenges. This position paper concludes with research questions and challenges for future studies in the area.

Keywords: Social Innovation, Social Good, Social Entrepreneurship, Big Data.

1 Introduction

Various problems exist in societies and multiple attempts are made to find and employ solutions, by taking advantage of all existing means, methods, and tools. Although emphasis has been given on technical and economic innovations, further work is needed to address and solve existing societal problems and achieve social change (Franz et al., 2012). Social innovation is a great way for understanding and producing social good and social change (Phills et al., 2008). A good working definition is the following: “A novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals” (p.39) (Phills et al., 2008). Social innovation may disrupt and reconfigure existing systems through changes in their institutional logics, norms, and traditions (Nicholls and Murdock, 2012). Inherent in the concept of social innovation, is social entrepreneurship, two terms often used interchangeably, which is a human-centered concept that highlights the personal qualities of a person who starts a new organization (Phills et al., 2008). Social entrepreneurs have an

important role in performing social innovation and achieving social good (Goldsmith, 2010; Zahra et al., 2009).

Recent studies highlight the potential of social innovation in offering sustainable solutions to social problems, achieving social integration, and creating equal opportunities (Howaldt et al., 2015; Mulgan, 2012). Indeed, it is critical for citizens and/or organisations to collaboratively identify specific innovative solutions for achieving the desired Sustainable Development Goals, as defined by United Nations¹, in order to achieve systemic change and create sustainable societies. Although today's societies generate massive amounts of data, much of that remains unused for social policy and social action. Indeed, the social value of such data and their analytics is still understudied (Agarwal and Dhar, 2014). However, innovation is directly linked with data availability, and thrives with the existence of open data leading to open innovation and the creation of smart cities (Manyika et al., 2013; Schaffers et al., 2011; Zuiderwijk et al., 2014). Cities today create and collect vast amounts of data, which in turn are used to offer new and improved services to their members at different level and context (Caragiu et al., 2011), shaped by social, cultural, political, and institutional practices (Bibri and Krogstie, 2017). It is evident that social innovation needs to build upon the power of data, to enable data driven decisions and improve the available services. Existing social innovation ecosystems can directly benefit from big data, and at the same time add to the importance of open data and their impact, which is relevant to numerous fields and disciplines (Janssen et al., 2012; Kitchin, 2014).

Following the importance of social innovation, further work is needed to better define and understand this concept can be analysed for proper empirical research and practical application (Howaldt and Schwarz, 2017), as well how it can benefit from big data to increase social value and lead to social good (Agarwal and Dhar, 2014; Desouza and Smith, 2014). Thus, the challenge is to harness the power of big data, increase collective and individual awareness about societal problems, existing in multiple levels of society, and ultimately create the needed intelligence that will lead to innovative solutions for societal challenges, like for example, developing frameworks to foster entrepreneurship and innovation for immigrants. This will empower the stakeholders that try to solve societal problems to follow data driven decision making process towards a sustainable society. There is a need to identify how such stakeholders (i.e., entrepreneurs, companies, policy makers, academia, citizens) can benefit from social innovation, take advantage of the big data that are available, filter them and proceed to decisions that will help them innovate for social good. New empirically supported and data driven practices are needed, including descriptors of how to stimulate innovation, co-creation and inclusive growth aimed at bridging societal changes. Such practices are built around institutional frameworks and actors that articulate within those frameworks embedded in broader social contexts (Cajaiba-Santana, 2014).

In contrast to existing work, in this position paper we suggest examining big data deployment for social good and social innovation from multiple methodological standpoints. The main differentiating aspect should be on bridging theories and methods from multiple disciplines. The field of social innovation has been mainly led by practice, rather than theory, highlighting the need to bridge theories towards the development of social innovation theories (Franz et al., 2012; Mulgan, 2012). Also, such an interdisciplinary approach is necessitated by the nature of big data, which requires significant changes to be made on how social entrepreneurs, policy makers, and social innovators operate. Several commentaries stress the potential of big data for social innovation, along with important steps to be taken (Desouza and Smith, 2014), and towards this direction, recently studies have employed big data and analytics for social good (Dubey et al., 2017; Njuguna and McSharry, 2017). However no such holistic approaches have been performed so far stressing the need for more empirical studies in the area.

This paper is organized as follows. In the next section, we depict the importance of social innovation and present a sample of definitions existing in the literature. In section 3, the importance of big data is described along with examples of definitions present in previous studies. Next, section 4, discusses the role of big data for social good by looking into existing studies of social innovation, and presents the big data social innovation ecosystem. This position paper concludes by proposing research questions

¹ United Nations Sustainable Development Goals <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>

and challenges that need to be addressed by future studies, to harness the potential of big data to solve societal problems.

2 The importance of social innovation

Social innovation is a priority in European Union's (EU) strategic framework and is promoted through the Innovation Union Flagship Initiative (European Commission, 2011), which include the promotion of social innovation to increase growth and employment, the sharing of information about various social innovation activities in Europe, and the support of innovative entrepreneurs (i.e., social entrepreneurs) by connecting them with investors and public organizations. To this end, multiple EU funded projects are working on social innovation with various results and impact (European Commission, 2016). Similarly, the importance of social innovation has been identified on a global scale, which point out the need of more research in the field (Cajaiba-Santana, 2014; Franz et al., 2012). However, despite this growing awareness of the significance of social innovation, there is still no sustained and systematic analysis of social innovation, its theories, characteristics, and impacts (Howaldt et al., 2015; Tracey and Stott, 2017). A plethora of vastly diverging subject matters and problem dimensions, as well as expectations for resolving them are included under the heading 'social innovation' without making distinctions between different social and economic meanings, the conditions governing its inception, its genesis and diffusion, and without clearly distinguishing it from other forms of innovation.

Social innovation draws from social theories and social practice, examining the interrelations among its actors, processes and cultural contexts in order to achieve social sustainability and change (Howaldt and Schwarz, 2017). Social innovation firstly draws from innovation literature, where concepts such as diffusion, creativity, sustainability, and scaling have been well examined (Windrum et al., 2016). Furthermore, studies in social fields have adopted entrepreneurship theories, based on which entrepreneurs are able to change the market and under the right circumstances they are able to identify the needed value that will lead to systemic and societal change (Goldsmith, 2010; Westley and Antadze, 2010; Zahra et al., 2009).

As social innovation is dynamic and needs to constantly evolve in order to be able to understand and solve societal problems, it has been explained through complexity theory (Mulgan, 2012; Westley and Antadze, 2010). Complexity, inherent in many phenomena in the world, examines how emergent and dynamic systems and processes interact in order to influence an outcome (Urry, 2005). "*Complexity theory is destined to be the dominant scientific trend of the 1990's ... This revolutionary technique can explain any kind of complex system – multinational corporations, or mass extinctions, or ecosystems such as rainforests, or human consciousness*" (Lewin, 1999). An overview of social theories that have contributed to the development of social innovation is provided by Mulgan (2012). As social innovation is a complex concept and it bridges multiple disciplines and theories, more theoretical and practical work is needed to move the field forward (Cajaiba-Santana, 2014).

The term of social innovation is used interchangeably with the term social entrepreneurship or social enterprise. However, it should be noted that social innovation refers to systems and is inter-organizational, while it incorporates social enterprises and social entrepreneurship (Westley and Antadze, 2010). Next, social enterprise is focused on companies and organizations, and social entrepreneurship is focused on individuals who start a new company or organization. Social innovation is not just a subset of technological or economic innovation (Mulgan, 2012).

We present a sample of the different definitions of social innovation existing in previous studies (Table 1).

Definition	Source
Social innovations are new ideas that meet social needs, create social relationships and form new collaborations. These innovations can be products, services or models addressing unmet needs more effectively.	European Commission (2017b)
Social innovation refers to new ideas that work in meeting social goals. Inno-	Mulgan et al.

vative activities and services that are motivated by the goal of meeting a social need and that are predominantly developed and diffused through organisations whose primary purposes are social	(2007)
A novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals	Phills et al. (2008)
Social innovation is a complex process of introducing new products, processes or programs that profoundly change the basic routines, resource and authority flows, or beliefs of the social system in which the innovation occurs. Such successful social innovations have durability and broad impact.	Westley and Antadze (2010)
Social innovations as new ideas (products, services and models) that simultaneously meet social needs and create new social relationships or collaborations. In other words, they are innovations that are both good for society and enhance society's capacity to act	Murray et al. (2010)
Social innovation is simultaneously the production of new ideas and new structures, and a process of re-contextualization within social (re)constructed norms of the public good, justice, and equity.	Nicholls and Murdock (2011)
Social innovation is a measureable, replicable initiative that uses a new concept or a new application of an existing concept to create shareholder and social value. Identifying drivers, enablers, and barriers to idea generation, experimentation, and implementation is critical to understanding corporate social innovation institutionalization.	Herrera (2015)

Table 1. Definitions of Social Innovation

Although there are differences among the various definitions, the main concepts included in all of them remain the same, that is new ideas that may solve social problems. Thus, a less complex definition of social innovation that is easy to use, understand, and communicate, is *new ideas (i.e., innovations) that incorporate the social factor both as a medium and an outcome*. Indeed, society and its people may think of many new ideas in their daily lives, either small ones that solve problems of their daily routine, or larger ones that may solve problems of a whole community. These new ideas, or innovations, under the proper circumstances (e.g., strategic planning, diffusion) may be adopted by other individuals, communities, or organizations (Westley and Antadze, 2010). Such developments, indicate that the innovation is sustainable and scalable, two critical antecedents of systemic change, and parts of the social innovation process (Murray et al., 2010). Although various innovations may be developed, at various contexts, in order to achieve the end goal of social innovation process focus should be given on those with the potential to disrupt and change the social system.

To this direction, the social innovation process has been described by scholars in multiple contexts as it needs to be multidisciplinary and cross social boundaries, for its impact to reach more people (Herrera, 2016; Mulgan, 2006; Murray et al., 2010; Westley and Antadze, 2010). Also, social innovation includes different steps, which are defined as follows; prompts, proposals and ideas, prototypes, sustaining, scaling and systemic change (Murray et al., 2010) (Figure 1). The social innovation process, as presented in Figure 1, and in plain words, starts by identifying the problem and the need for innovation, proceeds to idea generation through various methods, and based on these ideas prototypes and pilots are created to test the aforementioned ideas. Next, the ideas need to be improved to be sustainable in the long run, and at this stage the ideas have been already transformed into companies or organizations. In scaling, the innovation needs to grow in various aspects, which might include spreading into a different or larger market. Finally, the goal of every innovation in this process should be systemic change, which is very complex, involves multiple actors and elements, and is expected to take a long time before it can be considered successful or not in this area. Achieving systemic change means that a social innovation has managed to contest the social system that defines peoples' lives and

has influences main beliefs, inherent in the system, that lead to the creation of new processes, routines, policies, laws and legislation.

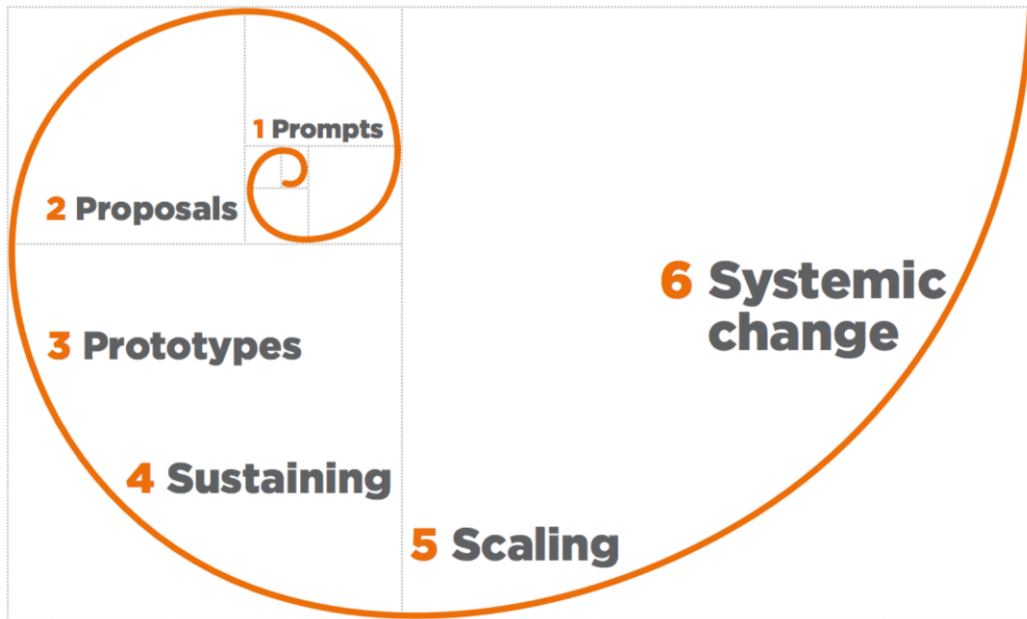


Figure 1. The social innovation process. Source: Murray et al. (2010)

3 The importance of big data

The role of big data is becoming more clear in various fields, including Information Systems, computer and information sciences, management, and social sciences (Constantiou and Kallinikos, 2015; Mikalef et al.). The evolution of big data is supported by the increasing adoption of mobile devices and sensors, social media, and artefacts related to Artificial Intelligence (AI) and the Internet of Things (IoT). To this end, research highlights the importance of big data in the aforementioned fields (Agarwal and Dhar, 2014; Chen et al., 2016). “Big data” loosely refers to the increasing amount of data and our ability to make productive and beneficial use of it. Nonetheless, different definitions exist in the literature, with different domains provide an alternative perspective on the notion of big data. To this end, we present a sample of different definitions of big data that exist in the literature (Table 2), although the goal of this paper is not to focus on the differences among the existing definitions. For the purpose of this paper, we adopt the following definition; big data refers to data sets that extend beyond single data repositories, too large and complex to be processed by traditional database management and processing tools, and encompass information like transactions, social media, enterprise content, sensors, and mobile devices (Desouza and Smith, 2014).

Definition	Source
Big data consists of expansive collections of data (large volumes) that are updated quickly and frequently (high velocity) and that exhibit a huge range of different formats and content (wide variety).	Davis (2014)
Big data refers typically to the following types of data: (a) traditional enterprise data, (b) machine-generated/sensor data (e.g. weblogs, smart meters, manufacturing sensors, equipment logs), (c) social data.	Opresnik and Taisch (2015)
Big data often represents miscellaneous records of the whereabouts of large and shifting online crowds. It is frequently agnostic, in the sense of being produced for generic purposes or purposes different from those sought by big data crunch-	Constantiou and Kallinikos

ing. It is based on varying formats and modes of communication (e.g., texts, image and sound), raising severe problems of semiotic translation and meaning compatibility. Big data is commonly deployed to refer to large data volumes generated and made available on the internet and the current digital media ecosystems	(2015)
Big data is defined in terms of five V's: volume, velocity, variety, veracity, and value. The 'volume' refers to the quantities of big data, which is increasing exponentially. The 'velocity' is the speed of data collection, processing and analyzing in the real time. The 'variety' refers to the different types of data collected in big data environment. The 'veracity' represents the reliability of data sources. And, finally, the 'value' represents the transactional, strategic and informational benefits of big data	Akter et al. (2016)
Big data is used to refer to data sets that extend beyond single data repositories (databases or data warehouses) and are too large and complex to be processed by traditional database management and processing tools. Big data can encompass information such as transactions, social media, enterprise content, sensors, and mobile devices.	Desouza and Smith (2014)

Table 2. Definitions of Big Data

Although the topic of big data has received increased popularity the past years, current research on big data and analytics is still at an early stage (Gupta and George, 2016), with studies focusing on technology and infrastructure (Chen and Zhang, 2014). However, it is important study and explain other aspects of big data, in order to obtain a holistic view of big data ecosystems (Agarwal and Dhar, 2014). It is critical to develop the proper big data and analytics capabilities for companies to gain competitive advantages, transform, and increase their business value, thus managers need to improve their decision-making philosophy and take data-driven decisions (McAfee and Brynjolfsson, 2012; Mikalef et al., 2017). To this end, research frameworks have been recently developed that build on the dynamic capabilities view of the firm, and can guide managers and decision makers to learn how to implement big data analytics, business analytics, and social media analytics in their competitive strategies (Mikalef et al., 2016; Pappas, Mikalef, et al., 2016). The dynamic capabilities view of the firm posits that an organization's ability to purposefully adapt its resources and capabilities to external pressure is the ultimate source of sustained competitive advantage (Eisenhardt and Martin, 2000). Furthermore, recent studies raise the need to identify what capabilities can improve social and human development, building on the interactions among social practices, social innovations, capabilities, and well-being (Howaldt and Schwarz, 2017).

Beyond improving data-driven decision making, it also is crucial to identify the social value of big data (Agarwal and Dhar, 2014), and what is their role and potential impact in the society. The potential of big data for social good has been addressed (Desouza and Smith, 2014), and recent studies examine the impact of big data on social good and sustainability, arguing at the same time that further work is needed to uncover the full potential of big data in the area (Chandy et al., 2017; Dubey et al., 2017). In order to be able to use big data to solve societal problems, first it is important to explore existing big data ecosystems, extend them beyond organizations and include civil society as major stakeholder, and thus reduce the gap between their potential and the actual use in solving societal challenges. Thus, the question remains on how to take advantage of the vast amount of data available to solve essential societal problems in a sustainable manner towards achieving systemic change.

4 Big data for social good

Social innovation is based on the power of data, and while EU emphasizes the importance of open access (European Commission, 2017a), the need to harness the potential of big data remains to be ful-

filled (Desouza and Smith, 2014). Adding to the importance of open data, the United Nations Global Pulse² has been created to harness digital data and analytics to increase the understanding of changes in people well-being. The value of big data is clear for tackling complex technical and business problems (Chen et al., 2012), but there is still not enough work on what is the social value of big data (Agarwal and Dhar, 2014), and how well big data can be used to address complex social problems. In detail, regarding social problems, data are still highly unstructured and largely limited to numbers, rather than other types of data (Desouza and Smith, 2014). A deliberate and systematic approach towards social innovation through big data is needed as it will offer social value and competitive advantage for entrepreneurs. Although entrepreneurs may have various ways on engaging in social innovation, providing a holistic and consistent approach will serve as a pathway for them to follow, one that will increase their chances for successful social solutions. So it is crucial to understand the conditions that produce successful solutions, along with the strategies, tactics and theories of change that lead to lasting impact (Cajaiba-Santana, 2014). To do so, insight from entrepreneurs and policy makers is critical to be combined, and extended with existing knowledge on both social innovation and the use of big data for social good.

Big data can foster collaboration and partnerships among multiple stakeholders. However, using data from different platforms and in different formats is a challenge to some stakeholders (e.g., entrepreneurs, policy makers), who lack the proper resources and skills for data analysis, compared to large enterprises and organizations. Thus, social innovation needs to be multidisciplinary and cross social boundaries to reach more stakeholders, different people, and different organizations (Westley and Antadze, 2010). Based on the triple-helix model interactions among academia, industry, and government are essential to create the needed technological, institutional, and psychological conditions to innovate in a knowledge-based society (Etzkowitz and Carvalho de Mello, 2004). The triple-helix model has been extended to the quadruple-helix model by incorporating the civil society (Carayannis and Campbell, 2009), which includes individuals and citizens. All stakeholders need to actively interact and collaborate in order to create knowledge and innovation, leading to new relations among stakeholders, as well as to new technologies or companies.

Such a complex environment can be described as an ecosystem. An ecosystem in the area of management, technology and innovation is defined as “*To provide a product/service system, an historically self-organized or managerially designed multilayer social network consists of actors that have different attributes, decision principles, and beliefs*” (Tsujiimoto et al., 2017). Based on this definition, an ecosystem is a complex system as it is able to organize itself, and requires long term data collection. Also, an ecosystem comprises of multiple separate layers with different hierarchy, suggesting that cooperation and collaboration among actors within the ecosystem is not always easy or easy to comprehend. Furthermore, as the actors form a social network, their relations extend beyond the business context, such as personal or procedural. Finally, as actors differ from one another, analysing and understanding how each one behaves, based on their attributes or beliefs, will improve how the efficiency, coherency, and the performance of the ecosystem.

Figure 2 presents the social innovation ecosystem and the factors that need to cooperate, coordinate, and collaborate to enable the use of big data for social good towards the achievement of social change. Building on the above discussion, we posit that a social innovation ecosystem comprises of academia, industry, government, civil society, and individuals. We differentiate, individuals as social entrepreneurs from the civil society, considering their importance in innovation and social good (Goldsmith, 2010; Zahra et al., 2009). In the social innovation ecosystem, multiple stakeholders (i.e., social entrepreneurs, social enterprises, academia, government and policy makers, civil society) have more than one roles in this process, as they may create or analyze big data, use big data and their outcomes, as well as create and influence relevant policies at the same time. Furthermore, as users belong to more than one categories there is also an interrelation between the different stakeholders. Next, in order to

² United Nations Global Pulse. www.unglobalpulse.org

achieve social change, a combination of two elements is needed, that is the social innovation process along with innovative practices, guidelines, and policies.

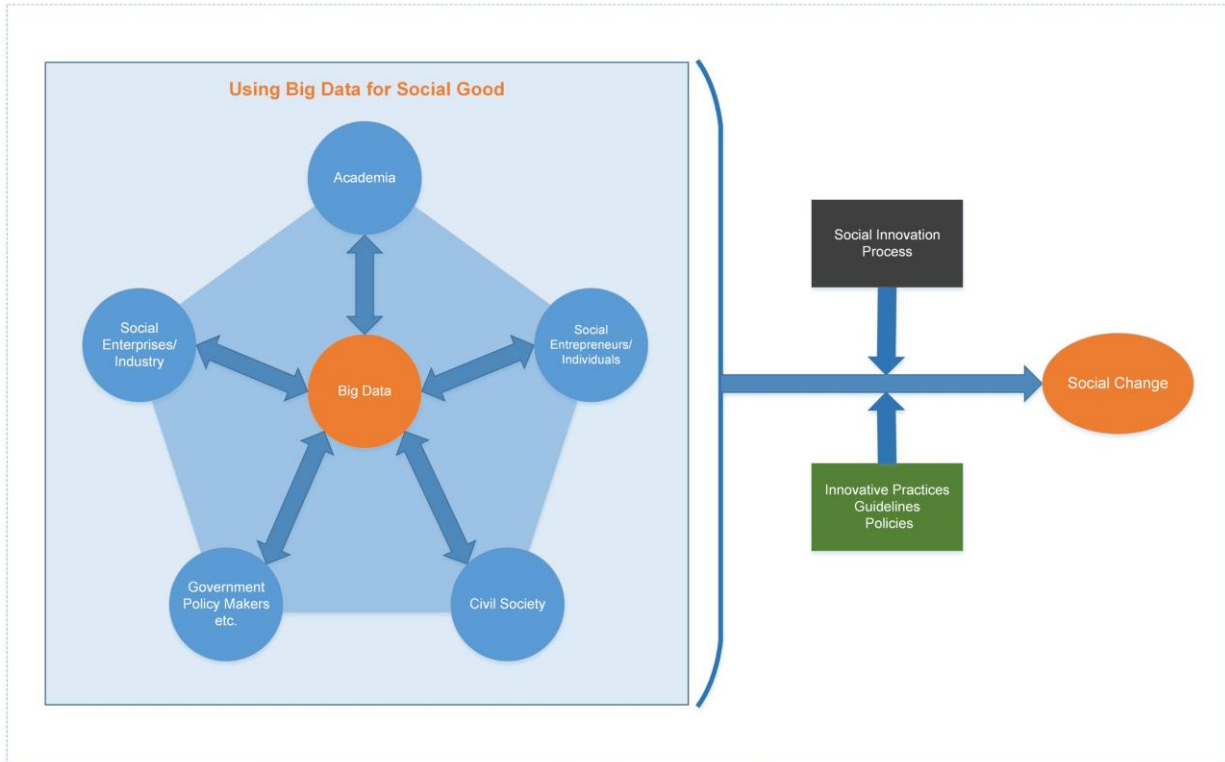


Figure 2. Using Big Data in the Social Innovation Ecosystem

The business and technological perspective of big data has been examined in the literature (Chen et al., 2012), in contrast to the social good perspective of big data (Zicari, 2014). Since more data become available at a smaller cost, big data can be used as actionable information to identify needs and offer services for the benefit of the society, and ensure aid to the individuals and society that generate them (Zicari, 2014). For this to be possible, multiple actors should collaborate, including governments, development organizations, and companies that own the produced data. Big data can empower policy makers and entrepreneurs to provide solutions for social problems, if problems from data collection, organization, and analysis are resolved (Desouza and Smith, 2014). Multiple barriers exist before big data can be used to enable social innovation, like data reliability, data accessibility, and data governance standards (e.g., Data are available publicly but they miss or have privately held key parts inaccessible due to legal reasons or national interests). One of the biggest barriers is the lack of social awareness that will enable people to take action (Zicari, 2014) and will lead to more inspiration from activists (e.g., social entrepreneurs) on how to use big data for social good. Thus, a disciplined approach of social innovation through big data is needed in order to help, empower and support entrepreneurs and policy makers institutionalize mechanisms that increase the likelihood of initiating and implementing successful social innovation.

Literature on social innovation identifies various factors that determine its success (Cajaiba-Santana, 2014). Recently, focus has been given on producing models offering a high level approach on the social innovation process (Herrera, 2016) or offering companies the means to engage in social innovation and change (Herrera, 2015). However, more theoretical development in the area is required as the quality of the theoretical work in the area needs improvement as it is now mainly based on anecdotal evidence and case studies (Murray et al., 2010) lacking unifying paradigms (Cajaiba-Santana, 2014). The social innovation process requires attention to the individual persons, like social entrepreneurs, thus it is crucial to understand their thoughts, values, overall behavior and their relations with the rest of the actors in a social system. Thus, it is needed to address the existing need for theoretical and methodological frameworks, which build on the different elements that iterate in the social construc-

tion of social innovation and account for its complexity and contextual dimensions (Cajaiba-Santana, 2014).

5 Discussion and Research Directions

In this position paper, we argue that social innovation, an overarching concept, when properly combined with big data may lead to the solution of societal challenges. Indeed, we propose that innovative practices, guidelines, and policies, which will help entrepreneurs leverage big data to better design social innovation are needed. Such an approach, will provide a sound basis for the wider implementation of social innovation in the world. Focus should be given on (1) identifying big data intelligence needs for social innovation, (2) understanding how academia, industry, government, and society cooperate and coevolve to achieve innovation for social good, and (3) developing a set of metrics for the evaluation of the social impact of big data and innovation. Further empirical work is needed, in order to develop and test a framework of guidelines and best practices that enables entrepreneurs to utilize and exploit the vast amount of available data for social innovation, and enhance their value and impact. Building on the importance of both social innovation and big data, the need to answer the following question is urgent; How big data will help social innovation? Recently the need to identify the social value of big data has been highlighted by papers on big data and analytics (Agarwal and Dhar, 2014), while articles on social innovation point out the need for data to be open and available in order to be able to be used by social entrepreneurs and social enterprises (Desouza and Smith, 2014; Pitt et al., 2013), which will lead to the evolution of both the society, on a practical level, and the field, on a theoretical level.

We believe there is a significant opportunity to build on the social innovation ecosystem by using big data for social good, which can foster the emergence of creative and intelligent cities, the smart cities (Letaifa, 2015). Such cities combine open innovation and central support and coordination and may benefit greatly if its members are able to use big data for social good. The most compelling effects of big data on social good have not yet been documented, as the requirements and conditions for their proper implementation remain understudied. To this end, we pose the following research questions which will guide researchers in their future studies:

RQ1: How can an explicit identification of *drivers, enablers, and barriers* for *social innovation*, merged with *entrepreneurs' needs* explain the *opportunities and challenges* that *big data analytics* provide for *social innovation*? And how can *entrepreneurs and policy makers* be aided to overcome the difficulties in creating *social innovation* and set *social goals* with standard *social responsibility*?

RQ2: What is the *impact* of *big data* towards *societal change*? What *conditions* can lead *entrepreneurs and policy makers* to (re)design their *social innovation strategies* in such a way that *big data* will have a *critical role* in them? How can *big data analytics* evolve in order to help *social innovation* and how is their output exploited to its fullest extent among *academia, industry, government, and society*?

To answer these complex research questions, multidisciplinary approaches need to be followed that bridge information science, computer science, management and business economics, in order to explore how big data are effectively leveraged to enable social innovation in multiple contexts, and identify key success factors that can impact social good. Also, interdisciplinary approaches should be employed, to ensure the active participation of entrepreneurs, policy makers, and social innovators from different fields, who will contribute towards defining, shaping and improving the methods that will be implemented to develop prototype applications and create a framework of best practices for big data deployment and management in social innovation. To help answering the posed research questions we propose tackling the following research challenges:

Challenge 1: Study the literature on social innovation to identify the drivers, enablers, and barriers for successful implementation of big data for social good.

- Challenge 2: Capture what resources, conditions, or capabilities the entrepreneurs, policy makers, and social innovators need to use big data for social innovation.
- Challenge 3: Explore the social impact of big data, and identify mechanisms through which social innovation is achieved.
- Challenge 4: Develop prototype applications to maximize the impact of social innovation through big data.
- Challenge 5: Create a framework of best practices for big data deployment and management in social innovation.

To address the proposed challenges a multitude of methodological approaches need to be applied. Here, we offer specific propositions and guidelines on how to overcome these challenges. In detail, a systematic literature review will allow researchers to determine drivers, enablers, and barriers for successful implementation of big data for social good, which then should be extended and verified through pilot studies including social entrepreneurs and policy makers. Qualitative methodologies should be employed to capture the needs of entrepreneurs and policy makers, such as semi-structured interviews or case studies from companies that have engaged in social innovation by using big data for social good. Since the field of both social innovation and big data has seen great advancements in their practical applications (Mulgan, 2012), it is critical for researchers in the area to collaborate actively with the companies that have experience in these two fields.

Key success factors can be identified with a multidisciplinary approach, that takes into account technological, human, relational, managerial, and strategic elements. Also, they can be empirically evaluated through quantitative studies, that will also assess the social impact of big data and the corresponding mechanisms. The studies should be performed with multiple respondents, including entrepreneurs, policy makers and social innovators to allow a greater breadth of answers and depth of information. The information obtained from the target population should be subjected to numerous statistical *analyses* including structural equation modelling, multivariate and non-linear regression analyses (Byrne, 2016), and the novel fuzzy set qualitative comparative analysis (fsQCA) (Fiss, 2011; Rihoux and Ragin, 2009), to identify general tendencies and context specific patterns of conditions that promote the use of big data in social innovation. Special attention should be given to fsQCA, which is able to capture complex and asymmetric relationships among factors, and when employed with complexity theory, offers better insight into the data and may lead to the development of new theories (El Sawy et al., 2010; Pappas, Kourouthanassis, et al., 2016; Woodside, 2014).

As described in the proposed social innovation ecosystem (Figure 2), and to successfully answer the research questions, all actors need to actively participate in this process. Thus, to explore how big data can evolve to help society, pilot applications of social innovation through big data should be undertaken. This may be achieved with the collaboration of companies that possess such data, while applying a series of efficient big data and analytics techniques (George et al., 2014) (e.g., sentiment and affect analysis, anomaly detection, social network analysis, social media monitoring and association and rule mining) that will guide entrepreneurs and policy makers towards social innovation. Finally, the findings from the aforementioned techniques will allow the creation of a *framework* to act as a *roadmap* for entrepreneurs and policy makers, on how to use big data for social good, implement them in their social innovation strategies and minimize the risk of failure. Furthermore, to increase the resonance of the proposed framework, case studies can showcase how the most important factors for successful big data use for social good are addressed within social enterprises that possess or use big data. Such companies could be the same as the ones that engaged in producing the previously described pilot applications, offering a holistic perspective of how big data is used for social good.

Following the proposed research agenda will lead future researchers to the creation of new theories, that are now needed to advance the field of social innovation (Mulgan, 2012), and provide more empirical work that is missing from the field (Cajaiba-Santana, 2014). Furthermore, the need to identify the social value of big data will be answered (Agarwal and Dhar, 2014), and their role on social sustainability and innovation will become more clear (Desouza and Smith, 2014; Dubey et al., 2017). Thus, to address the existing gap in the literature, we posit that a disciplined approach of social inno-

vation through big data should be adopted to help, empower, and support entrepreneurs and policy makers institutionalize mechanisms that can increase the likelihood of initiating and implementing successful social innovation towards achieving social impact and social change.

6 Conclusions

In this position paper, we build on the current status of social innovation ecosystems and the use of big data for social good, and propose how the field can move forward to address the multiple societal problems. Since existing literature offers limited insight on the impact and potential of big data for social good, it is needed to identify drivers, enablers, barriers, and needs for successful implementation of big data for social good. Further, no unifying framework exists on classifying big data needs and the data sources that should be used for social innovation, highlighting the necessity for an integrated solution for social innovation process that will detail existing and new knowledge, linked with data sources and needs. Next, existing studies do not offer detailed explanations on how big data can shape or enable strategic implementation of social innovation techniques, thus future studies should build on novel theoretical developments and empirical findings to present how big data can be leveraged in core areas to foster social good and innovation. Finally, as there is limited guidance on what structure to follow for entrepreneurs, policy makers, and social innovators for big data deployment in social innovation, the existing ecosystem of social innovation should evolve and go further by developing and incorporating participatory developing methods and tools that as a result can be used by all interested stakeholders. Bridging (1) two novel subjects, (i.e., social innovation and big data), that academia, industry, governments, society, and individuals are interested in, with (2) traditional and novel research methods, will lead to advancements, theoretical and practical, in the social innovation ecosystem.

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References

- Agarwal, R., & Dhar, V. (2014). "Editorial—Big data, data science, and analytics: The opportunity and challenge for IS research". *Information Systems Research*, 25(3), 443-448.
- Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R., & Childe, S. J. (2016). "How to improve firm performance using big data analytics capability and business strategy alignment?". *International Journal of Production Economics*, 182, 113-131.
- Bibri, S. E., & Krogstie, J. (2017). "On the social shaping dimensions of smart sustainable cities: A study in science, technology, and society". *Sustainable Cities and Society*, 29, 219-246.
- Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*: Routledge.
- Cajaiba-Santana, G. (2014). "Social innovation: Moving the field forward. A conceptual framework". *Technological Forecasting and Social Change*, 82, 42-51.
- Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). "Smart cities in Europe". *Journal of urban technology*, 18(2), 65-82.
- Carayannis, E. G., & Campbell, D. F. (2009). "'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem". *International journal of technology management*, 46(3-4), 201-234.

- Chandy, R., Hassan, M., & Mukherji, P. (2017). "Big data for good: insights from emerging markets". *Journal of Product Innovation Management*.
- Chen, C. P., & Zhang, C.-Y. (2014). "Data-intensive applications, challenges, techniques and technologies: A survey on Big Data". *Information Sciences*, 275, 314-347.
- Chen, H., Chiang, R. H., & Storey, V. C. (2012). "Business Intelligence and Analytics: From Big Data to Big Impact". *MIS quarterly*, 36(4), 1165-1188.
- Chen, Y., Chen, H., Gorkhali, A., Lu, Y., Ma, Y., & Li, L. (2016). "Big data analytics and big data science: a survey". *Journal of Management Analytics*, 3(1), 1-42.
- Constantiou, I. D., & Kallinikos, J. (2015). "New games, new rules: big data and the changing context of strategy". *Journal of Information Technology*, 30(1), 44-57.
- Davis, C. K. (2014). "Beyond Data and Analysis". *Communications of the ACM*, 57(6), 39-41.
- Desouza, K. C., & Smith, K. L. (2014). Big data for social innovation. *Stanford Social Innovation Review*.
- Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Luo, Z., Wamba, S. F., & Roubaud, D. (2017). "Can big data and predictive analytics improve social and environmental sustainability?". *Technological Forecasting and Social Change*, in press. doi:10.1016/j.techfore.2017.06.020
- Eisenhardt, K. M., & Martin, J. A. (2000). "Dynamic capabilities: what are they?". *Strategic management journal*, 21(10-11), 1105-1121.
- El Sawy, O. A., Malhotra, A., Park, Y., & Pavlou, P. A. (2010). "Research Commentary-Seeking the Configurations of Digital Ecodynamics: It Takes Three to Tango". *Information Systems Research*, 21(4), 835-848.
- Etzkowitz, H., & Carvalho de Mello, J. M. (2004). "The rise of a triple helix culture: Innovation in Brazilian economic and social development". *International Journal of Technology Management & Sustainable Development*, 2(3), 159-171.
- European Commission. (2011). *Europe 2020 Flagship Initiative Innovation Union*. Retrieved from https://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication-brochure_en.pdf
- European Commission. (2016). Research on Social Innovation. Retrieved from https://ec.europa.eu/research/social-sciences/pdf/project_synopses/ssh-projects-fp7-5-6-social-innovation_en.pdf
- European Commission. (2017a). Open access and Data management. Retrieved from http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-dissemination_en.htm
- European Commission. (2017b). Social Innovation. Retrieved from http://ec.europa.eu/growth/industry/innovation/policy/social_en
- Fiss, P. C. (2011). "Building better causal theories: A fuzzy set approach to typologies in organization research". *Academy of Management Journal*, 54(2), 393-420.
- Franz, H.-W., Hochgerner, J., & Howaldt, J. (2012). *Challenge social innovation: potentials for business, social entrepreneurship, welfare and civil society*: Springer Science & Business Media.
- George, G., Haas, M. R., & Pentland, A. (2014). "Big data and management". *Academy of Management Journal*, 57(2), 321-326.

- Goldsmith, S. (2010). *The power of social innovation: How civic entrepreneurs ignite community networks for good*: John Wiley & Sons.
- Gupta, M., & George, J. F. (2016). "Toward the development of a big data analytics capability". *Information & Management*, 53(8), 1049-1064.
- Herrera, M. E. B. (2015). "Creating competitive advantage by institutionalizing corporate social innovation". *Journal of Business Research*, 68(7), 1468-1474.
- Herrera, M. E. B. (2016). "Social innovation for bridging societal divides: Process or leader? A qualitative comparative analysis". *Journal of Business Research*.
- Howaldt, J., Kopp, R., & Schwarz, M. (2015). Social Innovations as Drivers of Social Change—Exploring Tarde's Contribution to Social Innovation Theory Building *New Frontiers in Social Innovation Research* (pp. 29-51): Springer.
- Howaldt, J., & Schwarz, M. (2017). "Social Innovation and Human Development—How the Capabilities Approach and Social Innovation Theory Mutually Support Each Other". *Journal of Human Development and Capabilities*, 18(2), 163-180.
- Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2012). "Benefits, adoption barriers and myths of open data and open government". *Information systems management*, 29(4), 258-268.
- Kitchin, R. (2014). *The data revolution: Big data, open data, data infrastructures and their consequences*: Sage.
- Letaifa, S. B. (2015). "How to strategize smart cities: Revealing the SMART model". *Journal of Business Research*, 68(7), 1414-1419.
- Lewin, R. (1999). *Complexity: Life at the edge of chaos*: University of Chicago Press.
- Manyika, J., Chui, M., Groves, P., Farrell, D., Van Kuiken, S., & Doshi, E. A. (2013). "Open data: Unlocking innovation and performance with liquid information". *McKinsey Global Institute*, 21.
- McAfee, A., & Brynjolfsson, E. (2012). "Big data: the management revolution". *Harvard Business Review*, 90(10), 60-68.
- Mikalef, P., Pappas, I. O., Giannakos, M. N., Krogstie, J., & Lekakos, G. (2016). *Big data and strategy: A research framework*. Paper presented at the The 10th Mediterranean Conference on Information Systems (MCIS).
- Mikalef, P., Pappas, I. O., Krogstie, J., & Giannakos, M. (2017). "Big data analytics capabilities: a systematic literature review and research agenda". *Information Systems and e-Business Management*, (in press). doi:10.1007/s10257-017-0362-y
- Mulgan, G. (2006). "The process of social innovation". *Innovations*, 1(2), 145-162.
- Mulgan, G. (2012). Social innovation theories: Can theory catch up with practice? In H.-W. Franz, J. Hochgerner, & J. Howaldt (Eds.), *Challenge social innovation: potentials for business, social entrepreneurship, welfare and civil society* (pp. 19-42). Berlin: Springer.
- Mulgan, G., Tucker, S., Ali, R., & Sanders, B. (2007). "Social innovation: what it is, why it matters and how it can be accelerated".
- Murray, R., Caulier-Grice, J., & Mulgan, G. (2010). *The open book of social innovation*. London, UK.: National endowment for science, technology and the art (NESTA).
- Nicholls, A., & Murdock, A. (2011). *Social Innovation: Blurring Boundaries to Reconfigure Markets*: Springer.
- Nicholls, A., & Murdock, A. (2012). The nature of social innovation *Social innovation* (pp. 1-30): Springer.

- Njuguna, C., & McSharry, P. (2017). "Constructing spatiotemporal poverty indices from big data". *Journal of Business Research*, 70, 318-327.
- Opresnik, D., & Taisch, M. (2015). "The value of Big Data in servitization". *International Journal of Production Economics*, 165, 174-184.
- Pappas, I. O., Kourouthanassis, P. E., Giannakos, M. N., & Chrissikopoulos, V. (2016). "Explaining online shopping behavior with fsQCA: The role of cognitive and affective perceptions". *Journal of Business Research*, 69(2), 794-803.
- Pappas, I. O., Mikalef, P., Giannakos, M. N., Krogstie, J., & Lekakos, G. (2016). *Social Media and Analytics for Competitive Performance: A Conceptual Research Framework*. Paper presented at the International Conference on Business Information Systems.
- Phills, J. A., Deiglmeier, K., & Miller, D. T. (2008). "Rediscovering social innovation". *Stanford Social Innovation Review*, 6(4), 34-43.
- Pitt, J., Bourazeri, A., Nowak, A., Roszczynska-Kurasinska, M., Rychwalska, A., Santiago, I. R., . . . Sanduleac, M. (2013). "Transforming big data into collective awareness". *Computer*, 46(6), 40-45.
- Rihoux, B., & Ragin, C. C. (2009). *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques* (Vol. 51): Sage Publications, Thousand Oaks, CA
- Schaffers, H., Komminos, N., Pallot, M., Trousse, B., Nilsson, M., & Oliveira, A. (2011). *Smart cities and the future internet: Towards cooperation frameworks for open innovation*. Paper presented at the The Future Internet Assembly.
- Tracey, P., & Stott, N. (2017). "Social innovation: a window on alternative ways of organizing and innovating". *Innovation*, 19(1), 51-60.
- Tsujimoto, M., Kajikawa, Y., Tomita, J., & Matsumoto, Y. (2017). "A review of the ecosystem concept—Towards coherent ecosystem design". *Technological Forecasting and Social Change*, (in press). doi:10.1016/j.techfore.2017.06.032
- Urry, J. (2005). "The complexity turn". *Theory Culture and Society*, 22(5), 1.
- Westley, F., & Antadze, N. (2010). "Making a difference: Strategies for scaling social innovation for greater impact". *Innovation Journal*, 15(2).
- Windrum, P., Schartinger, D., Rubalcaba, L., Gallouj, F., & Toivonen, M. (2016). "The co-creation of multi-agent social innovations: A bridge between service and social innovation research". *European Journal of Innovation Management*, 19(2), 150-166.
- Woodside, A. G. (2014). "Embrace• perform• model: Complexity theory, contrarian case analysis, and multiple realities". *Journal of Business Research*, 67(12), 2495-2503.
- Zahra, S. A., Gedajlovic, E., Neubaum, D. O., & Shulman, J. M. (2009). "A typology of social entrepreneurs: Motives, search processes and ethical challenges". *Journal of business venturing*, 24(5), 519-532.
- Zicari, R. V. (2014). Big data: Challenges and opportunities. In R. Akerkar (Ed.), *Big data computing* (pp. 103–128): Boca Raton, FL: Chapman and Hall/CRC.
- Zuiderwijk, A., Helbig, N., Gil-García, J. R., & Janssen, M. (2014). "Special issue on innovation through open data: a review of the state-of-the-art and an emerging research agenda: guest editors' introduction". *Journal of theoretical and applied electronic commerce research*, 9(2), i-xiii.