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Intertwining the internet of things and consumers' behaviour science: Future promises for businesses

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ABSTRACT

Destructive changes and breakthrough innovations are embraced in the development of Internet of Things (IoTs). These network-connected smart devices or machine-learning algorithms transfer information on consumers to the Internet by small sensors and computing processors. Companies thus track consumers' behaviour and offer personalised products and services. However, consumers are still sceptical in using these devices due to privacy risks and a dearth of awareness about the technologies' perceived value. Therefore, to overcome these barriers, the research seeks to measure the relationships among the elements that affect customers' willingness and decisions to use IoTs-based products. On the basis of motivation theories, two categories of motivational factors are individuated: extrinsic factors such as entertainment and social interaction and intrinsic factors such as information acquisition, privacy risk, and technology readiness level. They are analysed using a sample of 782 early-adopter customers in Italy. The aim is to offer an explorative, quantitative study on the IoTs to enhance the existing knowledge and support business in the process of engaging more users and creating new personalised products. In line with this, the study's implications, limits, and recommendations for further research are presented.

1. Introduction

Social and economic dynamics are acquiring new shapes and boundaries for companies as a result of rapid and unpredictable digital transformation (Del Giudice and Della Peruta, 2013; Jovarauskienė and Pilinkienė, 2015; Laudon and Laudon, 2015; Scuotto et al., 2016a). New network-connected devices are infused in people's daily lives. These devices, recognised as Internet of Things (IoTs), transfer information about consumers to the internet by small sensors and computing processors (Gubbi et al., 2013). For instance, wireless telecommunication instruments and wearable technologies such as radio-frequency identification (RFID) and mobile web services (Berezdivin et al., 2002; Del Giudice et al., 2013) track consumers' behaviour and thus allow companies to create personalised products and services (Scuotto et al., 2017). In fact, these devices generate a huge amount of data, which act as a kind of self-reported consumer survey (Nunes and Gonçalves, 2017). Also falling within the realm of IoTs are machine-learning algorithms that provide companies with opportunities to gather data on customers' habits, lifestyles, and behaviours (Davenport, 2013; Henderson and Venkatraman, 1993; Lee and Lee, 2015; Lu and Cecil, 2016; Santoro et al., 2017). IoTs is, in turn, becoming more accessible and usable to consumers, shifting their behaviour from late adopters to early adopters (Xiang et al., 2015). Yet there are many consumers who are sceptical of using IoTs due to the risk to privacy and a dearth of awareness of technologies' perceived value (Simmons, 2008). Gubbi et al. (2013) claim that people tend to be more worried to the violation of their privacy, which limits online consumers' purchases. By contrast, companies seek to overcome this risk by assuring consumers about the protection of their privacy as well as by offering different forms of payment that encourage data sharing and adoption of IoTs (Accenture, 2014). In this way, in acquiring detailed information on consumers' needs and desires, the creation of new products is facilitated (Glass, 2015; Murthy and Kumar, 2015; Scuotto et al., 2017; Utterback, 1996).

Therefore, on the basis of motivation theories (Mitchell, 1982; Porter and Lawler, 1968), the research seeks to explore early adopters' motivational factors in their use of IoTs. These theories, considered as a complex of theories based on Maslow (1965), aim to explain motivations and causes of consumers' behaviours and choices (Sheeran, 2002; Webb and Sheeran, 2006). With this in mind, two categories of

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motivational factors are individuated: extrinsic factors, such as entertainment and social interaction, and intrinsic factors, such as information acquisition, privacy risk, and technology readiness. They are analysed using a sample of 782 early-adopter consumers in Italy.

The aim is to offer an explorative, quantitative study on IoTs to improve the engagement of early adopters and to help create new personalised products. This study seeks also to extend the existing knowledge on IoTs primarily based on companies' perspective (Al-Fuqaha et al., 2015; Bughin et al., 2015; Del Giudice, 2016; Del Giudice et al., 2016; Sicari et al., 2015; Solima et al., 2016). Few authors have developed descriptive and theoretical research on the use of IoTs-based products (Deci, 1975; Kim et al., 2007; Lin and Bhattacherjee, 2008; Lu and Su, 2009; Moon and Kim, 2001; Teo et al., 1999; van der Heijden, 2004; Ward and Peppard, 2016; Whitmore et al., 2015).

Aiming to provide a better understanding of this research area, on which future theories might be built (Weick, 1995), the rest of the paper is structured as follows. First, the theoretical framework offers an overview on the concept of IoTs-based products, describing customers' motivational factors; these factors are extrinsic (i.e., entertainment and social interaction) and intrinsic (i.e., information acquisition, privacy risk, and technology readiness). On this basis, hypotheses are offered and tested by empirical research structured in two stages: data collection and data analysis. Data are collected by administrating a survey on a sample of 782 early-adopter customers in Milan (Italy). Data are then analysed by Structural Equation Modelling (SEM). The research concludes by arguing that findings are in line with the theoretical framework in order to show the research contribution. Alongside this, limits and recommendations for further research are suggested.

2. Conceptual framework and hypotheses development

The Internet of Things is defined as “a world-wide network of interconnected objects uniquely addressable, based on standard communication protocols” (INFSO D.4, 2008). IoTs is made up of things that are both network-oriented and oriented with each other. This twofold orientation calls for the embrace of advanced technological tools in society (Atzori et al., 2010).

In a nutshell, IoTs is all about digital technologies, semantic languages, and virtual identities (Bandyopadhyay and Sen, 2011). IoTs improves the efficiency, accuracy, and effectiveness of companies' organizational and environmental levels, aiming to guarantee a high quality of life and to stimulate companies' innovation processes (Barile et al., 2017; Del Giudice and Straub, 2011; Ma, 2011). In addition to IoTs, two other categories have been introduced: Internet of Services (IoS) and Internet of People (IoP) (Siemiatycki, 2002). Internet of Services (IoS) harmonizes various applications into interoperable services and uses semantics for understanding, combining, and processing data and information from different service providers, sources, and formats (Scuotto et al., 2016b). Internet of People (IoP) envisages “people becoming part of ubiquitous intelligent networks having the potential to seamlessly connect, interact, and exchange information about themselves and their social context and environment” (Hernandez-Munoz et al., 2011: 449). IoP reflects the fact that the future of the economic world relies on the willingness of customers to improve their lifestyles by using new, advanced technologies (Di Fatta et al., 2016; Guo et al., 2013; Li et al., 2015). This customer-centred approach calls for motivational theories (Deci, 1992; Pinder, 1977; Weiner, 1972), which could be used as guides for companies to engage new customers. Basically, these theories claim that customers are encouraged to use technological tools by extrinsic and intrinsic factors (Davis et al., 1992). For instance, the extrinsic factors refer to the perceived usefulness of technology-based products, while the intrinsic factors consider the perceived enjoyment in adopting new technologies (see also Kim et al., 2007; Lu and Su, 2009; van der Heijden, 2004). Cognitive and affective benefits are also grouped in the extrinsic factors (Kim et al., 2007), whereas the acquisition of information, perceived relevance of privacy, and perceived ability are included in the category of intrinsic factors (Del Giudice et al., 2017; Maddux and Rogers, 1983; Rao and Troshani, 2007; Youn, 2009). Customers, thus, become the centre of attention for scholars and practitioners who are primarily focused on discovering and understanding motivational factors to facilitate and enhance the use of the IoTs.

The innovation literature offers few studies on the effect of new technologies on customers' behaviours and on the relationship between customers and companies (Antikainen et al., 2010; Del Giudice et al., 2011; Scuotto et al., 2016a, 2017). One of the main research streams that have analysed this phenomenon is rooted in the complex of contributions related to motivation theories (Hamilton and Singwhat, 2013; Hsu and Lin, 2016; Sjöklint et al., 2013). In the past, these theories were introduced to explore consumers' behaviours. Thanks to these contributions, three categories of needs were individuated as the drivers of consumer behaviour: growth needs, relatedness needs, and existence needs (Alderfer, 1972; McClelland, 1987). Specifically, as outlined by Alderfer (1972), growth needs refer to consumers' personal needs to achieve individual aims in terms of social gratification and professional recognition; relatedness needs are linked to individual needs to interact with each other, both in the personal and professional worlds; and existence needs are considered to be physical needs, such as food, clothing, and physical security. Alongside these, some other categories of motives are recognised as explaining consumer behaviour, such as functional motives, aesthetic-emotional motives, social motives, situational motives, and curiosity motives (Sheth, 1974). Functional motives and aesthetic-emotional motives refer to the double dimension (functional and emotional) of a product that defines its ability to satisfy specific needs and to be aligned with customers' preferences; social motives are linked to the ability of a product to satisfy customers' needs for social interactions; situational motives can be analysed in terms of availability of information about the product and its functionality; and curiosity motives are linked to the willingness of consumers to try new experiences and/or services, providing more information about their expectations and needs.

With the aim of developing in depth an analysis of customers' behaviours in using IoTs, the research investigates five elements that stem from the aforementioned categories, as follows: entertainment is associated with aesthetic-emotional motives, social interaction is related to social motives, information acquisition is connected to situational motives, privacy risk is linked to curiosity motives, and technology readiness is associated with functional motives (as summarised in Table 1).

In detail, entertainment addresses customers' behaviour and preference for using new technologies (Bandura, 2004; Childers et al., 2002; Heinonen, 2011; Shang et al., 2005). Wolf (1999) declares that new entertainment trends have arisen in line with the technological field, which can be linked to studies on the use of IoTs (Jensen and Jorba, 2012; Miller, 2004). For instance, Vorderer et al. (2004) and Bryant (2004) demonstrate that entertainment has strong influence on the use of IoTs by customers. Sayre and King (2003) claim that customers' behaviours have spurred entertainment. Entertainment is thus one of the most relevant motivations in customers' decisions to buy and use IoTs-based products (Miorandi et al., 2012).

Therefore, we believe that:

Table 1
Correlation between Sheth's categories and the investigated constructs.

Sheth's categories of customer motivations	Investigated constructs
Aesthetic-emotional	Entertainment
Social motives	Social interactions
Situational motives	Information acquisition
Curiosity motives	Privacy risk
Functional motives	Technology readiness level