Consumer Resistance to Innovation in Services

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Consumer Resistance to Innovation in Services: Challenges and Barriers in the Internet of Things Era*

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The Internet of Things (IoT) is expected to be the next phase of the Internet revolution and to transform consumers' service experience. It nevertheless raises challenges on innovation in services. Based on Ram and Sheth's (1989) theoretical framework, this work attempts to provide a better understanding of the barriers that lead to consumers' resistance to smart services as an innovation. To this end, our research adopts an integrative framework that combines functional barriers, psychological barriers, and individual barriers to explain consumer resistance to smart services. Structural equation modeling was used to test this theoretical framework. Our research enriches the existing literature by (1) adapting Ram and Sheth's (1989) theoretical framework to the evolution of digital technologies (technological vulnerability barriers), (2) taking into account the ideological aspect of resistance (ideological barriers), and (3) considering dispositional variables (individual barriers). Moreover, it highlights the key role of skepticism toward IoT devices as a mediator between technological vulnerability barriers and individual barriers on the one hand and consumer resistance to smart services on the other.

Practitioner Points

- In a context where consumers have ever more power, it is important for managers to take into account the factors that may cause consumers' resistance.
- Our results highlight, in the IoT context, the importance of considering consumer technological vulnerability barriers.
- Although it is difficult for firms providing IoT services to directly influence psychological variables, it is important to take them into account when setting up smart services.

Introduction

The Internet of Things (IoT) is expected to be the next phase of the Internet revolution and to transform consumers' service experience. The IoT is defined as a network of sensors and actuators embedded into everyday objects and devices that can (1) collect, aggregate, and analyze a significant amount of data; (2) interact and communicate with each other—and with humans—on an ongoing basis; and (3) activate actions with complete autonomy (Hoffman and Novak, 2015).

The IoT and more specifically IoT devices are undeniably an advance paving the way for new uses in different sectors (Ng and Wakenshaw, 2017). Services such as healthcare, insurance, transport, and smart homes could benefit from the capacity of these devices to collect, communicate, and exchange a great deal of data instantaneously and autonomously (Wünderlich, Wangenheim, and Bitner, 2013). This capacity will open up new business opportunities and the emergence of a new form of *smart service* (Wünderlich et al., 2013, 2015). Smart services are growing steadily with applications in different areas: smart homes, smart healthcare, smart grids, smart banking, etc. Today, a connected car can analyze how we drive and automatically provide insurers with driving history information, a smart light bulb can detect an intrusion into the home and alert the user and his security company, a smartwatch can analyze private data related to sports activities and offer training programs adapted to each user, etc. These IoT devices inside cars, homes, or infrastructure objects will allow service companies to gain a better understanding of customer personas, identify their lifestyles, and work with external parties

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to deliver relevant and personal offers to clients (Ostrom, Parasuraman, Bowen, Patrício, and Voss, 2015).

However, the ever more widespread use of these products raises new challenges, particularly with regard to the psychological barriers (e.g., technological dependence) and functional barriers (e.g., complexity, security risk). It is a matter here of taking account of the factors that may generate resistance toward these devices on the part of consumers (Mani and Chouk, 2017). The marketing literature identifies consumer resistance to innovation as a form of reaction or negative attitude to new products and services that trigger change or upset the status quo (Heidenreich and Spieth, 2013; Ram, 1987; Ram and Sheth, 1989). In a context where consumers have ever more power, they can go so far as to express their resistance by rejecting the innovation, calling for boycotts, spreading negative word-of-mouth, or taking actions against companies (Kleijnen, Lee, and Wetzels, 2009). It is therefore important for managers to take into account the factors that may cause consumers' resistance.

In the context of our research, "smart services" are those services that use IoT devices to provide services to customers. They can be considered as a service innovation since the IoT devices change the way the service is configured and rendered (Ostrom et al., 2015). This is consistent with Dotzel, Shankar, and Berry's (2013, p. 259) definition of service innovation as "a new or enhanced intangible offering that involves the firm's performance of a task/activity intended to benefit customers." Consequently, to ensure the success of these new services, it is important for companies to analyze the potential resistance factors (Wünderlich et al., 2015). Indeed, a large majority of innovations never become commercial successes (Gourville, 2006), and one of the main causes for failure is consumer resistance (Heidenreich and Handrich, 2015; Ram and Sheth, 1989). According to many (e.g., Claudy, Garcia, and O'Driscoll, 2015; Heidenreich and Spieth, 2013), this high rate of failure should not be surprising because innovation requires consumers to accept several changes (price, design, performance, etc.).

From a theoretical standpoint, the current literature is deficient in at least four respects. First, despite the importance of services in the global economy, innovation studies tend to focus on products rather than services (Storey, Cankurtaran, Papastathopoulou and Hultink, 2015). According to O'Cass, Song, and Yuan (2013, p. 1060), "we still have only a limited and divergent understanding of the nature of service quality and innovation and their role and importance in services marketing for both the customer and the firm." A number of studies emphasize that innovation in services is as risky as it is for new products (e.g., O'Cass et al., 2013; Storey et al., 2015).

Second, the introduction of IoT devices into services changes the way these services are delivered and conceived (Wünderlich et al., 2015). Indeed, IoT devices have specific technical capacities such as "sensors" (that collect data about the user and the environment), "actuators" (that activate an action based on the captured data), and "network connectivity" (that connects devices to the network via communication protocols, including WiFi, Bluetooth, or RFID) (Hoffman and Novak, 2015; Mani and Chouk, 2017). These capacities offer new opportunities that mark the transition to a new era of e-service, where the service experience becomes autonomous (intelligence); where devices communicate with each other (connectivity); and where the consumer can access the service anytime, anywhere, and through any device (ubiquity). Thus, "this environment represents a radically new context for providing and experiencing service" (Ostrom et al., 2015, p. 145). It is therefore necessary to take these evolutions into account and understand their implications for consumer behavior. However, relatively very few studies have been

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undertaken regarding smart services specifically, and the few studies that exist identified research avenues pertaining to both B2B and B2C environments (e.g., Ostrom et al., 2015; Wünderlich et al., 2015), or developed a general framework to understand users' responses to smart services (e.g., Wünderlich et al., 2013), or studied user quality experience of the IoT (Shin, 2017).

Third, the majority of existing research on innovation in services concentrates on success factors (e.g., Storey et al., 2015) and the adoption process (e.g., Kleijnen, de Ruyter, and Wetzels, 2004). These studies are often based on models that identify the success factors of a new service, such as the technology acceptance model (TAM: Davis, 1989), and the unified theory of acceptance and use of technology (UTAUT: Venkatesh, Morris, Davis, and Davis, 2003), and pay little attention to models of resistance to innovation such as the Ram and Sheth (1989) model (Claudy et al., 2015; Laukkanen, 2016). However, researchers stress the importance of considering the oppositional and negative reactions that lead to consumer rejection of innovations (Heidenreich and Handrich, 2015; Kleijnen et al., 2009; Laukkanen, 2016; Ram, 1989; Ram and Sheth, 1989). The adoption and diffusion approach explains how an innovation spreads in the market, while innovation resistance explains why a consumer is unwilling to accept novelty (Ram, 1989). Indeed, studying innovation under the paradigm of resistance provides a better understanding of the factors that inhibit its adoption and reduce its failure rate (Heidenreich and Handrich, 2015; Kleijnen et al., 2009). In the service sector, one of the most prominent obstacles is getting customers to accept and try new services based on new technologies. Indeed, the introduction of an innovation in a service "involves a significant behavior change in which patterns that are ingrained must be altered" (Meuter, Bitner, Ostrom, and Brown, 2005, p. 61).

Finally, the majority of marketing research on innovation resistance is based mainly on Ram and Sheth's (1989) theoretical model. This model has been continuously used and tested in different contexts (e.g., the Internet and mobile banking [Laukkanen, 2016], smart products [Mani and Chouk, 2017]). However, this model suffers from two limitations. On the one hand, according to Heinze, Thomann, and Fischer (2017), this model is based on past concepts that need to be adjusted in the digital age. On the other hand, Ram and Sheth's model is limited to studying only the functional and psychological barriers to explaining resistance to innovation (Antioco and Kleijnen, 2010; Heidenreich and Handrich, 2015). Indeed, this theoretical framework focuses on the situational antecedents of resistance and neglects the personal predispositions (Heidenreich and Handrich, 2015; Kleijnen et al., 2009; Roux, 2007) and demographic variables (Laukkanen, 2016).

To fill these theoretical gaps, the objective of this study is to provide a better understanding of the drivers of consumer resistance to smart services. In particular, the research aims at extending Ram and Sheth's (1989) theoretical framework with regard to the barriers that lead to the rejection of innovations. Hence, our paper will attempt to answer the following question: To what extent do psychological, functional, and individual barriers impact consumer resistance to smart services?

The remainder of the paper is divided into four sections. The next section offers a literature overview of resistance to innovation and provides the conceptual framework and the underlying hypothesis. The following section depicts the methodology and presents the results. Next, we discuss the findings. Theoretical and managerial implications are developed in the last section.

Theoretical Background and Framework

Smart Service as an Innovation

Smart services are IoT-based services that embody new capacities (Mani and Chouk, 2017; Porter and Heppelmann, 2015): intelligence (analyzing and understanding data related to users and their environment), connectivity (collecting and exchanging data with the user and with other devices), autonomy (carrying out automatic actions without the user's intervention), and ubiquity (providing services anytime, anywhere, and from any device). This new way of benefiting from service can be considered as an innovation, as defined by Rogers (1995, p. 11): "an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption." Thus, a smart service may be perceived by consumers as something new and different compared to existing services.

Smart service as an innovation has different consequences for consumers in terms of their service experience such as:

1. Consumers are able to benefit from new services made possible by IoT devices (for instance, making secure payments with a connected bracelet that uses the person's heartbeat for authentication purposes). In this context, the innovation stems from the use of IoT devices to provide a new service.
2. Consumers benefit from existing services (checking their bank information, paying for purchases, etc.); however, they use new channels (for example, they can pay for their purchases with new devices such as a smartwatch). In this respect, the innovation relies on the way existing services are delivered (Wünderlich et al., 2015).

Despite the numerous opportunities offered by smart services, there still remain major challenges to be addressed with regard to consumers' potential resistance to this innovation. In this context, it is important to focus on the paradigms underlying the consumer response to innovations.

Innovation Adoption and Resistance to Change

In marketing, the literature that explains the consumer response to innovation recognizes two research paradigms (Laukkanen, 2016): (1) innovation adoption and (2) resistance to innovation. Using the first paradigm, researchers focus on the process of the adoption of innovation. Studies in this field are based on Rogers's (1995) seminal work and innovation acceptance (Ajzen, 1991; Davis, Bagozzi, and Warshaw, 1989). In this sense, several theoretical models have been tested and validated to explain user adoption of innovation, such as the technology acceptance model (TAM: Davis, 1989), the theory of planned behavior (TPB: Ajzen, 1991), the unified theory of acceptance and use of technology (UTAUT: Venkatesh et al., 2003), and the unified theory of acceptance and use of technology 2 (UTAUT2: Venkatesh, Thong, and Xu, 2012).

The second paradigm focuses on innovation resistance (e.g., Heidenreich and Handrich, 2015; Kim and Kankanhalli, 2009; Lapointe and Rivard, 2005; Ram, 1989; Ram and Sheth, 1989). According to Gatignon and Robertson (1989), the decision to reject an innovation is not explained by the same factors that explain adoption. For Ram (1987), however, "innovation resistance is not the obverse of innovation adoption." Consequently, the adoption of an innovation is conditioned by the overcoming of consumers' initial resistance. Hence, resistance and adoption can coexist during the life of the innovation and can be explained by similar factors (Ram, 1987).

Studies on the resistance paradigm generally mobilize the concept of resistance to change for investigating the factors that lead individuals to reject new systems, products, or services. Resistance to change is defined as "any conduct that serves to maintain status quo in the face of pressure to alter the status quo" (Zaltman and Wallendorf, 1983; cited by Ram, 1987) and "is associated with the degree to which individuals feel themselves threatened by change" (Ram, 1987, p. 208). In marketing literature, resistance to change has been studied in the context of the introduction of a new product or service (consumer resistance) (e.g., Kleijnen et al., 2009; Ram, 1987, 1989; Ram and Sheth, 1989).

Consumer Resistance to Innovation: A Form of Resistance to Change

Consumer resistance is a particular form of resistance to change caused by innovation (Ram, 1987). Consumers may manifest resistance "either because it poses potential changes from a satisfactory status quo or because it conflicts with their belief structure" (Ram and Sheth, 1989, p. 6). To understand the antecedents of consumer resistance, various theoretical models can be identified in the marketing literature. For example, following the work of Zaltman and Wallendorf (1983) and Rogers (1995), Ram (1987) proposes a model of innovation resistance with three categories of determinants of resistance to innovation: (1) perceived innovation characteristics (e.g., complexity, perceived risk, communicability), (2) consumer characteristics (e.g., personality, motivation, self-confidence, previous innovative experience), and (3) characteristics of propagation mechanisms (e.g., credibility, clarity, informativeness). Furthermore, based on research in the psychology of action, Bagozzi and Lee (1999) developed a comprehensive model for "consumer resistance to, and acceptance of, innovations." In this model, resistance to innovation is presented as the outcome of a set of antecedents comprising negative emotions such as anger, fear, sadness, and disgust. Ram and Sheth (1989), for their part, propose a "model of consumer resistance to innovations" in which resistance

is considered a critical variable because innovation may create major changes in consumers' day-to-day existence, may disrupt their established routines, and may conflict with their prior belief structure. Unlike the models developed by Ram (1987) and Bagozzi and Lee (1999), the Ram and Sheth model proposes a conceptual framework based primarily on the barriers that promote resistance. We choose the Ram and Sheth model as a theoretical basis of our research model. This choice is explained in the next section.

Theoretical Foundation of the Research: Ram and Sheth's (1989) Theoretical Framework

In their model, Ram and Sheth (1989) identify two categories of barriers to explain consumers' resistance to innovation: (1) functional barriers and (2) psychological barriers. Functional barriers arise "if consumers perceive significant changes from adopting the innovation" (Ram and Sheth, 1989, p. 7). Indeed, consumers may express resistance to an innovation because of worries about its value barrier, its use barrier, and its risk barrier. With regard to psychological barriers, these arise when the innovation upsets the consumer's prior beliefs. These barriers are linked to the image of the innovation and to tradition.

Furthermore, our research is in line with the marketing literature on consumer resistance to innovation in services (Claudy et al., 2015; Joachim, Spieth, and Heidenreich, 2018; Laukkanen, 2016; Molesworth and Suortti, 2002). Within this literature, existing studies have variously examined the factors of resistance to the use of new technology in services (e.g., Laukkanen, Sinkkonen, and Laukkanen, 2008). Such studies generally use the Ram and Sheth (1989) model as a theoretical framework to identify barriers leading to consumer resistance to innovation in services (Table 1).

Two reasons justify the choice of the Ram and Sheth model as the theoretical foundation for our study. First, this model provides a solid theoretical framework for identifying the major barriers that create customer resistance to innovations. Since the aim of our research is to understand the barriers that promote resistance to smart services, the Ram and Sheth (1989) model provides an interesting theoretical framework that identifies five barriers (usage barrier, value barrier, risk barrier, image barrier, and tradition barrier). Second, this model has been applied and empirically tested in past studies on technological innovations in services, such as mobile and Internet banking (e.g., Laukkanen, 2016; Laukkanen et al., 2008).

Extension of Ram and Sheth's Model

The Ram and Sheth model has been extended and updated in various previous studies. For example, Laukkanen and Kiviniemi (2010) developed a model to examine the effect of information and guidance offered by the company on the five resistance barriers defined by Ram and Sheth (1989). More recently, Joachim et al. (2018) proposed integrating and testing empirically the Ram and Sheth model within a more general framework encompassing a more comprehensive typology of product- and service-specific barriers.

In line with these works, our paper proposes extending and enriching the Ram and Seth model through the inclusion of three types of barriers: technological vulnerability barriers (technology anxiety, technological dependence), ideological barriers (skepticism), and individual barriers (inertia).

Technological vulnerability barriers. The model of Ram and Sheth is quite old and does not take into account the recent technological revolutions. In particular, it is necessary to include in this model variables related to the digital age (Heinze et al., 2017). Indeed, according to the Table 1, the existing empirical studies mainly identify psychological barriers related to the image (e.g., unfavorable image regarding the service) and the tradition (e.g., desire for personal contact) without taking into account the technological evolutions in the services. To overcome this limitation, our paper proposes to extend the Ram and Sheth model by integrating a new category of psychological barriers: technological vulnerability barrier. This category is justified by technological developments over the last 20 years that have radically changed the attitudes and beliefs of individuals. According to Ng and Wakenshaw (2017), understanding consumers' vulnerability in digital domains is a major challenge for marketing research. Indeed, consumers are increasingly confronted with technology and have grown up in a context where

Table 1. Review of Psychological and Functional Barriers in the Context of New Service

Ram and Sheth Model		Drivers of Resistance in Services		
Barrier Category	Description	Example of Drivers	References	Focus
Functional barriers				
Usage barrier	If the use of the new service is inconsistent with the consumer's past experiences, values, and acceptance requirements, the consumer then needs a long time to accept the innovation. Lian and Ye, (2013)	Perceived ease of use	Laukkanen et al. (2008); Laukkanen (2016)	Internet and mobile banking
		Complexity	Kim, Lee, and Rha (2017)	Mobile learning
		Consumers' perceived ability to use the Internet	Molesworth and Suortti (2002)	Online services: Buying cars online
		The conflict with existing usage patterns and routines	Gurtner (2014)	Mobile health applications
		Experience/Access barrier	Rudolph, Rosenbloom, and Tillmann (2004)	Online shopping
Value barrier	The value barrier refers to the lack of monetary and performance value of an innovation. Laukkanen et al. (2008)	Perceived usefulness	Laukkanen et al. (2008); Laukkanen (2016)	Internet and mobile banking
		Relative advantage	Kim et al. (2017)	Mobile learning
		Pricing	Molesworth and Suortti (2002)	Online services: Buying cars online
		Digital barrier	Rudolph et al. (2004)	Online shopping
Risk barrier	The risk barrier arises when the user cannot assess the risks and uncertainties associated with the new service. Laukkanen et al. (2008)	Security risk	Rudolph et al. (2004); Laukkanen et al. (2008); Laukkanen (2016)	Internet and mobile banking
		Privacy, confidentiality, and personal information issues	Chemingui and Ben Lallouna (2013)	Mobile financial services
		Physical, performance, and social risk	Gurtner (2014)	Mobile health applications
Psychological barriers				
Tradition barrier	The tradition barrier arises when new service poses a change in customer's established tradition. Laukkanen et al. (2008)	Desire for personal contact	Laukkanen et al. (2008); Laukkanen (2016)	Internet and mobile banking
		Lack of compatibility with existing offline behavior	Molesworth and Suortti (2002)	Online services: Buying cars online
		Fear of technology replacing human work	Chemingui and Ben Lallouna (2013)	Mobile financial services
		The tradition of a healthy lifestyle	Gurtner (2014)	Mobile health applications
Image barrier	Degree to which an innovation is perceived as having an unfavorable image. Claudy et al. (2015)	Unfavorable image regarding the new service	Laukkanen et al. (2008); Laukkanen (2016)	Internet and mobile banking
		Trust: the credibility and the benevolence of the merchant	Molesworth and Suortti (2002)	Online services: Buying cars online
		Online channel barrier	Rudolph et al. (2004)	Online shopping

technology is used in all areas of everyday life. Under these conditions, the human/machine interactions are more and more intense and lead to the question of technological vulnerability. Vulnerability refers to states of helplessness, a loss of control and dependence (Baker, Gentry, and Rittenburg, 2005), and technology can accentuate these states. As the importance of technology grows in our society, people may experience a vulnerability to technology (negative emotions, technostress, technophobia, etc.) (Shu, Tu, and Wang, 2011). In addition, consumers who are unprepared for technology may develop anxiety (Parasuraman, 2000), or those who cannot control the use of technologies may develop a technological dependency (Chouk and Mani, 2016). Anxiety and dependence are therefore two psychological variables that can potentially explain resistance to innovation and in particular to smart services (see table in supporting information Appendix A).

Ideological barriers. The Ram and Sheth model can be enriched by including the ideological dimension of resistance. Indeed, in addition to the barriers of tradition and image, innovation may come up against ideological barriers related to the personal convictions of the consumer. As argued by Kleijnen et al. (2009), consumers may develop a set of negative ideas about innovation because it conflicts with their beliefs and values. This situation may lead to consumers to doubt the promised benefits related to innovation and become skeptical toward it. Consumer skepticism is defined as an ideological tendency "to doubt, in principle and without evidence, the promises made by commercial sources" (Banikema and Roux, 2014, p. 35). This barrier has become increasingly pronounced with the development of new information and communication technologies (proliferation of commercial information sources) and anti-market activist networks (proliferation of commercial counter-discourses).

Individual barriers. The Ram and Sheth model is based on a framework that theorizes resistance as the outcome of a set of innovation-specific antecedents (functional and psychological barriers) (Heidenreich and Handrich, 2015). This perspective does not take into consideration individual variables that can explain the predisposition of individuals to reject change (Heidenreich and Handrich, 2015; Kleijnen et al., 2009). In this sense, Heidenreich and Spieth (2013) and Heidenreich and Handrich (2015) proposed to make a distinction between passive resistance and active resistance. On the one hand, active resistance is associated to "a negative attitude formation driven by functional and psychological barriers that follows deliberate new product evaluation" (Heidenreich and Handrich, 2015, p. 881). On the other hand, passive resistance refers to the "predisposition to resist innovations due to an individual's inclination to resist changes and status quo satisfaction that already forms rather unconsciously prior new product evaluation" (Heidenreich and Handrich, 2015, p. 881). In this respect, status quo bias (SQB) theory, developed by Samuelson and Zeckhauser (1988), provides an interesting theoretical framework to understand the resistance to innovation that results from variables related to the predisposition of people to resist (Kim and Kankanhalli, 2009).

The SQB refers to a behavioral bias that reflects resistance to change and a mental attitude in which any novelty is perceived as generating more risk than benefit. Samuelson and Zeckhauser (1988) showed in numerous experiments that most decisions have a status quo option. In this case, people prefer that the situation remain stable in order to minimize losses than take risks to earn more.

On the basis of the theoretical foundations developed in the previous section, the hypotheses of our research model are presented (Figure 1). This model adopts an integrative framework that combines individual barriers (SQB theory), functional barriers, and psychological barriers (Ram and Sheth, 1989) to explain consumer resistance to smart services. One the one hand, the Ram and Sheth model provides a theoretical basis for studying factors specific to the context of the IoT (e.g., complexity of the smart service, perceived health risk, skepticism toward the IoT, etc.). On the other hand, SQB theory provides an interesting framework for studying dispositional factors (e.g., inertia) that could account for consumer resistance. Indeed, consumer resistance is influenced not only by context factors but also by individual barriers (Heidenreich and Handrich, 2015).

Hypotheses

Based on Ram and Sheth's model and SQB theory, our conceptual model examined three categories of barriers: functional barriers (perceived complexity,

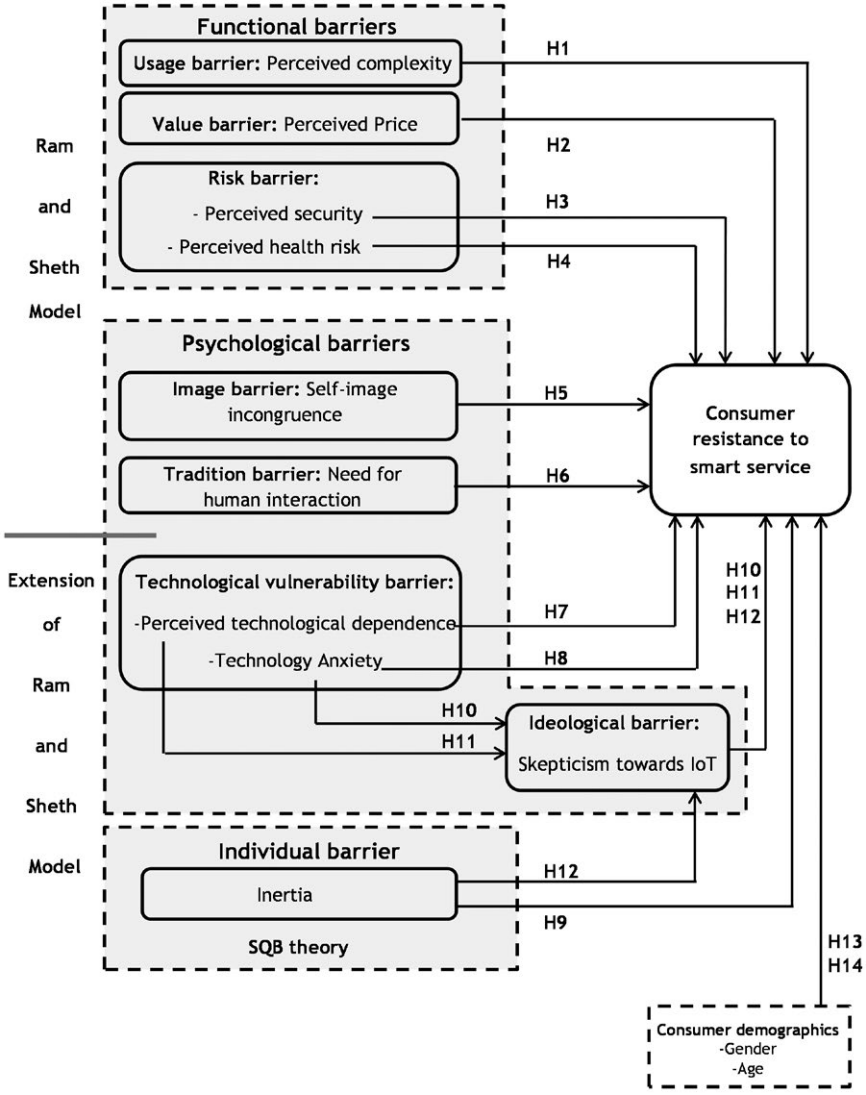

Figure 1. Theoretical Framework and Hypotheses

perceived price, perceived security risk, perceived health risk), psychological barriers (self-image incongruence, need for human interaction, perceived technological dependence, technology anxiety, skepticism toward IoT), and individual barriers (inertia). To enrich the proposed model, the impact of consumers' gender and age is examined.

Furthermore, the choice of these resistance barriers is motivated by the characteristics of smart services (see supporting information Appendix A for more details), companies' experiences, and recent academic research. Hence, a review of the literature on recent academic research focusing on resistance barriers to the IoT was conducted (e.g., Chouk and Mani, 2016; Sovacool, Kivimaa, Hielscher, and Jenkins, 2017; Touzani, Charfi, Boistel, and Niort, 2018). This review was enriched by several professional studies and reports (e.g., Accenture, 2016a; OpinionWay, 2017). Table 2 summarizes the main findings and provides theoretical and managerial justifications for the relevance of the barriers of our model.

Usage Barrier: Perceived Complexity

For Ram and Sheth (1989), the usage barrier is probably the main driver for consumer resistance to innovations. This barrier appears when the innovation is not compatible with existing workflows, practices, or habits. In the context of technological innovations, however, the usage barrier is comparable to

Table 2. Presentation and Justification of the Selection of the Barriers Examined in our Theoretical Model

Barrier			Justification with Regard to the IoT Context			
			Academic Study			
Concept	Construct	Definition	Source	Nature of Study	Relevant Findings	Industry Research
Usage barrier	Perceived complexity	"Degree to which an innovation is perceived as difficult to understand and use" (Rogers, 1995, p. 242)	Canhoto and Arp (2017)	Qualitative/focus groups	The use of IoT devices is linked to a perceived important effort because of their complexity	According to an Accenture report (2016a), "64% of consumers experienced a challenge when using a new IoT device this year"
			Pizza, Brown, McMillan, and Lampinen (2016)	Qualitative/filmed observation	The study provides evidence of the usability problems of the smartwatch	
Value barrier	Perceived price	"Price is what is given up or sacrificed to obtain a product" (Zeithaml, 1988, p. 10)	Hoffman and Novak (2015)	Conceptual	Slow rates of adoption for smart home can be traced to a number of hurdles related consumer concerns about price and security	According to a study by OpinionWay (2017) in France, 46% of respondents think that the manufacturers offer smart devices/services that do not respond to real needs for consumers
			Touzani et al. (2018)	Qualitative/ interviews	"People are more likely to use a connected object if it provides them with economic or informational benefit." (Touzani et al., 2018, p. 4)	
			Balta-Ozkan, Davidson, Bicket, and Whitmarsh (2013)	Qualitative/public deliberative workshops and expert interviews	Consumers express their concerns about the costs of different aspects of the smart home technology (costs of installation, repairs and maintenance)	According to an Accenture survey (2016a), "consumers report that price is the top barrier to the purchase of IoT devices, with 62% believing these devices are too expensive."
Risk barrier	Perceived security risk	"Unauthorized third-party access of consumers' personal and financial information" (Miyazaki and Fernandez, 2001, p. 56)	Wünderlich et al. (2015)	Conceptual	The invisible and continuous information exchange between IoT devices is a cause of security for consumers	A study by Hewlett Packard in 2015 found that 70% of the most commonly used IoT devices contain serious security problems
			Hoffman and Novak (2015)	Conceptual	Slow rates of adoption for smart home can be traced to a number of hurdles related consumer concerns about price and security	
	Perceived health risk	A physical risk that refers to the concern that the innovation might be harmful, unhealthy of cause injury. (Adapted from Ram and Sheth [1989] and Kleijnen et al. [2009])	Sovacool et al. (2017)	Qualitative/ systematic literature review and observation	Some consumers believe that smart devices wireless networks can expose people to non-ionizing electromagnetic fields	According to an Accenture study (2013), 64% of consumers would like to be informed about the health and safety concerns of smart meters

(Continued)

Table 2. (*Continued*)

Barrier			Justification with Regard to the IoT Context			
			Academic Study			Industry Research
Concept	Construct	Definition	Source	Nature of Study	Relevant Findings	
Image barrier	Self-image incongruence	"Refers to the comparison between a negative product-image and a positive self-image" (Sirgy and Danes, 1982)	Balta-Ozkan et al. (2013)	Qualitative/public deliberative workshops and expert interviews	Some consumers perceive a gap between their lifestyle and the smart home services, which they view as non-essential, luxuries, or "gadgetry"	
Tradition barrier	Need for human interaction	"The importance of human interaction to customers in service encounters" (Dabholkar and Bagozzi, 2002, p. 188)	Wünderlich et al. (2013)	Qualitative/ interviews	The effects of social presence beliefs emerge as important influencers of attitudes and usage behavior of use of smart services	According to an Accenture survey (2016b), banking consumers in North America want customer experiences that combine the latest in digital banking with human interaction
Technological vulnerability barrier	Technological dependence	"A sense of being overly dependent on, and a feeling of being enslaved by, technology" (Ratchford and Barnhart, 2012, p. 1212)	Slettemeås (2009)	Conceptual	The main problems related to IoT are the *lack of human control and the enslavement to devices*	According to an OpinionWay study (2017) conducted in France, the third most important barrier related to IoT devices/services is the fear of dependence (after price and security risk)
			Chouk and Mani (2016)	Netnography	According to Chouk and Mani (2016), IoT devices can generate functional and psychological dependence, which may lead to a resistance reaction	
	Technology anxiety	"Computer anxiety is defined as an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers" (Venkatesh (2000, p. 349)	Touzani et al. (2018)	Qualitative/ interviews	Some users of connected objects live a psychological state of mind characterized by anxiety	
Ideological barrier	Skepticism	"Tendency to doubt, in principle and without evidence, the promises made by commercial sources" (Banikema and Roux, 2014, p. 35)	Touzani et al. (2018)	Qualitative/ interviews	Skepticism may inhibit consumers' usage of IoT devices because of their potential harmful consequences	According to a Penton survey (2016), for 27% of participants there is uncertainty that the IoT will deliver the benefits promised

complexity, which, according to Rogers (1995), refers to the "degree to which an innovation is perceived as difficult to understand and use" (p. 242). The usage barrier arises from two dimensions: the complexity of the idea of innovation (is it easy to understand?) and the complexity of execution (is it easy to use?) (Ram, 1987). Complexity is associated with a cognitive effort that causes consumer resistance (Ram, 1989).

The effect of usage barriers on consumers' resistance is well documented and understood. Various studies point out that the perception of the complexity of using technological innovations makes consumers inclined to reject new services/products (Antioco and Kleijnen, 2010; Kuisma, Laukkanen, and Hiltunen, 2007; Laukkanen, 2016). For example, because mobile devices have small screens, inputting text is inconvenient, and so entering and reading data can be difficult (Bruner and Kumar, 2005). Such difficulties may explain consumer resistance to mobile services (Laukkanen, 2016). In the present study, complexity refers to the perceived cognitive effort made by the consumer in order to use smart services. These new services based on IoT devices may require special technical skills (for example, connecting a smartwatch to one's smartphone or installing software updates) (Mani and Chouk, 2017). Based on previous studies that identify complexity as an antecedent to consumer resistance (e.g., Laukkanen, 2016), the following hypothesis is proposed:

H1: Perceived complexity has a positive effect on consumer resistance to smart services.

Value Barrier: Perceived Price

Value corresponds to the performance-to-price ratio in comparison to substitutes for the product/service (Antioco and Kleijnen, 2010; Molesworth and Suortti, 2002). A value barrier refers to an innovation's lack of monetary value and performance compared to existing products/services (Laukkanen et al., 2008; Ram and Sheth, 1989). In the context of resistance to innovation, the value barrier generally refers to the perceived price of new products or services. The perceived price is associated by the consumer with a monetary sacrifice (Kim, Chan, and Gupta, 2007). According to Zeithaml (1988), the perceived price from the consumer's perspective is what is given up to obtain a product or service.

The influence of the value barrier on resistance to innovation has been widely studied in previous research (Antioco and Kleijnen, 2010; Claudy et al., 2015; Ram and Sheth, 1989). More specifically, in the case of technological innovations in services, the perception of a high price is the most frequently obstacle mentioned by consumers preventing the adoption an innovation (Laukkanen, 2016; Laukkanen et al., 2008). Similarly, recent qualitative research has explained that in the case of IoT devices and services consumers are concerned about the additional cost associated with these technologies (cost of installation, repairs, and maintenance) (Balta-Ozkan et al., 2013) and their low economic or informational benefit (Touzani et al., 2018). Hoffman and Novak (2015) identify price as one of the barriers explaining the slow rates of adoption of smart services.

Based on the Ram and Sheth model and on Zeithaml's (1988) work, we can therefore assume that a perceived high price for an innovation may lead to consumer resistance to smart services. Thus, the following hypothesis is proposed:

H2: Perceived high price has a positive effect on consumer resistance to smart services.

Risk Barrier

Perceived risk theory has been mobilized to analyze and understand consumers' behavior in the face of innovation, and it is defined as the uncertainty associated with a possible loss when aiming for a desired result (Featherman and Pavlou, 2003). According to Ram and Sheth (1989, p. 8), "all innovations, to some extent, represent uncertainty and pose potential side effects that cannot be anticipated." Under these conditions, customers, perceiving a risk, prefer to resist innovation until they can learn more about it (Ram, 1987; Ram and Sheth, 1989). Several types of risk may explain the resistance to innovation (see Kleijnen et al., 2009). However, our research focuses on two facets of risk: security and physical risks. More specifically, in the service context, security risk has been identified as the facet of risk that has the most significant effect on consumer behavior (Laukkanen, 2016). Similarly, physical risk is

considered important if the innovation is a product that could be harmful or cause injury (Kleijnen et al., 2009; Wiedmann, Hennigs, Pankalla, Kassubek, and Seegebarth, 2011).

Perceived security risk. Perceived security risk refers to concern about losing control over personal and private information (Kleijnen, de Ruyter, and Wetzels, 2007) through intrusion by potentially malicious individuals (e.g., piracy and theft of transaction and financial data) or fraudulent behavior by organizations (e.g., false declaration of intentions) (Miyazaki and Fernandez, 2001). For O'Cass and Fenech (2003), security risk involves negative feelings on the part of the consumer as to the ability of retailers and technological tools (e.g., web-based tools) to ensure the security of personal and financial information. In other words, security risk is closely related to uncertainty and to the potentially adverse consequences of the technology-based service experience (Montoya-Weiss, Voss, and Grewal, 2003). Several studies have highlighted the extent of this risk in the context of the intermediation of relations between companies and consumers through technical devices, particularly in the context of the Internet (e.g., O'Cass and Fenech, 2003). For example, Miyazaki and Fernandez (2001) point out that security risk in online shopping refers to two major consumer concerns: (1) system security, including the risk of fraudulent behavior by third parties who breach technological data protection devices in order to acquire consumers' personal, financial, or transaction-oriented information and (2) fraudulent behavior by online retailers, such as intentional misrepresentation or non-delivery of goods ordered. According to these authors, this risk is greater for consumers who are less experienced in the use of the Internet.

In the context of the IoT, recent research suggests that security concerns are a major barrier to adoption of IoT devices and services (Shin and Park, 2017). More specifically, several reports have been published in recent years highlighting critical issues related to the security of IoT devices (for example, a study by Hewlett Packard (2015) found that 70% of the most commonly used IoT devices have serious security problems).

Thus, based on Ram and Sheth's model that considers risk as a resistance barrier and in line with various studies that have identified a positive link between security risk and resistance to services available through electronic channels (e.g., Laukkanen et al., 2008), the following hypothesis is proposed:

H3: Perceived security risk has a positive effect on consumer resistance to smart services.

Perceived health risk. Health risk concerns the physical risk associated with the use of an innovative product (Ram, 1987; Ram and Sheth, 1989). Consumers may link the innovation to the risk of physical harm to their health and therefore express resistance (Kleijnen et al., 2009; Wiedmann et al., 2011). In the area of new technologies, uncertainties exist with regard to their effects on the physical health of the user. The proliferation of high-tech products and their presence in everyday life and intensive use increase this risk. A number of studies have emphasized the harmful effects of certain technologies through electromagnetic waves and radiation (Burgess, 2002). For example, the World Health Organization (2014) recently warned of the dangers of mobile phones, saying in its report that "the electromagnetic fields produced by mobile phones are classified by the International Agency for Research on Cancer as possibly carcinogenic to humans."

In our study, perceived health risk is defined as the degree to which consumers are concerned and worried that IoT devices can have serious consequences for their health (Marakhimov and Joo, 2017). In fact, the health risk from IoT devices could be higher compared to other information technologies (e.g., PC, mobile phone) because IoT devices require a permanent connection through Wi-Fi, RFID, or other protocols. For Marakhimov and Joo (2017), in the presence of a perceived health concern, consumers are more likely to view the use of IoT devices (healthcare wearable devices) as a threat rather than a challenge. Similarly, based on the Ram and Sheth model, health risk constitutes barrier that has a positive impact on resistance (Ram, 1987; Wiedmann et al., 2011). Our hypothesis may be formulated as follows:

H4: Perceived health risk has a positive effect on consumer resistance to smart services.

Image Barrier: Self-Image Incongruence

While in the literature on adoption of innovation the image refers to the degree to which an individual perceives that the use of an innovation will enhance their social status (Venkatesh and Bala, 2008), in the literature on resistance to innovation, the image refers to a psychological barrier related to the identity of innovation. Indeed, Ram and Sheth (1989) explain that innovations acquire a certain identity from their origin, such as the class of products or services and the categories to which they belong. The unfavorable associations with regard to these identities develop unfavorable images in the mind of the consumer (Laukkanen, 2016; Ram and Sheth, 1989). This image barrier can also appear when there is a lack of self-image congruence, that is to say, when the consumer perceives an incompatibility between his image and the image of the innovation.

In this respect, products and services may have personality attributes and psychological associations that determine their image (Sirgy, 1985). Hence, "the psychological comparison between this image of a product, the image of the typical user of that product, and the consumer's self-concept determines the congruence with self-image and, subsequently, consumer behavior" (Antón, Camarero, and Rodríguez, 2013, p. 375). Indeed, consumers tend to refuse innovations that do not conform to their own values, beliefs (Rogers, 1995), and lifestyle (Kleijnen et al., 2004).

According to self-congruity theory (Sirgy, 1985; Sirgy et al., 1997), self-image congruence is a critical psychological variable for understanding the consumer's decision-making mechanism. Previous research has highlighted the impact of self-image congruence on consumer behaviors (e.g., Cowart, Fox, and Wilson, 2008; Kleijnen, de Ruyter, and Andreassen, 2005), attitudes (e.g., Graeff, 1996), and perception of quality of service experience (Hosany and Martin, 2012; O'Cass and Grace, 2008). For example, a number of studies have established a positive link between self-image congruence and adoption (Kleijnen et al., 2005) with regard to a new product or service. Similarly, Antón et al. (2013) hypothesize that in the case of a new technological product (e-book readers) "consumers who perceive [e-book readers] to be compatible with their lifestyle and preferences will display a positive attitude toward them as well as less resistance to change" (Antón et al. 2013, p. 375).

Previous research (e.g., O'Cass and Grace, 2008) suggests that consumers are likely to have a negative attitude or display negative behavior toward a product (or a service or brand) when they identify an incongruence between their image and the product image. Thus, it can be assumed that the perception of a lack of congruence between the image of the smart service/IoT device and the consumer's self-image can trigger resistance. In other words, the possibly negative image of IoT devices, as found by certain previous studies—for example, as gadgetry (Balta-Ozkan et al., 2013) or as lacking added value (Mani and Chouk, 2017)—can run counter to the consumer's self-image.

Thus, in line with the theory of self-congruence and the many studies identifying the negative impact of the lack of congruence between the image of the product, service, or brand and the consumer's self-image (Hosany and Martin, 2012; O'Cass and Grace, 2008), it can be assumed that the less consumers perceive their own image (lifestyle, beliefs, and personality) to be compatible with the image of IoT devices, the more they will resist adopting services based on these devices. Therefore, the following hypothesis is proposed:

H5: Self-image incongruence has a positive effect on consumer resistance to smart services.

Tradition Barrier: Need for Human Interaction

According to Ram and Sheth (1989), the tradition barrier arises when an innovation is incompatible with an individual's existing norms, beliefs, values, and past experiences. In the service context, the image barrier refers to the need for consumers to have human contact in their service experience (Laukkanen and Kiviniemi, 2010). Indeed, for many consumers, a commercial transaction with a service company is an opportunity to interact socially with sales personnel and with other consumers (Dabholkar, 1996). According to Dabholkar and Bagozzi (2002, p. 188), the need for interaction can be defined as "the importance of human interaction to customers in service encounters." Consequently, there is considerable literature emphasizing that need for interaction is an important consumer trait that constitutes an essential dimension of the service experience (e.g., Evanschitzky, Iyer, Pillai, Kenning, and Schütte, 2015; Walker and Johnson, 2006). Several researchers have found that the need for human contact goes hand in hand with a need to avoid machines (e.g., Dabholkar and Bagozzi, 2002).

The development of new technologies has been accompanied by the digitization of various services previously carried out face-to-face (e.g., reception, advice, complaint), and consequently direct contact plays a smaller role. However, previous research has also noted that a powerful need for human interaction may discourage consumers from adopting self-service technologies (Marr and Prendergast, 1993) and may negatively impact their decision to use (Walker and Johnson, 2006) or continue using (Evanschitzky et al., 2015) service-related technology. In the same vein, Walker and Johnson (2006) found that the need for human interaction has a variable influence on consumer behavior. These authors showed that some consumers clearly prefer personal contact under all circumstances. Others may require human contact only on specific occasions (e.g., making a complaint or getting an answer to a particular question or problem). Some people, however, will refuse to use the technology-enabled services because it dispenses with the need for human interaction. In other words, in situations where users want to lodge a complaint, or where they have a problem that requires immediate resolution, as in the banking sector, the need for human interaction seems to be most pronounced (Walker and Johnson, 2006).

In line with this research, it can be assumed that the need for interaction is a psychological variable that impacts consumer behavior in the smart service experience. Indeed, smart services involve IoT devices able to perform tasks autonomously without human intervention. Given their intelligence, these devices can replace employees in various tasks. Hence, in accordance with Ram and Sheth's model and previous works (e.g., Evanschitzky et al., 2015; Laukkanen and Kiviniemi, 2010; Walker and Johnson, 2006), consumers are liable to perceive this lack of human interaction negatively in smart services and can be inclined to resist these new services. Therefore, the following hypothesis is proposed:

H6: The need for human interaction has a positive effect on consumer resistance to smart services.

Technological Vulnerability Barrier

Perceived technological dependence. According to the media system dependency theory, individual media dependency is defined as "a relation where the individual's capacity to reach his or her objectives, depends to a certain extent on the information resources in the medium" (Ball-Rokeach, Rokeach, and Grube, 1984, p. 3). As a result, individuals are increasingly dependent on information resources that are controlled by mass media, such as the Internet and television, to achieve some of their personal and collective objectives (Grant, Guthrie and Ball-Rokeach, 1991). More generally, the proliferation in recent years of new information and communication technologies in various areas such as work, school, and social relations has gone hand in hand with an increased dependence on these technologies.

In our research, the dependence on technology represents a form of non-pathological addiction (Charlton, 2002) and more precisely as "a sense of being overly dependent on, and a feeling of being enslaved by, technology" (Ratchford and Barnhart, 2012, p. 1212). In other words, dependence is a psychological state in which people see themselves as dependent on technology for attaining their objectives or feel that using technology reduces their autonomy. Marketing research shows that as the sophistication of technology products and services continues increasing, a heightened feeling of dependence on technology can have lasting consequences for the well-being of consumers and may inhibit the adoption of the technology (Ratchford and Barnhart, 2012). According to Mani and Chouk (2017), technological products permanently connected to the Internet can generate functional and psychological dependence, which may lead to a resistance reaction.

Several studies have highlighted the negative and dangerous effects on consumers of dependence, such as isolation (Davis, 2001) and technostress (Shu et al., 2011). Moreover, consumers are becoming ever more dependent because they cannot manage without these technologies and their behavior is negatively affected by them (isolation, lack of human interaction, loss of control, etc.) (Shu et al., 2011). These findings are in line with a number of studies in cyber-psychology that point out the negative impact on people of dependence on new information and communication technologies (e.g., Lu, 2008; Young, 2004).

Following the technology adoption propensity index (Ratchford and Barnhart, 2012), in which dependence is identified as a factor inhibiting consumers' adoption of technology, and previous works (e.g., Mani and Chouk, 2017; Shu et al., 2011), the following hypothesis can be formulated:

H7: Perceived technological dependence has a positive effect on consumer resistance to smart services.

Technology anxiety. The proliferation of technologies in all areas (e.g., private life, work, and studies) raises the question of consumers' capacity and willingness to adopt these new technologies to achieve their objectives (Meuter et al., 2005; Parasuraman, 2000). To understand consumers' use of new technologies to achieve their goals, Parasuraman (2000) proposes the concept of technology readiness (TR). This concept describes the propensity of individuals to embrace technology that influences their predisposition to use new technologies (Parasuraman, 2000). The concept of TR suggests that technology readiness is important for consumers' use of technology, while conversely technological anxiety leads to reticence, fear, and apprehension about using new technology (Igbaria and Parasuraman, 1989). In the same vein, Venkatesh (2000) defines technological anxiety (for the particular case of the computer) as the degree of "an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers" (Venkatesh, 2000, p. 349). In this sense, technological anxiety has been identified as an important psychological variable that can influence the adoption process of new services (Evanschitzky et al., 2015; Meuter et al., 2005).

Furthermore, since smart services are based on new technologies that allow consumers to access the service anytime, anywhere, and through any device, technology anxiety may be more critical (compared to conventional services). Touzani et al. (2018) have stressed that the use of IoT devices can cause a psychological state characterized by anxiety. Thus, like Evanschitzky et al. (2015), who identified technology anxiety as a variable that negatively impacts consumers' trial of service innovations, we assume that the proliferation of IoT devices in all domains (e.g., home, work, studies) can increase people's anxiety about these technologies and thus leads to consumer resistance. Hence, the following hypothesis is proposed:

H8: Technology anxiety has a positive effect on consumer resistance to smart services.

Individual Barrier: Inertia

As noted in theoretical background section, the Ram and Sheth model theorizes resistance as the outcome of a set of situational antecedents (functional and psychological barriers) and neglects personal variables specific to each individual (Heidenreich and Handrich, 2015). In the broader framework of SQB theory, our research integrates the preference for maintaining the status quo (inertia) (Polites and Karahanna, 2012) as an individual variable leading to resistance. In an organizational context, Kim and Kankanhalli (2009) demonstrated how the SQB theory can be applied in information systems (IS) research to explain user resistance to new IS-related changes. These authors emphasize that users tend to resist a new information system because of their personal preference to maintain the status quo. Similarly, in the marketing innovation context, for Heidenreich and Handrich (2015), individuals prefer to maintain the status quo for two reasons: (1) the propensity to resist and (2) the satisfaction with the status quo. In fact, consumers who are strongly inclined to resist encounter great difficulty breaking routines and experience cognitive difficulty when faced with innovation (Heidenreich and Spieth, 2013). Furthermore, the consumers' status quo satisfaction implies a tendency to be satisfied with existing products and services (Heidenreich and Spieth, 2013).

In line with this research, we use the SQB theory to take into account the tendency of individuals to maintain the status quo. This tendency refers, according to Polites and Karahanna (2012), to the concept of inertia. We conceptualize inertia as a personal predisposition to prefer the current situation to the uncertainty of change (e.g., uncertainty costs and a loss of control). Thus, in our study, we assume that inertia, which seeks to maintain the status quo, can function as an individual barrier that increases resistance to innovation. The following hypothesis is proposed:

H9: Inertia has a positive effect on consumer resistance to smart services.

Ideological Barrier: General Skepticism toward IoT Devices

Skepticism generally describes the tendency of the individual to disbelieve, doubt, question, and suspend judgment (Bunge, 1991). In marketing, most studies focus on skepticism toward companies' persuasion techniques (e.g., advertising, sellers) (Obermiller and Spangenberg, 2000) and new products (Morel and Pruyn, 2003). The latter is defined as "a consumer's tendency to question any aspect of a new product offering, in any form it may appear" (Morel and Pruyn, 2003). Skepticism in our study is viewed as a psychological barrier that leads consumers to doubt the truthfulness of companies' arguments and discourses about IoT devices and promised benefits. Three types of discourse can be distinguished: (1) marketing discourse, that seeks to promote new products (e.g., advertisements); (2) prospective discourse, that emphasizes the capacity of IoT devices to revolutionize the future (e.g., reports by consultancy firms on the economic potential of IoT devices); and (3) prescriptive discourse based on the technical characteristics and functioning of IoT devices (e.g., demonstration videos).

In this context, attribution theory has been mobilized to explain consumer skepticism about firms' discourses and claims (Skarmeas and Leonidou, 2013). Attribution theory addresses how individuals attribute different causes to events and how their cognitive perception affects their attitudes and behaviors (Heider, 1958; Kelley and Michela, 1980). According to Heider (1958), attributions can be external (the cause of the event is related to an environment, external to the individual) or internal (the cause of the event is due to the individual's personal characteristics and factors).

Attribution theory has been used in marketing to better understand consumer skepticism about firms' practices, messages, and new products (Skarmeas and Leonidou, 2013). On the basis of attribution theory, we can assume that skepticism impacts consumer resistance to smart services through attributional mechanisms such as inertia, technology anxiety, and perceived dependence. Hence, skepticism toward IoT devices can explain how perceived dependence, anxiety, and inertia may influence consumer resistance to smart services. Thus, the following hypotheses are proposed:

H10: General skepticism toward IoT devices mediates the effect of technology anxiety on consumer resistance to smart services.

H11: General skepticism toward IoT devices mediates the effect of perceived technological dependence on consumer resistance to smart services.

H12: General skepticism toward IoT devices mediates the effect of inertia on consumer resistance to smart services.

Consumer Demographics

According to many (e.g., Laukkanen, 2016; Rogers, 1995; Venkatesh et al., 2003), demographic variables are important antecedents in decisions to adopt or reject innovations. With regard to electronic services, the most frequently used demographic variables in past research are gender and age (Laukkanen, 2016). The existing literature also suggests that there is a difference between men and women in their perception of technology-based services. For example, Garbarino and Strahilevitz (2004) pointed out that men, in contrast to women, perceive online services as less risky. Similarly, Laukkanen (2016) found that men are nearly twice as likely as women to adopt services based on mobile technology. With regard to age, existing studies often agree that mature consumers are more inclined to resist technology-based services than young people (Laukkanen, 2016; Laukkanen, Sinkkonen, Kivijärvi, and Laukkanen, 2007). Thus, the following hypotheses are proposed:

H13: Women are more inclined to resist smart services than men.

H14: Mature consumers are more inclined to resist smart services than young consumers.

Methodology and Results

Measures

Consumer resistance to smart services was measured through items adapted from works of Wiedmann et al. (2011), Szmigin and Foxall (1998), and Kleijnen

et al. (2009). To measure perceived complexity, Moore and Benbasat's (1991) scale was used. Regarding the perceived price, the scale of Voss, Parasuraman, and Grewal (1998) was adapted. The scale of Dabholkar (1996) was used to measure the need for human interaction. Congruence with self-image was measured with the three-item scale proposed by Sirgy et al. (1997) and used by Antón et al. (2013). Security perceived risk was measured using the scales of Luarn and Lin (2005) and Parasuraman, Zeithaml, and Malhotra (2005). To measure health risk, Zhang, Tan, Xu and Tan's (2012) scale was adapted. Technological dependence items were adapted from Charlton's (2002) scale. Regarding technology anxiety, the scale of Meuter et al. (2005) was used. Inertia was measured with items from the scale proposed by Heidenreich and Spieth (2013). Finally, general skepticism toward IoT was measured with the three-item scale proposed by Morel and Pruyn (2003). We opted for seven-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree) to measure our constructs. To verify reliability of the scales, Cronbach's alpha and composite reliability values were calculated for each variable. Results show that reliability coefficients are satisfactory (Table 3). Details on the scales are set out in Table 3. With regard to demographics, gender and age were operationalized as dichotomous variables (gender: 1 = men/2 = women; age: "mature" consumers ≥ 42 years/"young" consumers < 42 years; 42 years is the average age of respondents).

Data Collection and Sample Characteristics

A web-based survey was developed to test the variables in the conceptual model. Panel members of a French research company, representative for the French population in terms of gender and age, were asked to fill out an online questionnaire regarding smart services in the banking sector. Three reasons justify the choice of the banking sector to study smart services: (1) IoT banking has a high development potential (Deloitte, 2015), (2) its history of technology usage (Internet banking, mobile banking, etc.), and (2) its familiarity to users (most people have used banking services at some point).

The survey was divided into three sections. In the first section, participants were instructed to watch a video with examples of bank smart services (to make sure that respondents have a good understanding of what a bank smart service could be). The video, lasting 2 min 46 s, depicts a real-life situation involving bank smart services devised by a specialized agency (details on the video are depicted in the supporting information Appendix B). To check the realism of the situation illustrated in the video, the following item was used "The situation described was realistic." Results show that the scenario was considered realistic by respondents with a rating of 5.01 on a scale of 1–7. Moreover, questions to check the ability of the respondents to hear voices and to interpret images were added. Respondents who have not satisfied this criterion have been excluded. In the second section, questions about consumers' perceptions of bank smart services (complexity, security, etc.) were included. The final section was focusing on personal variables (self-congruence, technological dependence, demographic questions, etc.). To improve the attention of respondents, a 10 s break was given after each set of questions.

Data were collected in December 2016. We used 653 completed questionnaires for the data analysis (incomplete questionnaires were disregarded). Respondents were located in different regions in France. Fifty-four percent of respondents are women and 64% are men. Their ages range from 19 years to 67 years. The average age is 42 years. Twenty-seven percent are employees, 11% are retired, and 6% are students. Other socio-professional categories were represented: farmers, business owners, unemployed. Eleven percent of respondents have a household monthly income under 1200 euros, 15% between 3000 and 3500 euros, and 10% more than 4000 euros. Three percent of participants have no diploma, 20% have a college degree, 61% have an undergraduate degree, and 16% have a postgraduate degree.

Psychometric Quality of Constructs

A confirmatory factor analysis using AMOS software was carried out. This analysis showed that all items for the independent variables and the dependent variable loaded highly on the respective constructs and confirmed the unidimensionality of the scales. Furthermore, convergent validity and discriminant validity of the constructs were checked according to the procedure suggested by Fornell and Larcker (1981).

Table 3. Reliability and Convergent Validity

Items	Loading	*t*-value
Perceived Complexity (AVE .81; α .92; CR .93)		
Learning to use smart bank services will be easy for me (R)	.86	30.12
Smart bank services will be easy to use (R)	.96	34.63
It is easy to get results that I desire from smart bank services (R)	.87	–
Perceived Price (AVE .91; α .97; CR .97)		
I think that the fees of the smart bank service will be high	.96	–
I think the smart bank service will be costly	.95	57.48
I think that the smart bank service will be expensive	.96	55.03
Perceived Security Risk (AVE .85; α .95; CR .94)		
The risk of an unauthorized third party overseeing the payment process is high	.93	–
The risk of abuse of usage information (e.g., credit card number, bank account data) is high when using smart bank services	.91	39.68
The risk of abuse of billing information (e.g., credit card number, bank account data) is high when using smart bank services	.93	42.27
Perceived Health Risk (AVE .83; α .94; CR .93)		
I believe that the use of the smart bank services involves risks to my health	.95	39.39
The smart bank services involve risks for its user's health	.90	38.12
I think that the electromagnetic radiations emitted by the devices of smart bank services (connected watch, payment terminals, sensors…) are harmful to my health	.89	–
Self-image Incongruence (AVE .91; α .97; CR .96)		
I identify with the typical smart service user (R)	.96	51.88
I fit in with the typical image of a smart service user (R)	.97	55.13
The image of the typical smart service user reflects the kind of person I am (R)	.93	–
Need for Human Interaction (AVE .69; α .87; CR .87)		
Human contact in providing services makes the process enjoyable for the customer	.86	–
I like interacting with the person who provides the service	.75	21.5
Personal attention by the service employee is not very important to me (R)	.88	24.34
Perceived Technological Dependence (AVE .72; α .88; CR .89)		
I'm afraid of becoming dependent on the technology	.87	–
The technology will reduce my autonomy	.82	24.37
I think my social life will suffer from my use of the technology	.87	25.93
Technological Anxiety (AVE .87; α .90; CR .90)		
I have avoided technology because it is unfamiliar to me	.85	–
I hesitate to use most forms of technology for fear of making mistakes I cannot correct	.85	26.42
I feel apprehensive about using technology	.90	28.27
Inertia (AVE .59; α .94; CR .87)		
I generally consider the change as a negative thing	.77	19.53
I'd rather do the same old things than try new ones	.87	21.92
In my opinion, past technological products were satisfactory so far	.75	–
Overall, I consider that my needs in the technological field have been met by existing technological products	.79	19.88
In general, I resist change	.62	17.00
General Skepticism Toward IoT (AVE .50; α .82; CR .74)		
I am skeptical toward IoT devices	.80	–
I do not think the IoT devices will be successful	.62	14.56
I doubt that IoT devices can actually do what their manufacturers promise	.75	17.26
Resistance (AVE .64; α .95; CR .92)		
In sum, a possible use of smart bank services would cause problems that I don't need	.82	23.77
I would be making a mistake by using smart bank services	.77	22.13
The use of smart bank services would be connected with too many uncertainties	.84	21.70
The smart bank services are not for me	.83	25.20
I'm likely to be opposed to the use of smart bank services	.76	25.86
I'm likely to be opposed to the discourses extolling the benefits of smart bank services	.80	–

AVE: average variance extracted, α: Cronbach's alpha, CR: composite reliability.
R: reversed item.

Convergent validity. To assess the convergent validity of our concepts, two conditions were verified:

- The link between the latent variable and each of its indicators must be significant. Student's *t*-test shows that all the factorial contributions are significant at the level $p = .001$. This condition is confirmed.
- The AVE must be greater than .5. This means that the mean variance shared between the latent variable and its indicators is greater than 50%. When the AVE is greater than this threshold, the variance explained by the items is greater than the variance due to measurement error. As indicated in Table 3, this condition is confirmed.

Discriminant validity. The discriminant validity of the latent variables was tested by demonstrating that the variance that each construct shares with its items is greater than the variance it shares with the other constructs. To this aim, we compared the correlation between the latent variables and the square root of the average variance extracted (AVE). Results show that this condition is verified, thus discriminant validity is confirmed (Table 4).

Test of the Research Model

To test our theoretical model (direct links and mediating effects), a structural equation modeling (AMOS) was used. The fit indices for the model are $\chi^2 = 2993.09$ with degrees of freedom (DF) = 766, comparative fit index (CFI) = .90, Tucker–Lewis index (TLI) = .90, incremental fit index (IFI) = .90, and root mean square area of approximation (RMSEA) = .067, suggesting a good overall model fit (Hair, Black, Babin, Anderson, and Tatham, 2006). Furthermore, two rival models were tested (details on statistical results of these models are provided in supporting information Appendix C). The first model examines exclusively direct effects (no mediator). Results show that the RMSEA could be considered as reasonable (.073); however, the other fit indices are below the usual threshold (CFI = .88, TLI = .87, IFI = .88). In the second model, skepticism toward IoT fully mediates the relationships between all the barriers and consumer resistance to smart services. This rival model showed an RMSEA of .069 but the other fit indices are not satisfactory (CFI = .89, TLI = .88, IFI = .89). Global indices of goodness of fit support our research model.

Antecedents of consumer resistance to smart services. The results indicate that perceived complexity has a significant positive impact on consumer resistance to smart services ($\beta = .36$, CR = 9.89, $p < .001$). H1 is therefore confirmed. H2 is not supported since the effect of perceived price

Table 4. Discriminant Validity

	1	2	3	4	5	6	7	8	9	10	11	12	13
1-Perceived complexity	**0.90**			–									
2-Perceived price	0.07	**0.95**											
3-Security risk	0.12	0.31	**0.92**										
4-Health risk	0.15	0.27	0.28	**0.91**									
5-Self-incongruence	0.34	0.19	0.17	0.33	**0.95**								
6-Need for human interaction	0.01	0.18	0.29	0.12	0.17	**0.83**							
7-Technology dependence	0.15	0.25	0.24	0.36	0.45	0.11	**0.84**						
8-Technology anxiety	0.36	0.16	0.12	0.33	0.63	0.15	0.44	**0.86**					
9-Inertia	0.28	0.21	0.19	0.37	0.59	0.18	0.39	0.61	**0.76**				
10-Resistance	0.53	0.26	0.40	0.39	0.53	0.22	0.33	0.45	0.51	**0.80**			
11-Skepticism	0.44	0.19	0.20	0.33	0.39	0.17	0.45	0.64	0.6	0.53	**0.71**		
12-Age	0.18	0.00	0.00	−0.02	0.06	0.08	0.02	0.13	−0.01	0.05	0.06	n.a	
13-Gender	0.08	0.07	0.01	0.06	0.05	0.03	0.01	0.07	0.07	0.16	0.05	0.03	n.a

Notes: Diagonal elements in bold represent the square roots of the average variance extracted.

Table 5. Results of Mediation Analysis

Path	Direct Effects	Indirect Effects	Total Effects
Perceived technology dependence → Consumer resistance to smart services	.01 (n.s)	.05*	.06 (n.s)
Technological anxiety → Consumer resistance to smart services	−.05 (n.s)	.15*	.10 (n.s)
Inertia → Consumer resistance to smart services	.19*	.12*	.31*

Note: Standardized coefficients are reported; Number of bootstrap samples: 1000; n.s: non-significant, (*): significant effects.

on consumer resistance to smart services is not statistically significant ($p > .05$). This result can be explained by the fact that consumers do not have a clear idea about the price of smart banking services (French banks do not yet offer these services). Moreover, perceived risk security has a positive significant effect on consumer resistance to smart services ($\beta = .26$, CR = 7.60, $p < .001$). This result supports H3. H4 is supported since the effect of perceived health risk on consumer resistance is statistically significant ($\beta = .12$, CR = 4.27, $p < .001$). Self-image incongruence has a significant positive impact on consumer resistance to smart services ($\beta = .19$, CR = 6.88, $p < .001$). Our results hence confirm H5. Need for human interaction has a significant positive effect on consumer resistance to smart services ($\beta = .09$, CR = 2.54, $p = .01$). H6 is then supported. The impact of perceived technological dependence and technology anxiety on consumer resistance to smart services is not significant ($p > .05$). Hence, H7 and H8 are rejected. Inertia is found to be a predictor of consumer resistance to smart services ($\beta = .23$, CR = 4.29, $p < .001$). This result confirms H9. Finally, with regard to the demographic variables, the results show a significant relationship between gender and consumer resistance to smart services ($\beta = .30$, CR = 3.10, $p = .002$); H13 is then validated. However, the impact of consumer age is not significant ($p > .05$). Thus, H14 is not confirmed.

Test for the mediating effects. To test the mediation hypothesis, this research followed the approach of Preacher and Hayes (2008) since the traditional approach by Baron and Kenny (1986) has been criticized. Indeed, the Preacher and Hayes approach was recommended by several innovation researchers (e.g., Spanjol, Mühlmeier, and Tomczak, 2012). Hence, the significance of direct, indirect, and total effects of the structural model was assessed through the use of confidence intervals provided by bootstrap procedures (Preacher and Hayes, 2008). The direct effects refer to the unmediated effects of perceived dependence, technology anxiety, and inertia on consumer resistance to smart services. The indirect effects represent the product of the paths from perceived technological dependence, technology anxiety, and inertia to skepticism and from skepticism to consumer resistance to smart services. The total effects refer to the sum of direct and indirect effects.

Bootstrapping results (Table 5) indicate that the indirect effects are significant (1000 bootstrap samples, 95% bootstrap confidence intervals between .02 and .24), thus providing evidence for mediation.

Further, the Sobel test was used to confirm the mediating role of skepticism toward IoT; the results of the Sobel test support the analyses by confirming the existence of mediated relationships for perceived technological dependence (z-value = 3.53, $p < .05$), technology anxiety (z-value = 4.39, $p < .05$), and for inertia (z-value = 4.37, $p < .05$).

Hence, our findings demonstrate that skepticism toward IoT mediates the relationships between perceived technological dependence, technology anxiety, inertia, and consumer resistance. H10, H11, and H12 are then supported.

Discussion

The purpose of our research is to provide a better understanding of the barriers that lead to consumer resistance to smart services. Accordingly, our paper developed a conceptual model that extends the Ram and Sheth (1989) theoretical framework on consumer resistance to innovation. Our model includes three new categories of barriers (technological vulnerability barriers, ideological barriers, and individual barriers). Overall, our results provide support for the conceptual model.

Specifically, our findings show that perceived complexity is a major barrier to adopting smart services ($\beta = .36$). This result is in line with prior studies that have found a positive impact of perceived complexity on consumer resistance (e.g., Antioco and Kleijnen,

2010; Kuisma et al., 2007). Indeed, smart services use IoT devices equipped with complex and sophisticated technical tools (sensors, microprocessors, actuators, meters, etc.). In this context, consumers do not have necessarily the required skills to understand how these devices work and how to take advantages from these services.

Moreover, contrary to our expectations, price was not significantly related to consumer resistance to smart services. This result is similar to the findings of Kleijnen, Wetzels, and de Ruyter (2004), who found no significant effect between the perceived cost of a banking technology service and the consumer's attitude toward it. These authors account for this finding by suggesting that when the technological service offers high-quality content, the perceived price is less important. In the context of our study, this same finding can be explained by the fact that consumers do not have a clear idea of the price of smart banking services (since French banks do not yet offer these services, it is difficult for consumers to know what they cost).

Our research also empirically confirms the relationship between risk (security risk and health risk) and consumer resistance. This result is in line with previous research showing that the perception of innovation-related uncertainty leads to consumers' resistance to new products or services (e.g., Joachim et al., 2018; Kleijnen et al., 2009; Wiedmann et al., 2011). Specifically, security risk has been identified by Rudolph et al. (2004) as the main obstacle to purchasing on the Internet. Similarly, our research shows that smart services are associated with risks related to fears about being hacked (e.g., the possibility that hackers take control of an IoT device) and the theft of sensitive data provided by the consumer (e.g., credit card numbers). This fear can be explained by the connectivity of IoT devices that exposes their security system to higher vulnerability (these devices could be connected to several external networks: Internet, other devices, NFC, etc.).

In addition, our research highlights an original aspect of physical risk, namely health risk. While a number of previous studies have tested the role of various types of perceived risk (e.g., security risk, performance risk, psychological risk, etc.) as barriers contributing to resistance to innovation (e.g., Joachim et al., 2018; Kleijnen et al., 2009; Wiedmann et al., 2011), none of them have examined the specific case of health risk. Our results reveal, however, that it is important to take this risk into account since some technological innovations are perceived by consumers as increasingly dangerous to health. Indeed, wearable contactless payment solutions could have adverse health effects.

Furthermore, whereas previous research on consumer resistance has used the image of innovation to examine the image barrier (e.g., Laukkanen, 2016; Laukkanen and Kiviniemi, 2010), our research studied this barrier from the original standpoint of self-image congruence. O'Cass and Grace (2008) showed that image congruency contributes to the understanding of retail store choice. For Antón et al. (2013), self-image congruence appears to have a considerable effect on consumers' adoption behavior. Our research extends these works by showing that self-image congruence is relevant to understand potential consumer resistance to an innovation. Indeed, some consumers perceive a gap between their image and the smart services, which they view as non-essential, luxuries, or "gadgetry."

Our study also reveals that the need for human interaction (tradition barrier) is one of the drivers of consumer resistance. This is an interesting result insofar as smart services use IoT devices able to perform tasks autonomously without employee's intervention. This finding is possibly accounted for by the fact that consumers are used to being in contact with bank employees in the service experience. Our result is in line with the work of Walker and Johnson (2006), for whom the need for human interaction is an important variable in the banking sector. Because consumers perceive a greater risk due to the financial nature of transactions, they experience a greater need to be in contact with bank employees so as to quickly resolve any potential problems.

With regard to technology vulnerability barriers, our findings suggest that technology anxiety and technological dependence do not directly impact consumer resistance to smart services. Instead, the effect of technology vulnerability barriers (technology anxiety and technological dependence) is captured by skepticism toward the IoT. Although Mani and Chouk (2017) found no direct effect between technological dependence and resistance, the present study extends this work by providing empirical evidence of the indirect impact of this variable on consumer resistance (through skepticism toward the IoT). Our findings enrich the literature by providing evidence of the critical role of skepticism toward the

IoT in understanding the relationship between technology vulnerability barriers and the development of consumer resistance. Hence, the perception of a technological vulnerability by the consumer increases first the skepticism toward IoT which in turn leads to the resistance to smart services.

In addition, the results indicate that consumer resistance to innovation may be caused by individual barriers. Thus, inertia is a barrier that impacts consumer resistance to smart services, both directly and indirectly (through skepticism toward the IoT). This result is in line with previous research (e.g., Heidenreich and Handrich, 2015; Heidenreich and Spieth, 2013), which highlights the importance of individual predispositions in explaining the mechanism of resistance to innovation. In other words, within a context of uncertainties related to a new service (smart service), inertia inclines the consumer to prefer the current situation and thus to manifest resistance.

With regard to gender, our findings indicate that women report a higher level of resistance to smart bank services than men. This result is in line with previous research (e.g., Laukkanen, 2016). It can be explained by works in psychology showing a gender difference in decision-making and risk perception (e.g., Arch, 1993; Byrne and Worthy, 2015). A meta-analysis by Byrnes, Miller, and Schafer (1999) compared risk-taking tendencies of men and women. Their results support the idea that men are more likely to take risks than women. According to Arch (1993, p. 3), in a risky situation, "males are more likely to see a challenge that calls forth participation while females tend to respond as to a threat in ways that encourage avoidance of the risk." Given that the use of smart services in the banking context could be associated to a certain level of risk (security and privacy issues), women tend to be more reluctant to try this innovation.

Last, the relationship between age and consumer resistance to smart services was not significant. This finding may be due to two possible reasons. First, our result can be explained by the use of an Internet-based panel for the data collection. In fact, it seems that these respondents are heavier users of the Internet than the average consumer (Fulgoni, 2014). Consequently, mature Internet panel respondents are more familiar with technology than mature people in the population. This may explain the fact they don't report a significantly higher level of resistance to bank smart services than "younger" consumers. A second possible explanation is that the generational digital divide is shrinking between mature consumers and younger ones. Indeed, a survey conducted by TNS Sofres (2016) revealed that French elderly consumers are becoming increasingly connected and only 7% are opposed to the use of Internet based technologies.

Implications

Theoretical Implications

Prior work on the adoption of innovations has been criticized for neglecting factors that lead to the rejection of innovations (Claudy et al., 2015). The present research contributes to the existing literature on resistance to innovation in various respects. Indeed, our paper has extended and updated the Ram and Sheth model in three respects.

First, three additional types of barriers were examined: technological vulnerability barriers, ideological barriers, and individual barriers. Existing research on resistance to innovation generally uses the Ram and Sheth (1989) model as a theoretical framework (e.g., Antioco and Kleijnen, 2010; Laukkanen, 2016; Laukkanen et al., 2008) by applying the five original barriers: usage barrier, value barrier, risk barrier, tradition barrier, and image barrier. The fact that the Ram and Sheth model is limited to five barriers has been criticized in previous studies (Joachim et al., 2018). Our research enriches the existing literature by (1) adapting the Ram and Sheth (1989) model to the evolution of digital technologies (Heinze et al., 2017) (technological vulnerability barriers), (2) taking into account the ideological aspect of resistance (Roux, 2007) (ideological barriers), and considering dispositional variables (Kim and Kankanhalli, 2009) (individual barriers).

Second, our study highlighted the key role of skepticism (ideological barrier) as a mediator of the relationship between technological vulnerability and individual barriers on the one hand and consumer resistance on the other. While skepticism has been studied in previous research as an antecedent to resistance (Banikema and Roux, 2014) or as an outcome of internal and external attributions (Skarmeas and Leonidou, 2013), our research emphasizes its mediating role in explaining consumer resistance.

This study has a third key theoretical implication in terms of SQB theory. This theory was developed

to explain bias toward maintaining the status quo in human decision-making and behavior (Samuelson and Zeckhauser, 1988), and it has been applied in specific areas such as resistance to reform in government (Fernandez and Rodrik, 1991) and user resistance to information systems in an organizational context (Kim and Kankanhalli, 2009). Our findings show empirically that inertia has not only a direct effect but also an indirect effect (through skepticism) on consumer resistance. As an extension of previous research, this study has demonstrated that combining the Ram and Sheth model and SQB theory can be relevant for providing a better understanding of consumer resistance to smart services.

Managerial Implications

One of the major issues for managers is to reduce consumers' resistance to new services and thus avoid their failure. More specifically, this study has numerous practical implications that contribute to new service development and marketing in the service sector.

Managerial implications with regard to functional barriers. First, our findings demonstrate that it is important for companies to reinforce the perceived security of smart services. As our results show, perceived security is a significant variable for consumers particularly in a sector in which sensitive data are exchanged (private data, financial information, geographical location, etc.). Accordingly, companies wishing to offer smart services need to reinforce their security in two ways. First, they can work on the technical capabilities of IoT devices so as to offer enhanced security protocols to consumers. Indeed, through IoT, consumers can, for example, strengthen access to their accounts by double authentication, using biometric data (heartbeat rhythm). This capability reassures consumers regarding data protection and reduces the perceived risk of security. The second lever involves implementing R&D investment strategy in the area of cyber-security. For example, investing in "blockchain technology" may be of interest in enhancing operational safety. Such investment needs to be made within the framework of a strategy that variously involves users, employees, manufacturers, and experts from other sectors (e.g., healthcare, industry, etc.). The interactions between these actors make it possible to trace information on security breaches. Manufacturers are thus able think about the conception and design of IoT devices by taking into account their enhanced security from the outset.

Our results also identify perceived complexity as an important barrier that contributes to consumer resistance to smart services ($\beta = .36$). It is important for companies to take this variable into account and make smart services more intuitive and easier to use. Hence, working on the design of IoT devices, simplifying setup procedures, and personal data management are important levers. Indeed, the collection of data through different sensors in the IoT is going to trigger a massive influx of big data. Since IoT devices can generate very sensitive personal information, we recommend that firms use the concept of "privacy by design" (Cavoukian, 2012) to make less complex personal data management. The core idea of this notion is that privacy is embedded into the design and architecture of IT systems. For example, IoT firms can incorporate features into the design of the IoT devices that allow the user to easily erase collected data.

Furthermore, our results show that smart services worry consumers in terms of health risks, particularly those who are aware of the proliferation of sources of electromagnetic radiation. As mentioned earlier, one of the characteristics of the IoT is its ubiquity. Consequently, compared to other new technologies, consumers could be exposed to a large volume of radiation. Hence, healthcare concerns are particularly critical. To reassure consumers, companies could work with independent organizations to test the IoT devices used in smart services. These organizations can create labels certifying the safety of these products.

Managerial implications with regard to psychological barriers. Although it is difficult for firms to directly influence psychological variables, it is important to take them into account when setting up smart services. Companies should first address the perceived compatibility between the consumer's self-image and the image of the smart service. To this end, the advertising of smart services should aim to make consumers feel that smart devices are compatible with their behaviors and habits. Advertising campaigns should highlight how the image of smart services will enhance consumers' self-image (modernity, need for mobility, need for ubiquity, etc.).

Moreover, our results show that general skepticism toward IoT devices is a factor that should not

be ignored. Indeed, it is one of the key drivers of consumer resistance. Since technological dependence and technology anxiety have an impact on skepticism, it is important for firms to take these variables into account. To reduce technology anxiety, we recommend that managers enhance consumers' perception of power and control. In this regard, firms can develop communication strategies showing that, thanks to their intelligence and connectivity features, IoT devices can provide more control through IoT applications useful to consumers' daily lives (smart door locks, pet tracking, etc.). In addition, to overcome the fear of technological dependence, firms should not impose the use of IoT-based services on consumers. Instead, firms should always make alternative offers that do not include the IoT. Indeed, when consumers perceive a threat to their freedom of choice or a limitation of the range of alternatives, this can lead to psychological reactance and hence to consumer resistance.

Finally, our findings show that even though consumers are increasingly familiar with the use of technology in their daily lives, the need for human interaction is still important from their point of view. In this respect, customers should have a hybrid experience that alternates the use of smart services and a human interaction when necessary. The latter will need to be trained in the skills needed to provide support regarding the use of smart services. Moreover, thanks to the IoT, personal contact can enhance the user service quality experience by providing personalized and real-time offers. For example, a wearable device could trigger an alert to a bank when a potential consumer walks into a car dealership. The most advantageous credit offer could then be proposed in real time to the customer by his bank advisor.

Conclusion, Limitations, and Possible Future Research

Despite the rapid growth of IoT devices and IoT-based services, academic research is still in its infancy. However, the development of studies focused on the evaluation of these innovations from a user-centered perspective is critical for the development of this new technology (Shin, 2017). Our study contributes to a better understanding of the barriers leading to resistance to smart services as an innovation from a consumer perspective. This approach responds to calls for further research into service innovation (Dotzel et al., 2013; O'Cass et al., 2013; Storey et al., 2015) and also highlights the challenges in terms of service innovation in a rapidly changing context (Ostrom et al., 2015).

Although our findings have interesting theoretical and managerial implications for understanding and overcoming consumer resistance to smart services, the study has some limitations. Although, indeed, the choice of a financial context for our research protocol prevents generalizing the findings to other economic sectors and to other countries, banking is viewed as a service associated with many risks for consumers, which can amplify their fears and accentuate their resistance (Laukkanen, 2016). It would be interesting to conduct another study in a different service sector such as tourism by way of comparison. Moreover, our research was conducted in a French context; it would be interesting to replicate it in other countries so as to identify cultural differences in terms of resistance behavior. In addition, our experiment protocol is based on a video that puts the consumer in a situation involving a smart service. Even though we ensured that the situation was realistic, consumers have not yet encountered the smart services presented in the video. Hence, this paper did not study actual consumer behavior. Future research could focus on real use of smart services and examine other dependent variables such as consumer potential dissatisfaction and distrust. Furthermore, other factors that may explain resistance to smart services were not included in this work, such as privacy concerns, self-efficacy, and performance risk. It would be interesting to take into account these variables in future research. Similarly, our model will benefit from moderating effects of individual variables such as technological innovativeness, techno-familiarity, and involvement. Exploring how these variables influence the relationship between barriers and consumer resistance to innovation could be a fruitful avenue for further research. Finally, the IoT is stimulating studies in several disciplines (marketing, IS, computer science, etc.). A future challenge is to conduct multidisciplinary studies that will provide a more complete and richer perspective of the impact of the development of the IoT on our lives.

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