Big Data Analytics Affordances for Social innovation: a Theoretical Framework

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Abstract. This paper proposes a theoretical framework to identify the mechanisms by which actors perceive the affordances of big data analytics (BDA) and how institutional voids and supports enable or hinder the actualisation of those perceived affordances. In doing so, we contribute to identifying the missing link needed to understand the social innovation process in relation to BDA. The framework paves the ground towards understanding the institutionalization process of social innovation and its implications for research and practice.

Keywords: Affordance theory, Big data analytics, Social entrepreneur, Social innovation, Institutional support, Institutional void

1   Introduction

Big data analytics (BDA) can generate business and social value [1-3], improve social and environmental sustainability [4, 5], allow data-driven decisions, and contribute to the creation of sustainable societies [1]. BDA and Artificial Intelligence (AI) enabled tools can be used in a variety of ways, for example, to offer personalized healthcare [6] improve learning environments [7], or to analyse data from social media to predict suicide [8]. In several countries, governments have made their data openly available, while individuals develop applications to address specific problems. Such actions foster innovation and the generation of new ideas.

Previous works highlight the potential of social innovation in offering sustainable solutions to social problems, achieving social integration, and creating equal opportunities [9-11]. It is critical for citizens and organisations to collaboratively identify specific innovative solutions for achieving the desired Sustainable Development Goals (SDGs). However, there is a lack of theoretical frameworks to describe and explain the mechanisms by which technology, such as BDA or AI, can facilitate the social innovation process vis-a-vis social change [11-13].

We address this gap, by proposing a theoretical framework that combines the theory of affordances and concepts from institutional theory. This framework offers a way to uncover the aforementioned mechanisms for successful BDA implementations in social innovation processes.

In the subsequent section, we describe these theories and discuss their complementarities in understanding how actors perceive affordances of BDA and the role of institutional voids and institutional supports, within their institutional context, for actualizing the perceived affordances. Next, we present our theoretical framework, and conclude the paper suggesting ways for future research.

2 Theoretical Background

2.1 Big data analytics ecosystems

The topic of big data analytics has received increased popularity the past years [3, 14, 15], with studies focusing on technology and infrastructure [16] and recent developments in the area leading to new technologies and applications [17]. The term big data refers to large volumes of extensively varied data that are generated, captured, and processed at high velocity [18], while big data analytics refer to analysis of the data in order to realize value from them [14]. For a list of definitions of BDA see also Mikalef, Pappas [19]. Although organizations consider BDA as a major source of value [2, 20], generating such value often raises social risks [21], that can have different impacts in the society.

Several stakeholders, including organizations, their competitors, partners, and customers, can mutually benefit from data being shared and combined [14], as in a digital ecosystem. An ecosystem comprises multiple hierarchical layers and requires its actors to cooperate and collaborate to increase its efficiency, coherency, and overall performance [22]. Big data analytics ecosystems, drawing from the business ecosystems [23], refer to the environment created and supported by the numerous actors, that comprise the ecosystem, their perpetual data generation along with their interactions and interrelations, which can lead to the creation of sustainable societies [1]. Thus, we need to extend existing ecosystems, or develop new ones, to be more dynamic and actively include more of their stakeholders, taking into account both their capabilities and needs. However, the challenge 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. The social innovation process can be excelled by using BDA towards solving societal challenges.

2.2 Social Innovation

Social innovation can be defined as new ideas (i.e., innovations) that incorporate the social factor both as a medium and an outcome. These innovations, under the proper circumstances (e.g., government conducive policies for technological interventions) may be adopted by other individuals, communities, or organizations [24]. It examines interrelations among actors, processes and cultural contexts and possibilities that lead to social sustainability and change [25].

Considering the importance and potential of social innovations, we build upon previous studies that describe the nature and interlinkages between institutional context

and social innovation process [12, 26] who consider the role of the actor in the interface. Three critical parts of the social innovation process are the challenge that the actors have identified, their goal, that is to solve the challenge, and the process they will follow to achieve this goal. The end goal of the social innovation process is systemic change [27]. We consider the actor to be the social entrepreneur who can drive societal and systemic change, through the social innovation process, and we seek to understand how social entrepreneurs can benefit from contemporary technologies, such as BDA, and how institutions can enable or hinder this process. In the next section, we introduce the theory of affordance as it can help the entrepreneur to see the action possibilities from BDA while employing the social innovation process to achieve their goals.

2.3   Affordance Theory

Affordance theory originated from the field of ecological psychology. As Gibson [28] states "[t]he affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. It implies the complementarity of the animal and the environment". Affordances examined in IS studies, are defined as "the possibilities for goal-oriented action afforded to specified user groups by technical objects" [29], and further advanced as the potential for behaviours associated with achieving an outcome, where the potential arises from the relationship between the object (e.g., BDA) and the goal-oriented actors [30], therefore, they are neither properties of the artifact nor characteristics of the actor. Our view resonates with affordances as potential for action, where the specific actualisation is dependent on the context [30, 31]. An example of such view is described recently by Meske, Amojo [6], who suggest that the affordance of accessibility to relevant information in healthcare applications arises out of conversational agents and the patients using them. However, affordance theory does not describe the institutional context that can enable or inhibit the actualization process, thus, we complement affordance theory with concepts from institutional theory.

2.4   Institutional theory

Institutional theory explains how institutions (norms, rules, conventions, and values) influence our understanding of how societies are structured and how they can change [32, 33]. Institutions have a critical role in developing new ideas and new types of social systems, thus institutional theory allows to better explain the interrelations and patterns among the different actors in the society [34]. The institutional theory, however, puts less emphasis on the human agency, for example, why an actor will interact with technology. Thus, we propose that combining institutional theory and theory of affordances can offer a better understanding of the implementation of BDA for social innovation process.

Institutional mechanisms, systems, and structures can either be absent or present, thus constraining or enabling the social innovation process. The absence, weakness or failure of formal or informal institutions that support the markets can be defined as institutional void [26]. The existence of voids can naturally hinder the social innovation process (e.g., lack of governance structure or policy, infrastructure, absence of access

to funding). However, the existence of voids can create opportunities for social inno-
vations as social entrepreneurs may come up with innovative ways to overcome them.
For example, good policy environment can help increase foreign aid effectiveness to
developing countries, however an extremely increased trade deficit, due to appropriate
policies, can reduce the effectiveness of foreign aid [35]. Overall, the existence of sup-
portive institutional mechanisms, systems, and structures is designed to support social
innovation.

3 A theoretical framework of BDA for SI

The purpose of this paper is to suggest a framework that can help identify the mech-
anisms which enable the social innovation process and allow actors, such as social en-
trepreneurs, to perceive and actualize the possibilities that BDA provide for solving
societal challenges. However, the social innovation process mainly focuses on pro-
cesses that can lead to systemic change, while considering technology, such as BDA,
as a black box [26, 36]. Existing research does not explain how actors perceive the
action possibilities of BDA.

Furthermore, recent studies examine how BDA can be utilized to achieve digital
transformation and sustainability [1, 5], while discussing the role of the actors, without
though, examining the interrelations between actors and technology. To address this
issue, we complement the theory of affordances with the concepts of institutional void
and institutional support, that derive from institutional theory, to explain the relational
aspects of technology and actors within their institutional context.

In summary, we propose the following theoretical framework (Fig. 1), for ICT and
societal change through social innovation. Based on this framework, the actor has a
central role in the process of using the IT artifact for SI. The actor that can use the IT
artifact, perceives its affordances into taking action for employing the social innovation
process. At the same time, the actor needs to consider the threats of voids and opportu-
nities of supports, inherent in institutional context, when actualizing the affordances of
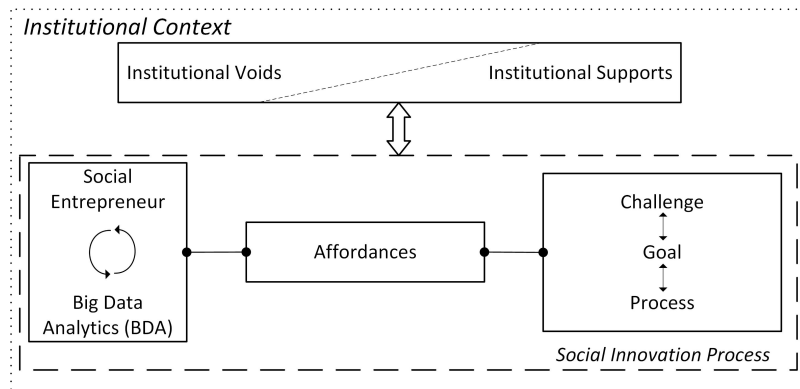the IT artifact for societal change.

Fig. 1. Theoretical framework of BDA for social innovation

4   Conclusions

The paper contributes by offering a theoretical framework of BDA affordances for social innovation. There is a lack of theoretical lenses to understand and describe the social innovation process in relation to technology [12, 26], and particularly the role of BDA in such processes [1]. In this paper, we contribute to the social innovation process by coupling it with the theory of affordances, which allows us to better explain and understand the role of BDA for social innovation. In addition, we contribute to the affordance theory by combining it with institutional void and support, which can better explain the institutional context that influences the perception and actualization of BDA affordances for social innovation.

Based on the proposed framework, we argue that to make the action possibilities of BDA possible, the actors, like social entrepreneurs, need a holistic understanding of the institutional context and the social innovation process. To this end, more studies are needed to evaluate and further develop this model. Likewise, there is an opportunity to perform comparative studies among multiple countries, and thus investigate how the institutional context among different societal cultures and contexts, influences the way actor perceives and actualizes the affordances of ICT for societal change.

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