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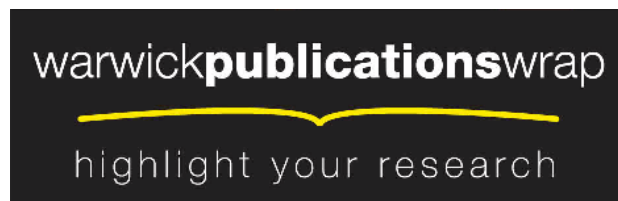
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“Futurizing” smart service: implications for service researchers and managers

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“Futurizing” Smart Service: Implications for Service Researchers and Managers¹

Academics and business practitioners agree that technology has been a major driving force behind the progress of today’s service world (Meuter et al., 2005; Rust and Huang, 2014). More recently, driven by advancements in communication technologies, microchip design, sensors, power efficiency, and more broadly the Internet of Things, the possibility to remotely connect to objects and products has given rise to the emergence of smart services (Wunderlich et al., 2013). For example, Caterpillar integrates sensors into the design of its vehicles. By doing this Caterpillar is able to provide operators and service personnel with information about potential problems related to the machine as well as instructions concerning the appropriate action whether that be “modifying machine operation, notifying the shop of needed maintenance, or performing a safe shutdown of the machine” (Zeithaml et al., 2014, p. 9). Another example is *Ambient Assisted Living*, where a house or a person is equipped with sensors and actors monitor the person’s activity. If, for example, a person falls and attempts to contact her/him are not successful, the technology can automatically send a notice to relatives or an emergency physician, who can then decide on the appropriate action (Steinke et al., 2014).

These examples illustrate a special service type – a smart service - that is delivered to or via an intelligent object that is able to sense its own condition and its surroundings and thus allows for real-time data collection, continuous communication, and interactive feedback (Allmendinger and Lombreglia, 2005). The intelligent object of a smart service may be associated with an individual customer (e.g., health monitoring), a group of customers (e.g., family home monitoring) or a firm (e.g., monitoring of industrial equipment). Managers can use the information gathered through intelligent objects to improve their service offerings and let customers benefit from customized service features.

Despite the accelerating development of these smart services, academic research is still in its infancy. We see the need to further explore the effect that smart service has on organizations, customers and the evolving service landscape. Smart technologies have great potential; however, their success requires an in-depth understanding of customer perceptions and behaviors. Moreover, it is important to understand how we can design and innovate services and business models to move from smart technologies to smart services that add

¹ This article is based on discussions in the workshop on “Fresh perspectives on technology in service” at the *International Network of Service Researchers* on September 26, 2014 at CTF, Karlstad, Sweden.

value to customers (Norman, 2007). Thus, the main objective of this essay is to craft an agenda to advance smart service research that is guiding researchers and practitioners alike. In the following, we will first discuss fruitful research avenues in the B2C area such as exploring “perceived embeddedness”, control and value perceptions of consumers regarding smart services, and then focus on research implications regarding the organization and management of business models predominantly applied to B2B environments.

Investigating the Nature of Smart Service and Consumers’ Perception of Embeddedness

So far literature on smart services has provided a discussion of the characteristics of this service type, has shown how smart services differ from other technology-mediated services and explored how smart services affect markets and industries (Allmendinger & Lombreglia, 2005; Biehl et al., 2004; Porter and Heppelmann, 2014; Schumann et al., 2012). Research has identified technology characteristics, customer characteristics and context specific perceptions such as privacy concerns as factors affecting the perception and adoption of smart services (Wunderlich et al., 2013). Customers perceive smart services as highly risky if they are invisible, feature a high level of automated decision making or enable the service provider to access sensitive information. The increased risk perception is mainly driven by fear of privacy violations and concerns about data security (Keh and Pang, 2010). As previous research has mainly been conducted in B2B environments, there is a vast knowledge gap on how smart services affect end consumers’ perceptions in B2C environments.

We propose that – beyond the factors already identified as being relevant in business settings (e.g., invisibility and autonomous decision-making) – the specific level of “perceived embeddedness” plays a major role and defines the nature of the smart service offering in B2C environments. Consumers’ perception of smart service may relate to how deeply smart technologies are embedded in their lives. The most extreme example is when intelligent objects such as pacemakers and implanted cardioverter defibrillators are embedded in human bodies. However, perceived embeddedness may also relate to how visible the smart technology is or how consistently intelligent objects monitor and affect consumers’ behavior. Different levels of perceived embeddedness might trigger different emotional responses in consumers. We need to explore in depth what “perceived embeddedness” is, how to define it and how we can measure it. We encourage researchers to investigate the contexts that shape

the perception of embeddedness. How is embeddedness perceived by consumers across different application scenarios?

In addition to different levels of embeddedness, smart services embody varying degrees of autonomous and/or intelligent decision-making via the object. This ranges from alerting a consumer when a parameter is exceeded (e.g., notifying a patient when blood sugar levels are too high) to self-regulating processes (e.g., administering insulin or adjusting temperature to prevent over-heating in smart homes) thereby relieving the consumer of both the monitoring and decision-making necessity. While some smart service applications provide observable cues to the consumer (e.g., Disney's *MagicBand* that allows for payment services or tracking lost visitors in the park), other smart services operate invisibly (e.g., remote monitoring of medical equipment) unless the consumer actively queries the status and logged information. However, the invisible and continuous information exchange is a cause of security and privacy concerns for potential consumers (even if the smart services do not include autonomous decision-making), especially in telehealth services (Rixon et al., 2013).

We assume that customer concerns about smart services dramatically increase with increasing embeddedness of the technology in their lives and bodies. Future research should explore how the level of perceived embeddedness affects consumers' initial acceptance or resistance to use smart services. Further studies should analyze how strongly characteristics such as invisibility and autonomous decision-making of the smart service affect end consumers' smart service adoption and how this relates to different levels of perceived embeddedness.

Analyzing Consumers' Control Perceptions of Smart Services

Research has shown that smart service business customers see lacking control options as a main hindrance for smart service adoption and express a strong desire not only for increased visibility of system actions but also for the power to override or change them (Wunderlich et al., 2013; Paluch and Blut, 2013). Regarding end consumers' responses to technological products Mick and Fournier (1998) emphasized the existence of the control/chaos and freedom/enslavement paradox. For example, technology was seen as a supportive tool to facilitate regulation, order and independence and, at the same time, technology was seen to lead to dependence.

Future studies should investigate whether and how the importance of control perceptions as known from studies in the B2B context applies to end consumers' perceptions of smart services in B2C environments. If, as we suspect, control perceptions are also important to consumers in B2C contexts but differ in their characteristics and manifestations, managers and researchers alike should develop new design approaches that enhance the perception of control, the visibility of the smart service process and quality signals for B2C services.

We recommend further analysis of whether the control/chaos and freedom/enslavement paradoxes apply to consumers' reactions to smart services. Smart service technology might enable consumers to feel more in control and, at the same time, could enhance the feeling that consumers lose control over the service process or outcome. For example, health-related ubiquitous monitoring devices can help free patients from life disruptions like doctors appointments, but they also give health care providers greater control via a more omnipotent and objectified view of the patient, which can contribute to the dehumanization of health care (Tian et al., 2014). We encourage research to further explore the relationship of the juxtaposing control perceptions of end consumers in a smart service context and analyze how these affect consumers' perception and adoption of smart services.

Exploring Consumers' Co-Creation of Value of Smart Service

The invisibility of smart services not only affects how consumers perceive risk and control options; it also sets the boundaries of how value can be co-created. The importance of a consumer's co-creation of value has been emphasized repeatedly. Consumers appreciate co-creating and interacting with the service provider in the service process (Prahalad and Ramaswamy, 2004). In a smart service context, however, the consumer's co-creation might be challenging and requires skills and effort. For example, in the energy industry, the potential of smart grid technology to increase energy system flexibility and create value for consumers is very promising. But this would require active participation of consumers connected to the grid to smoothen demand in situations/times with large variations in the energy supply (e.g., from renewable energy sources). By exploring a smart metering infrastructure, it will be possible to have real-time information about capacity usage and renewable energy production, which enables the development of new smart services for customers. Consumers may be requested to dynamically reduce their consumption in exchange for some incentives (price reduction, sustainability outcomes), and may define their

responses in an automatic way (e.g., turning on and off appliances according to those incentives). The success of the innovation is dependent on the value consumers see in smart services and in how much they value their own active participation. In the energy smart services example, it may not be enough for the consumer to receive a reduced monthly bill to attach value to smart services (Viana and Patrício, 2012).

One main research avenue is to explore new forms of value co-creation through smart services and how this shapes the value proposition for consumers and service providers. Service managers have to integrate smart services into an overall solution that consumers are aware of and find valuable. Research should explore how consumers co-create and assess smart services and how they can be made to be aware of the value of a smart service when it is not sensorily perceptible.

Developing New Business Models Based on Smart Services

Companies across industries that have their origins in producing goods and heavy machinery increasingly acknowledge the importance of services to their business models. The core technologies of smart services that enable remote monitoring have been used in B2B services for some years. By the late 1980s embedded sensors were being used in diverse products such as computers and elevators. However, it is only recently that the broader use of smart services has led to the need for and creation of radically new business models and services. This in turn has led to major organizational change in companies that provide higher value product-related services.

One of the challenges for organizations is how to efficiently derive profitable new business models based on smart service provision (Reinartz and Ulaga, 2008). Providers that offer smart services as added value services to machines or within guarantee services and want to move smart services from free to fee are faced with customer unwillingness to pay extra for these services, arguing that providers also benefit through travel cost reduction and increased flexibility. However, the availability of smart technologies has already led organizations to change their business models from product-centric to solution-based models (Brax and Jonsson, 2009). For example, Rolls Royce uses remote sensors to monitor real time engine data in flight as a key part of its service offering, where it sells use (power by the hour) rather than selling aero engines. This shift to solution-oriented business models based on smart service delivery has led to the need for a dedicated customer-facing organization,

and developing a greater service culture. In particular, there is a perceived need for changes in the way the organization interacts with customers in information exchange, organizational linkages, legal bonds, cooperative norms and buyer and supplier adaptation (Bastl et al., 2012).

To accelerate the development of smart service offerings, it is important that researchers and managers collaborate in identifying profitable business models and smart service strategies. Organizations need to adapt their business models, internal cost structures and their product/service offerings to accommodate the new smart service business models. Still, there is no knowledge on how - or how dramatically - an organization has to adapt to the smart service paradigm. Research should give organizations guidance addressing questions such as: How should the workforce be organized if work is increasingly done remotely? Should there be a separation between the product organization and the service organization?

Depending on the context of the smart service provision, the importance of physical facilities for delivering solutions to customers might change (Baines et al., 2011). On the one hand, the increase in service provision may require more decentralized facilities, closer to customers. On the other hand, smart services are usually provided remotely and thus do not depend on physical facilities or geographical proximities of service provider and customer organizations. Future research should identify the trade-offs between physical facilities, digital representation and storage facilities. We encourage future studies to closely examine whether the need for physical facilities is dependent on the stage of the service such as the installation/initiation stage or the post-consumption stage. The need for geographical proximity may arise primarily in the set-up/installation stage, after which it may be reduced. Furthermore, researchers should think about flexible facility arrangements that might be able to cater to the different needs of the set-up and operation stages.

Conclusions

Smart services are gaining strategic importance in B2B and B2C environments and have attracted much attention by service managers and researchers alike. Our essay highlights several research areas that should be explored in the future to advance smart service research and practice. For this we identified research avenues pertaining to both B2B and B2C

environments. We encourage researchers to explore end consumers' perception and acceptance of smart services. We propose that the nature of smart services is determined by the level of embeddedness of the smart technology in consumers' lives or bodies amongst other factors. As such we encourage further research on "perceived embeddedness" and additional factors that driver end consumers' attitudes and behaviors. We specifically call for research that examines potential juxtaposing perceptions of control and its consequences. Moreover, we propose that future research should address how and why consumers co-create value in smart services and how this can lead to prosperous service innovations. Finally, the provision of smart services requires new business models and organizational changes. We call for research that helps to increase firms' capability to provide smart service provision. We summarize the direct questions that follow from our discussion in Table 1.

-- Insert Table 1 here --

We hope that the research opportunities discussed in this paper will stimulate fruitful and exciting future research and advance the understanding and practice of smart services. For this we call for collaborations between business practitioners and researchers that will extend our knowledge by developing, implementing and running smart services and scientifically evaluating the consequences of and the factors that influence the success of these offerings.

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Table 1: Future Research Questions

B2C	Investigating the Nature of Smart Services and Consumers' Perception of "Embeddedness"	<ul style="list-style-type: none"> • What is consumers' "perceived embeddedness" of the smart technology and how can we measure it? • Which factors influence "perceived embeddedness"? • How do different levels of "perceived embeddedness" affect consumers' emotional and behavioral responses such as acceptance or resistance to use smart services? • How do different levels of "perceived embeddedness" interplay with consumers' perception of autonomy and visibility?
	Analyzing Consumers' Control Perceptions of Smart Services	<ul style="list-style-type: none"> • Which factors affect consumers' adoption of smart services, e.g., control perceptions? • How can service systems be designed to influence control perceptions? • Do consumers have juxtaposing control perceptions while using smart services? • How do these juxtaposing control perceptions affect consumers' smart service perception and adoption?
	Exploring Consumers' Co-Creation of Value of Smart Services	<ul style="list-style-type: none"> • How can value be co-created through smart services? • How do new forms of value co-creation shape the value proposition for consumers and service providers? • How can service systems be designed to make consumers aware of the value of a smart service?
B2B	Developing New Business Models Based on Smart Services	<ul style="list-style-type: none"> • What are profitable business models and smart service strategies? • How can organizations adapt their current business models to match the requirements for smart service provision? • How should the workforce be organized if work is increasingly done remotely? Should there be a separation between the product organization and the service organization? • Does the provision of smart services require more or fewer decentralized physical facilities? • Are there flexible facility arrangements able to cater to the different needs depending on the operational stage of the service provision?