Sustainable Product-Service System

Joshua Centenera[1] & Maruf Hasan[1]

[1] School of Mechanical and Manufacturing Engineering, University of New South Wales, Sydney, Australia

Correspondence: Maruf Hasan, School of Mechanical & Manufacturing Engineering, University of New South Wales, Sydney 2052, Australia. Tel: 61-2-9385-5692. E-mail: m.hasan@unsw.edu.au

Abstract

Product-service systems provide societal benefits through collaborative consumption. They must also provide financial benefits for investors to encourage deployment of such systems. Given these financial benefits, not only will the company profit effectively, but also efficiently in terms of material usage therefore reducing the need for manufacture and mitigating the impact on the environment. Specifically, this project aims at developing a sustainable product-service system, a system incorporating financial, social and environmental sustainability. The resulting model is sustainable for the environment and the operator, while also financially beneficial for the user. This project provides social commentary to examine Australian characteristics and suggest conclusions on the state and future of product-service systems in Australia. The greater objective of this project is to introduce the concept of a product-service system and raise awareness of such a model.

Keywords: sustainability, product, service, environment, social, financial

1. Introduction

A product-service system (PSS) is an integrated combination of product and services for optimal consumption. To form a context, it is widely common to participate in a product based system, in which consumers are encouraged to purchase as many units as possible. The focus of the product system business model is to produce maximum volume to achieve maximum profits. In the past these systems have always been encouraged while it has been known to be most profitable to sell as many units as possible. It is a common misconception that this outcome is ideal.

Product-service systems, on the other hand, aim to achieve maximum efficiency by selling as many services as possible. The potential shift towards services can be beneficial to all parties involved. High sales and transactions are still sought after, however this does not necessarily mean high volumes of products need to be produced. Product-service systems support sustainable consumption as utility is maximised through services replacing products. In this paper, sustainability will be considered as a major factor, as well as the effects that such product-service systems have on the modelled economic and environmental sustainability.

2. Literature Review

2.1 History

Product-service system is a new term for an age-old model. Product-service systems such as libraries and community centres were in use thousands of years ago. Limited resources also drove the development of product-service systems long before the term was used. Older generations were smarter consumers having had less materials and technology available to them. This is evident in the levels of consumption from older household in Australia throwing away less waste than their younger counterparts. This suggests that as people grow older, they waste less or that the older generation grew up in a period that required thrifty skills to create more with less, and have maintained that attitude (Hamilton, 2005). This attitude has changed throughout history alongside the drastic changes to industry and technology.

The term has been alluded to as early as 1989 with growing globalisation, the dawn of the internet era and raised concerns of sustainability (Robert, 1991). The need to cope with population growth has encouraged the innovation of smarter consumption. However, despite their societal, environmental and economic benefits, product-service systems have been shown to be more successful with services (i.e., Car sharing, bike sharing, online trading, etc.) in highly populated cities, such as London, New York and but also Sydney. These ventures

have generally struggled to reach critical mass in Australia, and the reasons for and against their success will be an underlying focus of this project.

2.2 Drivers for Development

Although product-service systems are inherently better for the environment, this does not provide enough drive for sales. Choices are made depending on benefits to the consumer or the service provider. A particular strength of product-service systems is that they provide potential benefits to multiple parties. If it's a cheaper alternative, the consumer will be happy. It it's profitable, the provider will be happy. It it's beneficial to all parties, everyone wins.

There are drivers that have encouraged the use and development of product-service systems such as:

- Peer-to-peer (P2P) Technologies

- Resurgence of Community

- Environmental concern

- Cost consciousness (Bostman & Rogers, 2010)

These drivers have been described in What is Mine is Yours: The rise of Collaborative Consumption by Rachel Botsman and Roo Rogers (Botsman & Rogers, 2010) and have been summarized to outline the positive outlook for collaborative consumption through PSS use.

2.2.1 P2P Technologies

Peer-to-peer (P2P) technologies is a group-based driver as it drives more than one user. P2P technologies improve the way in which people can connect with network availability. We can observe growing use or smart technology through smart phones and computers all capable of Internet connections. Such advances in technology encourage the involvement of collaborative consumption through convenience provided by an instant connection. For instance, online marketplaces like Gumtree and eBay provide a very efficient and effective platform upon which users can trade.

2.2.2 Environmental Concern

Environmental concern is both an individual and group based driver, as initial individual concerns develop into group concerns for environmental and socially sustainable consumption to maintain services for future generations. Sustainability of our current consumption patterns is a growing issue. The unsustainability of current consumption patterns based on the assumption in infinite resources is developing awareness, which can affect the way in which consumers make choices. Sustainable consumption reduces environmental impact, but this shift will only occur when consumers change their behaviour.

2.2.3 Resurgence of Community

Resurgence of community is a group-based driver that depends on the community mindset. People are becoming more socially involved and more open to meet people. There are developing systems that help to facilitate this, such as increased type of P2P technologies. Trust between strangers has been strengthened with the use of P2P technologies, and as this grows so will the potential for community power to change consumer behaviour. This allows people and consumers with common interests to gather and make efficient use of the available resources, which is the basis of collaborative consumption and product-service systems.

2.2.4 Cost Consciousness

Cost consciousness is a powerful individual- based driver as it affects the single user. This driver can potentially direct consumers to seek alternative cost-effective options as solutions to expensive products and services. This may be a temporary by-product of financial crises causing consumers to decrease spending but regardless of the cause, it is a mitigating driver to cost-effective collaborative consumption through product-service systems. Whether or not this driver will remain as a long-term cultural trend with staying power is irrelevant as its purpose is to introduce users to product-service systems.

2.3 Barrier Factors

In a country like Australia, we have less inclination to change our consumerism habits as we have a low population; therefore there is less necessity to consume collaboratively. This, however, does not mean that a product-service system would not be successful in Australia. As long as it is profitable to the provider, and more convenient and/or cheaper for the consumer, there is potential for success.

There are problem-specific barriers that inhibit success of product-service systems, such as cultural barriers. For

instance, car share might not be appealing to some, as they would prefer to own their own car from a cultural mentality. Some have a lifelong aim to own a house, and would rather pay off a mortgage than rent in shared accommodation regardless of how much more cost-effective it can be. And some just prefer not to share.

Another obvious barrier is the management inertia of a large corporation. If high volume profits are being made, and the business model has been tailored and proven successful while providing the lowest cost and highest volume, then there is no reason to change. This barrier could be overcome if more revenue could be achieved with fewer resources, proven by successful PSS business models that can threaten the operations of current models based on product systems.

2.4 Current Types of Product-Service Systems

There are three main types of product-service systems:

1)   Product-oriented

2)   Use oriented

3)   Result oriented (Suspronet, 2004)

2.4.1 Product Oriented PSS

A product oriented PSS occurs when ownership of the product is transferred to the consumer while other services such as maintenance are provided by the service provider. An example of such a system would be using solar panels on a house to own the electricity, or to use a rainwater tank to capture water as opposed to purchasing the prospective product from the respective utility company. This concept of the user desiring the service over the product is key to the success of product-service systems. Product oriented PSS examples have been observed in developing countries due to the limited resources available having an effect on consumer behaviour. In this type of PSS, the user own the product and generates the services for themselves.

2.4.2 Use Oriented PSS

A use oriented PSS occurs when ownership of the product is retained by the service provider, and functions of the product are shared amongst users. Examples of such a system would be any form of rental. In particular, car share is a growing use oriented PSS, having succeed through government support. This model can range to other forms of transport such as public transport. These systems are particularly successful when the capital outlay is high for such a product, or when the product is not used often. The initial purchase cost of an item and its potential uses affects the justification for purchase, therefore highly priced items and/or items used infrequently are optimal for use oriented PSS models such as renting.

2.4.3 Result Oriented Product-Service System

A result oriented PSS occurs when the product is entirely replaced by a service. An example of such a system would be online services replacing a multitude of products. The internet has facilitated great advances in result oriented PSSs (i.e. e-mail replacing postal mail). In this type of PSS, products are entirely replaced by services, thereby reducing the need for ownership.

3. Project Proposal

Having introduced the general concept of product-service systems, the following is a brief outline to provide the direction of this project. The case studies provide examples of the product-service systems types introduced earlier. Case 1 will demonstrate reuse as a product oriented PSS, Case 2 will demonstrate renting as a user oriented PSS and Case 3 will demonstrate the use of online service as a result oriented PSS. The variation of PSS types explored ensures that case studies have been carried out from different perspectives within the product-service system range. The final results incorporate successful aspects of each case study to create a model that maintains financial, social and environmental sustainability.

4. Case 1: Product Oriented PSS

4.1 Case Description

4.1.1 Reuse

A product oriented PSS can be described as a PSS that allows one to benefit from more uses or services from a single item. This can be applied naturally to disposable products or those with limited lifespans. Effectively, prolonging the use or life of any item before disposal or replacement acts as a product oriented PSS. It is more common in developed countries to dispose of product remains without considering other uses since these products are easily accessible. Australians spend approximately $10.8 billion every year on goods they do not

use, which is an average of $1250 for each household (Hamilton, 2005). In developing countries, solutions have been engineered to reuse materials due to a lack of income and possessions, which results in more resourcefulness and austerity. The aim is to reduce waste by achieving multiple uses from a particular product.

4.2 Current Models

4.2.1 Plastic Recycling

As of 2012, plastic bags are still in use throughout most of Australia despite their impact on the environment. Plastic bags are made of low-density polyethylene (PSPE), which is difficult to recycle compared to others. Most councils do not have the appropriate recycling facilities for this plastic, and if recyclables are enclosed in a plastic bag, staff at recycling centres do not open plastic bags for safety reasons, resulting in the contained recyclable materials going to landfill. (Clean Up Australia, 2009). In Australia, if you were to go to a store such as Aldi, Bunnings, or Dan Murphy's, you would notice the availability of boxes. These boxes can be reused as methods as methods to carry purchased items, and although it may not be as convenient, it remains a product oriented PSS as the user obtains more opportunities to utilize a single product, that being the cardboard box in this case.

4.2.2 Mobile Recycling

More than 90% of the components in a mobile phone can be recycled, however most end up in general disposal. Batteries can cause significant impacts on the environment when knot recycled properly. This is due to the mixed metal component contained in batteries, especially heavy metals. Although Australia has a high level of participation for recycling, Australians have not yet adopted battery recycling as 94% of dead batteries end up in landfill–this equates to 8000 tonnes of batteries of landfill every year (CMA Ecocycle, 2012).

Consider the standard mobile phone plan in Australia. It is customary to pay a monthly subscription fee to cover mobile usage, with extra costs depending on the handset, insurance and other options. At the end of contract – usually 24 months–the customer own the handset, at which point, it is common to upgrade the handset and renew the existing contract. This leave the user with an extra redundant phone. The mobile phone contract is similar to that of a car lease, but it is common to trade-in cars for their salvage value. Despite a mobile phone having a minimal salvage value, it would be better for the environment and easier on consumption if mobile phones were treated similarly to cars upon contract expiry. They could be resold to those looking for a cost-effective alternative to purchasing a new item; or recycled to avoid components send to landfill. Another possible alternation to the standard mobile phone contract could be to rent the handset from the provider instead of buying them.

4.2.3 Multiple Use Items

The Apple iPhone is a product oriented PSS, similar to Swiss army knife in the way that these products can serve multiple functions. Each item can replace several single-function items. The reuse of a single product for a different purpose is the basis for a product oriented PSS. The iPhone will be compared to a reality in which consumers would have used other single function alternatives. Estimations were carried out on the materials saved by using an iPhone instead of the individuals using single function items. iPhone could potentially replace 13 items (such as, address book, book reader, calculator, calendar, camera, GPS, MP3 player etc.) over a 2 year period, therefore requiring less products consumed by the user and less need for manufacture. Data for the Greenhouse Gas (GHG) emission produced as a result of manufacturing the iPhone 3G is 55 kgCO2e. The production, consisting of 45% of the GHG emissions for iPhone 3G incorporate the "extraction, production and transportation of raw materials and the manufacture, transport and assembly of all parts as well as product packaging." (Apple, 2009). The remaining GHG comes from customer use (49%), transport (5%) and Recycling (1%). The GHG produced during manufacturing will be compared to the aggregate of the emission estimates for product of the 13 single function items mentioned above. The total emissions from estimated plastic and paper production for the items that the iPhone would replace is 16.14 knCO2e which is 8.6 kgCO2e less than produced by iPhone. Despite any numerical result, it is important to note that the key factor is the use of the iPhone or multi-function item over the other alternatives. The more consumers use such items to replace other items as a form of product-oriented PSS, the more the benefits of such a system will develop.

4.3 Results and Conclusions

Considering the main forms of sustainability discussed throughout this project, the product-oriented PSS of reuse and recycling currently provides minimal financial benefits to the consumer and operator, moderate social benefits, and high environmental benefits.

Minimizing the need for manufacture will undoubtedly have a good impact on the environment, but it must be

considered that it is not in the best interest of the product provider or manufacturer, for consumers to reuse items as – according to the product system principle–less volume will be required, therefore less production and potentially less profits could be made. With this in mind, it is most important for legislation and regulation bodies to monitor companies and provide transparency for such issues and implement changes to industry, as business users have been shown to produce the majority of waste. A secondary feature to product-service systems, which can be critical to reuse and longevity, is the quality of a product. If a product is of high quality and durability, it will last longer and will be more suitable for reuse. Ideally, a six-sigma attitude should be kept in mind from a manufacturing level, as this would eliminate the low quality products prone to landfill. High quality products would continue to have a longer lifespan where low quality products would fail and be reduced to waste. And our energy should not be wasted on low quality products.

Design for endurance also supports social sustainability, as it encourages high quality products designed to maintain lasting user experience. Consumer benefits also include minimizing waste with fewer items, therefore requiring less storage while developing more efficient use of durable high quality items.

High quality items have also been proven to be financially sustainable, however it is important to note the target for comparable items to reach a compromise in pricing. This will ensure that a product is not overdesigned, which would result in unrealistic pricing for consumers.

5. Case 2: Use Oriented PSS

5.1 Renting

A use oriented PSS is a system in which a service is shared amongst users to replace a product. The process of renting a product was investigated specifically through examples of car sharing programs. A consumption driven culture based on a product system has conditioned consumers to own as many products as possible, which is the aim of most marketing campaigns. Not all of these products will be used as much as they are intended to, as described in Case 1. Considering idling capacity of an item, renting - a use-oriented PSS – will be very beneficial to the consumer.

A clear benefit is the foregone capital cost of purchasing an time. It is common for people to develop myriad possessions with the aim to have them convenient and available when needed. However, if it is possible to merge convenience with no required capital cost, this model could prove highly beneficial to consumers through foregone capital and maintenance costs. Consider a drill, which spends much of its lifetime resting idle. Purchase of a drill would not be necessary if an idle drill was available nearly. And given a network platform upon which to share, it would then be possible to borrow that drill instead of having to purchase a new item.

The specific type of renting model under discussion in this case study is renting vehicles through car share business models. Two types of business models have been considered. One in which the operator provides the vehicle, and the other in which rental vehicles can be operated on a peer-to-peer basis. In other words, instead of the company owning the product and renting it to the user, privately owned cars carry potential to be rented by other private users.

5.2 GoGet Car Share

GoGet is the largest and most successful car share business in Australia, with participating location including Adelaide, Brisbane, Melbourne, and Sydney (GoGet, 2012). It was started in 2002 and has grown increasing levels of growth, particularly in Sydney. The basis of the business model consists of vehicles provided by GoGet being available to registered users for rental.

Some features specific to GoGet are:

- Cars owned by GoGet as the operator retains ownership of the product in a use-oriented PSS

- "Pods" provided as council approved parking spaces to collect, park and return care share vehicles, which suggests strong government support.

- Potential to save money on foregone vehicle operating costs given appropriate usage

- Swipe cards available to registered users to allow convenient access.

- Fuel, insurance, cleaning and maintenance are included in membership fee.

The co-founder of GoGet, Bruce Jeffreys attributes its growth to "low product monogamy" and "consumer philandering" (Botsman & Rogers, 2010). This is a beneficial feature to consumers who appreciate the ability to choose between different car model as they wish, without having to commit to one single asset, psychologically as well as financially.

5.3 Peer-to-Peer Car Rental

GoGet is the first and most established care share provider in Australia, but there are others with similar models. While using the foremost successful example of Go Get, it is important to acknowledge alternative car share systems to explore their differences, strengths and weaknesses. P2P car rental models offer features such as:

- Extending rental cars to a P2P network

- Privately owned rental cars – providing income potential from idle car

- No pods required, therefore no council approval required for land development

- Utilise less space than operator driven car share models

- In-car device to monitor vehicle operation

- Comprehensive insurance model

5.4 Model Benefits

The main environmental benefit of care share models is the reduced need for manufacture. However, given consistently increasing vehicles figures (OICA, 2010), the actual behaviour of consumers must be explored. Since Toyota remains the leading international vehicle manufacturer, their emission level were used to approximate the potential environmental benefits of foregone vehicle manufacturing caused by car share schemes.

Car sharing is shown to have substantial growth in Sydney, and from this growth alone it is clear that there must be consumer benefits. The type of consumer ranges between private and business users. Business users constitute over 3000 of the total GoGet subscriber base, estimated to be between 10,000 and 11,000 users (Council of City of Sydney, 2012). The application of this model to business users is a great strength to improve consistent participation rates, as businesses from reliable clients due to the continual demand required for business operation. Business users are then able to avoid the sunk capital costs of a vehicle, and since marginally higher operating costs can be easier to manage than higher capital costs to depreciate, this can be highly beneficial to a compatible business model. As for the private users, consumer benefits materialize in the savings from foregone purchase and operating costs of a new vehicle. GoGet has been tested for its claims to potential savings. Operating costs based on data from the National Roads and Motor Association (NRMA, 2012) was crosschecked against GoGet benefits.

5.4 Results and Conclusions

There is definitely substantial potential for car share – only if the model is adjusted as described to develop a change in customer behaviour while encouraging sustainability through innovative strategies such as expansion to P2P networks. The aim of car share is to maximize a utility and reduce redundancy in idle vehicles, which would ideally decrease the demand for manufacturing. The current car share model does have environmental benefits, but these remain minimal as the current car share model is designed for limited use, therefore limiting environmental benefits. These benefits are low since the number of GoGet members is significantly low compared to the overall Australian driving population. It is acknowledged that user conversion can take some time and it is difficult to appreciate the silent successes and foregone negative impacts. This conclusion defies what many reports have alluded to as substantial benefits from the use of car share.

6. Case 3: Result Oriented PSS

6.1 Online Services

A result oriented system is a product-service system in which a product is entirely replaced by a service. Online software is a good example of the way in which web services can reduce or replace the need for other products. Well designed software available online will streamline the way in which web services are used to replace other software such as Google software replacing the need for Microsoft Office products, Cloud storage replacing personal storage, and online search engines such as Google or Gumtree can replace any lookup service such as Yellow pages.

Online market places combined with delivery models can function as substitutes for the physical retail industry. The provider in this case is the online software provider, and while many of these products can be free of charge, the online distribution medium allows for low cost solutions. This results in a much more efficient and beneficial user experience, which develops social sustainability while extending to high environmental benefits. Financial sustainability for online services as a result oriented PSS is usually simple to maintain due to the low operating costs of hosting a web site or distributing data.

6.2 Online Software

Online software has been used extensively as a replacement for physical software packages. It is much more cost effective for the provider to distribute material online, and these savings are passed onto the consumer. The standard of high speed internet has also contributed to the success of this model as it enables users high-speed access through which they can download a vast amount of material. Not only does this help with distribution, but other features such as access are improved. An example of current models includes Google software as Google Docs provides a free online office suite, which is stored online just as Dropbox functions as an online storage medium.

6.3 E-mail and Document Management

Although newspapers and print media allows for zero energy consumption during use, e-mail and the Portable Document File (PDF) format has allowed mass distribution of documents for no cost to the user and negligible cost to the environment. Online distribution for print media is highly beneficial to the user through instant free access, and there are extensive environmental benefits. The foregone emissions that would have been produced during paper manufacture and delivery include material energy and transport emissions. This is a fine example of result oriented PSS in the form of online services, having replaced a product while maintaining financial, environmental and social sustainability.

6.4 Social Connectivity

Given the widespread use of social connectivity, it would be remiss not to acknowledge the platforms for social networking such as Facebook, Twitter and MySpace. Any social networking platform provides methods of communication at no cost to the consumer. These systems are highly efficient as they are instant, and very effective and reliable. They have also been able to replace fee based communications and newspapers for those who are not averse to online technology. Other applications such as Skype, Viber and other voice and text based services provide communication through Voice Over Internet Protocol (VOIP). VOIP allows user to contact others over an internet connection as opposed to standard calls through the Global System for Mobiles (GSM) network. This allows users to avoid local and international calling fees, given their access to network connection. The advancement of Internet communications no longer requires the existing infrastructure for standard calls if a network is available. Financially, this is a model that can be sustained through common use and the combination of advertisements and subscription bases. In terms of social sustainability, these online services are provided free to the consumer, therefore improving their quality of life by expanding their options for communications. Environmentally, such systems require large databases, and alongside manufacturing emission, the main source of emissions would be electricity use to power and cool these data centres, aside from these factors, there are no sustained manufacturing costs or transports cost involved as the service operates solely online.

6.5 Results and Conclusions

Efficiency of online services has been shown through access and distribution of software, documents and media over a global online network. Such systems will improve in efficiency as the consumer market is driven by convenience, therefore maintaining social sustainability. The environmental benefits will continue to rise as online services improve resource efficiency and replace further physical products.

The financial sustainability of this model relies mainly on webpage traffic, which feeds back to the operator through third party advertising and brand exposure. Another common financial feature that many online services incorporate is the subscription fee based service. This usually consists of providing a baseline service at no cost to the user, while offering features to users who upgrade their subscription. This allows operators to hold a commodity over users, that being functionality of their software. This has proven highly lucrative as even with a lost cost option, high subscription volume can largely increase revenue.

Online services have shown to be financially viable due to the market being a global network combined with low operating costs and an easily duplicable service. We can expect continued innovation and improved efficiency through online services offered to users, which are often offered at a low cost or free, which will continue to improve the quality of life for its users, thus maintaining social sustainability.

7. Sustainable Model Business Plan

7.1 Business Concept

The aim of this project, amongst building awareness of product-service systems and their potential application, is to develop a sustainable product-service system. A PSS is a business model, in which the aim is to shift emphasis towards services as described in the preceding case studies. The following business model will incorporate

aspects described in the case studies to provide a sustainable product-service system.

This model will consist of an **online system** in which users can **rent existing products** offered by the nearby users.

It was concluded that the only way to develop a truly sustainable model is to create a successful business model (financial) that provides ongoing services (social) with minimal cost involved while reusing already available resources (environmental). Leveraging used products satisfies the constraint that sustainability is not possible while manufacturing requires the use of limited resources. However, we can develop sustainable models that do not encourage production, but rather collaborative consumption. Product, use and result oriented PSS systems from case studies 1,2 and 3 have been combined in a culmination of reuse, renting and online services to create the final model.

"Rent-sense" will be used as a working title for this final model. Rent-Sense can be considered a middle ground between eBay and Gumtree, and key aspects of these successful models will be incorporated to emulate their success given their accomplishment of critical mass. Unlike, eBay, this model will provide a marketplace only for items that are not new (i.e. used or currently owned items) and leased to other users as opposed to traded. And unlike Gumtree, the original owner of the product retains ownership and will have the product returned. The entire system will be online, and serves as a network for users share. This combines the concepts of the product oriented PSS of reuse, with the use oriented PSS of renting and the result oriented PSS of online services. There are a multiple of potential products or services that can be shared through such a service. This will reduce the need for more possessions and encourage a communal sharing mentality.

There are many possibilities for innovation through this sharing platform. A simple example can be demonstrated in which an idle home gym set can be rented out. Let us estimate an intermediate home gym to cost $5000, and by renting it for $50 per week you could depreciate the equipment over two years. The model will allow flexibility in that the owner can retain not only ownership, but location of the gym equipment. The user can provide their own gym service and share it amongst their neighbours. It would be possible to depreciate the full amount over years if you charged a fee of $5 per week and had at least 10 subscribers at any one time during this 2-year period. This idea could even be specialised as its own product-service system to share home gyms in local areas. This also provides a social experience that you may not encounter at a public gym strengthening the sense of community and sharing. It is possible to see the values of community and trust evolve through any example of P2P renting.

Rent-Sense also expands its function to cover other existing business models based on use-oriented product-service systems. Although it cannot legally facilitate rental property agreements, it can cover nearly all forms of renting. For instance car share can be applied to Rent-Sense through a P2P sharing model, or a geolocal social platform can be provided to help encourage car-pooling. As Rent-Sense expands its use to other functions, it exhibits characteristics of a product-oriented PSS. And while operating through a broad functioning online system to replace other, it also exhibits characteristics of a result-oriented PSS. The previous case studies have been appropriately applied to develop this model.

7.2 Major Achievements

The major achievement of this model is financial, social and environmental sustainability. There are expandable benefits to a range of parties, that being the consumer, business clients and the environment. For a consumer, there are many uses for such a service, as it would provide nearby products conveniently at a fraction of the purchase cost. Business customers can benefit widely through using this model as a marketing tool. If renting is a service provided by a business, this model would be an inexpensive way to develop a wider market share and brand exposure. This key element has been taken from the success of eBay, and has not been implemented in the other competitive models. This model has growing potential to reduce manufacturing through less new items purchased. If envisaged on a large scale, consumers will develop lean consumption and produce less waste. Freecycle keeps over 700 tons out of landfills per day across the world (Botsman & Rogers, 2010), and this model aims to do the same with a strong financial model to benefit all parties involved.

8. Final Conclusion

Case studies were carried out to investigate the current and potential use of product-service systems. Comparisons were made between different types of product-service systems and the alternative product replaced, this producing metrics on foregone manufacturing. Sustainability was considered a high priority factor for case developments as financial, environmental and social sustainability were qualitatively evaluated for each group of systems.

Case 1, which investigated reuse and recycling as a product-oriented PSS, found that this system produces minimal financial benefits to the consumer and operator, moderate social sustainability and potentially high environmental benefits. Financially, this system does little to benefit the user due to the product-system of consumption being widespread in industry. It was shown that different forms of consumption must occur at a business level to realize the high environmental benefits.

Case 2, which investigated renting as a use-oriented PSS, focused on the current car share model employed by GoGet. Conclusions were made that defy the common misconception found in many reports, which claim that car share produces substantial consumer and environmental benefits. It was found that the current model has low consumer and environmental benefits, resulting in low social and environmental sustainability. When compared to GoGet, P2P car rental was shown to have great potential to make use of idling capacity of existing vehicles to maintain high environmental sustainability.

Case 3, which investigated online services as a result-oriented PSS, focused on the replacement of products with online software. Each service was shown to improve sustainability of all types. Social sustainability is high due to the increasing consumer benefits such as free or low-cost services, higher user efficiency, and convenience. Environmental sustainability remains high due to the negligible production required for the operation of an online network when compared to conventional manufacturing models. Financial sustainability is high due to the low costs involved with maintaining online services with a vast market potential.

A sustainable product-service system was designed to discourage the consumption of newly manufactured goods and encourage sharing the use of existing items in an online marketplace. The reuse of existing items provide a high form of environmental sustainability as this model does not require unsustainable consumption of raw materials. And once a product has already been made, there is nothing that can be done about the impact to the environment due to production, but to offset that impact by maximising its potential use   while sharing it amongst users. This can have growing benefits on the environment, as it is not widely employed as a method of consumption. Currently, most consumers purchase new products as an alternative to sharing, therefore there is much to gain for consumers if a model such as this reaches critical mass. The final model was described as a business model, and is proven to have high financial sustainability given successful marketing and the potential of business users. While maintaining high social sustainability through the provision of services, the final resulting model improves on this a sit allows a single model to cover all other forms of renting. This allows any rental product to be traded online, and with critical mass, such a model could prove highly effective to provide a rental platform upon which any rental service provider can market their product. The potential social sustainability is high due to the high volume of rental services being possibly available to future generations. A secondary form of environmental sustainability, which is provided by social sustainability feedback, as increased rental services could provide high consumer benefits, which may shift consumer behaviour towards collaborative consumption, this mitigating the impact to the environment.

There is a medium in which all forms of sustainability can be maintained for a product service system. Although this is a difficult balance to achieve given the current technology and resource use, the final model maintains full sustainability through more efficient use of privately owned items shared over an online network, it has been shown that online technology is key to deploying highly efficient PSS models to a high volume of users, which can be used to make significant potential impacts across a global network.

Acknowledgement

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