

Exploring the benefits of productization in public services utilities

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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 public 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 public 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: public utilities; 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 (Tukker, 2015; Cavalieri and Pezzotta, 2012). In particular, PSS are often described as opportunities for companies to guarantee customers' satisfaction, therefore increasing their market share, while reducing material consumption (Beuren et al., 2013; Mont, 2002). The concept of PSS in literature is mostly associated with the servitization process, according to which many manufacturing firms are moving from a product-centred 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 (Lindberg and Nordin, 2008; Pirayesh et al., 2018). This shift is also referred to as “productization”, but it has not been studied and explored as largely as its twin (Andreini et al., 2015; Baines et al., 2007; Leoni, 2015). In fact, while the servitization perspective has been widely analysed to understand the implications and benefits for the manufacturing sector (Beuren et al., 2013), productization is not equally known and described.

This work is an attempt to contribute filling this gap, analysing the main impacts that productization strategies can have in the service sector. In particular, the public utilities segment is considered (water, energy, gas and waste management supply), given its importance in everyday life for citizens. Utilities companies are facing disruptive changes in the sector, due to the massive

diffusion of new technologies, as well as national and international regulatory pressures (Golovatchev and Budde, 2016). This is pushing firms to adopt PSS as a strategy to satisfy customers' request in innovative ways, exploiting the advantages of digitalization and new technologies to provide a more complex and adaptive offer for their market.

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

2. The idea 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 (Jaakkola, 2011; Leoni, 2015). Several researchers have attempted to provide a definition for the concept of productization so far (Harkonen et al., 2015; Leoni, 2015). 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. (Baines et al., 2007), 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. (Salmi et al., 2008)

“the aim of productization is to give more tangible features for the service”. Later on, Beuren et al. (Beuren et al., 2013) 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. (Djellal et al., 2013), productization is the tendency to standardize a service, similarly to what happens in the product industry, in order to be able to replicate easily 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 (Harkonen et al., 2015), where they argue that productization indicates “the process of analysing a need, defining and combining suitable elements, tangible and intangible, into a product-like object, which is standardised, repeatable and comprehensible”. Similarly, Leoni (Leoni, 2015) 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”.

Based on these definitions, we can state that one main objective of service productization is to address 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 centre.

A few more findings in the most recent literature about productization have to be mentioned in order to clarify some issues. Harkonen et al. (Harkonen et al., 2015) 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. (Andreini et al., 2015) 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 (Jaakkola, 2011) analyses service productization starting from empirical evidence in small professional firms, identifying three main practices: specifying and standardizing the service offering, tangibilizing and concretizing the service offering, and systemizing and standardizing processes and methods. Lahy et al. (Lahy et al., 2017) 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 (Baines et al., 2007; Beuren et al., 2013; Harkonen et al., 2015). This work aims at addressing this need in literature, considering the perspective of service providers in the public utilities sector.

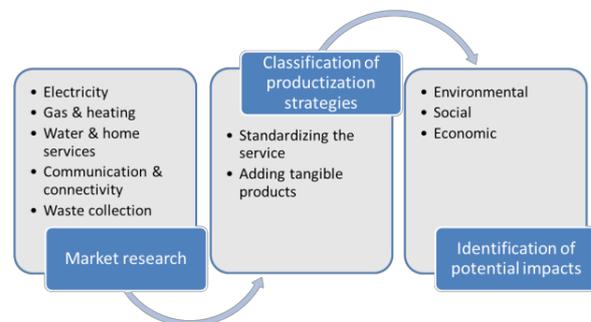
3. Methodology

The study followed a 3-steps methodology illustrated in Fig. 1. In the first step, a market analysis on the main players in the Italian public utilities sector has been performed. For the scope of this work, the public 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 categories of public services have been considered, namely:

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

In step 2, for each of these categories, the most common PSS offerings to private customers have been analysed. Based on the definitions and on the features of “productization”, the strategies have been then classified in two main 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.

Fig. 1: The 3 steps of the methodology adopted



4. Productization strategies in the public utilities sector

In this section, an overview of the main strategies adopted is proposed. A summary is presented in Table 1.

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 that integrate the service offering. 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. Another example, related to the use phase, is the sale of Led light bulbs to their customers: not only the company supplies the lighting service, it also provides a lighting device that allows energy savings. Some companies include remote energy control kits, useful for managing the energy use in an efficient way even when the customer is not at home. 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 PSS.

For what concerns the strategy of service standardization, it mainly consists in the offer of insurance and maintenance services for the electric system. These services are also included in the PSSs based on the devices previously described.

4.2 The gas, heating and air conditioning sectors

This market sector is also characterized by the introduction of PSS solutions including tangible products. Smart and efficient boilers and air conditioners are the main examples, and these solutions also entail a standardization of the service given by installation and maintenance of the device during its lifetime. Other PSS provided by some companies include smart thermostats and devices for the remote control of home heating and conditioning. 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. Like for the electric sector, some companies offer insurance and maintenance service for the heating system.

4.3 The water and home services sectors

The sector of water and home services offers fewer solutions than the electricity and heating ones. The main PSS for water services is 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). Next to this, some companies offer devices and sensors for a smart home focused on increasing comfort and security. Examples are video cameras, movement sensors, smoke detectors. All these solutions come with 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. Lately, companies have been enriching these packages including in their service media contents (e.g. streaming of music and video). Other productization strategies are related to the sale of a complementary product: most ICT companies allow to lease a smartphone when choosing a mobile service, or to include the rent 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 if keeping the device at the end of the contract, or return it and lease a new one. Lately, some companies have included in their portfolio smart home kits, devices connecting the electric or safety system for a remote control.

Table 1: Examples of productization strategies in the public utilities 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 & 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 Smart home kit
Waste collection	Pay-as-you-throw programs Dynamic scheduling	Sensors for bin filling Domestic composter

4.5 The waste collection service

Innovation in the waste collection sector is mainly pushed by policy forces that aim at improving material recovery and recycling rate, as well as preventing waste production. 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 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 (Elia et al., 2015). In dynamic scheduling models the collection service is performed only when actually required from the user (household or commercial), and usually the state of the collection point is monitored through smart sensors connected with a central server for real time data collection (Elia et al., 2016). 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.

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 public utilities companies. The combination of the two main productization strategies identified (service standardization and addition of a tangible product) can result in three different PSS integration levels.

The first is represented by pure standardized services. Considering the examples presented in Section 3, the proposal of insurance or maintenance services for the home electric and heating systems fall in 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 with both a standardized service and a product component. Some examples are the installation of photovoltaic systems, efficient boilers, air conditioners and water purifiers, all of which come with an integrated service of maintenance included in the contract, and the remote control devices and smart thermostats, that allow a smart control of the heating and electric systems. In the communication sector, the inclusion of smartphones, laptops and tablets, or modem and web cubes, are typical examples of product and service integration. The sensors for bin filling in the waste collection sector are another example of integrated PSS, since their installation is necessary to implement a dynamic collection service.

Finally, the integration of electric car and charging station with the electric service is also included in this category.

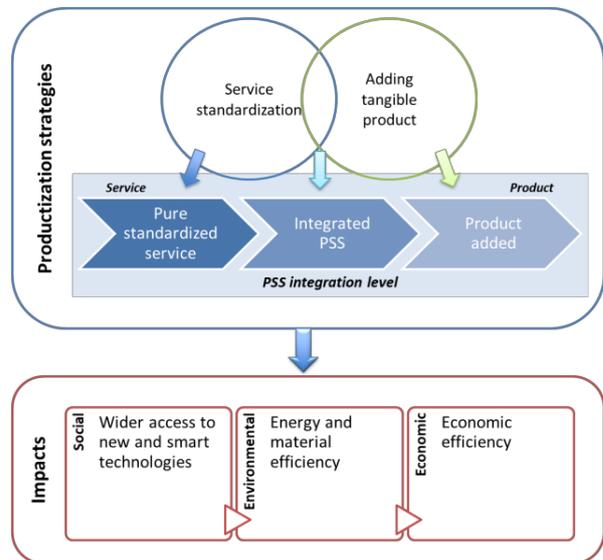


Fig. 2: Framework of productization strategies and impacts identified in the public utilities sector.

On the third level we find PSSs that are prominently product-based. Typical examples are the sale of kits with energy-saving led bulbs, comfort and security sensors, smart home kits and domestic composters.

In addition, the application of productization strategies in the public utilities sector can generate several potential impacts on the three main dimensions of sustainability (Fig. 2). In detail, looking at the social sustainability, the adoption of productization in the public service could enable the use of more “innovative” products and technologies for people that did not have access to them before, due to their high purchase costs. 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 (Gnoni et al., 2017). This would also enable a more efficient use of resources, spreading the use of energy efficient technologies, with benefits for both the environmental and economic sustainability of these offers. One example is in the gas, heating and air conditioning sector, where productization of services include the provision of high efficient and smart devices, which would be usually characterized by a high investment cost: these solutions allow customers to have access to highly efficient products, saving on the operational costs and reducing their environmental impacts.

6. Conclusion

In conclusion, the present study has proposed a critical analysis of a research topic – i.e. productization in the

public service – which has not been fully developed in literature yet, but has an increasing trend of application in this sector. The analysis has outlined the main productization strategies adopted by several companies in the Italian public service sector, along with some impacts on sustainability related to their adoption. As a preliminary study, this work aims at contributing to lay the foundation for a deeper analysis of productization, in public services as well as in other sectors. Further developments will be oriented to define a more structured framework of analysis to support researchers and practitioners in both designing and managing these new business models.

References

- Andreini, D., Salo, J., Wendelin, R., Pezzotta, G., Gaiardelli, P. (2015). From a service-dominant logic to a good-dominant logic: Consequences for the buyer-seller relationships of a corporate bank. *IMP J.* 9, 250–266. <https://doi.org/10.1108/IMP-07-2015-0034>
- Baines, T.S., Lightfoot, H.W., Evans, S., Neely, A., Greenough, R., Peppard, J., Roy, R., Shehab, E., Braganza, A., Tiwari, A., Alcock, J.R., Angus, J.P., Bastl, M., Cousens, A., Irving, P., Johnson, M., Kingston, J., Lockett, H., Martinez, V., Michele, P., Tranfield, D., Walton, I.M., Wilson, H. (2007). State-of-the-art in product-service systems. *Proc. Inst. Mech. Eng. Part B J. Eng. Manuf.* 221, 1543–1552. <https://doi.org/10.1243/09544054JEM858>
- Beuren, F.H., Gomes Ferreira, M.G., Cauchick Miguel, P.A. (2013). Product-service systems: a literature review on integrated products and services. *J. Clean. Prod.* 47, 222–231. <https://doi.org/10.1016/j.jclepro.2012.12.028>
- Cavaliere, S., Pezzotta, G. (2012). Product-Service Systems Engineering: State of the art and research challenges. *Comput. Ind.* 63, 278–288. <https://doi.org/10.1016/j.compind.2012.02.006>
- Djellal, F., Gallouj, F., Miles, I. (2013). Two decades of research on innovation in services: Which place for public services? *Struct. Change Econ. Dyn.* 27, 98–117. <https://doi.org/10.1016/j.strueco.2013.06.005>
- Elia, V., Gnoni, M.G., Tornese, F. (2016). Assessing the Efficiency of a PSS Solution for Waste Collection: A Simulation Based Approach. *Procedia CIRP* 47, 252–257. <https://doi.org/10.1016/j.procir.2016.03.086>
- Elia, V., Gnoni, M.G., Tornese, F. (2015). Designing Pay-As-You-Throw schemes in municipal waste management services: A holistic approach. *Waste Manag.* 44, 188–195. <https://doi.org/10.1016/j.wasman.2015.07.040>
- Gnoni, M.G., Mossa, G., Mummolo, G., Tornese, F., Verriello, R. (2017). Circular economy strategies for electric and electronic equipment: a fuzzy cognitive map. *Environ. Eng. Manag. J.* 16, 1807–1817.
- Golovatchev, J., Budde, O. (2016). PLM Framework for the Development and Management Smart Energy Products, in: Bouras, A., Eynard, B., Foufou, S., Thoben, K.-D. (Eds.), *Product Lifecycle Management in the Era of Internet of Things. Springer International Publishing, Cham*, pp. 698–707. https://doi.org/10.1007/978-3-319-33111-9_63
- Harkonen, J., Haapasalo, H., Hanninen, K. (2015). Productisation: A review and research agenda. *Int. J. Prod. Econ.* 164, 65–82. <https://doi.org/10.1016/j.ijpe.2015.02.024>
- Jaakkola, E. (2011). Unraveling the practices of “productization” in professional service firms. *Scand. J. Manag.* 27, 221–230. <https://doi.org/10.1016/j.scaman.2011.03.001>
- Lahy, A., Li, A.Q., Found, P., Syntetos, A., Wilson, M., Ayiomamitou, N. (2017). Developing a product-service system through a productisation strategy: a case from the 3PL industry. *Int. J. Prod. Res.* 1–17. <https://doi.org/10.1080/00207543.2017.1367861>
- Leoni, L. (2015). Servitization and Productization: two faces of the same coin? *Presented at the RESER 2015, Copenhagen (Denmark)*.
- Lindberg, N., Nordin, F. (2008). From products to services and back again: Towards a new service procurement logic. *Ind. Mark. Manag.* 37, 292–300. <https://doi.org/10.1016/j.indmarman.2007.07.006>
- Mont, O. (2002). Clarifying the concept of product-service system. *J. Clean. Prod.* 10, 237–245. [https://doi.org/10.1016/S0959-6526\(01\)00039-7](https://doi.org/10.1016/S0959-6526(01)00039-7)
- Pirayesh, A., Doumeingts, G., Seregini, M., Gusmeroli, S., Westphal, I., Gonzalez, L., Hans, C., Núñez Ariño, M., Canepa Eugenio, A., Laskurain, A. (2018). Conceptual Framework for Product Service Systems. *Systems* 6, 20. <https://doi.org/10.3390/systems6020020>
- Salmi, P., Torkkeli, M., Ojanen, V., Hilmola, O.P. (2008). New product creation process of KIBS firms: a case study. *Int. J. Serv. Stand.* 4, 16. <https://doi.org/10.1504/IJSS.2008.016082>
- Tukker, A. (2015). Product services for a resource-efficient and circular economy – a review. *J. Clean. Prod.* 97, 76–91. <https://doi.org/10.1016/j.jclepro.2013.11.049>