DATA-DRIVEN SOCIAL INNOVATION: A METHODOLOGY TO SUPPORT EMPLOYEES OF RETAIL SHOPS

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Abstract. *Showrooming is a social issue of small-medium shops at the worldwide level. This problem means customers are going to physical stores to try products and buy on-line from the competitor. It is a pressing issue for both shops owners and sales assistants. Shop owners are suffering from the reduction of revenue and number of customers, who are buying on-line (i.e. e-commerce Giants are more convenient in terms of pricing and delivery of products). And sales assistants are being pressured to work more and having their performance tracked every day. From this phenomenon, this research analyzes the way a public-private partnership (PPP) is developing data-driven social innovation. The main contribution of this paper is a methodology to support sales assistants of small-medium shops to increase performance and well-being. The results of this paper expand the field of social innovation by creating a new method capable of increasing employee performance and well-being.*

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1 INTRODUCTION

The digital retail sector is a key industry to explore the phenomenon of data-driven social innovation. In this global landscape, retailers are adopting new technologies (e.g. Bradlow et al. 2017) not only to remain competitive but also to increase the efficiency of employees and better satisfy the needs of final consumers (e.g. Brynjolfsson et al. 2013 and Barocas and Levy, 2016). New digital technologies are being used to help consumers to better interact with employees while they are visiting stores (e.g. Grewal et al. 2017). Thus, the advanced personalized information about the consumer needs is a key success factor for companies to understand consumer behavior and address social needs, as supported by Inman and Nikolova (2017).

With the grow of digital technologies, such as social networks, consumers leave a lot of digital footprints in the social media, for example they select Facebook profile pictures, use hashtags on tweets, connect to colleagues on LinkedIn and post pictures of places they love on Instagram, in particular, related to the role of actors in digital retail as argued by Sorescu et al. (2011). These digital footprints can be exploited to analyze and predict their behaviors, interests, attitudes, and psychometric characteristics (e.g. personality traits, emotional dispositions). These features can be predicted with a certain accuracy and represent valuable information that can be used for understanding consumer behavior, thus helping shop owners and sales assistants to increase employee performance (e.g. Barocas and Levy, 2016), thus increasing in-store sales and at the same time help shoppers to find the right products that best fit their needs, an argument supported by Grewal et al. (2017).

From this empirical field of study, this research focuses on data-driven social innovation, which is a new challenge for researchers and managers. Furthermore, the paper creates a new methodology to help companies to deal with social issues of the workforce while doing business, an argument supported by Brynjolfsson et al. (2013), in particular, aiming at helping companies to be competitive in the current highly digitalized retail era that we are living. Even more, companies are leveraging the opportunities of Information and Communication Technologies (ICT) and available data from consumers to create new data-driven social innovation that really copes with social issues, it is a research opportunity supported by Archibugi (2017) and Bijker (2017), in particular by exploring technologies for social impact. Furthermore, this research extends the work of Battisti (2012) who carried out an in-depth analysis of the behavior of people in the vehicle security sector, analyzing a network of companies that developed new data-driven services to help consumers to find cars

and trucks after an event of robbery in large cities.

To understand the phenomena of data-driven social innovation in the retail sector, this research focuses on a reference definition from the work of Mulgan (2012), who stated social innovation as "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". It is supported by the research of Martinez et al. (2017) that explains social innovation can be understood as a process driven by human in-depth interactions.

Thus, the research question is: *How are managers implementing data-driven social innovations, in order to monitor the performance of employees while increasing their well-being at the workplace?*

2   THEORETICAL BACKGROUNG

Social innovation research is a very fragmented field, which could be considered at the intersection among social, local development, economics, and management theories, as argued by Pol and Ville (2009), Cajaiba-Santana, G. (2014), van der Have and Rubalcaba (2016) and Edwards-Schachter and Wallace (2017). Recently, Edwards-Schachter and Wallace (2017) carried out a literature studied based on sixty years of research for defining social innovation and found that products, processes, and services that are mediated by technologies (i.e. with social purposes) can be powerful to deliver social impact. Furthermore, Lawrence et al. (2014) present the mainstream model in the management of social innovation that is the nature of this kind of innovation as being "social" both on the process and on the outcomes.

The nature of the innovation process considered as socially constructed is a mandatory characteristic for an innovation to be considered "social innovation", an argument supported by Nicholls and Murdock (2012). Towards social process understanding, this research adopts the definition of Katzy et al. (2012) for living labs, to understand the way different people interact (i.e. consumers, managers, and employees), as following presented: "living labs are innovation intermediaries that coordinate network partners for the execution of innovation processes with engagement of end-users for which they provide the technical and organizational infrastructure". Furthermore, we leveraged our study on Battisti (2014) that argues collective intelligence in living labs environments empower user experience, creating a

strong interaction between civil society and companies for the creation of social innovation towards solving pressing issues

This research focuses on exploring the sub-field of technology-based innovations, those innovations capable of helping target groups in solving social problems of the society while helping companies doing business (e.g. Battisti, 2012). From this perspective, this research focuses on social innovation throughout the theoretical lens of Mulgan (2012) that explains innovation can be considered social, only when it is social on the process as well as on the outcomes. This view of social innovation is also supported by Turker and Vural (2017), which argue social innovation has its starting point at societal well-being. In the same way, Battisti (2013) argues about the social innovation created in open innovation based on technology is a key competitive advantage.

The nature of social innovation explained by Nicholls et al. (2015) could be considered the technology disruption following the Schumpeter (1934) principles of the economic driver of the innovation. Furthermore, Martinez et al. (2017) argue the positive role of business actors involved in social innovation, considering they are fostering the progress of society by the creation of new services and products that cope with social needs, which is also supported by the platform innovations that can create impact throughout society, as proposed by Winter et al. (2017).

In order to explore the role of technology in social innovation, this research focus on Battisti (2014) work related to the understanding of the social innovation that is developed in strong collaboration with people, which is: "social innovation in living labs is an organizational form, which is managed by public-private partnership; it is aimed at fostering continuous interaction with citizens through the shaping of technology, in order to enable the citizens to use services that satisfy their specific needs". It is supported by the research of Remneland-Wikhamn et al. (2011) related to the concept of enabling user experience and continuous engagement in the Android ecosystem, as well as supported by Magnusson et al. (2016) by exploring the user community innovation of the Android ecosystem in Europe that includes 47.000 users supporting the ecosystem development.

Supporting this argument, Tracey and Stott (2017) explain the main open gap in the literature of social innovation is related to the use of technology to solve social challenges, in particular, the so-called digital social innovation. And they argue technology is at the center for the reshaping of social innovation, in order to create business and social value. Moreover, this argument is strongly supported by the research of Rahman et al. (2017), and Pentland

(2014) that explains the increase need to explore digital information (i.e. data-driven) to understand people behavior, a concept he defined as social physics.

Social interaction between actors in social networks can help companies to understand people needs, and better shape the new technologies to help on solving social issues (e.g. Bijker, 2017). This argument is supported by Fliaster and Kolloch (2017) that argue social networks provide relevant information for the understanding of stakeholders' behavior. Furthermore, Barocas and Levy (2016) argue detailed information from people about their purchase history, and intention for further purchases can directly affect sales assistants' day-to-activities, in particular their job security, financial well-being, as well as the negotiation power of workers with the owners of the shops (i.e. retailers), as well as supported by Bradlow et al. (2017) by analyzing the role of disruptive technologies in the understanding of consumer behavior, and user-generated content for business opportunities.

For the in-depth understanding of the behavior of our target people in-stores (i.e. consumers, sales assistants and shop owners) the approach presented by Rossiter and Percy (1985) was taken as reference. This approach proposes eight purchase motivations (i.e. see Table 1), five negatives and three positives, each one connected to a specific emotional sequence that, if triggered, improve the probability that the customer will buy the product. Furthermore, the motivations presented in this approach are divided into two types, positive or negative. This approach is fundamental to analyze consumer behavior as the seminal work in the field of technology for retail carried out by Wood (2002).

Table 1: Purchase Motivation Approach

MOTIVATION	EMOTIONAL SEQUENCE
NEGATIVE	
Problem removal	Annoyance → Relief
Problem avoidance	Fear → Relaxation
Incomplete satisfaction	Disappointment → Optimism
Mixed approach avoidance	Conflict → Peace-of-mind
Normal depletion	Mild annoyance → Convenience
POSITIVE	
Sensory gratification/hedonism	Dull (or neutral) → Sensory anticipation
Stimulation	Bored (or neutral) → Excited
Social approval/conformity	Apprehensive (or ashamed) → Flattered/ proud

Source: Rossiter and Percy (1985)

3   METHODOLOGY

This paper applied a combined methodology between "case study" (Yin, 2009) and "action research", in this case, the clinical inquiry research (Schein, 2008). It was applied due to the nature of the phenomenon, and the high innovativeness of the case under study, in particular, because the action research enabled the appropriate way for the collection and analysis of the actionable data produced by the involved actors.

From this perspective, this paper analyses the case of technology-based social innovations (i.e. more specifically, the data-driven social innovation) that enabled the creation of a new social innovation methodology. This methodology was targeted to help companies in the complex endeavor of launching new products and services (i.e. a technology-based artifact) that cope with business and social needs.

The unity of analysis is a network of organizations known as ALPHA. It is a leading European organization in innovation and entrepreneurial education. It focuses on Europe's digital transformation with a network of 130+ corporations, research institutes, universities, and scale-ups in the field of ICT. It operates in 9 European countries and in Silicon Valley. Furthermore, this network of organizations develops innovative products and services taking into consideration the business and social needs of stakeholders.

ALPHA can be considered a public-private partnership (PPP) created to promote shared value (i.e. economic and social) by delivering social innovations in the targeted markets. ALPHA was selected because follows the approach proposed by Battisti (2014), in which he argues PPP for social innovation should be an organization form that enables the creation of innovative solutions to capable of coping with particular social needs of target people on the one hand and address companies' economic needs on the other hand. Furthermore, the main reason behind the selection of this case for the study is the close collaboration with the key actors, that represented an important advantage for the researchers to explore the phenomenon, because of the complex nature of the organization ALPHA.

The data collection was realized from January/2016 to May/2017 in the city of Trento by the participation of the authors in the meeting of the organizations involved in the case studied. Furthermore, the data came from several different sources (i.e. annual report of the organization ALPHA, consumer's data from purchase transactions, shop owner's data and sales assistant's data).

In order to better collect the data required for the understanding of the technological artifact, which is the core of the social innovation methodology, this research applies User-Centered Design (UCD), in particular, to understand the usability of the technology by the final consumers in retail shops. Furthermore, UCD enables from the early stages of product development, understand customer needs, and define the most proper requirements to cope with final user needs. It enables to identify the potentialities and characteristics of the technological product, as well as to help people to use the technical artifact on the best possible way.

UCD was developed in the ICT field as a technique for improving the creation of portals and web-based applications, making them adapted to the user's knowledge and context of use. UCD suggests four steps of action: specify the context of use and user requirements; specify the strategic goals and web portal of communication; create design solutions; evaluate the implemented solutions. Furthermore, UCD enables researchers to get knowledge of the empirical field, the daily context, as well as the cognitive patterns of people that are at the base of the human-machine interaction.

The main advantage of applying UCD techniques is the ability to match people expectations with technology availability, thanks to the process of creating the ICT-based solutions centered on the user needs. This process enables the researcher to understand the content and features of a data-driven social innovation and understand in detail the way the innovation helps on solving the social needs of target groups.

4   DATA ANALYSIS AND RESULTS

The main business objective of the retailers is to focus on advanced metrics that reflect and impact the customer journey and experience. These metrics are very relevant to provide insights into how and why consumers (i.e. shoppers) make their decisions along their path to purchase. More specifically, metrics generated from shopper data, such as mobile devices, cameras, by browsing the internet, and by using social media.

This data is crucial to help the researchers to understand the technology used by the sales assistants to increase the sales performance, improve the well-being at the workplace, as well as solve the needs of final consumers by avoiding the phenomena of showrooming (i.e. customers are going to physical stores to try products and buy on-line from the competitors, and sales assistants are being pressured to work more and having their performance tracked every day).

Showrooming is a pressing issue for both shops owners and sales assistants, and this is the new opportunity for the development of a new methodology for "data-driven social innovation", which support managers and researchers to deal with this issue. In this way, retailers need really useful data from final consumers, in particular, they need the right consumer data to gain business and social insights. Furthermore, these insights can able to transform retailers' marketing campaigns, to inform their pricing actions, to enforce the loyalty to a brand, and more, in general, to increase their businesses by helping sales assistant to work better than without technological support. In this way, the consumer data must meet some key criteria to be considered useful for social and business opportunities: they should be: accurate, affordable, scalable, and actionable. This can be considered a pivotal cultural change because retailers are committing to ground their business decisions on this data.

In order to go more into detail, we considered the following situation: a retailer has a famous shoe designer who pushes a new combination of orange and yellow colors of neon for teen athletic shoes. However, social media analysis (e.g. analysis of tweets or Facebook posts and comments) is showing a negative sentiment around the marketing campaign focused on neon and a more positive sentiment around black and white color combination. At the same time, data from last month purchases show the trend for a "black-and-white" color.

Retail shops would be convincing the design of data-driven social innovation based on consumers' data can enable to take decisions about new product launch, as well as assortment and refinement of the products and services. However, it could be challenging: the insertion of insights into the designer's creative process at the right time can provide him inspiration, while the insertion of insights or facts at the wrong time can stop the product innovation process. In this way, to derive true business value, it is fundamental mapping the right data to the right process at the right time.

Thus, retailers are realizing that they need solutions and tools helping them (i) to quickly gather and process this enormous mass of data from multiple sources, and (ii) to derive real-time insights and metrics to enable a quick decision-making process able to generate true business value. This means that the main driver of retailers is to shift from how to acquire the data to how to extract insights, metrics, and decisions from data that can be turned into a competitive advantage for the retailer. This also increases the performance and well-being of sales assistants at the workplace, as well as creates a better shopper experience for the final consumer, such as by recommending new products or additional services that customers can really need (e.g. Cremonesi et al. 2012).

The technological artifact analyzed in this research is presented in Figure 1. It is a complex ICT-based social innovation solution that is capable of the following features: detecting a consumer that enters in a shop; recognize his/her identity; link the consumer identity to his/her social data; automatically predict useful information about the consumer (e.g. behavior patterns); and display the information to sales assistants that are in physical stores to serve consumers in the purchasing experience journey.
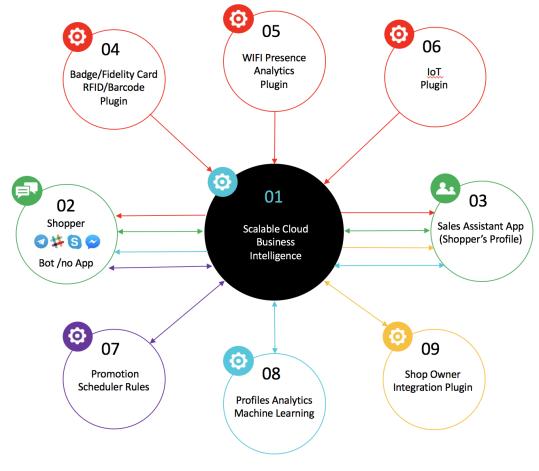
Figure 1: The technological platform for social innovation

Source: Authors.

The automatically prediction of consumer intentions is at the core of the system: in order to predict the psychometric dimensions of the personas minimizing the restrictions imposed by privacy settings, the technology created by ALPHA designed predictive models that take as input social media profile pictures, that is the only source of social media information always publicly available.

The technology used by ALPHA was the basis for the creation of the social innovation methodology. This technology is also based on the model developed by Celli et al. (2014) to

predict personality traits from profile pictures (extroversion, neuroticism, agreeableness, conscientiousness, openness). Furthermore, a model to predict personality from news sharing (Celli et al. 2016), and three personal values (hedonism, stimulation, and conformity) related to the path from purchase motivation to the emotional sequence described in the literature review.

From this perspective, the platform (see Figure 1) is presented as follows: It contains high technology features such as ChatBots UI (User Interface) Platform, Sales Assistant Dashboard, Message Broker with routing mechanisms, Complex Event Processing, and Rules Engine. This platform has the goal to be a customizable, scalable solution to help sales assistants to choose the best promotion, better interacts with their customers, increase the sales performance and reduce the stress at the workplace. It is useful to help retail shops to serve a wide variety of consumers with different needs, desires and preferences: every customer behaves according to her/his characteristics and her/his "psychological profile" ("The brand loyalist", "The passionate proclaimer", "The trend follower", "The fact finder").

ALPHA developed a dashboard, providing notifications to sales agents, based on customer profiling, analysis, and predictions obtained by machine learning algorithms. Specifically, the software platform collects and analyzes the multichannel data coming from ChatBots, customers' social media activities, previous purchases and in-store behaviors and eventually mobility data to recognize customers' personality and psychological traits, their habits, dispositions, and needs by means of machine learning techniques. Chatbots and Conversational UI can have an important role in online-offline integration for retail business.

Offline businesses are becoming more important, with their irreplaceable advantage in the shopping experience and personal connection with customers that online stores cannot provide. The online-offline integration allows the collection of physical stores data, useful to recognize customers' personality and psychological traits. ALPHA solution includes a fully managed scalable software infrastructure that can be easily deployed, managed and maintained from the remote.

In particular, the software infrastructure of the technological artifact is based on RabbitMQ, JBoss Drools, Facebook Messenger Bot API, Telegram Bot API, Android App and Deeplearning4j. Furthermore, the ChatBot UI is based on a configurable rule-based approach where workflow-like dialogue templates can be created/reused by store owners to define specific in-store interactions, which messages are sent to customers (e.g., to propose an item or a poll) and when, and how to reply to customers' answers, implementing complex dialogues and ultimately increasing conversion and retention rates.

The "Sales Assistant App" of ALPHA, identified by number 03 in Figure 1 is a mobile application that provides sales agents with customer information, deduced from social media, loyalty card data and in-store behavior. This tool is an engine based on particular rules for the mediation of the type of messages to be sent to the smart client, so can be easily integrated via technological services such as REST, AMQP, and MQTT protocols.

From the analysis of technology innovation presented in Figure 1, as well as the integration of people using the technology for social needs, this research creates as the main result, a methodology for social innovation. This methodology extends the research of Battisti (2014) by introducing a systematic way for collecting, interpreting, combining and translating needs of people into a "social innovation", that is data-driven. Furthermore, in our case, this social innovation is a technological artifact that could be used by employees of retail shops to solve their social needs towards the increasing of well-being at the workplace.

The methodology proposed by this research is called "SBU methodology", as presented in Figure 2. It is an ICT-based social innovation methodology that collects data from certain target groups; categorize this data in three different clusters, and integrate the data in the SBU integration module. Finally, the output of this methodology is a physical artifact to be used by employees of retail shops, such as the sales assistant of the clothing and footwear retail domain. Moreover, the social innovation methodology presented in this paper extended the work of Battisti (2012) by including data-driven interaction with people as key for business and social needs.
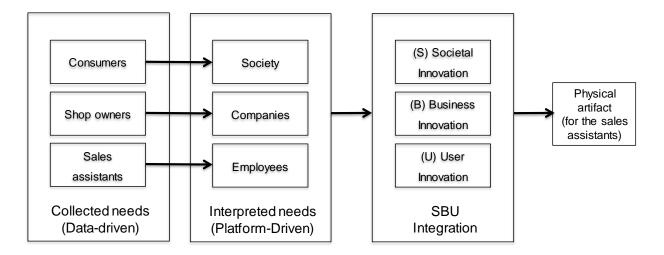
Figure 2: The SBU methodology of social innovation

Source: Authors.

The SBU methodology delivers actionable insight for the construction of social innovation that is based the data produced by people. Furthermore, the model extends the work of Pentland (2014) because the nature of data-driven solutions that is the basis for understanding the social problem, developing a new technology to help on solving this problem, and finally address the companies pain point. Furthermore, this method enables to create potential blue oceans (Kim and Mauborgne, 2005) by small-medium retailers, throughout solving the problem of sales assistants related to have the best information, increase sales performance, increase the well-being at the workplace, and finally satisfy the most demanding consumers that come to the shop with uncommon needs.

5   CONCLUSIONS

This research contributes to social innovation literature by creating a new data-driven methodology to understand the social issues of people and create ICT-based solutions to solve them. This methodology enables retailers to capture personal data from consumers, and process this data in a software platform, thus profiling every customer, as well as providing recommendations and engaging consumers while they are visiting physical stores. In particular, the fact that the ever-increasing available information from consumers is an asset for companies can act as a key driver for the creation of impact of social innovation, both from the worker point of view, then the final customer point of view.

Our paper studies the case of retail shops, which plays a key role in making sense and creates value from people data, in particular, the data from social networks. The trend in business innovation is moving from retailers' business models driven only by the products to models where every decision is informed by the analysis of customers' data. In this way, our research extends the work of Barocas and Levy (2016) by proving a new methodology to track workers' behavior, support shop owner to evaluate workers' performance, and finally help on the direction of future business actions towards the shopper satisfaction.

From this point of view, our research extends the work of Gatzweiler et al. (2017) considered they explored innovation based on social media, and found that content provided by consumers can be powerful for deviates the assumption of companies about common social norms. It is very valuable information to provide to retailers, and it helps them to address social innovation process as well as the social outcomes. Our research confirms the need for social media data and related technologies to create social innovations that deliver business

and social impact by extending the work of Brynjolfsson et al. (2013). Both elements (i.e. social needs and business needs) are key for the social innovation success.

The main limitation of this study is the use of one single case for the creation of the social innovation methodology, which can cause some biases in the interpretation of the findings. In particular, it occurred because the adoption of the retail technology by the shop owners in Italy is still nascent. Future empirical opportunities of research can enable a larger empirical setting for testing the effects of the technology and methodology on the work's performance, as well as the satisfaction of the needs of shopper.

Further research could explore our model in tow way. First, by applying quantitative data about the worker's performance to test our model. Second, by the inclusion of new technologies in the social innovation methodology. A way to do so could be by combining the sales assistant interaction with the effects of the technology inside the store day-by-day activities, such as smart lighting research carried out by Cremonesi et al. (2016). Our research suggests it can be useful to advance research in social innovation by understanding the effect of a combined approach between a mobile application for sales assistant and the technological lighting effects that can change consumer behavior.

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