Sustainability Via Servicing: From Individual Action To Institutional Action

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ABSTRACT

The servicizing of products constitutes a powerful tool to reduce the environmental footprint of the stages of a product's physical resources life cycle, ultimately to yield a more sustainable solution. It can be achieved via the co-creation of various clean services (CleanServs) by individuals. But to achieve the goal of sustainable consumption will require increasing the pace of development of organized and mass-use frameworks like, for example, shareconomy and eco-labeling. In this frame, the notion of the product-service system (PSS), which offers access to a solution rather than ownership of the goods or assets needed for that solution, also promotes greater responsibility and higher levels of obligation on the parts of both provider and customer.

Keywords: Servicizing; Product-Service Systems; CleanServ; Sustainability

INTRODUCTION

In their revolutionary paper about service-dominant logic (SDL), Vargo and Lusch, 2004 claimed that integral to any economic exchange today is the application of the specialized knowledge, mental skills, and physical labor of the actors, i.e., the producer and the client. From the SDL perspective, therefore, every exchange between a producer and a client is built on services rather than being based on goods (Vargo & Lusch, 2004). Moreover, they emphasized that in contrast to goods-dominant logic (GDL), according to which tangible values are produced and delivered from a supplier to a consumer in two separate and sequential steps through a value-in-exchange model, intangible values, i.e., services, are co-created through the interaction between a provider and a customer in a value-in-use paradigm. This co-creation process necessitates the active involvement of both provider and customer. In this scenario, the value is produced and delivered simultaneously through the joint efforts and capabilities of the provider and the customer, who also share in providing the physical and non-physical resources needed to realize the service (Vargo, Maglio & Akaka, 2008).

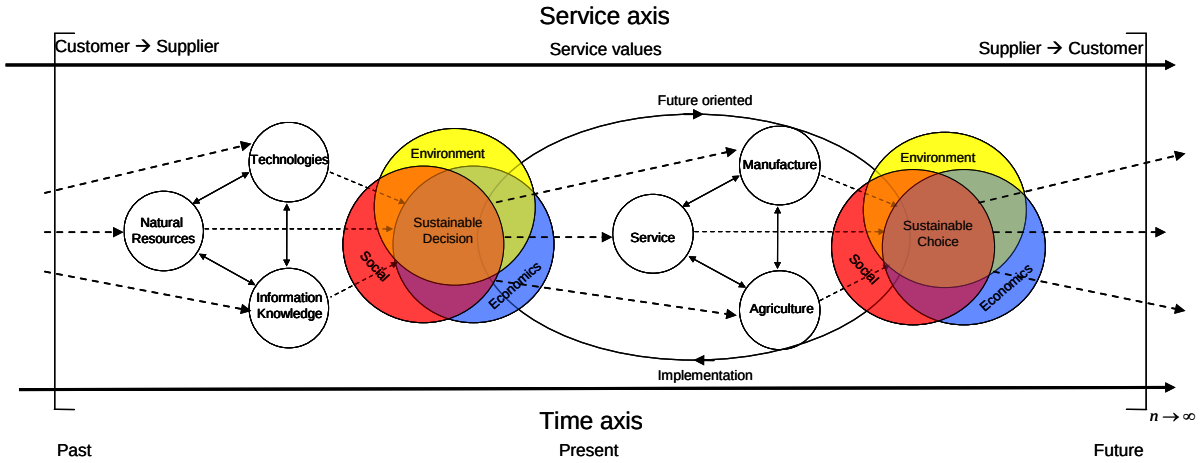
Value co-creation processes can take a variety of forms, each of which differs in how the role of the customer in the process is defined and how the joint responsibilities for the investments and tasks involved in service production and delivery are divided between the provider and the customer. Accordingly, value co-creation processes can be grouped into four categories based on the terminology of Kuusisto and Päällysaho: co-use, co-production or co-performance, co-generation, and co-design (Kuusisto & Päällysaho, 2008; Wolfson, 2016). Co-use refers to a service for which the provider is responsible for most of the resources and tasks in the production and delivery of the value, and the customer exploits the service and passively co-creates value by creating the perception of value. An example of co-use is a public transportation service, the operating company of which is solely responsible for providing the mode of transportation and the necessary physical facilities, for planning the timetable, and for managing its travel routes. The passengers, in turn, adapt their travel behavior to the system provided by the transportation company and use it as is. In the co-use scenario, therefore, the customers have very little control over the end service supplied by the company. The co-production of a service, however, requires that customers play a more active role by investing more of their resources and by sharing in some of the tasks required to produce and deliver the service. For instance, the use of a carpooling service, where the customer organizes and shares a journey with other passengers, requires that the customer participate in both route and timetable planning. Likewise, the co-generation mode assigns customers a more prominent role in value co-creation, as they are not only involved in the production and delivery of the value that they use, they also participate in generating the same value or a new value with the service provider for other customers. For example, Moovit, a public transportation application that provides an accurate, online, real-time picture of the

current public transport options, enables its customers to smartly navigate and move from place to place. But for Moovit to function as intended, it relies on its customers to post live reports to the application about the conditions on the transport line they used, including the line's punctuality and crowdedness, among other details, thereby improving the public transport experience for all passengers by recruiting them as providers. Finally, the co-design of a service – for example, ordering a taxi – is built on a dialog between a customer and a service provider to determine the types and forms of service desired.

Shifting the emphasis from a GDL- to an SDL-oriented approach usually also entails implementing corresponding changes in the quantities and qualities of the physical resources consumed in the value provisioning processes. Moreover, it obligates the provider and the customer to assume joint responsibility not only for the provision of the value, but also for the varied potential effects that the value provision has on the natural and social environments (Wolfson, Mark, Martin & Tavor, 2015; Wolfson, 2016). The adoption of an SDL-oriented approach, therefore, facilitates the imbuement of services with sustainability.

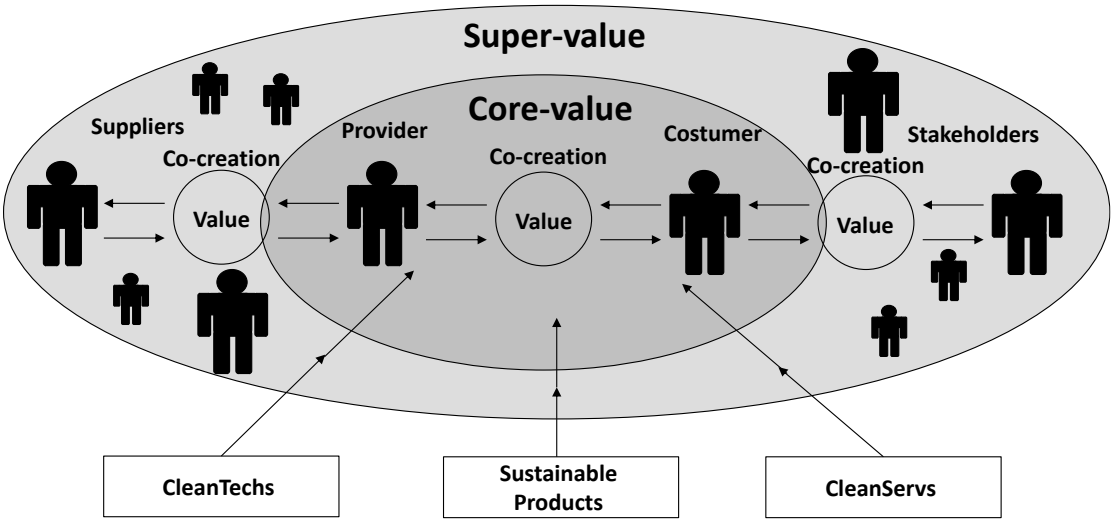
From the perspective of value provisioning processes, sustainability can be simply defined as the capacity of ecosystems to bear the stress of prevailing economic and social processes while not only meeting the needs of the present generation, but also ensuring those of future generations. The realization of sustainability in this sense relies mainly on the espousal and implementation of smart, daily decision-making processes that integrate economic, social, and environmental values (Edwards, 2005; Dresner, 2008). From this perspective, we recently proposed a two-stage model of sustainable services (S^3 – Sustainability as Service Science) that accounts for the co-creation of tangible and intangible values (Figure 1, Wolfson et al. 2010; Wolfson, Tavor & Mark, 2013a).

Figure 1. S^3 – Sustainability as Service Science model (Wolfson et al. 2010)



The first stage of the S^3 model entails making a sustainable decision that is based on the integration of physical and non-physical resources – like information, knowledge and time with technologies – to yield the most sustainable value. In the second stage, the sustainable choice should be selected from among the alternatives after evaluating each in terms of its integration of services with manufacturing and agricultural processes. Thus, the co-creation process in this model is driven by a broader, more comprehensive vision. In particular, it perceives the service's value chain as comprising a combination of a core-value, i.e., the essence of the solution that a certain service provides and that should be co-created and delivered from a provider to a customer, and a super-value, i.e., the generation of other, supporting and complementary values, via additional direct and indirect suppliers and customers that are involved in the service's value chain (Figure 2, Wolfson, 2016). This process not only ensures the rational use of resources, it also obliges providers to sustain their supply chains and to turn their customers into providers of sustainability to current and subsequent generations.

Figure 2. Sustainable service (Wolfson, 2016)



The shift from goods to services under the umbrella of SDL also motivated the creation of the product-service system (PSS), a mixture of goods and services, e.g., car leasing or rental, which yields a solution that is more efficient than the product itself (Goedkoop, van Halen, te Riele, & Rommens, 1999; Tukker, 2004). The coupling of a product with a service alters resource utilization and adds co-creation to the value production, delivery and use stages. As such, PSSs can also serve as frameworks to yield more sustainable solutions, and in that sense, they are also termed eco-efficient services (Brezet, Bijma, Ehrenfeld, & Silvester, 2001).

To define the PSS, Tukker (2004) suggested eight different PSS types along a continuum from pure product to pure service. The PSSs can be organized into three groups based on their relative locations along the continuum: (i) product-based is product oriented, as in an insurance service; (ii) service-based is service oriented, as in a carsharing system; and (iii) solution-based is a combination of relatively equal parts product and service, for example, a pay-per-view movie service.

Extending the notion of the PSS, we recently proposed a new framework for sustainable service innovation termed clean services, or CleanServs (Wolfson et al., 2013b, Wolfson, Tavor & Mark, 2014). Designed to promote the realization of more sustainable solutions, CleanServs are services that are competitive with, if not superior to, their conventional tangible or intangible counterparts. Their advantages over the conventional solutions comprise reductions in the use of natural resources and the reduction or complete elimination of emissions and wastes while increasing the responsibilities of both provider and customer. To further define this new framework, we proposed five types of CleanServs that, in descending order from most to least sustainable, are prevention, reduction, replacement, efficiency and offset (Wolfson & Tavor, 2016).

In this paper, we discuss different methods to increase the sustainability of products by exploiting organized servicizing frameworks. These approaches, which add value co-creation processes to the production, delivery and use phases of the product, also decrease the use of natural resources and increase the engagement and responsibility of both the provider and the customer, thus yielding more sustainable solutions.

CleanServs

Our excessively high rates of natural resource consumption constitute one of the main challenges facing humanity this century. Over the last 200 years, increases in the global population and the levels of industrialization in many countries have functioned together to deplete the Earth's pool of natural resources while simultaneously assaulting the planet with the innumerable synthetic, incompatible and hazardous compounds that have been produced to address the needs of our increasingly crowded planet. Moreover, this culture of unrestrained production and consumption, which is

based on the linear process of produce-use-dispose, has resulted in the production of goods with very short shelf lives and of correspondingly large amounts of waste. While these processes have efficiently supported the current economic growth model and the industrial economy in which we live, they have also fostered increases in the prices of raw materials and they exert undue stress on the social and natural environments. In addition to forcing us to reconsider how we produce, deliver and use goods, this predicament has also driven efforts to promote the more efficient use of our planet's natural resources with the ultimate goal of realizing sustainable development.

Among the initial endeavors to advance the sustainability of the production processes of goods was the recycling of the resources, such as water, used during their production. Likewise, recycling of the final product as occurs in plastic bottle recycling, a form of environmental service or offset-type CleanServ (Wolfson, Mark, Martin & Tavor, 2015), was also at the forefront of these initial efforts. The additional services entailed in implementing an organized recycling system, however, typically also require the active involvement of the consumers, who must effect significant changes in their consumption habits. Another CleanServ of the offset type that has been implemented widely is carbon trading, which enables industry to compensate for the greenhouse emissions of a certain production process by reducing the emissions of one or more other processes

These early efforts at increasing the sustainability of conventional production processes were quickly recognized to be overly limited in focus, dictating the need for more directed change to achieve greater accountability for resource use. The more efficient use of the product itself envisioned in the notion of a CleanServ could be combined with the use of clean technologies (CleanTechs) implemented in production phases to obtain a more holistic increase in process efficiency with respect to resource utilization. Similar to the notion of CleanServs, CleanTechs are defined as technologies designed to use natural resources more efficiently, and with a less negative impact on the planet's ecosystems, than their conventional equivalents. For example, the overall energy of a process can be reduced by implementing energy efficiency measures, such as the use of insulation, and by adopting novel technologies that conserve energy, such as replacing incandescent light bulbs with LED bulbs. Likewise, CleanServs of the efficiency type, from energy surveys to carbon taxes that motivate users to reduce their energy consumption, can promote similar reductions in natural resource use.

The coupling of goods with services can also change the entire goods life cycle, from the extraction and processing of raw materials to their delivery and use. One such example is a CleanServ of the replacement type that offers an alternative solution, like downloading music over the internet instead of purchasing a CD. Alternatively, services can also be designed to reduce the intensity of goods production, for example, in the framework of the reduction-type CleanServ, such as second-hand shops that sell used, but still functional, goods. Finally, a CleanServ of the prevention type, which replaces a product with a pure service, eliminates the need to produce the good in the first place. A prominent example of a prevention-type CleanServ is the Bitcoin, a virtual currency that can replace the paper bills and metal coins that today define our financial systems.

The principal driving force behind servicizing the economy is to gain extra profit by, for example, offering lower prices, increasing ease of use, or reducing the amounts of time and effort invested relative to the GDL framework. Servicizing can be achieved by changing the amounts and types of resources invested in an existing process to alter the co-creation level and the division in resources and tasks between the provider and the customer or vice versa. CleanServs, on the other hand, focus on identifying the most sustainable solution that can address the needs and wants of the customer while realizing the goal of dematerialization through innovation.

All of the above-mentioned methods and examples, however, are based mainly on the first stage of the "S^3 – Sustainability as service science model" (Wolfson et al., 2010), where the rational use of resources and value co-creation generate are immediate and narrow profits on the personal, local and short-term scales. In the examples above, however, the second stage of the model, sustainable choice, is usually self-evident and unnecessary, as the product, the service or the PSS is the sustainable choice. In contrast, to account in the decision stage for broader and more comprehensive perspectives of sustainability that also consider global and long-term scales elicits time dilemmas and requires extreme changes in behavior (habits) as well as higher levels of decision-making while overcoming the psychological barriers to adopt change. This process should be motivated by concepts like green growth (Ekins, 2002) – which promise development and a widening of market opportunities in a way that does not compromise the social or natural environment – and by efforts to foster social and environmental equities that not only ensure equal

opportunity, but that also entail that the stakeholders share equally in the consequences, good and bad, of processes and decisions.

The following frameworks propose more institutionalized and organized platforms to achieve the goal of sustainability by exploiting PSSs.

Circular Economy

Today's economy is linear: we extract physical resources from nature, convert them into products whose lifetimes last anywhere from a few minutes to several years at most, and then discard those products in nature, usually in such a way that precludes recovery of the original resources and that often damages ecological systems. In addition to wasting both resources and money, this highly inefficient approach also inflicts significant harm on the social and natural environments. Furthermore, the linear economy neither recycles the products to recover their raw materials nor renews intangible resources.

In contrast, a circular economy is a biomimetic paradigm, and integral to its design is the reduction or elimination of waste and pollution and the renewability of resources (Ning, 2001; Andersen, 2007). Yet the circular economy is not merely about "closing the loop" of product life cycles by adopting rigorous notions of recycling and reuse or about reaping benefits for both the environment and the economy. It is also about changing human habits and about effecting a societal shift from the production and consumption-based model of today to a system designed with a greater awareness of the implications of its actions and that searches for smarter solutions. Indeed, the juxtaposition of local business and massive corporations has myriad effects on our lives, with the benefits ranging from fairer prices to increased employment levels to the conservation of nature's capital. The circular economy thus advances strategies like design to repair, i.e., extending the product lives and driving social responsibility by designing more usable and fixable products and by using "cradle to cradle" design instead of the commonly used "cradle to grave" approach (McDonough & Braungart, 2010). Finally, though the circular economy refers mainly to different methods of physical resource flow and goods production, its implementation requires the addition of service, i.e., servicizing. Two frameworks imbued with the main concepts of the circular economy and that were devised in efforts to break the theory into action are local economy and share economy (shareconomy).

Local Economy

Globalization has transformed the world into a global village. In so doing, it has not only changed societies and economic models while generating new opportunities, but it has also created societal and economic incongruities. With respect to the production and delivery of goods, globalization has opened markets and facilitated reductions in the prices of many goods while increasing the prosperity of faltering countries. However, globalization has also reduced the power of local markets and local labor, and frequently it has led to the exploitation of people and the environment through, for example, unfair employment practices and damage to open spaces or air pollution wrought by antiquated production processes. One of the problems elicited by globalization is the disconnect between the place where a a good is produced on one side of the world and its consumption on the other side of the world. This scenario leaves less money in the local community where the good was produced, thereby hurting the local labor market and retarding local economic and social development. In addition, it is functioning on an essentially linear trajectory, and as such, it damaged and unclosed natural cycles, the natural resources extracted for the production of the goods that are exported abroad can neither be recycled nor renewed. For example, the international vegetable market entails the use of fertilizers and pesticides that both harm the local environment and affect the health of local residents. But because the vegetables use nutrients during their growth, the consumption of these vegetables in another place, where their leftovers are also discarded, fails to return the nutrients to the ground where the vegetables were grown and does not close the nutrient cycle.

The notion of local economy describes a micro-economic approach that generates development and prosperity based on bottom-up, locally defined growth rather than top-down development imposed by national or international markets. It espouses the "buy local" or "act local" concept, and at its most basic level, the local economy ensures that the community retains more of the money it generates, thereby increasing local resilience (Benington, 1986; Hildreth,

2011). Moreover, the local economy has many environmental benefits, as it is based on local resources and it renders unnecessary the addition of more resources in for packaging, transport, and retail facilities, among other things.

The bottom-up development of a flourishing local economy is based on a wide variety of supporting services that must also be obtained locally. Moreover, the local economy is based primarily on the co-creation of value, which is a feature of services rather than goods. It is also based on the second stage of the "S^3-sustainable service model", which encourages the customer to choose the most sustainable option, i.e., sustainable choice. In a local economy approach, services that were provided through outsourcing and mediators should be co-created by the producer, who is now the provider, and the consumer, who becomes a customer. It includes not only the co-design of the PSS in the pre-production stage of its life cycle, but also many other, post-production services, such as storage, delivery and recycling. For example, in the current top-down, globally driven market, farmers sell their products to a mediator, such as a fruit and vegetable distribution company, which delivers it to the market, e.g., supermarkets, and from there to the client, who has no say and can only choose either to buy or not to buy the product due to its price, visibility, taste, etc. Yet famers can also sell their products directly to shops, mainly small, local stores, or even directly to the customer in the market or by selling door-to-door. Alternatively, produce can also be sold directly to customers who travel to the farm to buy what they need. In a local economy, therefore, vendor services are based on co-perform-type services that necessitate the greater involvement of both the provider and the customer in the process and that require joint investments by both parties in terms of resources and the division in tasks required to deliver the service. Moreover, this model also enables the customers to play a more active part in the design of the PSS, as they provide the farmer with their preferences, e.g., desired fruit species or the price that they are willing to pay, thus influencing the farmer's production process, i.e., co-creation of the co-design type.

Shareconomy

Consumerism, described often as the worship of the acquisition of goods and services, is one of the main weaknesses of modern society. The dominance of the culture of consumption in today's society, manifested in the overblown extraction of natural resources, is unsustainable. The quest for more sustainable ways to streamline resource utilization while expanding market opportunities has been promoted by advances in technology, especially those brought about by the digital revolution. Alternative methods to provide solutions and to couple products with services have therefore been proposed. Among these are a variety of new economic models that strive to utilize underexploited or underused values while allowing everyone to act as both a provider and a customer but without the need for intermediaries (Table 1). These new opportunities enable the smarter utilization of resources that, in turn, decreases the prices of goods while increasing the overall sustainability of the process.

Table 1. New economic models

Economic model	Main concept	Example
Collaborative economy	Matching between 'needs' and 'haves' of underused values	AirBnB – new marketplace that enables people to rent private assets for vacation.
Peer-to-peer economy	Interaction of two individuals to buy or sell goods and services directly without mediation by a third party	eBay – e-commerce company that provides consumer-to-consumer internet services
On-demand economy	Matching between customer needs and provider to deliver goods and services immediately	Uber – online transportation network company that provides trips on demand
Access economy	Trading values on the basis of access instead of ownership	Zipcar – automobile reservations company that provides car sharing services

These economic models are situated under the umbrella of the sharing economy or the shareconomy (Meade, 1986; Heinrichs, 2013), which replaces ownership by the access to and the sharing of resources, assets, goods and services. In general, there are four main categories of sharing (Table 2). A recent survey to assess the scope of the online shareconomy activities of American adults found that 72% have used at least one of 11 different shared activities (Smith, 2016). The parentage of users of the main activities that were assessed is listed in Table 2 under the corresponding shareconomy category.

Table 2. Online shareconomy services (Smith, 2016)

Category	Online activity	% of users
Recirculation of goods	Purchased used or second-hand goods	50
	Rented clothing or other products for a short time	2
Increased utilization of underexploited assets	Used ride-hailing apps	22
Exchange of services	Used programs offering same-day or expedited delivery	45
	Purchased tickets from online reseller	28
	Purchased handmade or artisanal products	22
Sharing goods, services or assets	Used online home-sharing services	11
	Worked in shared office space	4

Eco-Labeling

The goal of increasing the sustainability of products through the addition of services and the co-creation process can also be achieved by implementing laws and regulations. For example, the addition of sustainability labels to products not only allows the customer to choose between products based on their sustainability, it also compels the supplier to increase the sustainability of their supply chain and value chain, e.g., production and delivery. Commodities labeling – from the price to the net contents and identity of the product to the name and place of business of the product's manufacturer, packer or distributor – is now required and is included in regulations in most countries. In recent years, between regulation-driven or voluntary initiatives, labeling has expanded to include specific ingredients like sugar and salt levels in food and hazardous molecules in cleaning products. This method was also applied to eco-labeling, which includes labels such as "green" or ecologically/environmentally friendly as well as labels designating energy efficiency and carbon or water footprints, the latter of which refer to the total amounts of greenhouse gases and water that are associated with the whole life cycle of the product, i.e., carbon or water labeling (Czarnezki, 2011; Mason 2012). However, the former, amorphous labeling system for green products may be misleading and often evokes suspicions of greenwashing, i.e., "co-creation of an external accusation toward an organization with regard to presenting a misleading green message" (Seele & Gatti, 2015). In contrast, both the carbon and water footprint systems supply comparative numbers that can be understood, interpreted, and compared, although the methods for calculating these two measures are still being debated. But eco-labeling can potentially encourage companies to streamline their processes, in the process lowering their footprints and increasing their competitiveness. In addition, assessing the life cycles of different resources can have immediate effects on the production and delivery stages, and it usually also leads to reductions in costs. For it to be effective, however, the design of any initiative to advertise the environmental friendliness of a given product for the benefit of consumers must be easy to understand.

Research about the effects of labeling raisins with labels of "eco-friendly" and/or "genetically modified" on client reports about taste, health consequences and willingness to pay was recently performed in Sweden and the UK (Sörqvist et al., 2016). The experiment consisted of adding both the labels (eco-friendly and genetically modified), only the eco-friendly label, only the genetically modified label, or neither label to the same brand of raisins. Among the findings, the results showed that Swedish participants were willing to pay 36% more for raisins that were labeled as eco-friendly but not genetically modified and 11% less for raisins that were labeled as genetically modified but not eco-friendly compared to raisins that were not labeled at all (Table 3). The results for the UK participants showed a similar trend but with lower intensity.

Table 3. Effect of labeling on customer willingness to pay (Sörqvist et al., 2016).

Label		Sweden	UK
Eco-friendly	**Genetically modified**		
Yes	No	+36	+16
Yes	Yes	+10	+10
No	Yes	-11	-2

CONCLUSIONS

The sustainability of a product can be increased by adding CleanServs to the product life cycle to, in turn, yield a smarter solution, i.e., PSS. This approach is applicable to different types of services, all of which oblige the producer to become a provider and the consumer to become a customer while the two jointly co-create the value. Merely implementing short-term and local change at the individual level, however, is not sufficient to achieve the ultimate goal of sustainable consumption. In addition, institutional frameworks and innovative methods and tools that will enable the mass provision of sustainable PSSs must also be developed. Changing the economic paradigm from that of a global consumption economy to that of local and sharing economies is an appealing option. Another attractive option is the use of eco-labeling that allows the customer to choose between similar products based on their relative levels of sustainability and that simultaneously obliges the producer to increase the sustainability of the product. Future research should be done, however, to identify how to promote changes in behavior as well as higher levels of decision-making while overcoming the psychological barriers to adopt change.

AUTHOR BIOGRAPHIES

Professor Adi Wolfson is one of the founders of Shamoon's Green Processes Center. Prof. Wolfson earned his Ph.D. summa cum laude in chemical engineering at Ben-Gurion University in Beer-Sheva and continued his post-doctoral in the University of Leuven, Belgium. Professor Wolfson has worked in the field of green chemistry and engineering for the last 20 years working mainly on catalytic applications in organic reactions and alternative environmentally friendly solvents. Professor Wolfson is also working with the national and local authorities as well as with the industry on imbuing sustainability and sustainable development in Israel.

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