

## **Meeting Triple Bottom Lines through Product Service Systems, Selling Purified Water Instead of Chemicals: An Extended Case Study**

S.D.S.R. Maheepala\* (*phd6115fm2014009@sjp.ac.lk*)

B.N.F. Warnakulasuriya

Y.K. Weerakoon Banda

*University of Sri Jayewardenepura, Sri Lanka*

### **Abstract**

A Product-Service System (PSS) is an integrated product and service offering that delivers value in use. The purpose of this paper is to study the contribution of PSS to economic, social and environmental performance by changing the offering from product to product-service systems. The key attributes such as co-creation of value with customers, application of competences such as knowledge and skills on intangible resources are studied in depth in this case study. Authors have conducted a single-case study in order to achieve the aim of the paper. Analysis focuses on chemical supplier and the customer. Semi structured interviews were conducted to collect the primary data and supplementary data were used for theoretical triangulation (Jick, 1979; Yin, 2003; Baines et al., 2009). Deductive content analysis (Elo and Kyngäs, 2008) is conducted and findings were reported. By changing the business model of selling chemicals into selling purified water, the company has transformed from product focus to PSS focus. Both the customer and supplier were able to create value within and between systems. Customer acted as a co-creator of value. It has enhanced the triple bottom line by increasing the profit, reduced the environmental impact by reducing the chemical component and enhanced the employee morale and safety. This study creates the awareness about product service systems to enhance customer bonding, diminish competition and enhance triple bottom lines. This paper originates an empirical evidence of PSS in Sri Lanka and the economic, social and environmental benefits which can be derived thereby.

**Keywords:** Product Service Systems, Triple Bottom Line, Sustainability, Servitization, Sri Lanka.

## INTRODUCTION

Manufacturers are moving from a product dominant view towards a service oriented view of manufacturing (Martin & Horne, 1992; Mont, 2002; Brax 2005; Neely 2008; Cohen et al., 2006; Kohtamaki et al., 2015). The concepts such as service infusion (Kowalkowski et al., 2012), manufacturer service strategy (Raddats & Kowalkowski, 2014) and servitization (Vandermerwe & Rada, 1988) explained the systematic trend in service additions by manufacturing companies to retain competitive advantage and enhance business performance. Product service systems (PSS) explain “a marketable set of products and services, jointly capable of fulfilling a client’s need” (Goedkoop et al., 1999). As per Baines et al. (2007) PSS is a special type of servitization. PSS concerned with environmental impact and economic benefits by combining products and services (Spring & Araujo, 2009; Baines et al., 2007). With a different perspective to above concepts, service dominant logic explains the complete shift of selling based on services instead of integrating or bundling services with products. Lusch, Vargo & O’Brien (2007) explained this view as competing through services rather than competing with services. The similar view is explained as “adopting a service logic in marketing” (Gronroos, 2006) and “Adopting a service logic in manufacturing” (Gronroos & Helle, 2010) where Gronroos (2006) concludes that service logic fits the context of most goods producing businesses today. In exploring the PSS transition, scholars have adopted a service-dominant logic (SDL) view of value creation, using it as a lens through which to explore value propositions of the product-service transition (Smith et al., 2014).

European Union countries significantly depend on services to the gross value added and employment (Bikfalvi et al., 2012). Services have gained in importance in most of Asia and the Pacific, with 36 out of 47 economies seeing an increase in services’ share of Gross Domestic Product (GDP) between 2000 and 2013 where services provided much of the growth in GDP and employment across Asia in recent years (Asian Development Bank, 2014, p.166). In Sri Lanka service sector contribute more than 50% of GDP of Sri Lanka (Central Bank of Sri Lanka, 2014).

There is a trend in manufacturing companies in North America, Western Europe, and Japan to incorporate service elements in their product offerings (Cohen et al., 2006; Visnjic et al., 2012). The Aberdeen Group, GM, IBM, Rolls-Royce Aerospace, BP, Shell, Boeing, Xerox are some good examples which shows success through adding services (Wise & Baumgartner, 1999; Cohen et al., 2006; Neely, 2008). Even though there are ample empirical

studies done in the developed countries around the manufacturer's service orientation the studies done in developing countries are rare. Scholars opine that research on the manufacturer's service strategies in developing countries would be valuable to the research field (Gebauer et al., 2012; Gebauer et al., 2007; Raddats & Kowalkowski, 2014). Research on PSS, servitization and industrial service strategies are rare in Sri Lankan context. The problem arise whether the PSS transformation provides the required social, environmental and economic benefits in Sri Lankan context.

Empirical example of how PSS positively contributes to the triple bottom line (economic, social and environmental) performance of manufacturer and the customer are investigated in this article. The following research questions are posed and case study is conducted covering the supplier and the customer to generate data and study the phenomenon.

RQ1 – How does the selling purified water instead of selling chemicals explains the result oriented PSS transition in Sri Lanka?

RQ2 – What economic, social, and environmental benefits are created with the shift from selling product to selling PSS?

## **LITERATURE REVIEW**

### **Product Service Systems**

The PSS concept was introduced in a report commissioned by the Dutch ministries of Environment and Economic Affairs which introduced PSS as a positive prospects for sustainable economic growth in the medium and long term (Goedkoop et al., 1999). Mont (2002) explained the concept as a new trend that has the potential to minimize environmental impacts of production and consumption. Tukker (2004) introduces economic value addition in different PSS business models.

**Table 1 – Definitions of PSS**

Construct	Author (date)	Definition
Product service systems	Goedkoop et al. (1999, p.18)	“A Product Service system (PS system) is a marketable set of products and services capable of jointly fulfilling a user’s need”.
Product service systems	Mont (2002, p.5)	“[A] system of products, services, supporting networks and infrastructure that is designed to be: competitive, satisfy customer needs and have a lower environmental impact than traditional business models”.
Product service systems	Baines et al. (2007, p.3)	“A PSS is an integrated product and service offering that delivers value in use. A PSS offers the opportunity to decouple economic success from material consumption and hence reduce the environmental impact of economic activity”
Product service systems	Neely (2008, p.10)	“A Product-Service System is an integrated product and service offering that delivers value in use”.

From this start publications have covered a range of topics associated with the design of PSS, classification, strategies, principles, business models , drivers and barriers of PSS. Commonly used PSS definitions are explained in Table 1. All of the above definitions denote to product(s) and service(s) combined in a system to deliver required user functionality (Tukker, 2015). Table 2 reveals the PSS classifications explained in the literature.

**Table 2 – Classifications of PSS**

Author	Year	Type of services
Mont	2002	product service combinations/substitution services at the point of sales different concepts of products use (use oriented, Result oriented) maintenance services revalorisation services
Tukker	2004	product oriented PSS (Product related/ Advice and consultancy) use oriented PSS (Product lease/Product renting/sharing Product pooling) result oriented PSS (Activity management/ Pay per service unit/Functional result)
Neely	2008	Integration oriented PSS Product oriented PSS Service oriented PSS Use oriented PSS Result oriented PSS

Based on above classifications the types of PSS (product oriented PSS, Use oriented PSS and Result oriented PSS) presented by Tukker (2004) are frequently used in the literature and is

currently considered to best represent the terminology of the PSS (Beuren et al., 2013). Figure 1 shows the main and sub categories of PSS. This study is focused on result oriented PSS where the value is mainly in service content.

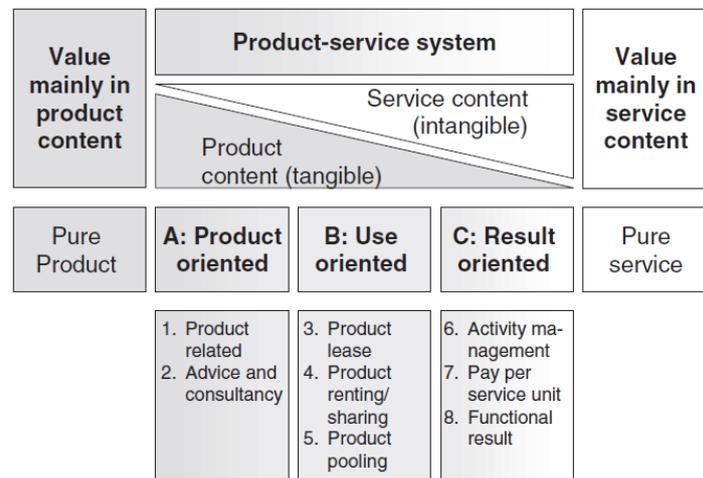


Figure 1- Main and Sub Categories of PSS

Source (Tukker, 2004, p.247)

Service dominant logic consider a broader and comprehensive view of exchange. As per Lusch, Vargo & O'Brien (2007) service-dominant logic (SDL) will best explain the logic of competing through service. Vargo and Lusch (2004, p.2) defined a service as "the application of specialized competences (skills and knowledge), through deeds, processes, and performances for the benefit of another entity or the entity itself". Lusch & Vargo (2006) argued that new logic is the foundation of a paradigm shift in marketing, the basis of new theory of the firm, reorientation of economic theory, and a rationale for a theory of society.

In SDL, the value is defined by and co-created with the customer and firms attempting to serve better and improve the performance (Vargo & Lusch, 2004). The service-centered view has important characteristics such as identify and develop core competences, identify potential customers that could benefit from competences, cultivate relationship with customers and develop compelling value proposition, measure the market place feedback by analyzing the financial performance and improve firm performance through the learning (Lusch & Vargo, 2006). They further explained that SDL is consistent with resource advantage theory and core competency theory. Aitken et al. (2006) explained that SDL may be understood as a restatement of marketing thought from earlier phases such as services marketing, relationship marketing, market orientation and diverse network perspectives.

Lusch & Vargo (2006) explained some of the imprecise statements of SDL to better understand the concept. SDL could provide the foundation for a theory of service systems, expanding the theories of economics and society (Vargo & Lusch, 2008).

Vargo & Lusch (2004) developed eight foundational premises. Later original eight foundation premises were extended into nine foundation premises (Lusch & Vargo, 2006). These nine foundation premises (FPs) were reviewed and modified into undermentioned ten premises in 2008 (Vargo & Lusch, 2008). Later these were modified into 11 foundations premises and five of them were termed as axioms from which the remaining six FPs could be derived (Vargo and Lusch, 2015). FPs are considered as the background to evaluate the shift towards the PSS business together with the impact on triple bottom line. Since the case study is focused on result oriented PSS it is suitable to use SDL mindset (Smith et al., 2014).

FP1: Service is the fundamental basis of exchange.

FP2: Indirect exchange masks the fundamental basis of exchange.

FP3: Goods are a distribution mechanism for service provision.

FP4: Operant resources are the fundamental source of strategic benefit

FP5: All economies are service economies.

FP6: Value is cocreated by multiple actors, always including the beneficiary.

FP7: Actors cannot deliver value but can participate in the creation and offering of value propositions

FP8: A service-centered view is inherently beneficiary oriented and relational

FP9: All social and economic actors are resource integrators.

FP10: Value is always uniquely and phenomenologically determined by the beneficiary.

FP11: Value cocreation is coordinated through actor-generated institutions and institutional arrangements.

### **Customer Relationship in Offering Services Instead of Products**

As per Lusch & Vargo (2006, p.9) it is important to “cultivate the relationships that involve the customers in developing customized, competitively compelling value propositions to meet specific needs”. Manufacturers providing services benefitted through better customer relationship which could be lengthened by including more services in their total offering (Tukker, 2004; Brax, 2005). Shift into services requires a shift from transactional marketing to relational marketing as it changes the nature and the length of the relationship between

supplier and customer (Neely, 2008). Firms can gain service-based advantages and the strongest relationships with the most profitable customers (Wise & Baumgartner, 1999). Together with services a customer can provide significant inputs and increased insights into the production process (Reim et al., 2015). Organizations further can extend customer satisfaction and loyalty by offering unique and unparalleled services to their customers (Brady et al., 2005; Li et al., 2015). Organizations with service orientation engage with customers to develop conceptual solutions to address potential problems (Brady et al., 2005). In product service context long term customer relationship has a significant effect in customer loyalty which will positively contribute to the organizational performances (Tukker, 2004). On the other hand deepening the relationships with customers may create an attractive avenue for knowledge-intensive service components such as consulting or training (Visnjic et al., 2012).

### **Benefits during the Journey towards Service Orientation**

Scholars opine that manufacturer's services are more profitable than product sales. Wise & Baumgartner (1999) explained that manufacturers should develop profitable service business to avoid the risk of thinner margins from product sales. However, Neely (2008) found that manufacturers who offer services generate lower profit than pure manufacturing firms. Agreeing with findings of Neely (2008), Visnjic et al. (2012) explained that service breadth negatively affect profitability while service depth has a positive impact on the profitability. They suggest not to widen the service but to focus on selected service offerings rich with knowledge intensive service components. Further, they explained that combining knowledge intensive services with product innovation may result in an increase in profitability in the long term. Kastalli and Van Looy (2013) reported an overall positive effect of manufacturer services on profitability.

Difficulty in a firm to increase profits by adding services is called "service paradox" (Neely, 2008; Visnjic et al., 2012). The existing research on service offering by manufacturing organizations has provided mix results where many have provided positive and some with negative effect. The literature is silent on the overall profit impact on customer and supplier when shifting from product dominance to service dominance.

Business growth opportunities become a motivating factors for manufacturing firm to add services (Visnjic et al., 2012). Manufacturing companies add services to achieve financial growth (Brax, 2005; Gebauer et al., 2012). The higher growth rate of service sector

comparative to manufacturing creates an opportunity for the larger market size for manufacturers who provide solutions (Wise & Baumgartner, 1999). In recent years, industrial manufacturers around the world have deployed growing efforts in developing services in addition to their traditional core product business in order to secure long-term growth (Jacob & Ulaga, 2008). Companies move to the service dominance have an opportunity to continuously grow due to the broader opportunities they get than a pure manufacture.

Environmental benefits when moving towards service orientation in manufacturing is well explained in PSS literature (Mont, 2002; Tukker, 2004). Mont (2002) emphasis that PSS increase the responsibility of manufacturer throughout the product's full life cycle and emphasis the importance of design of the closed-loop system. In the reviewed literature it is evident that moving towards service dominance can enhance economic, social and environmental benefits in developed countries but there is lack of empirical studies in developing countries. This research is focused on the benefits generated in a business model shift from a product dominance to service dominance which is the first research in the topic in Sri Lanka.

### **Service based chemical procurement**

The chemical industry is an important sector in global manufacturing. Other manufacturing sectors use products made by the chemical industry and it has strong B2B focus (Buschak & Lay, 2014). As per them 52% of global requirements of chemical products are manufactured in Asia where Europe manufacture 23%. Traditionally chemical suppliers earn money by selling higher volumes of chemicals. Inefficient use by customers will increase the sales of chemicals. This trend was challenged and Chemical management services (Stoughton & Votta, 2003) were introduced due to environmental pressure and competitive reasons. In the Chemical management services companies looking at service replacing a product-selling approach. For example paint suppliers to automotive manufacturer are now often engaged to run the paint line and be paid per automobile painted instead of selling paint and being paid per liter supplied (Spring & Araujo, 2009).

Chemical management service is defined as “a business model in which a customer engages with a service provider in a strategic, long-term contract to supply and manage the customer's chemicals and related services” (Stoughton & Votta, 2003, p.841). As per United Nations

Industrial Development Organization (UNIDO) this concept is called as “chemical leasing” and their definition is presented in Table 3.

**Table 3. Definitions of chemical leasing**

- Chemical Leasing is a service-oriented business model that shifts the focus from increasing the sales volume of chemicals towards a value-added approach.
- The producer mainly sells the functions performed by the chemical, and functional units are the main basis for payment.
- Within Chemical Leasing business models, the responsibility of the producer and service provider is extended and may include the management of the entire life cycle.
- Chemical Leasing strives for a win-win situation. It aims to increase the efficient use of chemicals while reducing the risks of chemicals and protecting human health. It improves the economic and environmental performance of participating companies and enhances their access to new markets.
- Key elements of successful Chemical Leasing business models are proper benefit sharing, high quality standards and mutual trust between participating companies.

Source: Chemicalleasing.com (2015). Chemical Leasing. Retrieved 20 December 2015, <http://www.chemicalleasing.com>

## **RESEARCH METHODOLOGY**

This paper is developed based on qualitative case study methodology (Eisenhardt, 1989). Data collection was based on five axioms and contribution to economic, environmental and employee benefits (triple bottom line approach). The extreme case of business model which shifted to PSS completely within 18 months were selected. Due to the limited number of cases which can practically be studied, it is reasonable to select cases from extreme situations (Eisenhardt, 1989). This case study is conducted covering the transition of exchange from product sales to PSS between Linea Intimo (LI) and Water care (WC) with the support of UNIDO and the National Cleaner Production Centre (NCPC) of Sri Lanka (Newsline.masholdings.com, 2015).

Data was collected through semi-structured Interviews and discussions with LI (the customer) and WC (the supplier) between July 2015 and December 2015. Series of interviews were conducted with both the customer and the supplier and the data was recorded. In addition to the primary data, supplementary data available with companies such as presentations, reports, process maps were used for theoretical triangulation (Jick, 1979; Yin, 2003; Baines et al., 2009).

Total of 9 in-depth interviews were conducted, with the participants designated as General Manager (LI), Sustainability manager (LI), Business Analyst (LI), Employees (LI) Managing director (WC), Executive technical services (WC). The interviews were conducted with the average duration of 45 to 60 minutes in Sri Lanka and the data were recorded. Deductive content analysis was done following the method explained by Elo and Kyngäs (2008). Inductive content analysis is used in cases where there are no previous studies dealing with the phenomenon and deductive content analysis is done when aim was to test a previous theory in a different context (Elo and Kyngäs, 2008). Steps to improve the trustworthiness of a content analysis are followed (Elo et al., 2014).

The findings reported here are based on the business model shift from purchasing chemicals into purchasing a service for water purification. On Supplier side it is a shift from selling chemicals into selling purified water. The business model has been shifted to result oriented PSS. Company's process transition from goods dominance to service dominance in the context of the foundation premises (Vargo & Lusch, 2008; Vargo and Lusch, 2015) and Triple bottom line performances were evaluated and reported. The questions focused on the company's profile, current and previous activities in chemical selling (WC) and purchasing (LI), their perception of the shift from goods dominance to service dominance, process transition, the impact on profit, social aspects and employee moral were studied.

## **CASE STUDY**

Linea Intimo (LI) is a large scale private limited company, employing around 3200 employees. They manufacture seamless garments for world renowned brands. They carry out knitting, dyeing, finishing, stitching and testing during the manufacturing process. Water care Technologies (WC) is a medium scale private limited company which sells chemicals, deliver products and consumables for water treatment and deliver projects. They serve customers in different industries including government sector, apparel and textile, industrial

manufacturing, food processing etc. The business model shift discussed in this case study is a new perspective where the customer and supplier have engaged in service oriented business relationship with a complete shift from product selling to PSS based relationship. LI which used to buy chemicals and paid for chemicals are now getting the water purification service where they pay for the amount of water being cleaned.

As per the company website this is the “world’s first Chemical Leasing project for waste water treatment. UNIDO applauds it as a great start for Sri Lanka and a giant leap in rethinking chemical management by responsible business brands” (Newslines.masholdings.com, 2015). Below are the summary of the data from the supplier (WC) and the customer (LI) with the experience of complete shift from product dominance to service dominance.

**Table 4. Reflection of the shift from product dominance to service dominance according to WC and LI.**

	Foundational Premise	Change from goods dominance to service dominance observations from manufacturer (WC)	Change from goods dominance to service dominance observations from customer (LI)
FP1	Service is the fundamental basis of exchange	With the new model company deliver the service to purify the water instead of selling chemicals and customer pay for the purified water instead of the chemicals. Business model has completely shifted to deliver service rather than a product.	LI gets the service instead of chemicals from the supplier. Company pays for the service which the supplier delivers.
FP2	Indirect exchange masks the fundamental basis of exchange	In this model WC sells the specialization skill to the customer. Chemicals, money and other resources are exchange media.	In new model LI gets set of services with the specialized skills from the WC. Those services are water purification, training of employees, demand planning etc.
FP3	Goods are a distribution mechanism for service provision	Main drivers of the exchange are the specialized knowledge and skills. Using these company modifies and continuously improves the chemical combinations (goods) to enhance the service deliver. Goods are used to render the service	The current model drives based on service provision. Payments are directly linked to the service delivered hence goods are used by supplier to deliver the service they promise to deliver.

FP4	Operant resources are the fundamental source of strategic benefit.	WC has the access to customer facilitates. The expertise and knowledge can be effectively used in service dominance as LI is expecting the total solution from WC. LI frequently share knowledge with WC and WC trained employees at customer end in order to mutually enhance the knowledge.	Knowledge exchange and transfer between the supplier and customer is a critical success factor in this model. Knowledge is shared in the service provision chain where as supplier is openly engaged in the process of LI. Companies mutually enhance the competency on the project through knowledge sharing.
FP5	All economies are service economies	In this model WC sells the specialization skill to the customer. Chemicals, money and other resources are exchange mediums.	In new model WC is delivering combination of different services as a unique service proposition to LI.
FP6	Value is cocreated by multiple actors, always including the beneficiary	In this model success is driven by the customer as they are fully involved in the value creation process. Employees of LI together with WC are responsible for the final results hence this is customer driven approach.	As the customer LI is continuously involve in this model in order to continuously improve the value created. LI monitor and continuously driving to enhance the value created. This is customer centered value creation model.
FP7	Actors cannot deliver value but can participate in the creation and offering of value propositions	The value on this model is created through the process with the customer relationship. Without customer involvement value cannot be determined or understood.	LI is perceiving the value created in this process due to the engagement it has to the project. It is necessary to engage in order to perceive the value
FP8	A service-centered view is inherently beneficiary oriented and relational	Success of this model is depend on customer focus approach. Most of the functions has to be carried out by mutual understanding.	It is very important to have a strong collaboration with the supplier and good relationship as benefits are mutually derived.
FP9	All social and economic actors are resource integrators	It is necessary to connect with many parties to integrate the resources required to deliver the new model	New model requires close connect with the suppliers , customers and other stake holders.
FP10	Value is always uniquely and phenomenologic ally determined by the beneficiary	It is essential to have a unique model to deliver the solution which customer is determined.	Most of the time value created in this model will be viewed based on customer experience.

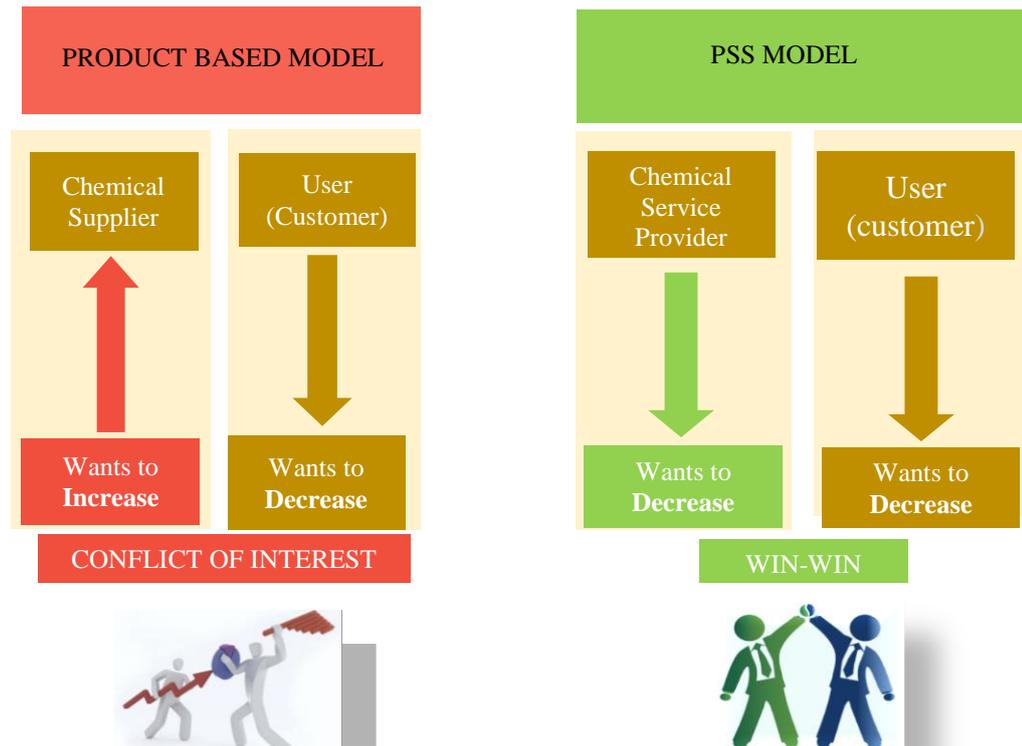
E1	Economic benefits	Economic benefits are obvious and mutually shared with the customer. Economic benefits are driven through optimizing the consumption and materials rather than maximizing the sales.	Economic benefits are driven by both LI and WC without any conflict. In chemical selling model the supplier direction and customer direction for economic benefits were in conflict. In service dominance model the economic benefits are derived and shared mutually.
E2	Environmental benefits	Environmental benefits are clearly achieved where as LI and WC drives to optimize the consumption and minimize the environment impact.	LI was able to achieve 20 – 30% of overall chemical savings while substituting chemical with lower environmental impact chemical.
E3	Social benefits	The Job role of employees get enhanced and they have the opportunity to closely working with customers and enhance the knowledge. Same transparent objectives with the customer to optimize the solution hence positive moral is created.	The Employees involved get the training opportunities to understand the supplier process hence wider knowledge is developed. Health and safety aspects are further improved due to reduction in chemicals and shift towards environmental friendly chemicals.

Source: findings of data analysis

## DISCUSSION

In contrast to previous chemical selling business it is clear that the new business model in the case study focuses on service based model where empirical evidence can be seen in Sri Lanka similar to the developed countries. Some examples from developed countries are IBM and Rolls-Royce Aerospace where they have changed the business from product focus to PSS focus. In Servitization Literature “power by the hour” concept of Rolls-Royce Aerospace is frequently discussed (Neely, 2008).

According to the case study it is clear that goods are acting as a distribution mechanism in the exchange of service. In the traditional business model customers always strive to reduce the consumption and the price whereas the suppliers were trying to increase chemical quantity and revenue. This conflict has been avoided in the new business model where both customer and supplier are targeting to maximize the profit by optimizing the chemical usage.



**Figure 2: Representation about the shift from product dominance to service dominance**

The service dominant logic looks at how the purpose of exchange is mutually served where as general commerce looks at producing and selling more units (Vargo & Lusch, 2008). Based on the case study it is explained that companies could save chemicals and share the savings between companies based on mutually agreed proportion. This has improved the profitability aspect of the firm and the customer. New model of working has achieved 20 – 30% of overall chemical savings while substituting one chemical with one with a lower environmental impact. The environmental impact of chemicals has been cut down and continuous improvements had been taken place. The moral of the employees in both companies has increased while achieving clear environmental benefit. The outcome is explained in figure 2 where PSS business model has been identified as a win-win model for both supplier and customer. As per Lusch et al (2007), when employees are viewed and treated as operant resource they become empowered in their role as value co-creators. These employees become the primal source of innovation, organizational knowledge, and value. This trend is clearly visible in the case study where the business model between LI and WC transformed into a PSS oriented business.

Shifting towards PSS oriented business model is not an easy task and it is a complete shift of thinking. Lusch & Vargo (2006) explained “service-centered dominant logic represents a reoriented philosophy that is applicable to all marketing offerings, including those that

involve tangible output (goods) in the process of service provision” (Lusch & Vargo, 2006, p.4). Following view from LI management explain the shift.

“You may think this is an optimization project or an efficiency improvement project. The most important factor of this project is not the amount of chemical saved but the concept itself and the paradigm shift of thinking. We have redefined how chemical management can be done in a business environment” (Newsline.masholdings.com, 2015).

Martin & Horne (1992) explained that major strategic hurdles faced by the firms which shift from product dominance to service dominance are re thinking the customer as co-producer and design and management of new service development process. Case companies have clearly overcome these challenges during the transition process. As per findings of the case study it can be depicted that the shift from selling chemicals to chemical solution model is well explained in Sri Lankan context. According to the case study the shift into PSS model can be viewed as sustainable business model which enhance its benefits to economic, environment and employees. Due to the qualitative case study approach there is a limitation in generalizing the finding of this case study, hence further research in different settings are suggested.

## REFERENCES

- Asian development bank, (2014), *Key Indicators for Asia and the Pacific 2014*. [Online] Mandaluyong City: Asian Development Bank, pp.162-165. Available <http://www.adb.org/publications/key-indicators-asia-and-pacific-2014> [Accessed 18 Oct. 2015].
- Aitken, R., Ballantyne, D., Osborne, P. and Williams, J. (2006), Introduction to the special issue on the service-dominant logic of marketing: insights from The Otago Forum. *Marketing Theory*, 6(3), pp.275-280.
- Baines, T., Lightfoot, H., Evans, S., Neely, A., Greenough, R., Peppard, J., Roy, R., Shehab, E., Braganza, A., Tiwari, A., Alcock, J., Angus, J., Bastl, M., Cousens, A., Irving, P., Johnson, M., Kingston, J., Lockett, H., Martinez, V., Michele, P., Tranfield, D., Walton, I. and Wilson, H. (2007), State-of-the-art in product-service systems. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 221(10), pp.1543-1552.
- Beuren, F., Gomes Ferreira, M. and Cauchick Miguel, P. (2013), Product-service systems: a literature review on integrated products and services. *Journal of Cleaner Production*, 47, pp.222-231.
- Baines, T., Lightfoot, H., Peppard, J., Johnson, M., Tiwari, A., Shehab, E. and Swink, M. (2009), Towards an operations strategy for product-centric servitization. *International Journal of Operations & Production Management*, 29(5), pp.494-519.
- Bikfalvi, A., Lay, G., Maloca, S., & Waser, B. (2012), Servitization and networking: large-scale survey findings on product-related services. *Service Business*, 7(1), pp.61-82.

- Brady, T., Davies, A., & Gann, D. (2005), Creating value by delivering integrated solutions. *International Journal Of Project Management*, 23(5), pp.360-365.
- Brax, S. (2005), A manufacturer becoming service provider – challenges and a paradox. *Managing Service Quality: An International Journal*, 15(2), pp.142-155.
- Buschak, D. and Lay, G., 2014. Chemical Industry: Servitization in Niches. In *Servitization in Industry* (pp. 131-150), Springer International Publishing.
- Central bank of Sri Lanka, (2014), *Economic and Social statistics of Sri Lanka 2014*. Colombo: Statistics Department Central Bank of Sri Lanka, pp.1-182.
- Chemicalleasing.com. (2015), *Chemical Leasing*. [online] Available at:<http://www.chemicalleasing.com/> [Accessed 20 Dec. 2015].
- Cohen, M.A., Agrawal, N. and Agrawal, V., (2006), Winning in the aftermarket. *Harvard business review*, 84(5), p.129.
- Eisenhardt, K. (1989), Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), pp.532.
- Elo, S., Kaariainen, M., Kanste, O., Polkki, T., Utriainen, K. and Kyngas, H. (2014), Qualitative Content Analysis: A Focus on Trustworthiness. *SAGE Open*, 4(1).
- Elo, S. and Kyngäs, H., 2008. The qualitative content analysis process. *Journal of advanced nursing*, 62(1), pp.107-115.
- Gebauer, H., Bravo-Sanchez, C. and Fleisch, E. (2007), Service strategies in product manufacturing companies. *Business Strategy Series*, 9(1), pp.12-20.
- Gebauer, H., Ren, G., Valtakoski, A., & Reynoso, J. (2012). Service-driven manufacturing. *Journal Of Service Management*, 23(1), pp.120-136.
- Goedkoop, M., van Halen, C., Te Riele, H. and Rommens, P. (1999), *Product service systems, ecological and economic basics*. Ministry of Environment, The Hague, Netherlands.
- Gronroos, C. (2006). Adopting a service logic for marketing. *Marketing Theory*, 6(3), pp.317-333.
- Gronroos, C., & Helle, P. (2010), Adopting a service logic in manufacturing. *Journal of Service Management*, 21(5), pp.564-590.
- Jacob, F., & Ulaga, W. (2008), The transition from product to service in business markets: An agenda for academic inquiry. *Industrial Marketing Management*, 37(3), pp.247-253.
- Kastalli, I., & Van Looy, B. (2013). Servitization: Disentangling the impact of service business model innovation on manufacturing firm performance. *Journal of Operations Management*, 31(4), pp.169-180.
- Jick, T. (1979), Mixing Qualitative and Quantitative Methods: Triangulation in Action. *Administrative Science Quarterly*, 24(4), p.602.
- Kohtamaki, M., Hakala, H., Partanen, J., Parida, V., & Wincent, J. (2015), The performance impact of industrial services and service orientation on manufacturing companies. *Journal of Service Theory Practice*, 25(4), pp.463-485.
- Kowalkowski, C., Kindström, D., Alejandro, T., Brege, S., & Biggemann, S. (2012), Service infusion as agile incrementalism in action. *Journal of Business Research*, 65(6), pp.765-772.
- Li, J., Lin, L., Chen, D., & Ma, L. (2015), An empirical study of servitization paradox in China. *The Journal of High Technology Management Research*, 26(1), pp.66-76.

- Lusch, R.F. and Vargo, S.L., (2006), Service-dominant logic: reactions, reflections and refinements. *Marketing theory*, 6(3), pp.281-288.
- Lusch, R., Vargo, S. and O'Brien, M. (2007), Competing through service: Insights from service-dominant logic. *Journal of Retailing*, 83(1), pp.5-18.
- Martin Jr, C. R., & Horne, D. A. (1992), Restructuring towards a service orientation: the strategic challenges. *International Journal of Service Industry Management*, 3(1), pp.25-38.
- Mont, O. (2002), Clarifying the concept of product–service system. *Journal of Cleaner Production*, 10(3), pp.237-245.
- Neely, A. (2008), Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, 1(2), pp.103-118.
- Newsline.masholdings.com. (2015), *MAS Holdings unveils a sustainability project that became a world's first for Sri Lanka / MAS Holdings*. [online] Available at:<http://newsline.masholdings.com/mas-holdings-unveils-a-sustainability-project-that-became-a-worlds-first-for-sri-lanka/> [Accessed 20 Dec. 2015].
- Raddats, C. and Kowalkowski, C. (2014), A Reconceptualization of Manufacturers' Service Strategies. *Journal of Business-to-Business Marketing*, 21(1), pp.19-34.
- Reim, W., Parida, V., & Örtqvist, D. (2015), Product–Service Systems (PSS) business models and tactics – a systematic literature review. *Journal of Cleaner Production*, 97, pp.61-75.
- Smith, L., Maull, R. and C.L. Ng, I. (2014), Servitization and operations management: a service dominant-logic approach. *International Journal of Operations & Production Management*, 34(2), pp.242-269.
- Spring, M., & Araujo, L. (2009), Service, services and products: rethinking operations strategy. *International Journal of Operations & Production Management*, 29(5), pp.444-467.
- Stoughton, M., & Votta, T. (2003), Implementing service-based chemical procurement: lessons and results. *Journal of Cleaner Production*, 11(8), pp.839-849.
- Tukker, A. (2004), Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet. *Business Strategy And The Environment*, 13(4), pp.246-260.
- Tukker, A. (2015). Product services for a resource-efficient and circular economy – a review. *Journal of Cleaner Production*, 97, pp.76-91.
- Vandermerwe, S., & Rada, J. (1988). Servitization of business: Adding value by adding services. *European Management Journal*, 6(4), pp.314-324.
- Vargo, S. and Lusch, R. (2004). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing*, 68(1), pp.1-17.
- Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: continuing the evolution. *Journal of the Academy of marketing Science*, 36(1), pp.1-10.
- Vargo, S. and Lusch, R. (2015). Institutions and axioms: an extension and update of service-dominant logic. *J. of the Acad. Mark. Sci.*, 44(1), pp.5-23.
- Visnjic, I., Neely, A., & Wiengarten, F. (2012), Another performance paradox?: A refined view on the performance impact of servitization. *A Refined View on the Performance Impact of Servitization (July 4, 2012)*. *ESADE Business School Research Paper*, (231).
- Wise, R., & Baumgartner, P. (1999), Go downstream: the new profit imperative in manufacturing. *Harvard business review*, 77(5), pp.133-141.
- Yin, R.K. (2003), *Case Study Research: Design and Methods*, 3rd ed., Sage, London