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Product-services: a specific value proposition

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One of the surprising findings in the SusProNet project was that much of the theory development on what has been termed (sustainable) product-services is not well linked to business literature. Indeed, we found that many of the company members in SusProNet had never heard of the term 'product-services'. At the same time, this was the header under which the EU funded more than ten major projects, and the activities of many of the firms surely could be classified as putting product-services on the market. Hence, there is a clear need to define the term 'product-services' in more detail, preferably in a terminology that is usually applied by business and/or the business literature. We will first review terms and definitions mainly used in the sustainability-oriented literature. After that, we will review how the business literature tries to describe business systems. On this basis, we will choose a descriptive model and terminology that suits this book best, and introduce a classification of product-services.

2.1 Product-service systems in the sustainability literature

2.1.1 Definitions

Table 2.1 shows some definitions for product-services or product-service systems given in the sustainability-oriented literature. All these sources acknowledge that products and services are linked. In practice the provision of services involves a number of tangible and intangible elements, while the supply of products relies on the culmination of a long chain of services. The idea of serviceless products or productless services is thus flawed (Cooper and Evans 2000). In reality there is a spectrum from product-dominant entities (e.g. an apple) to service-dominant entities (e.g. serving apple pie in a restaurant). Having identified this common feature, it is also clear that definitions may differ on the following points:

1. The central term varies. Authors use, for example, one of the following terms:
 - Product-service systems
 - Product-service combinations or mixes, in short: product-services
 - Eco-efficient services
2. The parameter indicating whether and to what extent products and services are ‘mixed’ varies. Most authors do not make this parameter explicit, and just talk about mixes of products and services. The initial definition used by the SusProNet team saw product-services as an offer where the *value* consists of both a (tangible) product and (intangible) service element. Hockerts and Weaver (2002) speak of product-services when the *property* rights related to a product are distributed between user and provider. Such property rights include:
 - The right to retain profits/the obligation to cover losses
 - The right/obligation to maintain and operate a product
 - The right/obligation to dispose of a product
 - The right to exclude others
 - The right to use a product
3. Some definitions include the normative demand that a lower environmental impact should be reached, while others do not (e.g. Brezet *et al.* 2001; James *et al.* 2001; Mont 2004)
4. Some definitions are purely related to what the provider offers to the client. In this context, the word ‘system’ is only used to indicate that the offer consists of a mix of products and services (e.g. Manzini 1996; Goedkoop *et al.* 1999). In other cases, the term also includes the organisation of the production network as being the ‘system’ that puts the ‘product-service’ on the market (Mont 2004)
5. Some definitions seem to cover any business process, or any offer a firm can put on the market (e.g. Mont 2004). Others try to indicate that a ‘product-service’ should fulfil a specific, integral client demand (e.g. Manzini and Vezzoli 2002)

We think this short overview already gives some indications of how this set of definitions can be better aligned and made more precise. First, we think that a clear difference should be made between the *offer* to the client, and the *organisational structure* (often involving a network of firms) providing it. Second, we think that a term should not implicitly include the normative notion of sustainability but, if relevant, that this should be indicated specifically. And, finally, it should contain the notion that the product-service tries to fulfil an integrated, final client need. The following set of definitions could align the language on product-services in the sustainability literature:

1. Product-service (PS): a mix of tangible products and intangible service designed and combined so that they are jointly capable of fulfilling final customer needs. NB: this concerns only the *offer* to a client. Terms such as 'mix' or 'combination' might be added, but this is not necessary
2. Product-service system (PSS): the product-service including the network, infrastructure and governance structure needed to 'produce' a product-service
3. Eco-efficient (PS or PSS): (a PS or PSS) causing minimum negative environmental impact while having maximum economic added value
4. Sustainable (PS or PSS): (a PS or PSS) causing minimum negative environmental and social impact while maximising social well-being and maximising economic added value

2.1.2 Visualisations

The sustainability-oriented literature has made relatively few attempts to come to a structured visualisation of PSS. Currently, there are two important approaches.

The first approach was developed in the context of environmental evaluation methods of production–consumption chains (e.g. life-cycle assessment [LCA]). Such methods break down the production–consumption chain into unit processes. The material flows between unit processes, and the input of primary resources and output of emissions of unit processes are mapped. This gives a good insight into the unit processes and material flows that take place in the system that provides the product-service (see e.g. Fig. 2.1).

A second approach was developed by François Jégou in the HiCS project, and later used in a variety of other projects dealing with product-services (Jégou and Joore 2004). His 'Design Plan' approach grew from the well-known 'blueprinting' techniques from the design field (e.g. Maylor 2000 and Zeithaml 1996). It aims to visualise the business relations in a system providing a product-service. The method uses standardised icons to indicate specific roles of actors in the system, and gives a structured overview of (aggregated) physical flows, financial flows and information flows between them. In this way, a simple figure should be produced that reviews in one A4 page the most important organisational characteristics of a product-service system (see for instance Fig. 2.2).

Both methods have been developed for different uses. The first comes from a scientific/engineering tradition and was developed to support transparency and under-

PSS definitions and connected terms	Source
The configuration (quantity and quality) of products and services supplied to meet the demand for well-being may be described as a product-service mix or product-service combination	Manzini 1996; Goedkoop <i>et al.</i> 1999
A product-service system is defined as 'a marketable set of products and services capable of jointly fulfilling a user's needs'	Goedkoop <i>et al.</i> 1999: 18
PSS is a system of products, services, supporting networks and infrastructure that is designed to be competitive, satisfy customers' needs and have a lower environmental impact than traditional business models	Mont 2004
Eco-efficient services are systems of products and services that are developed to cause a minimum environmental impact with a maximum added value	Brezet <i>et al.</i> 2001
An eco-efficient service is one that reduces the environmental impact of customer activities per unit of output. This can be done directly (by replacing an alternative product-service mix) or indirectly (by influencing customer activities to become more eco-efficient)	James <i>et al.</i> 2001
A product-service system can be defined as the result of 'an innovation strategy, shifting the business focus from designing and selling physical products only, to selling a system of products and services which are jointly capable of fulfilling specific client demands'	Manzini and Vezzoli 2002; Definition in the EU FP5 project MEPSS
A pure product system is one in which all property rights are transferred from the product provider to the client on the point of sale . . . A pure service system is one in which all property rights remain with the service provider, and the clients obtain no other right besides consuming the service. A product-service system is a mixture . . . of the above. It requires that property rights remain distributed between client and provider, requiring more or less interaction over the life time of the PSS	Hockerts and Weaver 2002
A product-service system consists of tangible products and intangible services designed and combined so that they jointly are capable of fulfilling specific customers needs*	Initial definition used in SusProNet

- * The SusProNet definition also included some aspects that describe the consequences of PSS development: 'As most of the business focus today is either on product manufacture or on service provision the strategic design of Product-Service-System shifts the business innovation focus from mainly product or mainly service design to an integrated product-service design strategy. This can result in the involvement of additional stakeholders and even the customers in the PSS development and design process.'

TABLE 2.1 Definition of product-service (systems) in the sustainability-oriented literature

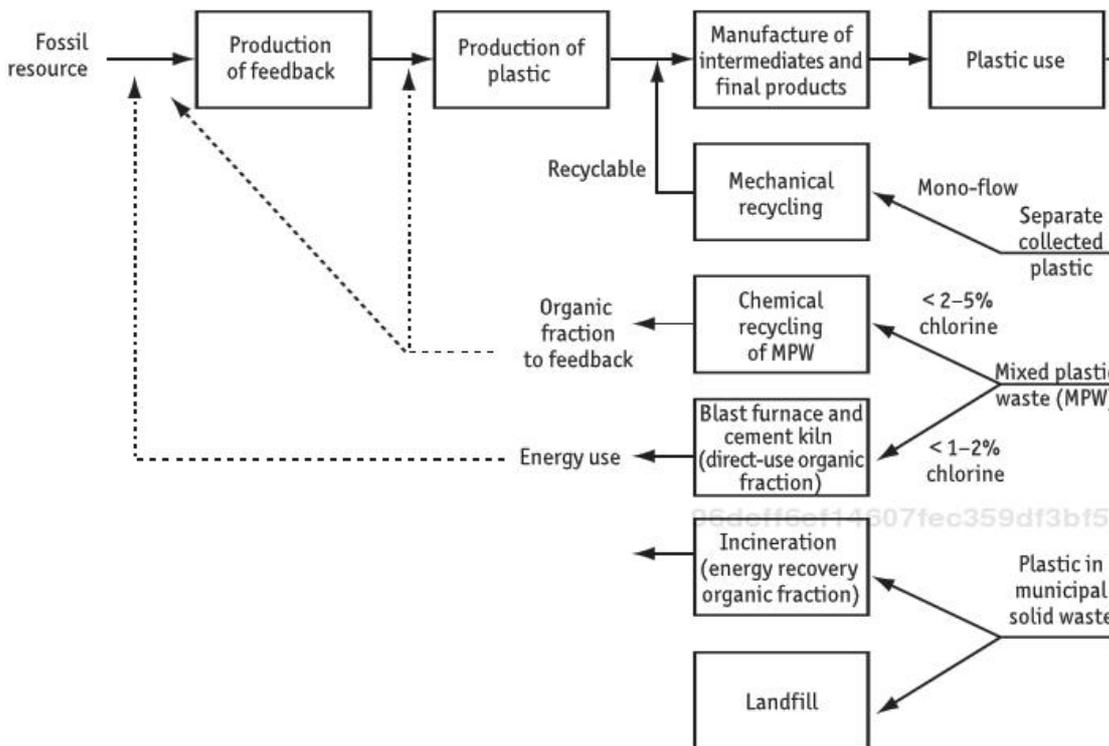


FIGURE 2.1 A typical process tree in life-cycle assessment

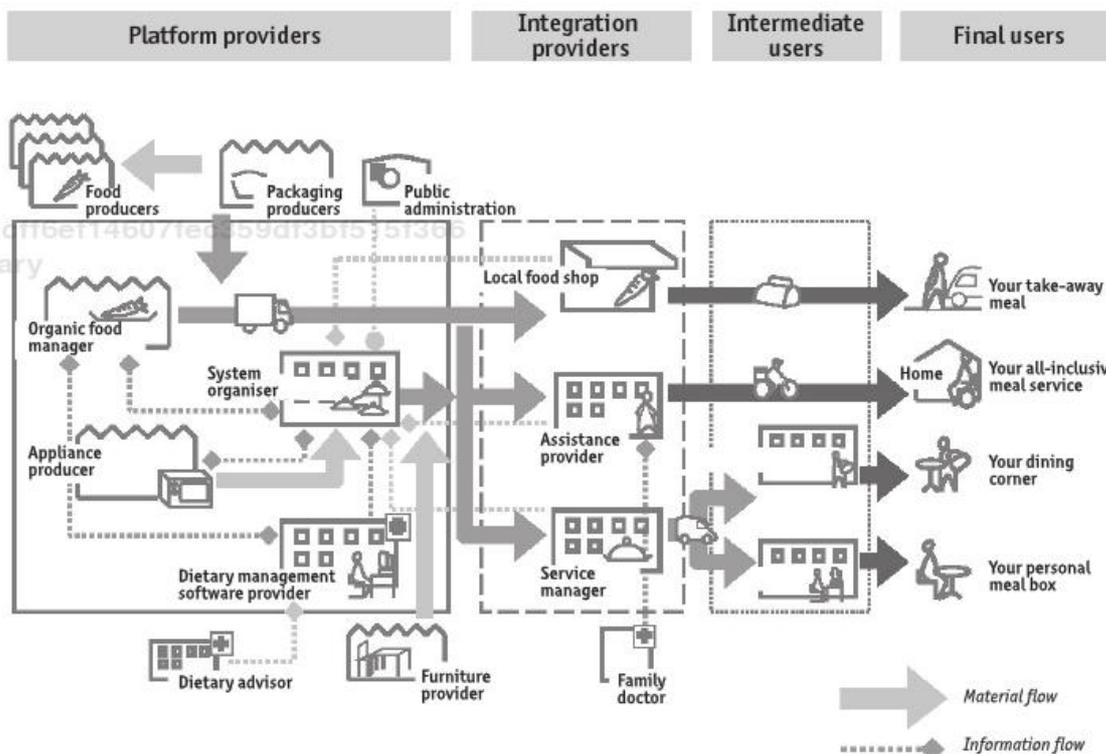


FIGURE 2.2 A business system presented via the 'Design plan' method

Source: Manzini et al. 2004

standing of the often complex calculations needed in LCA, for example. The second was developed by designers, mainly to support a process of PSS design. Given these different applications, it is not very useful to strive for harmonisation.

2.2 Value propositions and their production in the business literature

2.2.1 Definitions

'Product-service' and 'product-service systems' are terms that are hardly used in the mainstream business literature. Usually, what business puts on a market is described as an 'offer', 'offering' or 'value proposition'. This can be anything from a product, a service, to whatever else a client is willing to pay for. For value propositions that fulfil specific, integrated client needs, the following terms have become quite common:

- **Functional sales:** this concerns value propositions where the unit of transaction is the *function* of the product, rather than the product itself
- **'Experiences' and/or satisfaction:** this term, particularly used for the business-to-consumer market, seeks to shift the business focus from the actual good or service sold to the 'need behind the need' that is fulfilled (cf. Pine and Gilmore 1999; LaSalle and Britton 2003)
- **Integrated solutions:** these can be defined as value propositions that bring together products and services in addressing a customer's business or operational needs in an integrated way (Davies *et al.* 2001, 2003)

Several authors have developed structured ways of describing a business network that puts the offering on the market. One of the most influential is the 'value chain' concept of Porter (1985: 33). It illustrates how a firm designs, produces, markets, delivers and supports its value proposition, and disaggregates 'a firm into its strategically relevant activities in order to understand the behaviour of costs and the existing and potential sources of differentiation'. The value chain displays the total value (defined as the 'amount buyers are willing to pay for what a firm provides them'), and is divided into nine—technologically and strategically distinct—value activities and a margin: maintaining a firm infrastructure, human resource management, technology development, procurement, inbound logistics, operations, outbound logistics, marketing and sales, and service (Fig. 2.3). Though initially developed for an individual firm, the concept could be fruitfully applied to business chains as well.

In the 1990s, owing to the increasing complexity and flexibility of business, scholars started to argue that the linear value chain concept should be replaced by a more fluid 'value network'. In such networks, roles and functions can be combined in different ways by different actors.¹ The networks would further be described in terms of their

1 Interestingly enough, this concept has many similarities with the 'platform' approach used in the PSS project 'Highly Customised Solutions' (HiCS); see Chapter 5 and Manzini *et al.* 2004.

Definition and elements	Source
A description of how a company or a set of companies intend to create and capture value with a product or a service. A business model defines the architecture of the product or service, the roles and relations of the company, its customers, partners and suppliers, and the physical, virtual and financial flows between them	Ballon and Arbanowski 2005
A term that is often used to define the key components of a given business (a firm, normally) or to describe a particular business . . . we would propose a generic business model that includes the following causally related components, starting at the product market level: (1) customers, (2) competitors, (3) offering, (4) activities and organisations, (5) resources and (6) factor and production inputs	Hedman and Kalling 2001
The functions of a business model are to: <ul style="list-style-type: none"> ● Articulate the value proposition, i.e. the value created for users by the offering based on the technology ● Identify a market segment, i.e. the users to whom the technology is useful and for what purpose, and specify the revenue generation mechanism(s) for the firm ● Define the structure of the value chain within the firm required to create and distribute the offering and determine the complementary assets needed to support the firm's position in the chain ● Estimate the cost structure and profit potential of producing the offering, given the value proposition and value chain structure chosen ● Describe the position of the firm within the value network linking suppliers and customers, including identification of potential complementors and competitors 	Chesbrough and Rosenbloom 2002
'[A business model] elucidates how an enterprise works with those external stakeholders with whom it engages in economic exchanges in order to create value for all involved parties. [It is] a unit of analysis that centres on a focal firm but that also extends its boundaries'	Amit and Zott 2003

TABLE 2.2 Definitions of business models

'business model' (e.g. Ballon and Arbanowski 2005). The definitions of what a business model is diverge quite a lot, and some are extremely loose (see Table 2.2).² The interesting point for this chapter is that it tries to untangle the activities in a business network that puts a value proposition on the market. In doing so, most authors (Hedman and Kalling 2001; Chesbrough and Rosenbloom 2002; Amit and Zott 2003; Davies *et al.* 2003; Ballon and Arbanowski 2005)³ discern elements such as:

- 2 The fact that business modelling was a concept developed by scholars that focused on 'new economy' businesses emerging in the 1990s made it even a little controversial. The term was almost inevitably caught in the discussion about whether this 'new economy' indeed created new rules of the business game, or was merely the same play in a new technical context (e.g. Porter 2001).
- 3 We use here mainly the terminology proposed by Ballon and Arbanowski (2005).

- The value proposition
- The value network (actors involved in producing and using the value proposition)
- The revenue model (which reflects the formal [contractual and governance] relations within the network, essentially dividing the costs and revenues between the actors in the value network)
- The technological infrastructure (the ‘hardware’ needed to produce the value proposition, generating the costs that have to be covered by revenues received by selling the value proposition)

Specific business models cannot be regarded as inherently ‘good’ or ‘bad’; their performance depends on how successfully the business model creates a ‘fit’ between different interests in the value network, at all relevant levels: the functional, strategic/organisational and financial (e.g. Ballon and Arbanowski 2005).

2.2.2 Visualisations

In the business literature, simple actor-process chains (as already shown in Fig. 2.1) or blueprint-like techniques (compare Fig. 2.2) are a common way of visualising (activities in) a business network (e.g. Fitzsimmons and Fitzsimmons 1994; Gattorna and Walters 1996; Kaczmarek and Stüllenbergh 2002).

However, when describing the system that creates the offering, business literature is not only interested in the actors and the physical flows between them, but also in monetary flows, activities, mutual agreements, and so on (see for instance Porter’s [1985: 33] value chain approach illustrated in Fig. 2.3). The literature on business modelling goes a step further than describing just the structure of the network in terms of value. Using the work of Ballon and Arbanowski (2005) as an example, Figure 2.4 visualises the value proposition, technological architecture, value network and revenue model

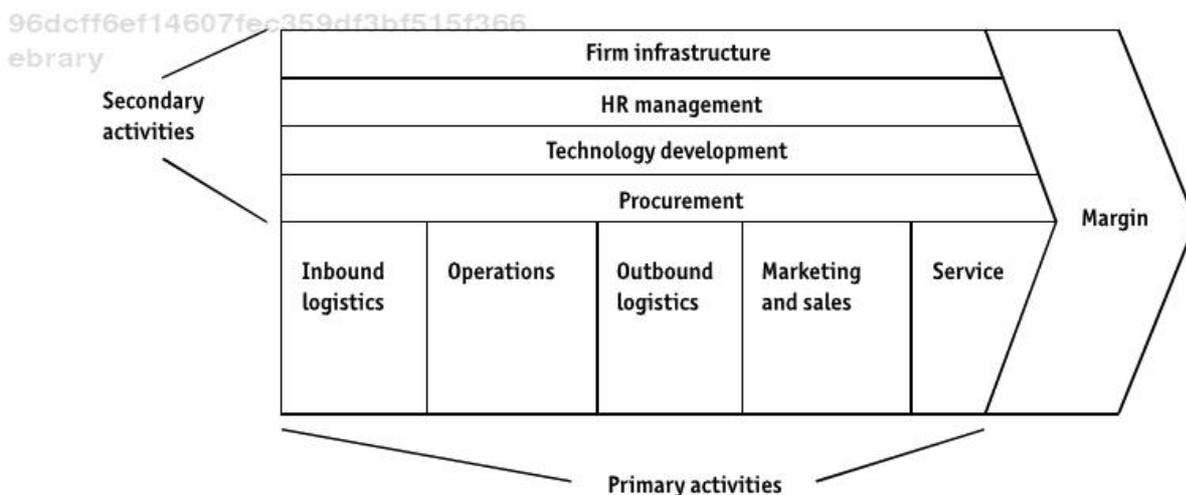


FIGURE 2.3 The generic value chain

Source: Porter 1985: 37

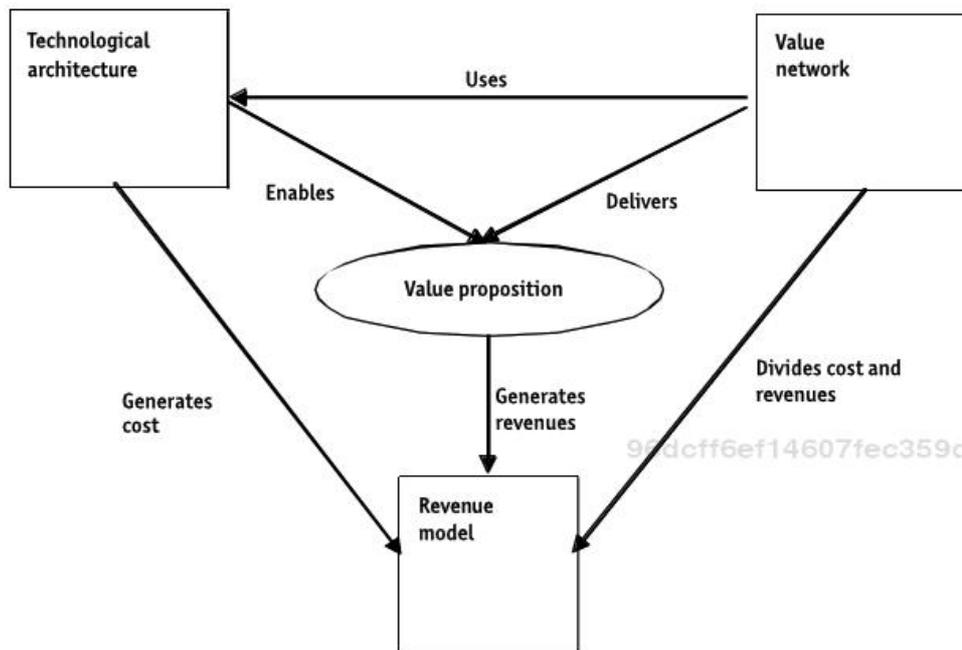


FIGURE 2.4 Elements in a business model as proposed by Ballon and Arbanowski (2005)

(i.e. the business model elements described above). It basically differentiates between the value proposition and three different elements (technical, actor-related and governance-related) of the system putting the value proposition on the market.

2.3 Definitions and terminology used in this book

2.3.1 A comparison between the sustainability and business-oriented literature

When we look at the definitions of product-services and their 'production' systems in the more sustainability-oriented literature, and the terminology used in business literature, a few things stand out.

Despite coming from rather different points of departure and developed in rather unconnected science networks, the overlap between the concepts from the two streams is striking. First, it is crystal clear that what in the sustainability-oriented literature is called a 'product-service', is in the business literature covered under (though admittedly with a wider reach) terms such as 'value proposition' or 'offering'. Second, in both streams a structured way of describing the system (co-)producing this value proposition is developed. And particularly the visualisations from the 'blueprinting' tradition and the business modelling approach describe the systems in almost similar compos-

ing elements (actors, financial flows, material flows and information flows versus the value network, revenue model and technological architecture). Furthermore, the philosophy that business models are the result of a negotiation and alignment process between actors in a network in the best fit with regard to the elements of the network structure is well in line with the PSS concept. After all, due to their part service and part product character, most PSSs will be put on the market by a network of businesses that negotiated a form of collaboration beforehand. We hence think that it is useful to conceptualise PSS in terms of a business model approach. This implies that the PSS has to be described in terms of the following questions:

- What is the offering or value proposition?
- Which parties in which roles make up the value network?
- Which revenue model is used?
- How is the technological architecture organised?

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The conclusion is now straightforward. What the sustainability-oriented literature calls a 'product-service' is nothing more and nothing less than a specific type of 'offering' or 'value proposition'. What the sustainability-oriented literature calls the 'system' is nothing more and nothing less than the combination of the value network, technological architecture and revenue model. Putting a product-service on the market rather than a product hence implies first and foremost an innovation of the value proposition. Changing this value proposition might have implications for how to organise the value network, technological architecture and revenue model, but this is no automatism.

2.3.2 Definition of product-services

On the basis of Section 2.3.1 we can now refine the first definitions given in Section 2.2 of this chapter:

- **Product-service (PS):** a value proposition that consists of a mix of tangible products and intangible service designed and combined so that they jointly are capable of fulfilling final customer needs
- **Product-service system (PSS):** the product-service including the (value) network, (technological) infrastructure and governance structure (or revenue model) that 'produces' a product-service

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The definition of product-service in particular deserves a few remarks. As indicated, one has to acknowledge that products and services have always been linked. With 'product-service' we simply want to indicate a value proposition that derives its value from a significant part of both the product and service element (see Fig. 2.5).

Second, it is also clear that the definition we decided to use is not often applied in the business literature. This is of course a severe drawback. After all, in essence we are writing a book on value propositions, which is at the heart of business strategy and management. However, generic terms such as 'offerings' or 'value propositions' cover everything that a business can put on the market and hence seem too broad. The term 'functional sales' is, as we will see in the next section, more limited than the term 'prod-

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uct-service'. The term 'solution' might be the only viable alternative, but this also has a generic character and does not reflect the fact that the object of analysis is a mix of products and services.

2.3.3 Types of product-service

Various classifications of product-services have been proposed (e.g. Brezet *et al.* 2001; Zaring *et al.* 2001; Behrend *et al.* 2003). Most classifications make a distinction into three main categories of PSS. Product-services are literally seen as a mix of a (tangible) product and a (intangible) service; the different types of product service differ in the extent to which their value is determined by the product or the service component (see Fig. 2.5).⁴ They are also a more radical deviation from the traditional product sales concept:

1. Product-oriented services. Here, the business model is still dominantly geared towards sales of products, but some extra services are added
2. Use-oriented services. Here, the traditional product still plays a central role, but the business model is no longer geared towards selling products. The product stays in the ownership of the provider, and is made available in a different form, and sometimes shared by a number of users
3. Result-oriented services. Here, the client and provider in principle agree on a result, and there is no predetermined product involved

In the SusProNet work it appears that each of the main categories defined above still covers product-services with quite different economic and environmental characteristics. Elaborating on typologies in PSS literature and previous studies⁵ we will discern the following more specific types:

Product-oriented services

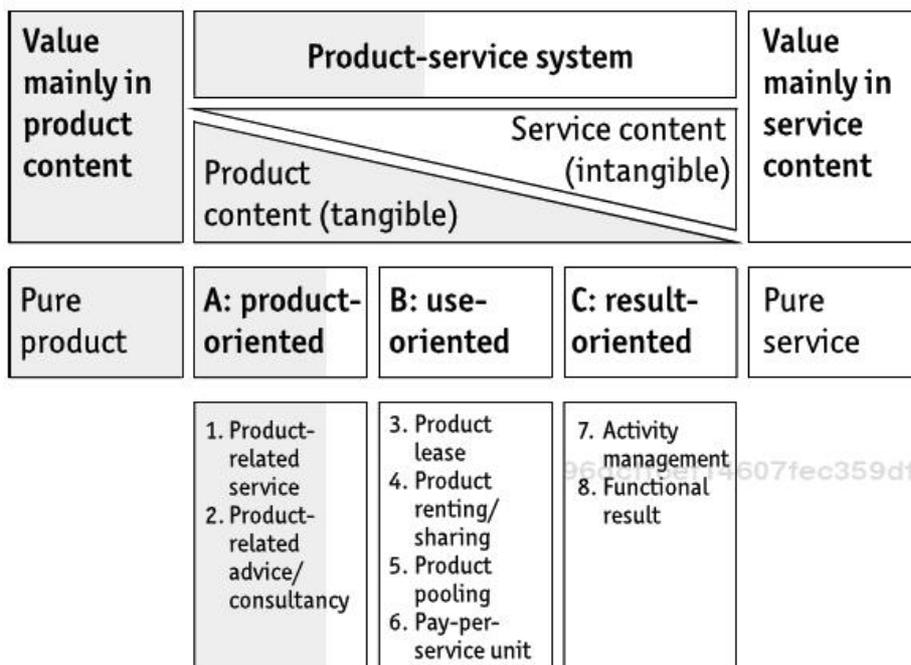
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1. Product-related service. In this case, the provider not only sells a product but also offers services that are needed anyway during the use phase of the product. This can imply, for example, a maintenance contract, a financing scheme, the supply of consumables, but also a take-back agreement when the product reaches its end-of-life
4. Hockerts and Weaver (2002) argue that the value of the product and service component should not be the determining factor for classification, but the extent to which the property rights of the product are transferred from the provider to the user. Though the basis for classification is hence different, their classification criterion leads to the same categories as in Figure 2.5. For product-oriented services, the property rights of the product are transferred totally to the user; for use-oriented services, the user buys access to a product (which stays in the ownership of the provider); and for result-oriented services, the user buys a result (without any predetermined product, let alone property rights involved).
5. The typology presented here was mainly inspired by those given in Zaring *et al.* 2001 and Tukker and van Halen 2003. See among others Hockerts *et al.* 1994, Behrendt *et al.* 1999 and Prepare 2000 for similar classifications.

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The classification in this figure allows for a logical grouping of virtually all types of value proposition that one can think of, including 'non-material' offerings such as (non-product-related) advice and consultancy (which is a pure service). However, as with any classification system, there are exceptions for which this classification does not work well. The classification assumes that 'products' by definition have a material character, and for some products—most notably software—this is simply not the case.

FIGURE 2.5 Main and sub-categories of product-services

- 2. **Product-related advice/consultancy.** Here, in relation to the product sold, the provider gives advice on the most efficient use of it. This can include, for example, advice on an organisation structure of the team using the product; or optimising the logistics in a factory where the product is used as a production unit

Use-oriented services

- 3. **Product lease.** Here, the product does not shift in ownership. The provider keeps the ownership, and often is also responsible for maintenance, repair and control. The leaser pays a regular fee for the use of the product; in this case normally he or she has an unlimited and individual access to the leased product
- 4. **Product renting or sharing.** Here, the product in general is in the ownership of a provider who is also responsible for maintenance, repair and control. The user pays for the use of the product. The main difference with type 3 is, however, that the user does not have unlimited and individual access; others can

use the product at other moments. The same product is sequentially used by different users

5. Product pooling. This resembles type 4 to a large extent. However, here there is a simultaneous use of the product
6. Pay-per-service unit. This category contains a number of other classical PSS examples. The PSS still has a fairly common product as a basis. Yet the user no longer buys the product, but pays for the output of the product according to the use level. Well-known examples include the pay-per-print formulas now adopted by most copier producers. In this formula, the copier producer takes over all activities that are needed to keep a copying function in an office available (i.e. paper and toner supply, maintenance, repair and replacement of the copier when appropriate). The difference with the category 'Functional result' (type 8, below) is that the users still have to operate the machine themselves: the process of making copies is *not* outsourced

Result-oriented services

7. Activity management/outsourcing. Here, a part of an activity of a company is outsourced to a third party. Since most of the outsourcing contracts include performance indicators to control the quality of the outsourced service, we group them in this chapter under result-oriented services. However, in many cases the way in which the activity is performed does not shift dramatically. This is reflected by the typical examples for this type, which include the outsourcing of catering and office cleaning that is now commonplace in most companies
8. Functional result. Here, the provider agrees with the client to deliver a result. We use this category, in contrast to type 6, for a functional result in rather abstract terms, which is no longer directly related to a specific technological system. The provider is in principle fully free to choose the means to deliver the result. Typical examples of this form of PSS are companies that offer to deliver a specified 'pleasant climate' in offices rather than gas or cooling equipment, or companies that promise farmers to keep harvest losses to an agreed minimum level rather than selling pesticides

After this basic introduction into the concept of product-service systems the next chapter will discuss the economic side of this concept.