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Contexts of Consumption and Their Evolution in the Digital Age: Beyond the Service-Dominant Logic

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Abstract: Starting from the observation of a conceptual gap regarding the association between consumption and the contexts in which it occurs, the paper has two objectives. The first is to fill this gap by developing a framework that includes: the identification of consumption contexts based on their building blocks (actors, goods, relationships), the basic classification of their variety, and a knowledge-based reading of consumption contexts capable of explaining their functioning. The second aim is to show that the framework allows the understanding of the digital transformation of consumption contexts. We show that services are produced in two contexts: in the first type, consumers interact directly with goods; in the second, the intermediation of frontline personnel comes into play. Actors and goods present in the consumption contexts are knowledge-holders, and the relationships between them are learning relationships. The shift from traditional consumption contexts to contexts based on artificial intelligence and the internet of things introduces a major change in that learning relationships are no longer the domain of only (human) actors who learn by interacting with each other and using goods. Both types of contexts are in fact powered by smart goods capable of interacting with each other and with humans within a given context and endowed with structural cognitive connections outside that context.

Keywords: goods; services; consumers; frontline personnel; consumption contexts; artificial intelligence

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1. Introduction

The literature of marketing has always devoted great attention to how goods are designed, communicated, priced and distributed, while much less attention has been given to how they are used in the contexts in which they are in the hands of consumers, or employees who serve consumers. By contrast, explicit or implicit reference to consumption contexts, wherein specific actors use specific goods at certain points in time and in specific spaces, is frequent in other and more specialized strands of research: the management or marketing literature specifically devoted to services (e.g., Drengner et al. 2018; Han et al. 2008); those studies that have adopted the perspective of the consumer as prosumer (consumer *and* producer) initiated by Ritzer (1993); and the sociological literature on the domestication process that technological artifacts undergo when they enter the household setting or contexts outside the home, for instance, within the car (Haddon 2006). However, none of these approaches has developed a conceptualization of consumption contexts.

One step in the direction of consumption contextualization has certainly been taken by service-dominant logic (SDL) in the course of its evolution beginning with an essay by Vargo and Lusch (2004) published in the *Journal of Marketing*. Furthermore, during its evolution, SDL has gained a leading position even beyond the boundaries of the marketing literature, earning the title of 'academic brand' (Bocconcelli et al. 2020; Cova et al. 2009). The SDL seminal contribution states that goods are service-provision mechanisms whatever the context in which consumers come in contact with them (Vargo and Lusch 2004). Furthermore, SDL claims that goods provide services because of the knowledge embedded in those artifacts (Vargo and Lusch 2004) and that their value depends on the contextualized

use of them (Vargo et al. 2008). However, SDL scholars neither develop their insight about knowledge in use (and in contexts) nor even go deeper in the analysis of consumption contexts, particularly with regard to the heterogeneity of these contexts.

Despite the step forward made by SDL, there therefore remains a conspicuous conceptual gap regarding the association between consumption processes and the contexts in which they occur. The first goal of this theoretical paper is to fill this gap by developing a framework that includes: the identification of consumption contexts based on their essential building blocks (actors, artifacts, relationships), the basic classification of their variety, and a knowledge-based reading of consumption contexts capable of explaining their functioning. In developing this framework, we confronted the tradition of SDL studies (Vargo and Lusch 2018) in order to account for the step forward our analysis takes from that perspective regarding the contextualization of consumption. In addition, reference has been made to various empirical studies, for example, carried out in the wake of prosumption theory (Ritzer 2014), both to anchor our theoretical proposal in observed facts and to highlight how it manages to connect phenomena that would otherwise remain unrelated.

The lack of conceptualization regarding consumption contexts looks even more likely to be overcome when we consider the fourth industrial revolution rooted on Industry 4.0 technologies, that is the digital revolution that is changing the world (Schwab 2017). The presence in these contexts of intelligent goods such as service or domestic robots based on artificial intelligence (AI) and internet of things (IoT) changes them (Davenport et al. 2020). As García et al. (2017, p. 7) say, AI and IoT are 'two ideas which describe the future, walk together, and complement each other'. How do these technologies describe the future of consumption contexts? Answering this question represents the second goal of this paper. Precisely, the aim is to show that the conceptual framework we have devoloped also allows us to understand the digital transformation of consumption contexts. This was done by drawing on literature showing the characteristics and uses of digital technologies, especially AI and IoT, in consumption contexts.

The analysis developed in the paper is structured as follows. The first step (Section 2 of the paper) introduces the two key constructs of consumption contexts (actors and goods) and analyzes the difference between contexts in which consumers directly exploit the capacity of goods to provide services and contexts in which the mediation of frontline personnel comes into play. The second step (Section 3) proposes a knowledge-based reading of consumption contexts, while the last one (Section 4) uses the developed framework to explain how consumption contexts change when goods are associated with AI and the IoT.

2. Conceptualizing the Variety of Consumption Contexts

Following the classic division between consumer marketing and industrial marketing (Cova and Salle 2008), the following analysis deals with consumers as individuals or families who buy goods and services for their own use.

The SDL literature interprets economic (and non-economic) exchanges as services (Lusch and Vargo 2018; Vargo and Akaka 2009). This is because goods are inextricably linked to the services they can provide. In fact, one of the foundational premises of SDL contained in the seminal contribution of Vargo and Lusch (2004) states: 'goods are distribution mechanisms for service provision' (p. 8). However, if thinking of goods as artifacts used in service provision contributes to blurring the distinction between goods and services, it cannot be denied that, for example, a consumer who buys a razor to shave himself represents a clearly different situation from a consumer who enters a barber shop to get shaved with a razor handled by a barber. What distinguishes the two situations is the different context in which the use of the good (the razor) and service provision occurs.

Curiously, such an obvious difference between consumption contexts has remained essentially overlooked by SDL. Nevertheless, in both contexts, goods play the role that SDL assigns to them, i.e., mechanisms for service provision. Therefore, we agree with Vargo and Lusch (2004) when they state that 'a well-designed and easy-to-use razor replaces barbering services' (p. 9), since in this sentence they implicitly mean that it is not the razor that replaces

barbering services but the services it can directly provide to consumers. Consistently, we recognize that consumers' use of goods is 'a special case of service provision' (Vargo and Lusch 2017, p. 54). In addition, and most important, the way service provision takes place is very different in the two cases (contexts), while what paradoxically remains invariant is precisely the razor as an artifact to provide services.

2.1. Type A Contexts, Type B Contexts, and Hybrids

Focusing on goods, i.e., artifacts used in service provision and produced by manufacturing firms, there are two general types of contexts of use in which consumers are engaged (Figure 1). In the first, let's call them type A contexts, goods are used directly by consumers in their homes or in other places and situations (e.g., driving a car). The second ones, call them contexts of type B, are characterized by the co-presence of two kinds of actors: consumers and frontline personnel to the dependencies of an organization of services. Essentially, type B contexts find correspondence in the concept of service encounter employed in service marketing research (Bitner and Wang 2014; Robinson et al. 2020). In these contexts, the role of the user of the goods may be played by frontline personnel alone, even if the consumer enters into contact with, for example, the razor and other goods used by the barber. There are, however, type B contexts in which the consumer is also a user, for example when, in a gym, an instructor teaches a client to use a machine. The consumption contexts of types A and B are networks of actors and goods. Their complexity grows as the number of goods that are used in the context increases, as does the number of co-present consumers[1] and—in type B—co-present service employees (and also the number of service organizations to which they belong).

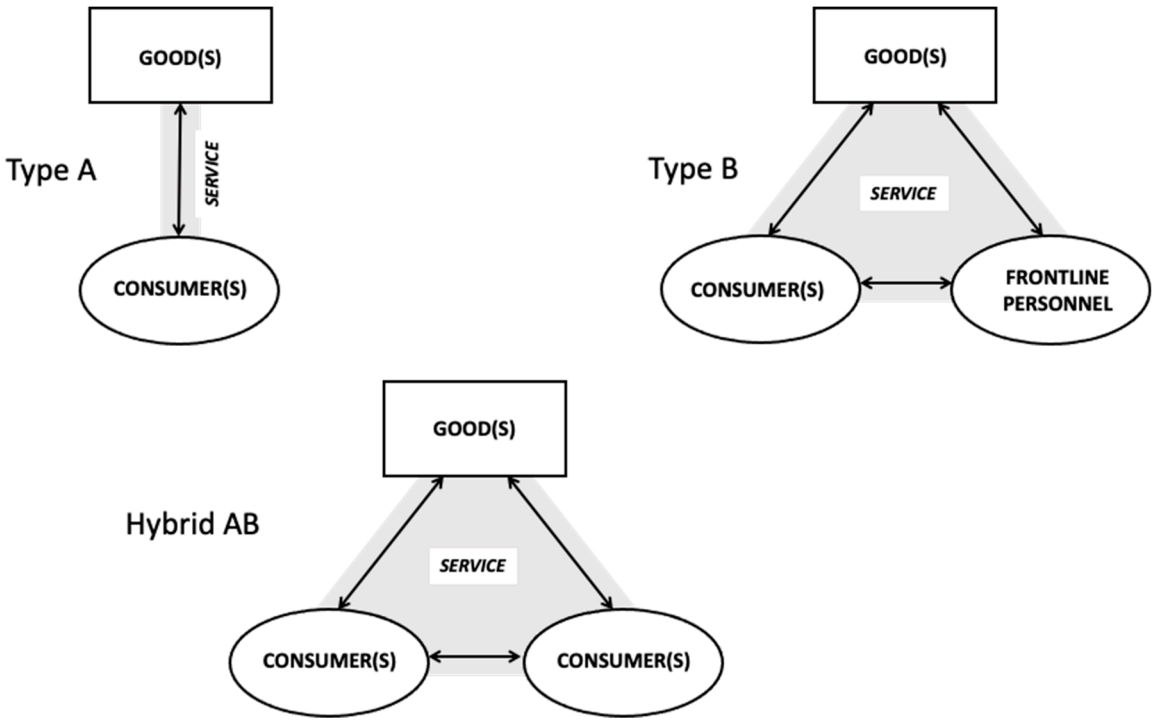

Figure 1. Different consumption contexts.

The places where goods work as service provision mechanisms—for example, a family home or a store—should not be confused with the contexts of their use, which are always specified in time and space (Håkansson et al. 2009; Vargo et al. 2010). Thus, each of the first synchronically and diachronically generates a plurality of type A and/or type B contexts for use. For example, in traditional stores, the contexts of use (and the production of value) of type B prevail, while in free-service stores, those of type A predominate. A limiting case

is given by places of entirely free-service provision, such as a laundromat or an ATM, in which the service organization renounces the role of the user in type B contexts by setting up the conditions for the consumer to operate in type A contexts. Consumers' homes are typically pervaded by type A contexts and occasionally by type B-contexts. In addition, they host contexts of use that can be considered a hybrid of type A and B, due to one family member providing specific services to other members, thus acting as the frontline personnel of a service organization (Figure 1). That is the case when a family member teaches how to use a specific good to another family member (i.e., a slow cooker in the kitchen) or when a family member specializes in the use of a specific good and becomes a point of reference for other family members (i.e., she is the only one to use the slow cooker and provides other family members with cooked food).

To understand why an important difference as the one between type A and type B contexts has been overlooked by SDL literature, it is useful to go back to how SDL founders come to the concept of the context of use. None of the nine foundational premises that form the first conceptual framework proposed by Vargo and Lusch (2004, 2006) concerns consumers or customers as users and contexts of use. A later work introduces a last premise that is important in our perspective: 'Value is always uniquely and phenomenologically determined by the beneficiary' (Vargo and Lusch 2008, p. 9), which means that it 'is idiosyncratic, experiential, contextual, and meaning laden' (p. 7). There is not yet an association between context and use, which is made explicit in Vargo et al. (2008) wherein they speak almost interchangeably of value-in-use and value-in-context and again in Vargo et al. (2010), wherein they point out that 'value-in-context emphasizes the importance of time and place dimensions and network relationships as critical variables in the creation and determination of value' (p. 148). However, type A–B difference fails to emerge from the analyses of Vargo, Lusch, and colleagues. The reason can be found in a paper by Chandler and Vargo (2011) specifically dedicated to clarifying the role of contexts in SDL, wherein a particular context is defined as 'a set of unique actors with unique reciprocal links among them' (p. 40). Thus, goods do not appear in this definition: the imperative to distance from the good-dominant logic has led the SDL scholars to the oversight of artifacts, which are instead an essential component of our reasoning. Furthermore, SDL contexts include pure or hybrid type B contexts, while excluding type A contexts in which a single consumer (actor) interacts with one or more goods. In turn, this exclusion stems from the fact that, at the heart of the SDL service is the application of resources (including goods) for the benefit of others (Vargo and Lusch 2004, 2017).

2.2. Service Production in Consumption Contexts

Type A-B difference is important to outline in relation to the service co-production processes. Figure 1 helps in identifying two fundamental issues in this regard. First, in type A contexts, there is no co-production of service if the prefix 'co-' is used to link actors on both sides of the classical market exchange, as in all service management and marketing literature (Grönroos 2012; Normann and Ramirez 1993a; Prahalad and Ramaswamy 2000), in studies on prosumption (Dujarier 2016; Ritzer et al. 2012), and also from the SDL perspective (Lusch and Vargo 2018; Vargo and Lusch 2004). Service co-production[2] takes place in all contexts of type B. These contexts are characterized by a lesser or greater degree of McDonaldization—as reported in the seminal contribution of prosumption theory (Ritzer 1993)—depending on the amount of work done in them by consumers. Instead, in type A contexts and in hybrid contexts consumers are self-producers of the service, working consumers who use goods as means of the self-production of the service.[3] Interestingly, in the special case of A-contexts created by (working) consumers in stores and other places of service provision, they are, within the same service experience, both self-producers and co-producers. The 'working' dimension of consumption can be extended to the production, total or partial, of goods. The latter was an all-too-common practice in traditional societies but then has continued to recur not only in the self-production of food but also in other forms of do-it-yourself and do-it-with-others (Fox 2018; Vannini and Taggart 2014), from the adaptation of goods of all

kinds carried out independently by the consumer or self-customization (von Hippel 2005) to the self-assembly of modular products, as in the much-celebrated case of Ikea, another iconic company in putting its customers to work (Ritzer 2017).

A second relevant aspect that type A–B difference leads to emphasize is the presence and role of goods in consumption contexts, an aspect to which the authors of the SDL did not pay attention to. Goods play a fundamental role in consumption contexts due to the fact that without them, there would be no self-production (A, AB) or co-production (B) of services. Goods are indispensable resources for the (co-)production of services, and this role does not change in the different contexts we have discussed. Consequently, consumption contexts should not only be defined according to actors and their interacting as in Chandler and Vargo (2011) but also taking into account goods and both good–good and good–actor relationships (Holbrook 1999; Löbler and Hahn 2013). Service arises from the set of these relationships (Figure 1), as the model of 'servuction' (service production) developed within service marketing studies (Eiglier and Langeard 1987; Grönroos 2012) has clearly shown for type B contexts.

3. Actors, Goods, and Consumption Contexts in a Knowledge-Based Perspective

A knowledge-based perspective on consumption contexts as defined and classified in the previous section drives the understanding of how they work. The key idea of this view is as follows: each context can be identified on the basis of specific actors, artifacts, and relationships, but it is their cognitive dimension that makes them a true context (Carrillo et al. 2019; Håkansson et al. 2009). This goes for any kind of context and thus also for the contexts of our interest. Precisely, the three components that constitute them—consumers, frontline personnel, and goods—represent knowledge-holders, while the relationships between them can be defined as learning relationships (Di Bernardo and Grandinetti 2012).

On the one hand, to maintain that the frontline personnel is able to participate in the production of the service thanks to the knowledge and skills that are in their possession is pretty obvious. In the SDL perspective, this assumption simply represents the contextualization of the first foundational premise established by Vargo and Lusch (2004, 2008): the application of specialized knowledge and skills, i.e., service, is the fundamental basis of exchange.

On the other hand, consumers also bring their knowledge and skills into play in the contexts of use in which they participate. This could be true for all types of consumption contexts (Figure 1). The knowledge endowment of the consumers introduces strong individual differences (that moreover are also not lacking in the frontline personnel of the same service organization). The non-uniform distribution of this resource in the population of consumers affects the quality of the services that they produce using the goods independently (A, AB) or co-produce with the frontline personnel (B). Consider, for example, how important the information that the consumer transfers to frontline personnel can be in order to obtain a customized service (Norberg and Dholakia 2004). A different effect relates to the intensity of service (co-)production chosen by consumers. Specifically, considering type A contexts, inexperienced consumers tend to use only a portion of the services potentially providable by a given good (Langdon et al. 2007). Similarly, with reference to type B contexts, inexperienced consumers will avoid offerings in which co-production (which, in general, is always there) involves a strong contribution from the consumer (Etgar 2008). However, there are nuances in the role played by the knowledge of the consumer. In fact, its relevance decreases in relation to the degree of standardization of the services/goods offered (Li et al. 2022; Miceli et al. 2007).

The idea that knowledge is embodied in goods, which therefore become productive resources, is part of the great intellectual legacy that Edith Penrose (1959) has left to both business economics and management studies. Penrose was thinking primarily of capital goods used in production processes, but the output of those processes, i.e., goods in general, also represent knowledge artifacts (Holsapple and Joshi 2001). The knowledge they embody is not directly usable like the knowledge encoded in the patent documentation that may

be related to them (Cardinal et al. 2001), but it is knowledge nonetheless, as evidenced by the well-known reverse engineering practices implemented by firms interested in absorbing the knowledge associated with new products launched in the market by their competitors (Glückler 2013). For the same reason—the knowledge they embody, the 'pre-packaged knowledge' as Normann and Ramirez (1993b, p. 100) have called it—goods are used by consumers and frontline personnel in consumption contexts (Di Bernardo and Grandinetti 2012; Lusch and Vargo 2018). Furthermore, because of their pre-packaged knowledge, goods are defined by Vargo and Lusch (2004) as distribution mechanisms for service provision, a potential that is activated and exploited in all consumption contexts by consumers and/or service personnel.

Consumption contexts are, in general, anything but static. From a knowledge-based perspective, what makes them dynamic is the fact that all three types of relationships that we find in them—between consumers and frontline employees, between consumers and goods, and between frontline employees and goods (Figure 1)—are learning relationships through which service employees and consumers manage to increase their knowledge and skills. For example, consumers increase their knowledge of products by using them. Through learning by using, consumers who have a particular interest for a given product (even a single brand) or product category, can become experts on it: this is a segment that has not failed to attract the attention of management scholars and practitioners (Greer and Lei 2012; Prahalad and Ramaswamy 2000). Expert consumers are referred to by some authors as prosumers to combine not the meanings of 'producer' and 'consumer' but those of 'professional' and 'consumer', in that the expertise they acquire of a good (e.g., a camera) in association with a hobby of theirs makes them similar to professionals who use the same good (Humphreys and Grayson 2008).

It is important to add that, since each of the three components of consumption contexts may consist of multiple units, the learning processes that take place in such contexts may acquire a collective character. In particular, quite studied are the consumer communities of practice that have developed online (Armstrong and Hagel 1996; Quinton and Harridge-March 2010; Schau et al. 2009). Following the perspective of our analysis, these elective contexts of knowledge-sharing and individual/collective learning (Ardley et al. 2020; Klein et al. 2005) represent the virtualization of a plurality of contexts of use: precisely, in them users exchange information and experiences that have emerged in their real contexts of use.

Finally, as contexts in which information and knowledge circulate and in which people learn and can produce new knowledge, contexts of use can become contexts of innovation. We are here contextualizing von Hippel's theory on users as innovators, which had, as its original reference, the contexts of use of business-to-business products (von Hippel 1976, 1977) and was then extended to a wider set of situations, including our type A and AB contexts (von Hippel 2005, 2017).

4. Consumption Contexts with Robots and Other Smart Goods

The rise of a new technological revolution—which is referred to as the fourth industrial revolution, Industry 4.0, or digital transformation (Schwab 2017)—is changing the relationship between knowledge and goods and its implications for consumption contexts (Grandinetti 2020; Tregua et al. 2020). On the one hand, AI opens a new season in the story of mass customization, which Fox (2018) describes as 'creative prosumption' to mean that the creation of unique and customized goods is the result of a deeper and creative interaction between producer and consumer. On the other hand, AI breaks into type A and B consumption contexts, transforming them. The conceptual building developed in the previous two sections allows us to frame this digital transition of consumption contexts.

The technology-driven evolution of consumption contexts seems destined to make a real leap in the current phase. We focus on two technologies that we are most relevant in our perspective: artificial intelligence (AI) and internet of things (IoT), that is robots and other goods equipped with intelligence and capable of receiving and transmitting information via the internet (García et al. 2017). Within the broad set of knowledge artifacts, these

goods stand out because their primary constituent is knowledge (Salazar-Torres et al. 2008). Clearly, it becomes important to outline the theoretical implications for the consumption contexts related to goods whose abilities extend to natural language processing, image or speech recognition, problem solving, and machine learning (Davenport et al. 2020). We investigate how consumption contexts may change by referring first to type B contexts, which register the greatest advances in terms of the cognitive complexity of the smart goods designed for them, and then to type A contexts (including their AB variant).

4.1. Service Robots in B-Contexts

Robots have made their appearance in retailing, especially in inventory management or interfacing directly with customers visiting the shop (Shankar 2018) for a few years. The prospects for growth in both of these applications seem very promising (Bogue 2019; Guha et al. 2021). In the latter case, the ability to interact with customers and assist them is a distinctive trait of a new generation of robots destined to replace or work alongside human employees (Belanche et al. 2020; Wirtz et al. 2018). In the former field, several types of robot are designed and used in some retail chains in order to avoid costly out-of-stock and overstocking problems. Moreover, the growing tendency for people to purchase items online and pick them up in the store (Jin et al. 2018) is perfectly suited to the presence of in-store robots that know exactly where to find every product and the optimal picking route (Bogue 2019).

Focusing on robots helping consumers, they are being tested and introduced, not only in shops, but also in other service delivery contexts. There are robots that can serve as coffee baristas or restaurant waiters (Davenport et al. 2020; Fan et al. 2020), and robots at the reception desk or to do other tasks in hotels or museums (Fuentes-Moraleda et al. 2020; Shin 2022; Wirtz et al. 2018). Other robots are used in education as tutors or peer learners (Belpaeme et al. 2018) to assist child patrons in public libraries (Lin et al. 2014), and healthcare robots are now used in various hospitals (Kwon et al. 2022; Pee et al. 2019; van Wynsberghe 2016). As with robots in stores, the prospects for growth for all these other applications are strong (Guha et al. 2021). A recent factor that increased interest in service robots is the COVID-19 pandemic in relation to the resulting need for physically safe services (Schepers and Streukens 2022).

Frontline robots fitted with AI whose presence is expected to grow in type B contexts can be qualified as intelligent or smart goods because their cognitive architecture puts them in a position to not only perform complex series of actions but also to (Belanche et al. 2020; Bertacchini et al. 2017; Grandinetti 2020; Wirtz et al. 2018):

1. acquire the information that qualifies the specificity of the context in which they operate (context awareness);
2. analyze numerical and non-numerical data;
3. make autonomous decisions;
4. adapt and customize the services they provide;
5. behave proactively to help customers, not only by answering their requests;
6. learn within the service contexts and evolve behavior.

The information they use to do their job comes from incorporated devices (cameras, microphones, and sensors), from sources within the organization where they operate (in particular, its customer database), and from outside sources (IoT). Service robots that learn extract patterns from data; these data may take an enormous variety of forms: 'just about anything that can be captured, quantified, or represented in digital form' (Kaplan 2016, p. 28).

Thanks to the cognitive architecture that characterizes them and, in particular, the software modules that compose it, frontline robots can already perform a wide variety of functions, which are changing service encounters and are destined to grow further in the near future (Paluch and Wirtz 2020; Robinson et al. 2020). In stores, for example, robots can assist consumers in their shopping processes in a variety of ways (and degrees of complexity), from indicating the location of a product (in self-service stores) to consumers

who have already decided what to buy to guiding consumers who have not yet made that choice (in self-service stores and others) (Bertacchini et al. 2017; Bogue 2019; Guha et al. 2021; Hoyer et al. 2020). Nevertheless, a function that cuts across the specificities occurring we find within the multifaceted category of type B contexts is the collection of information about the customers whom robots interact with. Such information can then be used in a variety of ways—from being stored in a big data repository for the purposes of market segmentation to being processed by the robot itself to manage the relationship with the customer at that moment or in subsequent encounters.

Another cross-cutting function is consumer recognition in stores, hotels, or other places in which consumer services are provided. We consider this relatively simple function—which represents a specific module of the frontline robot cognitive architecture—as an example of the complexity that characterizes the cognitive work performed by AI- and IoT-based robots. Among the ways through which the robot is able to identify a visitor is the inference it performs based on the information it has access to, whether it is in the customer database developed by the service organization or in social media (a crucial alternative if the potential customer is visiting that store or another one in the same chain for the first time). Specifically, the robot welcomes the visitor and, without asking for her first and last name, takes a picture of him/her, then, applying a logistic regression model, verifies if she is already present at one of the information sources with which it is connected (Bertacchini et al. 2017). Comparing the robot with an employee (regardless of cost), surely the former is slower than its human analogue (albeit by a few seconds) if the latter is able to recognize the customer but wins whenever the employee has never seen the face of the visitor or does not remember her. Interestingly, here, the same result that the robot obtains thanks to its AI, humans obtain thanks to one of the skills that Michael Polanyi (1966) includes in his tacit dimension of knowing, recalling that this concerns knowledge so deep and sticky that it cannot be made explicit, not that which simply has not yet been made explicit (Grandinetti 2014).

Ultimately, the robotic 'things' that consumers have begun to encounter in service contexts are quite special artifacts, cognitively comparable to human actors (frontline employees) not because they have similar cognitive processes but because they achieve similar and even superior results to humans. This transformation from artifacts to actors is the element that marks the digital transition of type B consumption contexts. Recalling the patterns of Figure 1 and focusing on type B contexts, Figure 2 visualizes the change due to the presence of AI-based service robots or other similar frontline service technologies that have begun to animate these contexts (De Keyser et al. 2019; Grewal et al. 2020; Hoyer et al. 2020; Roggeveen and Sethuraman 2020). Figure 2 signals the fact that these are intelligent goods by representing them not as the other (non-intelligent) goods but as the humans present in the context, i.e., as interacting actors and service (co-)producers. Regarding the type B contexts, it is important to specifically mention the smartphone, a particular and now ubiquitous good which can be used by both frontline personnel and consumers to perform a variety of roles: for example, in robot-based learning contexts, teachers can use smartphones to control or complement the work done by robots (Jeong et al. 2014).

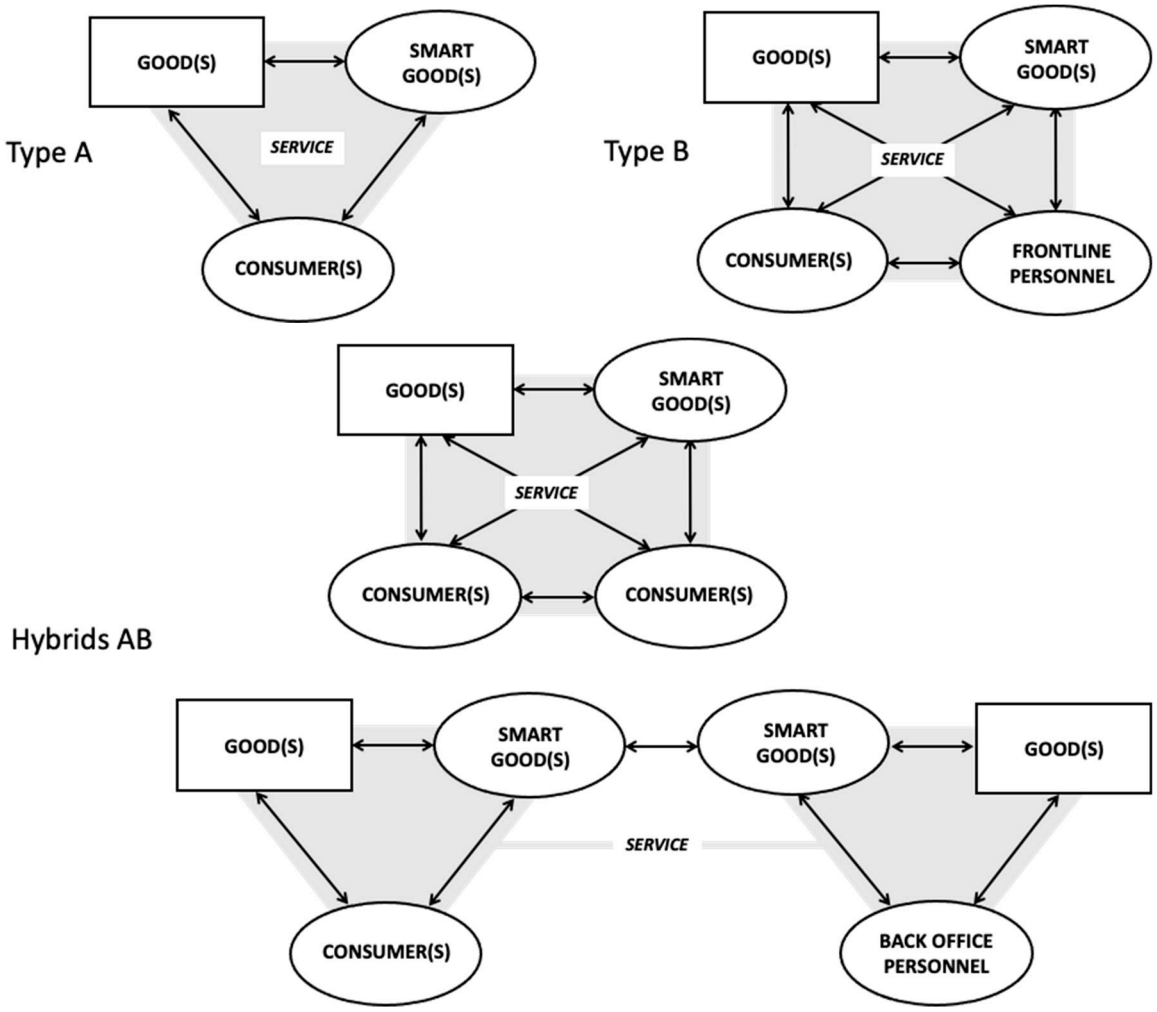

Figure 2. New consumption contexts.

Regarding the relationship between frontline personnel and smart goods in type B contexts, we recall that a service robot can completely replace or work with (behind or alongside) a frontline employee. In the second case, robots can augment the service provided by frontline employees, helping them do their job better (De Keyser et al. 2019; Larivière et al. 2017; Marinova et al. 2017). Alternatively, robots take over from employees in directly interacting with customers, so that the same employees can do something else or do their normal job differently or better (Grandinetti 2020). LoweBot, a service robot introduced in 2016 by a retailer specializing in home improvements, works in both ways: on the one hand, it assists employees in identifying low stock levels or misplaced items; on the other, it helps customers with simple questions, enabling employees to spend more time offering their knowledge to customers with less simple questions (Bogue 2019; Larivière et al. 2017).

4.2. Smart Products in A-Contexts

Consumer goods are becoming smarter, especially in the sense of more autonomous, since the 1990s, thanks to the strategy of manufacturers to equip them with information and communication technology (Rijsdijk and Hultink 2003). Although, since their first appearance, smart products could be more or less 'intelligent' (Meyer et al. 2009), there is no doubt that their average level of intelligence has increased due to recent advances in AI (García et al. 2017; Grandinetti 2020). Even for the diverse category of smart products—from self-driving cars to in-home voice assistants to home-assistant robots—there is an impressive growth in their number in recent years in parallel with the availability of

supporting smartphones by consumers. This growth is expected to be confirmed in the near future by making the presence of smart goods increasingly available in consumers' homes and other places where type A- and AB-contexts are created (Puntoni et al. 2021; Tomiyama et al. 2019; Urquhart et al. 2019).

The functions that home-assistant or domestic robots are capable of performing cater to a variety of needs associated with domestic life nowadays. There are robotic vacuum cleaners and other kinds of cleaning robots, robots that do garden maintenance and laundry, and companion robots such as those used in caring for the elderly and disabled people in private homes (Bogue 2017; Čaić et al. 2018; Dilip et al. 2022; Pettinico and Milne 2020). For each type of these robots, or prosuming machines as Ritzer (2015) called them, AI has proved to be a formidable lever for departing from the past, when single-function robots were able to perform a very limited set of tasks (Bogue 2017). AI-based domestic robots are essentially no different from the frontline service robots discussed previously, apart from the different places and contexts in which the former and latter provide their services.

Smart products, including domestic robots, can be considered platforms for service provision (Vargo and Lusch 2004), wherein their embedded AI and IoT enable them to: (a) use data obtained from the environment in order to be context-aware and to take actions autonomously and even proactively (Maass and Varshney 2008) and (b) adapt to the characteristics of the context, especially of different actors and other goods (García et al. 2017; Simoens et al. 2018). Adaptation to consumers means that the services provided by smart products are highly customizable (Kumar et al. 2019). In general, these goods acquire information, classify and process it, transform it into context-specific knowledge, and behave accordingly, such as intervening in risky situations in the case of an elderly-care robot (Lera et al. 2020). In the case of health care, a partially different pattern is also observed, wherein the robot transfers information from the patient (for example, a diabetes patient) and her sensors to an external carer who transfers to the robot the indications that the latter in turn provides to the patient (Simoens et al. 2018). Smart products also learn from experiences in which they are involved in, and, over time, this improves the alignment between their actions and the degree of customization they can achieve (Grandinetti 2020).

Figure 2 shows the type A and AB contexts of the digital age, characterized by the increasing presence of domestic robots and other smart goods inside consumers' homes (Argandoña et al. 2021) and also outside them in the type A contexts that consumers generate. As in the case of type B contexts, the presence of smart goods introduces new relationships, taking into account that their ability to relate with people and other objects is an indispensable component of their intelligence (Grandinetti 2020). On this basis, new variants of consumption contexts also emerge, such as the one exemplified earlier with the case of the diabetes patient: in Figure 2 such contexts are referred to as AB hybrids, other than those involving only consumers; they are consumption contexts connected to thr external contexts of service (co-)production through the presence of a frontline employee in the form of a robot. On the other hand, all consumption contexts shown in Figure 2 could be considered 'hybrids' given the presence in them of smart goods acting as frontline personnel.

Interestingly, the diffusion of smart goods in both type A and B contexts will make these two types of contexts increasingly similar. In addition to the technological resemblance of the intelligent goods used in the two contexts and consequently the complex cognitive work they can perform in both, other reasons drive this convergence. First, smart goods working in A contexts interact with consumers in the co-production of the service, which therefore ceases to be a prerogative of type B contexts. Moreover, in the IoT landscape, homes, stores, and other places where consumer services are produced and their contexts of use are created are interconnected with external information sources. From a relational perspective, each consumption context appears as a local network embedded in a larger network. The last reason for type A–B convergence represents a specification of the previous one concerning the fact that the presence of robots or other devices in type A contexts introduces in them the organization that manages the smart good as a mechanism

for service provision. In fact, smart goods operating in these contexts as frontline personnel are connected in various ways with 'back office' employees (or other artifacts)[4] that consumers do not see, as is typical in many traditional B contexts (Eiglier and Langeard 1987). On the other hand, in the most advanced form of intelligent automation applied to service provision contexts, robots and/or other intelligent goods completely replace frontline personnel. An example of this type of evolution is Amazon Go supermarkets, which are without checkout staff (Ives et al. 2019).

5. Discussion and Conclusions

The second industrial revolution has not only revolutionized the way consumer goods are produced (mass production and standardization) but has also profoundly transformed the contexts of their use. After the third industrial revolution (flexible automation), which substantially affected only the dimension of production, the new revolution underway will also impact the consumption contexts, particularly in relation to their matching with AI and IoT (Davenport et al. 2020; García et al. 2017). Starting from the idea of Vargo and Lusch (2004) that goods are mechanisms for service provision, we conceptualized the variety of consumption contexts and then adopted a knowledge-based view of them in order to understand their functioning and read their digital evolution, opening a promising line of research.

In particular, we first show that services are produced in two consumption contexts and in a hybrid of them: in type A or service self-production contexts, consumers are actors who interact directly with goods; in type B or service co-production contexts, the intermediation of a second kind of actors (frontline personnel) comes into play; in hybrid contexts, one or more consumers perform a role similar to that of frontline personnel. We conceptualize actors (consumers and frontline personnel) and the goods present in the contexts of their use as knowledge-holders and the relationships between them as learning relationships. The intensity of knowledge processes that occur in consumption contexts vary within a very wide range, from the minimum in highly standardized type B contexts to the maximum in some consumer communities of practice and innovation.

Our conceptualization of consumption contexts is parsimonious, based on a few essential elements. Thus, it does not take into account important differences between consumption contexts, such as that between contexts in which private services or public services are consumed (Cajková et al. 2021; Sønderskov and Rønning 2021), nor the influence that factors studied by the sociology of consumption (Warde 2014) may have on consumption contexts. While essential, our framework clearly highlights the major change that marks the shift from traditional consumption contexts to AI- and IoT-based contexts. This change involves the learning relationships that are no longer the domain of only (human) actors who learn by interacting with each other and using goods. Both type A and type B contexts are in fact powered by smart goods, i.e., intelligent artifacts capable of interacting with each other and with humans within a given context of use and endowed with structural cognitive connections outside this context. This being interconnected with the external environment is a factor of convergence between the two types of consumption contexts. Another factor of convergence is due to the fact that the presence of smart goods such as domestic robots 'opens the doors' of type A contexts to the organizations that manage those robots.

Our framework sheds light and at the same time prompts a reflection on the ongoing transition in consumption contexts. The recent success of several new commercial applications based on the combination of AI and IoT—from Amazon Echo to the Google Nest Learning Thermostat—indicates that this transition has not only begun but will continue in the next future. However, it is being slowed by both consumer-side resistance and technology shortcomings (Davenport 2018). On the second side, although the technological evolution is fast and promising, there could be several AI applications interacting with consumers that could not reach the interest of the consumer or be mature enough to be useful for the consumer. In particular, much work remains to be done before the 'intelli-

gence' associated with these applications achieves a full context awareness, i.e., when they 'address complex, idiosyncratic tasks by applying holistic thinking and context-specific responses' (Davenport et al. 2020, p. 27). On the side of consumers, their propensity to make use of AI applications is inhibited in part from the feeling that such technologies neglect their uniqueness (Davenport et al. 2020; Longoni et al. 2019), an aspect that goes hand in hand with the technological gap mentioned above (Grandinetti 2020). Moreover, consumers can find the AI–IoT applications intrusive in their privacy and are becoming more aware of the importance of the use of sensible data (Davenport et al. 2020; Grewal et al. 2020; McLean and Osei-Frimpong 2019; Zhou and Piramuthu 2015). All in all, the evolution of consumption contexts (A, B, or hybrid) based on smart goods will depend on how truly intelligent those goods will be and also on the regulatory role international political authorities will be able to play.

In any case, the transition we are talking about does not yet show well-defined traits, and this makes it an area to be monitored and on which to develop sound empirical and theoretical research. One thinks in particular of the cultural domestication of AI, a process that is still in its infancy (Fox 2018). Another relevant and intriguing issue is the possible combination of AI and IoT with other technologies that are usually defined under the umbrella of Industry 4.0. For example, the former could be combined with augmented reality and virtual reality for producing new consumption contexts. The use of a 'magic mirror' at the point of sale that is able to project (augmented reality) the image of the client in different clothes in real time is only an example of the potential of this combination (Caboni and Hagberg 2019). What we could experience in the near future is an increased interdependence among AI, IoT, and other 4.0 technologies and their convergence toward more integrated solutions (Davenport et al. 2020; Grewal et al. 2020). This integration will lead to new changes in the consumption landscape, including its contexts, which will deserve further attention.

Among the aspects most worthy of attention is certainly the cognitive asymmetry clearly highlighted by our analysis between the consumers of smart goods and the (big) organizations that manage these goods-in-contexts and exploit their intelligence. In the recent past, the spread of online consumer communities gave the opportunity to consumers to meet (virtually) with each other, exchange information about their interests, and jointly develop new knowledge. On this basis, consumers acquire a cognitive autonomy from good producers, and this autonomy allows the former to collaborate with producers (Sawhney et al. 2005) or to do without them for example by developing what von Hippel (2017) called 'free goods'. On the contrary, in the era of AI and IoT, this process seems to reverse as organizations involved on the supply side enter all contexts of use in which consumers are involved, increase the knowledge of consumers through the use of an increasing amount of data, and gain increasing control over them (Acemoglu 2021; Zuboff 2019). This new asymmetry could push consumers or consumer communities to react and to find a way—especially an AI- and Iot-based way—in order to be able to counter-balance the stronger power of smart products' suppliers (Mohamed et al. 2021).

Our theory of consumption contexts and their heterogeneity and evolution in the digital transition may offer a useful framework for some lines of empirical research. The first line could broaden and deepen our typology of consumption contexts by considering phenomena such as the individual or community self-production of goods, like in home self-building practices, the consumer upcycling of products at the end-stages of their lifecycle (Coppola et al. 2021), or the community self-production of services, which has a long tradition but is also taking on new forms as in health care (Lakomaa and Sanandaji 2021). In addition, specific studies could enrich our knowledge on the influence that factors such as country culture may exert on the intensity with which places and contexts of consumption adopt digital technologies and on the interactions between human actors and digital artifacts that take place in such contexts. Finally, in relation to the problem of the knowledge asymmetry in digital contexts of consumption, future research could explore the emerging cues of new forms of consumer self-organizing.

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Notes

1 Eiglier and Langeard (1987) have emphasized consumer relationships in type B contexts, calling them 'relationships of concomitance'.

2 In this paper we prefer to talk about service co-production rather than value co-creation. The latter term, much preferred in SDL studies (Vargo and Lusch 2004, 2008, 2016), is in fact burdened by a substantial ambiguity as Cova et al. (2011) have well highlighted.

3 We refer to working consumers in a different way then Cova and Dalli (2009, p. 333) according to whom the working consumer concept describes 'the phenomenon of consumers who, by the means of immaterial labour, add cultural and affective elements to market offerings'. On the contrary, in our definition working consumers add material labour to market offerings.

4 One such way is shown in the lower part of Figure 2.

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