

Note from the field

Product-services as a research field: past, present and future. Reflections from a decade of research

Arnold Tukker^{a,*}, Ursula Tischner^b

^a Sustainable Innovation, TNO Built Environment and Geosciences, PO Box 49, 2600 AA Delft, Netherlands

^b Econcept, Mainzer Strasse 23, 50678 Cologne, Germany

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Abstract

In the last decade many researchers, institutes and programs in the EU paid attention to product-service systems (PSS). Given this massive effort, it is time to take stock. Is PSS research a theoretical field in its own right? Is the PSS concept indeed the road to the Factor 10 world? Is it the road to enhanced competitiveness? What is needed to really use the potential of the concept? This paper discusses these questions summarizing the analysis done in the PSS review book 'New Business for Old Europe', various EU sponsored projects and the conceptual approach chosen in a new research network on Sustainable Consumption and Production, called SCORE!

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1. Introduction

Product-service systems (PSS) are a specific type of value proposition that a business (network) offers to (or co-produces with) its clients. PSS '*consists of a mix of tangible products and intangible services designed and combined so that they jointly are capable of fulfilling final customer needs*'. The PSS concept rests on two pillars:

1. Inherently taking the final functionality or satisfaction that the user wants to realise as a starting point of business development (instead of the product fulfilling this functionality).
2. Elaborating the (business) system that provides this functionality with a 'greenfield' mindset (instead of taking

existing structures, routines and the position of the own firm therein for granted).

In the 1990s, many authors in an environmentalist-driven arena argued that mankind would face near-certain disaster unless ways would be found to de-link economic growth from environmental pressure [1]. Such authors quickly understood that with a focus on final consumer needs (rather than the product fulfilling the need) the degrees of freedom to design need fulfilment systems with Factor 4–10 sustainability improvements are much higher [2]. This put PSS prominently on the sustainability agenda.

In the same period, business literature spurred interest into functional business models too. By a focus on the integrated, final client needs, and delivering integrated solutions fulfilling these needs, companies would be able to improve their position in the value chain, enhance added value of their offering, and improve their innovation potential [3]. This would provide an answer to sheer price competition from low-cost economies

* Corresponding author. Tel.: +31 15 269 54 50; fax: +31 15 276 30 24.
E-mail address: arnold.tukker@tno.nl (A. Tukker).

like China. In that sense, product-services can mean new business for old Europe [4,5], compare [6].

This potential of PSS to enhance competitiveness and sustainability leads to a massive research effort via EU-, national- and other programs in the last decade¹. Now it is clearly time to take stock. Is the PSS concept indeed the road to the Factor 10 world? Is it the road to enhanced competitiveness? Is PSS a theoretical field in its own right? What is needed to really use the potential of the concept?

In this paper, we will discuss these points using conclusions of the recent PSS review book ‘New Business for Old Europe’ [4], the experiences with PSS at the IIIIE at Lund University [13], and the conceptual approach chosen in a new research network on Sustainable Consumption and Production, called SCORE! (Sustainable Consumption Research Exchanges) [15].

2. Are PSS the road to a Factor 10 world?

As has been acknowledged by many authors, PSS are not *inherently* more sustainable as products. Yet, it is striking how often such simplistic messages are still conveyed (e.g. [16]).

First, many PSS form just an envelope around a system filled with products and materials. On a life cycle basis they may not score much better than products. There is an improvement potential by diverting societal expenditure from products to services, but this is by far no Factor 4 or 10 (see e.g. [17,18]). Second, it is paramount to acknowledge that different PSS exist, varying greatly in sustainability potential:

1. Product-oriented services just add services to an existing product system. Sustainability improvements of a few dozen percent due to issues like better maintenance can be expected at best – or may be a Factor 2, if the service boosts product- or material recycling.
2. Use oriented services (e.g. product renting, sharing, and pooling) intensify the use of the products. This can give intermediate (Factor 2) improvements [13,19].
3. Result-oriented services are in fact the only true ‘need-oriented’ ones. Provided that the PSS-supplier develops a fully novel way of function fulfilment, these ones have ‘Factor X’ potential.

To conclude, that PSS *equals* sustainability is just a myth. The real strength of PSS thinking is that it moves away from existing product concepts, and inherently focuses on

the final *need, demand, or function* that needs to be fulfilled. This enhances the degrees of freedom to find sustainable improvement options enormously. When sustainability considerations are factored thoroughly in PSS design, untapped potentials for sustainability gains may well be uncovered.

3. Are PSS the road to competitiveness?

Societal mega-trends, such as specialisation, internationalisation, smaller and double-income families, clearly favour PSS – services now make up some 70% of the GNP in most Western economies. Compared to products, they can produce *superior tangible and intangible* values by delivering more customized solutions, and reduce the efforts of the customer ‘to make the product work’. They also can *lower system costs*. For instance, sharing and leasing concepts lead to a more intensive and hence efficient use of products. In the case of result-oriented PSS, one actor becomes responsible for all costs of delivering a result, and hence has a great incentive to use materials and energy optimally. And finally, PSS can help a firm to *improve the position in the value chain*, for instance, if the PSS include elements with a higher profit margin, or creates unique and customized client relationships that cannot be copied by competitors (e.g. [20–22]).

However, PSS do not deliver such bonuses by definition. Particularly in a B2C context, product ownership contributes highly to esteem and hence intangible value. Access to the product is often more difficult, creating tangible consumer sacrifices. Costs can be higher, if the PSS has to be produced with higher priced labour or materials, or when the often more networked production systems generate high transaction costs. And sometimes a switch to PSS may weaken the position in the value chain. In industries where excellence in product manufacturing and design from the key to uniqueness and hence power in the value network, diverting focus to an issue such as PSS development is a recipe to loose rather than win the innovation battle. In sum, firms have to assess carefully if they can competitively make and consumers will buy their PSS [4].

4. Is PSS research a consolidated science field?

The past decade saw many studies presenting rather isolated concepts, manuals and case-research related to sustainable PSS. Case-research often was driven by normative sustainability goals and did not analyse the reasons for poor PSS implementation, such as a lack of consumer acceptance or business interest [23].² In 2004 the SusProNet

¹ For instance, the Eu’s fifth Framework Program (FP5; 1997–2002), supported the projects MEPSS (Methodology Product Service Systems; [7]), Home Services [8], HiCS (Highly Customerized Solutions; [9]) Prosecco (Product-Service Co-design), Innopse (Innovation Studio and exemplary developments for Product-Service), and SusProNet (the Sustainable Product Development Network; [4]). Other PSS research includes, e.g. [10–14], and of course the research projects reflected by the papers in this special issue.

² One of the more laudable attempts to overcome this gap came from Kazazian [24], who cross-checked his PSS ideas with managers from real life companies. Unfortunately, they quickly came to the conclusion that Kazazian’s business models would not work in their case.

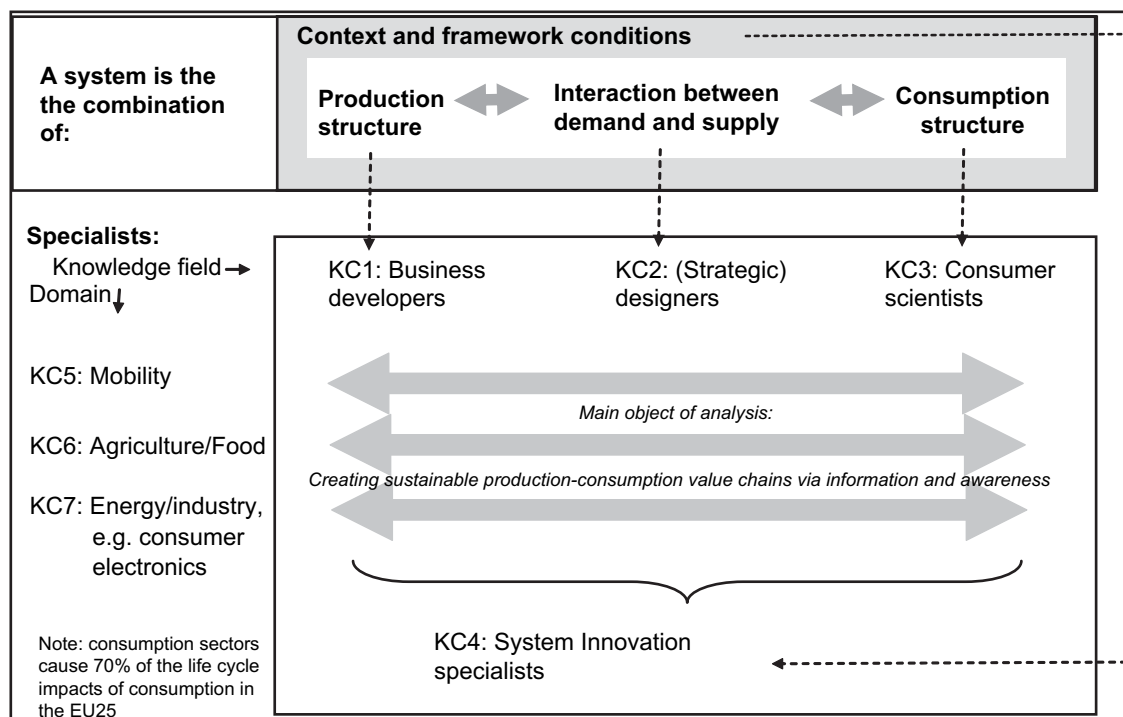


Fig. 1. The SCORE! – project knowledge communities relevant for system innovation [25].

project tried to analyse statistically the sustainability and competitiveness characteristics of a group of 200 ‘sustainable’ PSS cases. The SusProNet book commented ‘[s]uch approaches are nothing magic or novel in the development of scientific theories, and we are the first to acknowledge that our work was little more than a first, crude attempt to provide some kind of statistical proof of hypothesis. It is hence a kind of surprising that in the 10 years that the PSS issue is now on the agenda, this type of rigid theory development has been so scarce’ [4].

Given this lack of academic rigor it is no surprise that a sustainable PSS-theory with explanatory and predictive power still largely lacks [23]. Worse, though PSS essentially form a specific value proposition, the (sustainable) PSS community paid only limited attention to business management literature, where well-founded theories about the business sense of servicing had been developed [3]. We feel that these are the reasons why the PSS community had only limited success in creating a science field in its own right.

5. How should the transition towards sustainable systems be researched?

The PSS concept tries to solve sustainability problems (almost) entirely by changes in a business–client interaction along a value chain, in an existing market context. It assumes hence implicitly that radical sustainability changes can be

realised by using solely an untapped potential for an economic/environmental/social win-win.

This, probably, is not always right. Innovation sciences argue that radical novelties usually start in niches: a ‘protected space’ that is isolated from the regular market where innovations can be tested and become more mature. But like in ecosystems, radical novelties more often than not die out in their niche than that they become mainstream. The following factors provide important barriers for change [25,26]:

1. The *socio-technical regime* [27], which consist of dominant practices, rules and interests shared and embedded in institutions by a dominant multi-actor network (financiers, users, suppliers, and authorities).
2. The *landscape*. This landscape provides a (relatively stable) context in which actors interact and regimes evolve, such as infrastructures, normative values, worldviews, and dominant paradigms [28].

These factors, simply said the context and the framework conditions, determine the ‘space’ available for innovation within the market context. Incremental improvements, and to some extent system re-design, can be realised via traditional market mechanisms. However, a true radical system innovation will usually encounter a lot of opposition of the existing (and dominant) socio-technical regime. After all, in that case often also the factors forming boundary conditions (existing organisations, institutions and networks that share

dominant practices, rules and interests) have to change as well [25,28]. The conclusion is simple. A business model must fit with its specific context. Most radical ‘Factor X’ changes also require a change of context, and hence cannot be realised by asking a company to change its business model alone.

6. Implications: how to forward the PSS agenda

So what is the implication for the future of the agenda’s on PSS and radical changes to sustainability? A few points seem to stand out.

First, PSS have certainly a potential to enhance competitiveness and contribute to sustainability. But this potential win–win can only be realised by a careful *design* of the PSS, and may not *always* be achievable. The sustainable PSS community seems to be biased by the normatively desired sustainability promise of the PSS concept, under-addressing issues like consumer acceptance and business sense in the process. If PSS ever want to create a science field in its own right, it is paramount to involve practitioners from such research fields, to enrich and link the various individual conceptual approaches, and to greatly enhance the scientific rigor in for instance case study research.³ Another model, case study, or manual simply will not do.

And second, one simply has to accept that win–wins not always exist. True radical system innovations are a form of creative destruction, in which also contextual factors and framework conditions must change. This needs a much broader system approach than the business–consumer interaction along a value chain, so central in the PSS concept. It is for this reason that the follow-up project of SusProNet, called Sustainable Consumption Research Exchanges (SCORE), has been organised according to Fig. 1. It deliberately included science communities of business developers, designers, consumer scientists and system innovation specialists in its effort of depicting credible implementation pathways for sustainable systems in the field of food, mobility and housing/energy.⁴

Having and depicting sustainable PSS-dreams in themselves will not save the earth. Understanding what it takes to realise such dreams will, and that is where our community should focus on.

³ Note that this is also at odds with the practice that PSS seems to be mainly driven by a community with a designer background; see for instance the lists of contributors and information sources mention themselves very inspiring brochures and manuals on PSS disseminated by UNEP [29,30].

⁴ SCORE is a Co-ordination action on Sustainable Consumption and Production, running between 2005 and 2008, that is open for all interested practitioners, funded under the EU’s sixth Framework Program. It forms a support for the UN 10 Year Framework of Programs on Sustainable Consumption and Production agreed during the WSSD in 2002 in Johannesburg [31], organizing three workshops and two conferences. It will analyse the potential of sustainable solutions in the three mentioned domains, which together cause 70% of the life cycle impact of human activities, see [32]. Those interested can get involved via www.score-network.org.

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