

A Study of Product Services for A Resource-Efficient, Circular Economy

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ABSTRACT: *Product Service Systems (PSS) have been hailed as one of the most effective tools for transforming society into a resource-efficient, circular economy and sparking a much-needed "resource revolution" since the 1990s. This article examines the literature on PSS during the past ten years and compares the results to those of a previous review published in this journal in 2006. Nearly 300 articles were found to be relevant, with over 140 of them being cited in this study. PSS research has grown more prolific, with the number of refereed articles published quadrupling since 2000, despite the fact that overall scientific production has only doubled. PSS has also spread to a broader variety of scientific disciplines (such as manufacturing, information technology, business management, and design) and geographic locations (Asia currently generates more papers than Europe). The literature of the past seven years has improved insights into PSS design, as well as their economic and environmental advantages, and has verified definitions and PSS ideas that were accessible in 2006. Research into how firms have implemented PSS in their organizations, as well as the key success factors and issues that require special attention (such as a focus on product availability for clients; an emphasis on diversity in terms of services provided rather than product range; and the need for staff to possess both knowledge of the reasons for the lack of widespread adoption of PSS, especially in the B2C environment, seem to have been well addressed in the literature accessible in 2006. One of the most desired qualities for consumers is having control over objects, artifacts, and life itself. PSS are often less accessible or have less intangible value than competing products, in part because they typically do not offer customers with as much behavioral flexibility or even give them the idea that the PSS provider may dictate how they should act.*

KEYWORDS: *Business Strategy, Circular Economy, Economic Impact, Product Services, Resource Efficiency.*

1. INTRODUCTION

Product-service systems (PSS) are a kind of value proposition that a company (network) provides to its customers (or co-produces with them). 'A combination of physical goods and intangible services created and integrated such that they are jointly capable of satisfying ultimate consumer requirements,' according to one definition of PSS [1]. PSS has been a prominent topic for academics interested in sustainability and business since the mid-1990s. According to sustainability experts, focusing on end user requirements or the service a user desires rather than the product makes it far simpler to develop need-fulfillment systems with drastically reduced environmental effects [2]. Firms with product-oriented business strategies have an incentive to sell as many goods as possible.

A circular economy is characterized by marketplaces that encourage people to reuse goods rather than discarding them and extracting new resources. All types of trash, such as clothing, scrap metal, and outdated technology, are returned to the economy or utilized more effectively in such a system. This may help not just to preserve the environment, but also to better manage natural resources, establish new industries, generate employment, and develop new skills. Circularity is already a component of many UNCTAD projects, such as those addressing fossil

fuel and fisheries subsidies [3]. The promotion and enactment of national laws will not be enough to promote resource circularity in international value chains.

While businesses have made progress in reducing their social and environmental impacts, privatizing public policy via voluntary sustainability standards and Corporate Social Responsibility (CSR) falls short. Promoting global resource circularity requires international laws and collaboration, as well as educated people and consumers in a world where most commerce is in parts and components in increasingly globalized value chains [4]. The circular economy is promoted through promoting conversations and actions aimed at extracting value from waste streams, debates about collaborative economy sectors, the study of innovative business models, and consumer awareness and behavioral changes. UNCTAD's work on the circular economy at the national and global levels, in collaboration with other international organizations, puts this vital subject at the service of the international community [5].

This is their primary strategy of growing turnover, market share, and profit margins. The motivation in service-oriented company models, on the other hand, is theoretically different. Firms earn money by charging for the services they provide, and the materials and consumables used to provide those services become cost considerations [6]. As a result, businesses will be motivated to extend product service life, ensuring that they are utilized as extensively as feasible, design them to be as cost- and material-efficient as possible, and re-use components as far as possible at the end of the product's life [7]. All of these factors may result in the economy's material flows being reduced while service production or customer pleasure being increased [8].

Pioneers in recognizing the PSS concept's advantages in terms of sustainability and resource efficiency. The current resurgence of interest in resource efficiency among key players in civil society, industry, and government has boosted interest in PSS for environmental reasons. With up to three billion people expected to enter the global middle class by 2050, resource competition will unavoidably intensify [9]. Improving the productivity of resources like water and land by a factor of two, and energy productivity by a factor of ten or more, would go a long way toward mitigating resource depletion and the danger of climate change. As a result, resource efficiency has been recognized as one of the flagships of the European Union's (EU) Europe 2020 plan (EC, 2011). For the reasons stated above, prominent writers from civil society and policymakers view PSS-like business models as one of the most essential ways of achieving a 'lease society,' a circular economy (as championed by the Ellen McArthur Foundation (2013)), or simply a 'resource revolution [10].

2. DISCUSSION

The rising interest in new PSS business models within the business community stemmed from the awareness that in most markets, goods have become more identical and of excellent quality, leaving little opportunity for product uniqueness. Product design and manufacturing may no longer be a source of uniqueness and competitive advantage. Firms have to provide integrated solutions, or even experiences, to overcome price competition, allowing them to strengthen their position in the value chain, boost their innovation potential, and raise the added value of their product. Given PSS's potential, a wave of large research initiatives began about 2000, mostly in Europe, in which a few dozen prominent research institutions attempted to create a framework for categorizing PSS.

Their goal was to provide a firm scientific basis for the idea and to understand through case studies when and how it would operate. One of these initiatives was 'SusProNet,' a network that acted as a center for PSS scientists to share their experiences and perspectives. A review of sustainability-oriented PSS research was published at the conclusion of that project. Case studies were often guided by normative sustainability objectives and neglected to investigate the factors that contributed to poor PSS implementation, such as a lack of customer acceptability or corporate interest. There was too much emphasis on individual case studies and conceptual growth, and there was no systematic quantitative or statistical examination of vast numbers of instances.

Business management literature received only sporadic attention from the PSS research community, which was primarily concerned with sustainability. As a consequence of these flaws, PSS was still a pre-paradigmatic discipline with few clearly proven ideas and insights at the time. Since then, the PSS idea has gotten a lot of attention, especially from the business research community. Cranfield Business School, for example, got significant funding and began working with huge businesses like Rolls Royce to evaluate their service-oriented business models and determine what would work and what would not. This has resulted in significant advancements in the area since 2000.

The assessment is limited to formal literature articles and excludes novels, 'grey' research reports, and other non-formal research reports. For my literature search, I utilized Scopus as a starting point. Scopus is a bibliographic database that contains abstracts and citations for papers published in academic journals. It was believed that articles with less citations would not be evaluated because of their lack of influence or relevance. Another expectation was that in PSS research, the authors of the most frequently cited articles would form a nucleus. As a result, I searched Scopus for the authors of the top 30 articles by citation (with at least 13 citations) and added relevant publications to the initial list of 67. This resulted in a total of 113 papers. I assumed that publications citing this core set would most likely also discuss PSS. In all, 1095 papers referenced the 113 papers 2076 times.

The names and, if required, abstracts of these 1095 articles were manually reviewed again to see whether they related with PSS. As a consequence, a final list of 278 articles was compiled, which served as the foundation for the review in this work. The following are perhaps the most intriguing findings from this little examination. First, the steadily increasing number of publications indicates that interest in the PSS idea is not a passing fad driven by a slew of EU initiatives that began in the early 2000s. Between 2000 and 2010, the scientific production of PSS-related publications grew four to fivefold.

Even after accounting for the overall trend of more papers being published, this is a significant rise; the number of articles listed yearly in Scopus quadrupled from approximately one million in 2000 to two million in 2010. Second, we find that, although the PSS idea originated in Europe, it has obviously found a resonance in Asian nations, with all but four of the 41 Chinese articles and all but one of the 25 Korean papers being from 2009 or later. The specific findings in this article, for example, vary somewhat when it comes to writers with a large number of publications.

Product-oriented services are the first category. The business strategy is still primarily focused on product sales, but some other services have been introduced. Product-related services (such as insurance or maintenance contracts) and guidance and consulting are subcategories. The

use-oriented services category is the second. Although the conventional product is still important, the business strategy is not focused on product sales. The supplier retains ownership of the product, which is made accessible in a different format and is occasionally shared by many consumers. Product leasing (single-user usage), product renting or sharing (sequence use by different users), and product pooling (simultaneous use of the product by many users, e.g. carpooling) are subcategories. The last category is services that are focused on achieving a certain goal.

There is no predefined product involved, and the customer and supplier agree in principle on a solution. Activity management/outsourcing (for example, catering services), pay-per-service unit (for example, payment per copy produced in copying; per km driven in fleet management; or each aircraft landing in tire management services), and functional outcome are subcategories. Because the profit center is now the result provided rather than the product sold, this kind of PSS is the most promising in terms of enabling a transition to a circular and resource-efficient economy. All material goods and consumables required to achieve the outcome have now become cost considerations, incentivizing them to be used as little as possible. In essence, product-oriented PSS cannot be expected to offer a significant increase in terms of resource efficiency or circular economy.

The potential for use-oriented and result-oriented PSS is greater, however different case studies show that market spread of PSS may be hampered by the issues mentioned above. Renting office furniture is more cost-effective in principle than purchasing since furniture that is no longer required may be reused by others. People may only want to rent 'in vogue' designs, which causes uncertainty about whether goods will be leased long enough to pay off the expenses, among the issues highlighted by Besch. Products that a PSS business model would work for are usually costly, technologically sophisticated, needing maintenance and repair, simple to transport, utilized rarely by consumers, and not highly affected by branding, fashion, etc., as described in.

There is also a significant distinction between the consumer and corporate sectors in terms of PSS performance; consumers place much more value on owning the goods they use and having complete control over how they use them. It's not surprising, therefore, that a number of writers argue persuasively that legislative and political reforms are required if sustainable PSS are to break through in the market, for example, to achieve fair trade and recycling and remanufacturing objectives. Since 2006, case studies, sector evaluations, and more extensive assessments of PSS performance have been published in the literature addressing the benefits of PSS for business and sustainability.

However, case studies and qualitative evaluations continue to dominate, as they did before to 2006. Surveys, statistical data analytics, and meta-reviews analysis are all examples of research techniques. Classroom performance and study conduct have improved as a result of token economies in schools when penalties were administered at the participant's home. Behavior management may be aided through collaborations between the classroom instructor and the participant's home guardian. In many instances of children with extreme conduct, classroom instructors may lack reinforcing circumstances, necessitating the creation of effective consequences by a parent or guardian.

Furthermore, worries about a lack of maintenance and participants' inability to transfer behavioral improvements achieved in the classroom make home-involvement more appealing.

The tickets given out in New York City schools as part of Lancaster's "Monitorial System" of reward and punishment were withdrawn in the 1830s because the trustees believed that cunning behavior rather than meritorious behavior was a general concern. The ability of any behavior management system to be fair, reliable, and functional is a general concern inherent to any behavior management system. Theft of tokens, a lack of engagement, and player sabotage of the token economy are just a few of the ways that this behavior control system may collapse from within. Managers of token economies must be aware of these risks and take measures to avoid any negative repercussions of bad planning.

3. CONCLUSION

As a result, this final statement also offers a solution to two important issues that are addressed in this article and special issue. The first question is how sustainable PSS can help with resource efficiency and the circular economy. The motivation to boost product sales is unchanged by product-oriented PSS. Usage-oriented PSS may increase the use of material goods and therefore decrease the demand for materials, but one disadvantage is that they may encourage less cautious use, resulting in faster wear and tear. Result-oriented PSS have the most potential and provide an incentive to reduce material costs, but they require the most radical change in the business model when compared to product sales, which hinders their widespread adoption and, as a result, their real contributions to resource efficiency and circularity. The second topic, which is linked to diffusion and plays a key role in this special issue, is: "Why have sustainable Product-Service Systems not been extensively implemented?"

The solution, in our opinion, simply remains the same as it was in 2006. PSS may certainly offer greater tangible and intangible value to users in a variety of situations, can be produced with reduced system costs, and can enhance a company's position in the value chain and therefore its competitive advantage. However, as we already said in 2006. The limited dissemination of sustainable PSS, in particular, in our opinion, such as carpooling, shared use of do-it-yourself equipment, and so on. The factors that explain the factors that explain the factors that explain the factors that explain the factors that explain the factors that explain the as stated in the preceding quote Time is particularly important in B2C marketplaces. It has been discovered again and time again that one of the most important concerns for to be a consumer is to have power over objects, artifacts, and even life itself.

When opposed to elementary or middle school settings, high school students use token economies at a considerably lower rate. This may be owing to instructors' apprehension about this kind of system; alternatively, it could be due to a perceived lack of efficacy. Only around 10% of students engage in class discussions on their own will. Good questions that connected to material, made logic, and met other criteria were awarded with token slips that could be redeemed for extra course points in one study. When a token reinforce was added, both token economy experiments showed an increase in classroom engagement; significantly, in both instances, the tokens were traded for additional credit toward the final grades in the courses. Grades may be seen as highly desirable things by college students pursuing certain GPAs, career opportunities, and so on.

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