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Exploring the Benefits of Productization in the Utilities Sector

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Abstract: The adoption of Product–Service Systems (PSS) in a business strategy is often mainly associated with the servitization process, where a service component is added to the product component in order to improve the value proposition of the company and better satisfy the customer's needs. The productization phenomenon is far less studied in literature, but growingly prominent in today's market. In particular, companies in the utilities sector have been exploring the potentialities of productization and proposing new business models for improving their offer to the customers, in order to be more and more competitive on the market. In this paper, we provide a first analysis and classification of productization strategies in the utilities sector, starting from experiences in the Italian market, with the aim of understanding which can be the main benefits of a PSS approach in this field, considering the effects on the three dimensions of sustainability (economic, environmental, and social).

Keywords: utilities sector; productization; public services; PSS; sustainability

1. Introduction

The introduction of Product–Service System (PSS) business models is allowing more and more companies to improve their competitiveness, offering customers innovative solutions that are closer to their needs [1,2]. In particular, PSS are often described as opportunities for companies to guarantee customers' satisfaction, therefore increasing their market share, while reducing material consumption, with possible benefits related to the economic, environmental, and social sustainability [3,4]. PSS business models have also been identified as one of the enabling factors for Circular Economy strategies, resulting in an even higher attention from practitioners and researchers [1,5,6]. The concept of PSS in literature is mostly related to dematerialization and associated with the servitization process, according to which many manufacturing firms are moving from a product-centered offer to a product–service, where intangible resources are integrated with the product. On the other side, the service industry is also facing a shift, from pure service offerings to more complex solutions, including tangible goods. This "objectification" aims primarily at standardizing the service offered and making it more tangible [7,8]. This shift is also referred to as "productization," but it has not been studied and explored as largely as its twin [9–12]. In fact, while the servitization perspective has been widely analyzed to understand the implications and benefits for the manufacturing sector [3], productization is not equally known and described.

This work is an attempt to contribute to filling this gap, analyzing the main impacts that productization strategies can have in the service sector. In particular, the utilities segment is considered (water, energy, gas, communication, and waste management supply), given its importance in everyday life for citizens and its recent evolution pushed by liberalization in several countries. Utilities companies are still facing disruptive changes in the sector, due to the massive diffusion of new technologies,

as well as national and international regulatory pressures [13]. This is pushing firms to pursue business model innovation, often adopting PSS as a strategy to satisfy customers' requests in innovative ways, exploiting the advantages of digitalization and new technologies to provide a more complex and adaptive offer for their market [14]. While servitization in this sector has been studied by some researchers [15,16], productization is still largely unexplored [12].

In particular, the study focuses on the Italian market, which has been widely liberalized and regulated through reforms during the 1990s and 2000s, and where many providers respond to an increasing worldwide trend of horizontal integration, providing different types of service to their customers [17,18]. Specific features characterizing these sectors in the Italian market are well summarized by Asquer in [17].

The paper is structured as follows: Section 2 explores the concept of productization as it is described in literature, proposing a first classification of productization strategies. In Section 3, the methodology adopted is briefly described, while in Section 4 the main productization strategies observed in the utilities sector are summarized and classified. Finally, in Section 5 the implications of such strategies for sustainability in the analyzed sector are discussed, while conclusions are drawn in Section 6.

2. The Concept of Productization in Literature

Although the concept of productization is widely acknowledged by practitioners in the service sector, it has not received as much attention in the academic literature [11,12,19]. According to Li et al. [12], academics started to focus on productization only in the third phase of the PSS evolution described in their review, approximately since 2009. Several researchers have attempted to provide a definition for the concept of productization so far [11,20]. However, there is not a definitive clarification of the term: the same word has been used in the last 20 years to indicate quite different concepts. Nevertheless, these efforts help in defining the features and aims of productization.

For Baines et al. [10], productization represents "the evolution of the service component to include a product, or a new service component marketed as a product," while, for Salmi et al. [21], "the aim of productization is to give more tangible features for the service." Later on, Beuren et al. [3] agreed on Baines et al.'s definition, indicating the productization strategy as the opposite of servitization, in the context of PSS. For Djellal et al. [22], productization is the tendency to standardize a service, similarly to what happens in the product industry, in order to be able to easily replicate a service offering for different customers with minimal variations. A broader summary of all these efforts is given by Harkonen et al. in their recent review [20], where they argue that productization indicates "the process of analyzing a need, defining and combining suitable elements, tangible and intangible, into a product-like object, which is standardized, repeatable and comprehendible." Similarly, Leoni [11] defines it as "the process of transforming a service company offering by adding tangible products to core services or by decomposing service components into combinable modules, with the aim of fulfilling customers' needs and improving service quality and efficiency."

A few more findings in the most recent literature about productization have to be mentioned in order to clarify some issues. Harkonen et al. [20] identify and classify different types of productization, according to the object of the change, underlining how service productization is mainly oriented to clarify the service offering and design it based on the effective needs of customers. Andreini et al. [9] explore the transition from service-dominant to good-dominant logic in service companies, highlighting that the internal standardization process pushed by productization should be always supported by the external relationship-based activities typical of the service industry, in order to be cost-efficient and -effective. Jaakkola [19] analyses service productization starting from empirical evidence in small professional firms, identifying three main practices: specifying and standardizing as well as tangibilizing and concretizing the service offering, and systemizing and standardizing processes and methods. Lahy et al. [23] investigate the driving and restraining forces related to a productization strategy in a service company, pointing out that a significant gap in literature exists regarding the

adoption of PSS from service providers. Indeed, the introduction of PSS has mostly been studied from a product manufacturer perspective, with high emphasis on the servitization process, while very little has been said about productization [3,10,20]. This work aims at addressing this need in literature, considering the perspective of service providers in the utilities sector.

Starting from this brief literature review on the concept of productization that highlights its main scope and properties, we can state that one main objective of service productization is to overcome some of the typical inefficiencies of services, lying in the difficulty for customers and employees to perceive the intangible offerings, as well as the lack of standardization, keeping customers' satisfaction at the center. We also propose a new classification of productization strategies in two different categories: (i) strategies oriented to standardize the service offering [11,19,20,22], and (ii) strategies adding a tangible product/component to the service offering [11,19,20]. The framework described is summarized in Figure 1.

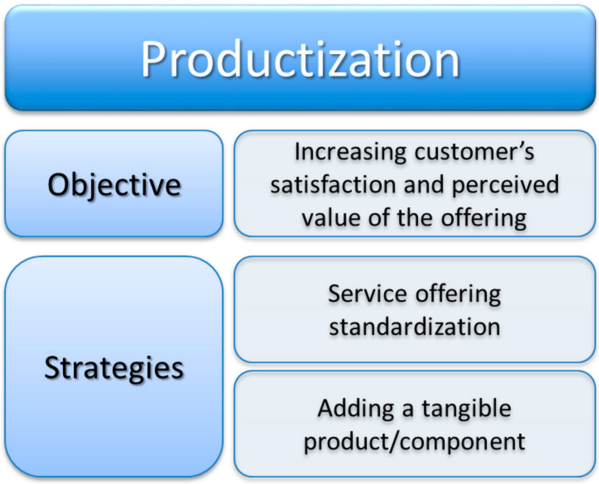

Figure 1. The productization framework proposed.

3. Materials and Methods

The qualitative study followed a 3-step methodology illustrated in Figure 2. In the first step, a market analysis on the main players in the Italian utilities sector has been performed. The decision to focus on the Italian market was driven by the choice to circumscribe the sample and by the ease of accessibility to the required information. For the scope of this work, the utilities sector is intended as the one that involves supply and maintenance of public services, can include several kinds of services (e.g., engineering, infrastructures, sanitation, etc.). Five main categories of public services have been considered, namely:

- Electricity;
- Gas, heating, and air conditioning;
- Water and home services;
- Communication and connectivity;
- Waste collection.

In particular, a market research online allowed to identify 21 major companies actively operating on the Italian market, most of them with businesses in more than one category, summarized in Table 1. Information was gathered through their official websites, analyzing the solutions offered to customers.

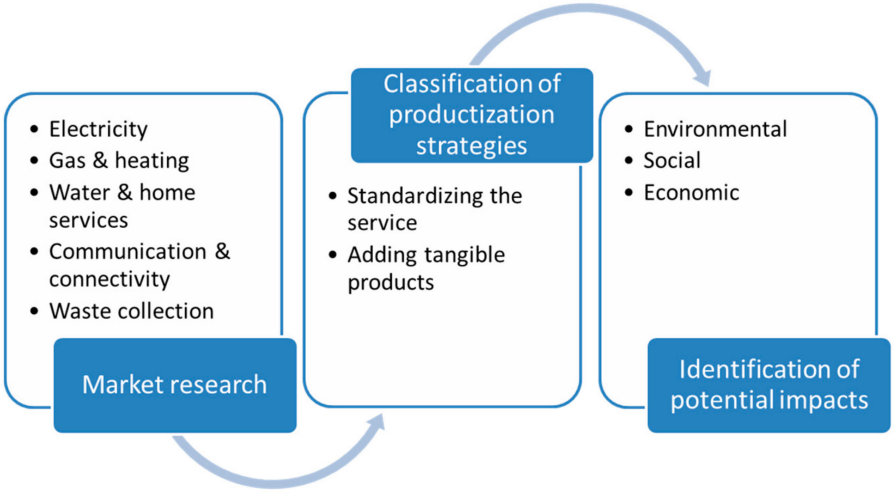

Figure 2. The 3 steps of the methodology adopted.

Table 1. List of the companies analyzed and category in which they operate.

Company	Electricity	Gas, Heating, and Air Conditioning	Water and Home Services	Communication and Connectivity	Waste Collection
A2A	x		x		x
Acea	x	x	x		
Agsm	x	x			
AMA Roma					x
Asia Napoli					x
Contarina					x
Edison	x		x		
Enel	x	x			
Eni	x	x	x		
Engie	x	x	x		
E.On	x	x			
Fastweb			x	x	
Hera	x		x		x
Iren	x	x	x		x
Novambiente					x
Quadrifoglio					x
Sorgenia	x				
Tim			x	x	
Tiscali				x	
Vodafone			x	x	
Wind/3			x	x	

In step 2, for each of the five subsectors identified, the most common PSS offerings to customers have been analyzed. Based on the "productization" framework previously presented, the strategies have been then classified in the two categories: (i) those oriented to standardize the service offering, and (ii) those adding a tangible product to the service offering. Finally, in step 3, some qualitative considerations about the potential impacts of the strategies presented have been outlined, focusing on the environmental, economic, and social dimensions.

4. Results

In this section, an overview of the main strategies adopted is proposed. A summary is presented in Table 2.

Table 2. Examples of productization strategies in the utilities sector.

Sector	Standardizing the Service	Adding Tangible Product
Electricity	Insurance and maintenance services	Photovoltaic system installation Kit energy-saving light bulbs Remote energy control kit E-car + charging station
Gas, heating, and air conditioning	Insurance and maintenance services	Efficient boiler Smart thermostat Air conditioner Air purifier
Water and home services	Insurance and maintenance services	Comfort and security sensors Water purifier installation
Communication and connectivity	Basic services packages Media contents packages	Modem/web cube Smartphone/tablet/laptop included TV boxes Smart home kit
Waste collection	Pay-as-you-throw programs Dynamic scheduling	Sensors for bin filling Domestic composter

4.1. The Electricity Sector

The sector of electricity services for private customers is one of the most diversified. Productization strategies are mostly focused on the supply of specific products integrating the company service offering and managed directly by the customer, with a low support provided by the company. One common example regarding the production phase is the installation of a photovoltaic system in the customer's house, which also includes the maintenance service, granting the user access to renewable energy generated locally. This can also increase the perception of control over the PSS on the customer's side, increasing at the same time the value proposition thanks to the environmental benefits generated.

Looking into the use phase, another example is the sale of led light bulbs to their customers: not only does the company supply the lighting service, it also provides a lighting device that allows energy savings, generating economic convenience for the user. Some companies provide remote energy control kits, useful for managing energy use in an efficient way, even when the customer is not at home. In this case, the perceived value for the user is given by the possibility to regulate and control energy use in a more conscious way, generating both environmental and economic benefits. Finally, a few companies extend the offer in partnership with other entities, providing products that are not their core business, but are complementary, like the electric car. In these cases, the installation of charging stations is also included in the PSSs.

Referring to the strategy of service standardization, it mainly consists in the offer of insurance and maintenance services for the home electric system. These services are also included in the PSSs based on the devices previously described. This finding is coherent with Hamwi and Lizarralde's classification, identifying three main types of business models in the energy sector: customer-owned product-centered BMs, third-party service-centered BMs and energy community BMs [24].

4.2. The Gas, Heating and Air Conditioning Sectors

This market sector also presents different PSS solutions adding tangible products. One example is the inclusion of smart and efficient boilers, often provided in partnership with the manufacturer, through offers that comprise the installation and maintenance service of the device. Similar offers can be found for air conditioners. These solutions can entail an added value given by the collection and disposal of old devices, the possibility of choosing special payment options, and customer service related to normative compliance. Other PSSs provided by some Italian companies include smart thermostats and devices for the remote control of home heating and conditioning, allowing the user to control temperature and energy consumption, with benefits on the economic, environmental, and social

sides. Another innovative solution is an air purifier based on plants and equipped with smart sensors that monitor temperature, humidity, and the level of some pollutants in the domestic environment. All the solutions described are based on energy-efficient technologies, allowing the customers to improve their environmental profile while saving on gas and electricity, and often improving the quality of the environment they live in.

Like for the electric sector, strategies based on the service standardization mainly include the offer of insurance and maintenance service for the home heating/conditioning system, providing the customer with a wider set of services related to the use phase.

4.3. The Water and Home Services Sectors

The water and home services sector offers fewer solutions than the electricity and heating ones, despite the importance of household drinking water quality and consumption in everyday life [25,26]. The main PSS for water services is based on a tangible product, a water purifier that allows customers to have pure drinking water in their homes without having to buy it in bottles (this also reduces the amount of plastic waste produced from the user). This can represent a challenge, since Italy is the biggest consumer of bottled water among the European countries, with a production of 14 billion liters per year [27,28]: it is evident that a successful implementation and diffusion on the market of this kind of solution would allow savings for the household and decrease the consumption of plastic bottles, which are the main packaging used in the water industry for private users.

For what concerns home services, some companies offer devices and sensors for a smart home focused on increasing comfort and security. Examples are safety kits including video cameras, movement and light sensors, connection hubs, all of which can be controlled through mobile devices; smoke detectors with alert system for smartphones; integrated remote control systems for heating and lighting. All these solutions can be provided with installation, insurance, and maintenance services that standardize the offering.

4.4. The Communication and Connectivity Sector

Productization strategies are widely adopted from companies in the communication sector. Mobile network operators have been standardizing their service for years, offering their customers packages with different service levels. These solutions typically include internet and voice services with monthly thresholds, which are sometimes customized according to the age and profile of the user. Lately, companies have been enriching these packages, including in their service access to media contents (e.g., streaming of music and video, gaming), often in partnership with other companies.

Other productization strategies are related to the sale of a complementary product: most telecommunication companies allow to lease a smartphone when choosing a mobile service, or to include the rental of a modem/web cube in the contract for the internet connection at home. This kind of offer is also expanding to tablet and laptops, and usually allows the customer to choose whether to keep the device at the end of the contract, or return it and lease a new one. More recently, with the massive diffusion of smart TVs, TV boxes are being offered by communication companies, allowing access to different platforms, in partnership with media content providers (e.g., Netflix, Infinity, NowTV, Chili, etc.). Lately, some companies have included in their portfolio smart home kits, devices connecting the electric or safety system for a remote control.

4.5. The Waste Collection Service Sector

Innovation in the waste collection sector is mainly pushed by policy forces that aim at improving the material recovery and recycling rate, as well as preventing waste production. Regulations on waste management are driving companies operating in this sector towards innovations aimed at increasing the environmental and economic performance of the system. With these objectives, some attempts of service standardization can be identified in the adoption of pay-as-you-throw (PAYT) models and dynamic scheduling collection services. PAYT models, which are pushed in Europe by the EU waste

Directive of 2008, are based on the polluter-pays principle and require that the users pay according to the service they request, therefore to the level and type of waste produced [29]. In this type of collection schemes, the user is encouraged to produce less non-recyclable waste and increase the diversion rate, sometimes through a system based on awards and penalties. Compared to traditional collection services, in which the fee is usually calculated based on a few factors (e.g., household dimension, number of people residing in the household, corrective factors, etc.), these schemes allow for adopting a fairer and more equitable charging model. In dynamic scheduling models, the collection service is performed only when actually required from the user (household or commercial), unlike traditional schemes where routing and scheduling for collection are fixed and independent on the actual needs of the user. Usually the state of the collection point is monitored through smart sensors connected with a central server for real-time data collection [30]. These sensors for bin filling represent the product component of the PSS offer, and are usually maintained by the company for the duration of the contract. Another example of product integration is the domestic composter, that some companies provide to their customers who want to recycle organic waste and produce compost autonomously. On one side, this solution allows the user to directly manage the recycling process at home, generating a product (compost) that can be used for domestic purposes with environmental and social benefits, and also savings can be obtained when a charging system accounting for the waste quantity produced is adopted, such as PAYT. On the other side, letting the user manage their own organic waste relieves the provider's workload, decreasing waste collection and management costs.

5. Discussion

Although the concept of productization has not been deeply investigated in the PSS scientific literature, which is more focused on the opposite phenomenon of servitization, this transformation in the service sector has several recent examples in utilities companies. The analysis conducted revealed a variety of PSS offerings, which can combine both the strategies identified (service standardization and addition of a tangible product) at different levels. This combination can result in different shades of productization, that we clustered in three different PSS integration levels. A summary is shown in Table 3.

Table 3. Clusterization of productization strategies in the utilities sector according to the PSS integration level.

Pure Standardized Service	Integrated PSS	Product Added
• Insurance and maintenance (for lighting and heating systems) • Basic services packages and media contents packages (communication and connectivity) • PAYT models (waste)	• Photovoltaic/energy control systems + installation and maintenance • E-car + electricity (Electricity) • Boilers/air conditioners/smart thermostats + installation and maintenance (Gas & heating) • Water purifier + installation and maintenance (Water) • Comfort and security sensors + installation and maintenance (Home services) • Modem/web cube/TV boxes + media contents (Communication) • Mobile phones/tablets + connectivity and media service (Communication) • Sensors for bins and dynamic collection (Waste)	• Kit energy-saving light bulbs (Electricity) • Air purifiers (Home services) • Domestic composter (Waste)

The first is represented by pure standardized services. Considering the examples presented in Section 4, the proposal of insurance or maintenance services for the home electric and heating

systems fall into this category, as well as the standard packages offered to customers in the mobile communication sector, the inclusion of media contents in such contracts, or the PAYT service in the waste collection sector.

The second level is represented by an integrated PSS, providing both a standardized service and a product component. Some examples are the installation of photovoltaic systems, efficient boilers and air conditioners, and water purifiers, all of which come with an integrated service of maintenance included in the contract. Similarly, the remote control devices and smart thermostats, that allow a smart control of the heating and electric systems, as well as comfort and security sensors, are usually sold with a service package including installation and maintenance. In the communication sector, the inclusion of smartphones, laptops and tablets, or modem, web cubes and TV boxes, are typical examples of product and service integration, since they include access to the communication service and, more often, to specific media contents. The sensors for bin filling in the waste collection sector are another example of integrated PSSs, since their installation is necessary to implement a dynamic collection service. Finally, the integration of electric cars and charging stations with the electric service is also included in this category.

On the third level, we find PSSs that are prominently product-based. Typical examples are the sale of kits with energy-saving led bulbs, smart home kits, air purifiers and domestic composters. These products are not usually provided with a strong service component, but aim at widening the offer for the customer.

Another interesting discussion point is represented by the possible impacts of productization in the utilities sector on the three main dimensions of sustainability. While the impacts on sustainability of PSSs in general, dematerialization, and servitization have been often analyzed in literature, discussing benefits and criticalities [1,3,4,10,31], a similar analysis on productization is still missing. The main objective of productization is identified in the possibility to improve the value offered to customers [11], but other possible environmental, social, and economic outcomes are not clear yet. For this reason, we propose a first analysis of the main impacts that the strategies presented for the utilities sector can have on sustainability, summarized in Figure 3.

5.1. Social Sustainability

Considering a social sustainability point of view, the adoption of productization in the public service can enable the use of more "innovative" products and updated technologies for people who did not have access to them before, due to their high purchase costs. In fact, most PSSs including a physical product often offer the possibility to choose flexible payment plans that facilitate the access to customers. Typical examples are boilers, air conditioners, photovoltaic systems, but also smaller devices such as smartphones and tablets. The proposal of new business models based on leasing plans or the possibility for the user to pay in instalments, including the cost of the product in the monthly fees paid for the service, can extend the market to users with lower income [32]. This can foster the diffusion of more reliable, safe, and energy-efficient technologies, improving the health and safety dimension in domestic environments. This can also be improved by PSSs based on sensors for comfort and security, aimed at improving the domestic quality of life.

Another social impact related to the more diversified offer of the company is the enhancement of its brand value, that can improve significantly thanks to the increase of the service level provided [33].

5.2. Environmental Sustainability

The possible impacts on the environmental dimension are mostly related to the use of energy-efficient technologies included in these offers. One example is in the gas, heating, and air conditioning sector, where productization of services includes the provision of high-efficient and smart devices, which in traditional business models would be usually characterized by a high investment cost: the access to highly efficient products allows the user to save on the operational costs, while reducing the related environmental impacts. Technologies for the remote control of air

conditioning also allow for reducing energy waste when possible. Resource efficiency would also improve, since higher quality devices are usually expected to last longer than inexpensive products, while some of the PSSs described have this as a main objective (i.e. water purifiers). Moreover, business models based on leasing, often used in the communication and connectivity segment, allow for the return of the product after the use phase, guaranteeing a recovery of components and materials that can be reused or recycled. Most offers also allow the customer to be more compliant with environmental regulations (e.g., heating and electric systems, waste management, electric cars, etc.).

Summarizing, an overall reduction of the environmental impacts can be reached through most of the PSSs analyzed.

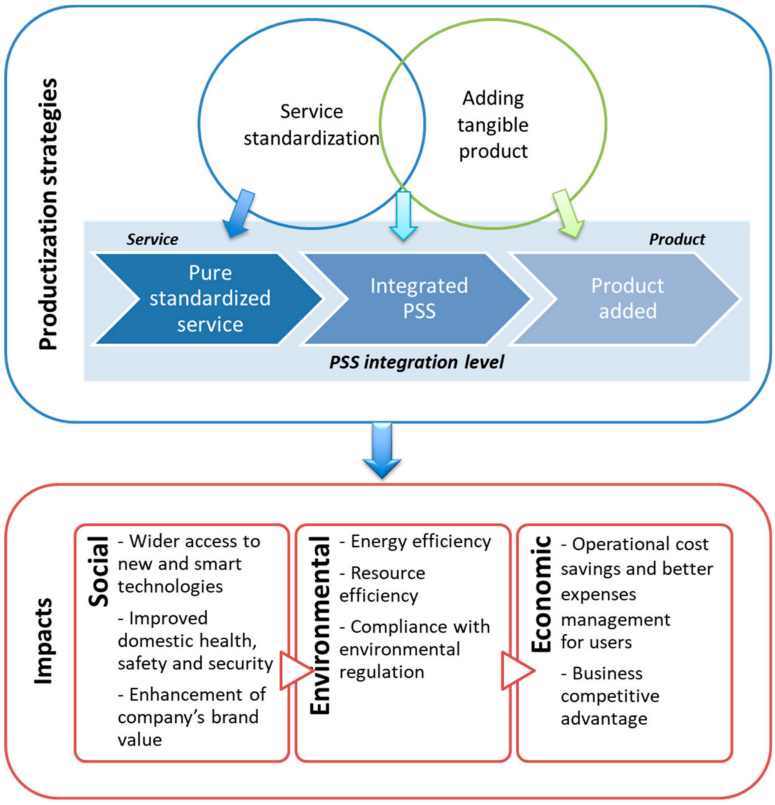

Figure 3. Framework of productization strategies and impacts identified in the utilities sector.

5.3. Economic Sustainability

The productization strategies presented can improve the economic performance for both the user and the company. On the user's side, as previously mentioned, access to energy and resource-efficient technologies can generate savings related to the operational cost of the systems considered (e.g., lower electricity and heating costs, decrease of bottled water use). Moreover, the chance to choose flexible payment plans can help the customer with better management of household expenses. On the company's side, increasing and diversifying the value offer to customers can generate more profit, increasing the competitive advantage of the business and improving its economic sustainability in the long run [33].

6. Conclusions

The present study has proposed a critical analysis of a research topic—i.e. productization strategies for the utilities sector—which has not been fully developed in literature yet, but has an increasing trend of application in this sector. Based on a literature analysis, a first classification of productization strategies has been proposed, clarifying its main objective and characteristics. The methodology proposed, based on research conducted on the main players active on the Italian market in the utilities

sector, allowed to identify several examples of productization strategies, which have been analyzed according to the two categories defined (pure standardized service and product added) and the possible impacts on sustainability related to their adoption. To our knowledge, this study represents the first attempt in literature to investigate productization strategies in a specific sector and their effects on sustainability, while most of the scientific literature available on PSSs focuses on servitization and dematerialization.

However, some limitations have to be highlighted. The choice to focus on a specific sector and a specific market could have an influence on the results discussed in the previous section. The utilities sector in Italy has been characterized by a quick evolution in the last decade, due to market and policy pressures, and is particularly fit for the purpose, while other service sectors could be less involved in the PSS transition. Another possible criticality can be related to the data sources analyzed (i.e., companies' websites), which could provide nonhomogeneous information. This could be overcome by conducting a structured survey to validate the results presented.

In conclusion, as a qualitative study, this work aims at contributing to lay the foundation for a deeper analysis of productization, in utilities as well as in other sectors. Further developments should be oriented to define a more structured framework to support researchers and practitioners in both designing and managing these new business models, and to study the adoption and effectiveness of productization in other sectors through empirical analyses. Moreover, the relationship between productization strategies and sustainability would require further investigation.

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