

Work package	1
Task	1.2 – PSS : Alternative models
Deadline	Month 6
Status	Completed – January 2008
Work package leader	Paul Micklethwaite, Kingston University
Objectives	
➤ Identification of alternative Product Service Systems (PSS) (inc. non-UK) to add value and reduce environmental impact	
Method	
➤ Secondary research : examination of published literature to discover PSS applicable to contract furniture	

Executive summary

- This report partially delivers Work Package 1, the objective of which is to identify current and potential best practice with regard to Product-Service Systems (PSS) which can be used to decouple manufacturing profit from the need to produce additional furniture (with associated emissions).
- PSS are generally seen as being applicable to contract (repeat purchase / business-to-business) rather than retail (single purchase / end consumer) commerce.
- Three types of PSS are usually identified: Product-oriented; Use-oriented; Result-oriented.
- A number of case studies of PSS in office furniture are presented. These mostly relate to first-level (product-oriented) PSS.
- Numerous potential benefits and risks in adopting PSS are identified. These must be considered, and the ‘pros and cons’ weighed-up, in any specific case. The risks of implementing PSS may be less than the risks of failing to do so and continuing with ‘business as usual’ in an increasingly hostile commercial context.

Task 1.1 PSS : Alternative models

1 Types of PSS

Product Service Systems (PSS) are generally seen as being applicable to contract (repeat purchase / business-to-business) rather than retail (single purchase / end consumer) commerce. (Cooper & Evans, 2000:13). Three types of PSS are usually identified: (1) Product-oriented; (2) Use-oriented; (3) Result-oriented (Tischner & Verkuijl, 2002:34; Verkuijl et al, 2004:4)

1.1 Product-oriented PSS

This type of PSS is product-focused. The product is owned by the user/consumer. The *provider* offers additional services for the product sold, eg. maintenance; guarantee; takeback at end-of-life. Examples of product-oriented PSS include:

- *Service integration* - a new service is added to an existing product
- *Product extension service* - the value of a product is increased through an additional service, e.g. upgrading, repair, guarantees
- *Vertical integration* – the retailer and/or customer gets directly involved in the process of production, e.g. via production-on-demand

Examples of product-oriented PSS in the office sector (considered broadly) provide an extra service on top of an existing product, e.g. furniture maintenance; warranties; textile cleaning; end-of-life treatment. The chair manufacturer Wilkhahn has pioneered a repair and refurbishment service for its office chairs. Customisation services are also included here, e.g. bespoke furniture and custom-order built computers. (Verkuijl et al, 2004:23-24)

1.2 Use-oriented PSS

This type of PSS is also product-focused, but this time product is owned by the service *provider*. The provider sells *product functions* rather than the products themselves, by means of modified distribution and payment systems, e.g. product sharing, pooling and leasing. The provider no longer sells the product, only its usage. High use-intensity reduces the amount of products needed but puts greater stresses on those products.

Examples of use-oriented PSS in the office sector involve rental or leasing of equipment, furnishings etc. The flooring company Interface has pioneered the leasing of flooring tiles for commercial premises. The document management company Xerox has pioneered the leasing of photocopiers to commercial customers.

1.3 Result-oriented PSS

This type of PSS is *system*-focused. The product is owned and run by the service provider as part of a managed system. The provider sells a *benefit*, and therefore has an incentive to intensify and optimise a product's operation and increase its service life. This can also be thought of as system optimisation. Examples of result-oriented PSS include:

- *Product substitution service* - products are substituted by new services (dematerialisation), often driven by new technologies, e.g. a remote telephone answering service replaces a personal answering machine; a pest control service replaces supplying pesticides.
- *Facility management* - the supplier gives the customer incentives to consume more efficiently, thereby optimising the system, e.g. by using modified payment systems such as contracting

2 PSS for office furniture

2.1 Wilkhahn

The German manufacturer Wilkhahn offers a maintenance, refurbishment and end-of-life disposal service for its swivel office chairs. This allows customers to extend the useful life of their chairs and enables Wilkhahn to reuse some components in new products. There is less need for new products, with consequent resource savings. (Verkuijl et al, 2004:95)

The company's 2005 environmental report (Wilkhahn, 2005:14) discusses implementation of producer responsibility via service agreements for servicing Wilkhahn chairs, repairs (if possible on site), general overhauling, e.g. exchange of seat shells and upholstery, and taking back worn products or product components for returning to the material cycle. An earlier report describes a 'service station' operated by the company, in which damaged chairs and tables, or ones suffering wear and tear from use, are revived for a second life.

Wilkhahn reports that it is developing product optimization and service concepts to continue to prolong the service life of its ranges. The company's 2001 environmental report (Wilkhahn, 2001) included plans for more ambitious takeback activity embracing products beyond Wilkhahn's own range: "we are negotiating with the local Action Group of the Unemployed ... with a view to setting up a socio-ecological pilot project for taking back, recycling and proper waste disposal of external products." (p.4)

These activities relate to product-oriented PSS.

2.2 Renew

Renew Inc. restores previously owned Steelcase office furniture systems to their original 'as new' condition, using environmentally responsible refinishing techniques. Renew offers four services programs that maximize the value of your existing

furniture assets. These services programs can be used to purchase either remanufactured Renew or new Steelcase furniture. (Verkuijl et al, 2004:96)

These activities again relate to product-oriented PSS.

2.3 Interface

Interface Inc. is the world's largest manufacturer of carpet tiles and upholstery for commercial interiors. The company has pioneered the leasing, rather than sale, of flooring tiles for commercial premises. This sits within a grander corporate ambition to be a leading example of a sustainable and restorative enterprise. The leasing model has brought associated innovations in carpet technology to make recovered carpet tiles easier to reuse, remanufacture and recycle. (Wong 2004)

Interface are the leading global example of PSS in action, and usually cited as the best practice case study. Their model relates to use-oriented PSS.

2.4 Other examples

Besch (2004) identifies a number of case studies and scenarios in her review of publications discussing PSS for office furniture. Those combining leasing and remanufacturing are presented here.

Strategy 1 : High quality office furniture : reuse / reconditioning

This strategy involves takeback of office furniture from customers at end-of-life, and subsequent refurbishment and reuse of recovered elements in new products. Refurbishment takes the form of extended usage of non-fashion dependable or non-wear parts and replacement of other parts.

This strategy can have ecological and economic benefits (a saving of up to 35% of production costs is suggested), translatable into lower producer costs and customer prices. The strategy can also offer customers a more flexible fulfilment of their office furniture needs under a service contract, as producers take back and remanufacture or reuse (reassign) furniture. An ongoing relationship is established between the service-provider / producer and their customers. Furniture is likely to be used longer under a service contract, resulting in fewer products sold for retailers and manufacturers.

Strategy 2 : Low quality, high volume office furniture : material recycling

This strategy involves takeback of office furniture from customers at end-of-life, and subsequent separation and recycling of economically recyclable fractions.

Disassembly and sorting of old furniture and components may be uneconomic at low volumes, with costs exceeding the revenue generated from recovered material. Economies of scale are likely to apply, such that the more office furniture is transported and disassembled together the more profitable the process becomes. The degree to which furniture is designed for easy dismantling and its materials are labelled also impacts on ease of disassembly and sorting. Market values for the recovered materials will also directly impact on the economic feasibility of this strategy.

Strategy 3 : Office chairs : remanufacture and sale

This strategy involves takeback, remanufacturing, and sale into secondary markets of used office chairs, accompanied by a maintenance and repair service during first usage phase. It extends Strategy 1 above to include subsequent sale into secondary markets.

The service offer can create competitive advantage for the producer as well as increased customer retention. Modular construction leads to standardized parts that can also be used in other chair models. Standardized parts can be produced in greater amounts leading to reduced unit production cost. Retailers may not be interested in selling remanufactured office chairs, however, due to lower profit margins on ‘second-hand’ products.

These strategies again all relate to product-oriented PSS.

3 Benefits and risks

There are several potential benefits and risks associated with switching to a PSS model.

3.1 Environmental benefit

Less products = less energy and materials

“The most significant environmental impacts associated with office furniture are generated during the production of raw materials for furniture and the disposal of old furniture.” (Hopfenbeck 1995, cited in Besch 2004) These two activities are both reduced through servicization, in which less products are required in total and so impacts associated with product manufacture and disposal (material use, waste, production energy) are reduced. The assembly, distribution and use phases of the product lifecycle are all extended by servicization, yet these are not as so significant in their environmental impact. There is thus likely to be a net environmental gain in moving from product- to service-provision, depending on the extent of redistribution transportation (Cooper & Evans 2000 : 2)

3.2 Customer benefits

Requirements met better

Customers can benefit from a service which ensures they have furniture which optimally fulfils their needs, supplied by the service provider. The burden of provision of office furniture is taken away from customers. (Besch 2004:13–14) Modern work concepts increasingly call for more flexibility and frequent reorganisation of office interiors. This enables furniture provision which is more responsive to changing working patterns and requirements such as ‘hot desking’.

Cost saving

“Least cost supply” addresses how the customer's long term 'needs' or 'goals' could be achieved with fewer resources and at lower cost; the economic benefits of this to the supplier may be passed on to the customer. (Cooper & Evans 2000:7)

3.3 Provider benefits

Customer retention

The service provider will have higher potential yields from this business model and stronger customer retention, deriving from contracts sold with the product. (Besch 2004:13–14) Intermittent product purchase (either one-off or repeat) is replaced by an ongoing service relationship. A multi-dimension service offering may create incentives for customers to maintain a contract over long periods.

Compete against low-cost imports

The office furniture industry in the EU is presently in crisis; service concepts might offer a chance to producers to escape from the price war and create competitive advantage against low-cost countries.

Financial savings

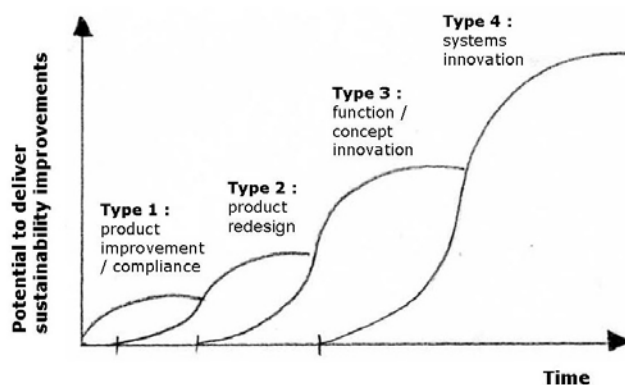
Servicization reduces the number of products required, thus reducing associated manufacture and disposal costs.

More effective take-back

“Producers considering the implications of being made responsible for end-of-life products when discarded may conclude that it would be preferable in future to rent or lease products rather than sell them (particularly if they want to retrieve their own branded products rather than be part of a pooled collection system).” (Cooper & Evans 2000:4)

Moving towards sustainable enterprise

Progression through Brezet’s four-step hierarchy of eco-innovation (Brezet 1997); leading to more secure long-term survival and competitiveness.



Brezet's four-step hierarchy of eco-innovation

Job creation

PSS models may create employment as they involve greater labour intensity in tasks such as product installation, repair and refurbishment, and also greater human interaction in continued service delivery. (Cooper & Evans 2000 : 25; 38)

3.4 Provider risks

Less products sold

Furniture is likely to be used longer under a service contract, resulting in fewer products sold for retailers and manufacturers. Servicizing reduces business opportunities to sell more furniture. This may be perceived as a risk.

New responsibilities

Managing the many elements of a service package which may for example consist of financing; furniture installation; maintenance and repair services to preserve the product's value; training for right furniture use; take back and reuse or recycling of old furniture. This could be extended to include add-on services such as space planning; furniture inventory analysis; consultancy for work organisation. Simultaneous provision of all these services may require a network of service providers acting in consort. (Besch 2004:13–14)

Cross-industry collaboration may go further to embrace materials pooling :

“Herman Miller might profitably begin to provide the service of custom-tailored office furniture, leasing rather than selling its valuable materials. ... Joining with other material users, as it is already considering, Herman Miller might lead an emerging pool of innovative companies in the creation of stable markets for ecologically intelligent products and services.” (McDonough & Braungart, 2002)

This would require the restructuring of whole industrial sectors.

Financial risk : need for pre-investment

Service providers would face a high financial risk in the PSS scenario. The risk is that service providers have to invest in the production and remanufacturing of the office furniture without knowing whether they will be able to rent out the furniture over a sufficient long period. (Besch 2004:viii) “Companies that operate leasing, rental or car share schemes also face greater financial risk than those involved in simple 'sell-buy' transactions as they must pre-finance the investment. The replacement of a lump sum payment at the outset by payment through installments may possibly act as a commercial barrier.” (Cooper & Evans 2000 : 39) Market research would be required to establish demand.

Difficult market conditions

The office furniture industry is in crisis; experimentation with implementation of a PSS scenario is risky as a wrong strategic decision could theoretically lead to bankruptcy in the current climate. (Besch 2004:viii) The same may be said of continuing ‘business as usual’. The current crisis can be seen as a spur or disincentive to innovate.

No legislative pressure

Furniture manufacturers are not currently required to organize the end-of life management of their products in the EU (Besch 2004:viii) This may however change; several other manufacturing sectors have recently become liable to takeback legislation.

No prior commitment to environmental improvement

Furniture manufacturers have not historically shown interest in improving the environmental performance of their products on a voluntary basis (Besch 2004:viii). This therefore requires a shift in values.

Product characteristics

Office furniture is typically a relatively simple and robust product, which does not require much repair or maintenance. (Besch 2004:viii) Complex office chairs produced by Wilkhahn, Herman Miller and the like contradict this.

Fashion

Office furniture is usually used over a long period (on average 12 years), which does not support the idea of renting. Trends and fashion seem to influence the purchasing decision for office furniture significantly, which inhibits renting furniture over several decades when fashion and design have considerably changed. (Besch 2004:viii)

Resistance to change (producer)

Manufacturers are used to a product-based business model in this sector (‘maximise material output to maximise profit’); a switch to a service-based model (‘minimise material output to maximise profit’, or ‘least cost supply’) would meet with resistance. (Besch 2004:viii; Cooper & Evans 2000) Adoption of a new system always requires persuasion.

Resistance to change (customer)

Customers are also used to a product-based business model in this sector; a switch to a service-based model may meet with resistance, despite the prospect of added value. (Besch 2004:viii; Cooper & Evans 2000) “The culture of ownership [of domestic washing machines] brings certain expectations about financing. Many people are used to paying the initial relatively large capital cost of new appliances and are then content to take a risk with reliability (although some purchase warranties despite the concern about value for money)” (Cooper & Evans 2000:18)

4 Conclusion

Product Service Systems (PSS) involve a reconsideration of the way in which furniture manufacturers sell their product, and offers the potential to decouple producers' business success from the amount of products sold. By creating value from the provision of additional service rather than additional product, it is possible to create greater economic benefit simultaneously with reduced environmental impact.

Product life extension strategies for office furniture, such as PSS, present a promising option to close material loops and reduce the most significant environmental impact of office furniture, ie. raw material production and furniture disposal. (Hopfenbeck, 1995, cited in Besch, 2004:vii) Such strategies also promise to remove a major element of the production costs for office furniture, ie. raw material costs. Longer product life means fewer replacements, which in turn means fewer units produced and less energy consumed in producing additional chairs. Product life extension strategies diminish the producer's business opportunity to sell more furniture, however, presenting a potential obstacle to their adoption.

Numerous potential benefits and risks are identified. These must be considered, and the 'pros and cons' weighed-up, in any specific case. The risks of implementing PSS may be less than the risks of failing to do so and continuing with 'business as usual' in an increasingly hostile commercial context.

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