A Methodology for Adopting Product Service Systems as a Competitive Strategy for Manufacturer

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Abstract

This paper presents the overview of a research program of the development of a new Product-Service Systems Evaluation (PSSE) methodology. The aim of the PSSE Methodology is to assist manufacturer to asses whether the adoption of a PSS is a good competitive strategy. The paper briefly reviews existing literature related to Servitization and PSS. It describes the competitive elements of a PSS competitive strategy and its performance criteria. Results of the case studies conducted in Singapore to understand the awareness of PSS concept and the requirement sets of the delivery mechanism of the new PSSE methodology are presented. The structure of the new PSSE methodology is briefly outlined at the end of the paper.

Keywords

Servitization, Product-Service Systems, PSS, Competitive Strategy, Manufacturing Operation Methodology

1 INTRODUCTION

PSS, Product-Service Systems, is an integrated combination of products and services that delivers value in use [1]. For manufacturers whose products are undifferentiated and commoditized, or with a wide installed base, going downstream represents significant opportunity to create a new competitive strategy to sustain further business growth and generate more profits [2]. Manufacturing capability and processes now represent opportunities to create more value via the provision of a PSS [3-6]. Although the concept might not be new [7], Servitization, 'the innovation of an organisation's capabilities and processes to better create mutual value through a shift from selling product to selling PSS' [4, 5], provides a possibility to shift traditional product focused manufacturing to a new servitized manufacturing paradigm with the support of advanced ICT and manufacturing and maintenance infrastructure. The surge of research papers in recent years reflects the level of intensity in interests from academia in this subject[see references 1-17], albeit conducted under different research themes like Servicising [11], Product to Service Transition [8], Service Engineering [10, 12] and Industrial Business Service [13] etc.

The assumption that manufacturers are being able to create more value in use via PSS lies in the fact that manufacturers are in a position of being able to effectively exploit the synergies of products and service combination. Manufacturers possess the ability to design "serviceability" into a product, be it servicing the products itself in operation or delivering the intended services to customers. For example, as manufacturer is likely to be responsible for the entire product life cycle support, special features are likely to be designed and developed onto the product itself to monitor the usage of the products and to prolong its operating life span.

Although expanding into services offers manufacturers opportunities to exploit more values from the products, the move to Servitization, however, generates new uncertainty, game rules and challenges [4, 14, 16]. Servitization requires significant organizational changes in language, values, design process, and organization structure [3, 8]. Manufacturers need to develop new competence profile and core competency base and undergo organisational changes, both structurally and infrastructurally [3]. To a certain extent, competences, resources and capabilities which may be so new to the manufacturer that it resulted in new collaboration with other partners [15], or formation of a decentralized new service unit with different metrics and performance measures to support the new service activities [18].

To date, despite the fact that many companies are moving towards Servitization, services have yet to be successfully integrated into the corporate competitive analysis and strategy formulation process. Hence, to develop tool and methodology to help manufacturing firm to effectively design PSS within the manufacturing context is important. In particularly, when a manufacturer decided to go for Servitization, an effective tool or methodology to help evaluating whether such a decision is a competitive move is also essential [5]. As pointed out by Wilkinson et al., traditional operations management tools, techniques and frameworks, were basically developed for traditional product manufacturing [19]. As the traditional manufacturing firms servitized, the models and methodologies used by the operations management community may need to be modified and enhanced [19]. Furthermore, Baines et al. stress the needs to develop new methodology to support the transition to servitized manufacturing [5].

Although currently there are some PSS methodologies developed for designing and implementing PSS, their approach is biased towards attaining sustainability and reducing environmental impact [20, 21]. In view of this, this paper sets out to present a methodology aims at assisting manufacturer in evaluating whether the adoption of a PSS is a good strategy from the point of view of competitiveness.

The paper commences by first describing the research programme, which includes research background, aim and research questions. Literature in the areas of Servitization and PSS is then reviewed. The central

sections of the paper focus in discussing the value preposition of a PSS competitive strategy. The later sections present the results of the exploratory case studies conducted in Singapore and the structure of the PSSE methodology. Future research is briefly described at the end of the paper.

2 RESEARCH PROGRAMME

2.1 Research Background

Singapore, like many other developed countries in the West, is gradually shifting from low value labour intensive manufacturing to high value manufacturing. Proposal put up by the Economic Review Committee in 2002 has recommended Singapore manufacturers to move downstream to capture values generated from additional service activities to maintain their competitive edge [22]. Although the concept of providing services to support customers and products are not new to most of the manufacturers, the concept of Servitization and PSS, which currently capturing the attention of policy makers in Europe and USA, still remain relatively a unknown one in Singapore.

2.2 Research Aim and Questions

The aim of this research is "to design and evaluate a methodology that will enable the manufacturing companies in Singapore to assess whether the adoption of PSS is a good competitive strategy".

The following research questions have been formulated to address the research aim:

1 What are the competitive elements of a PSS competitive strategy?

2 How can a manufacturing firm assess whether the adoption of a PSS is a good competitive strategy?

A 5-phased research programme has been established to achieve the research aim:

- Phase 1: Establishing the requirements set of the PSSE Methodology
- Phase 2: Identification & evaluation of existing methodologies against the requirements set
- Phase 3: Formation of pilot PSSE methodology
- Phase 4: Validation of the pilot PSSE methodology
- Phase 5: Refinement and development of the final Methodology

Section 3 to 5 of this paper present the background work of the research programmes that led to the establishment of the requirements set in phase 1 and the formation of the pilot PSSE methodology in phase 3 which is briefly discussed in Section 6.

3 LITERATURE REVIEW

3.1 General Definitions of Product and Services

As stated in the beginning of this paper, PSS is an integrated combination of products and services that deliver value in use. It includes both the tangible product and the intangible service as its basic elements. Although the term of "product" and "service" appeared to be easily understood by common laymen, its definition varies from the literature of marketing to manufacturing [1, 24]. Thus, it is important to provide a clear definition of "product" and "service" at the beginning of this paper before we discuss on the competitive elements of a PSS strategy and the methodology developed to evaluate its competitiveness.

Product

The term "product" is well understood in the world of manufacture. A product is typically referring to a material artefact, for example, a car, an engine or even small component parts being manufactured like screws and nuts. Goedkoop et al. describe it as "a tangible commodity manufactured to be sold, and of capable of falling on your toe and fulfilling a user's needs" [23]. The term "functional product", on the other hand, is not necessarily referring to a physical artefact, and can be consisting of any combination of hardware, software and services [17]. In the context of manufacturing, product is usually regarded as something tangible, and certainly do not contain any intangible service elements. The definition of the "product" adopted in this paper is shown in Table 1.

Service

As of the term "service", in the world of manufacture, it is usually referring to an offering provided to the customer [2]. For examples, services provided by a manufacturer to a B2B customer like training and consultancy, or to a B2C customer like installation and warranty. Although in most cases, these services involve the handling of physical products, the service itself rendered to the customers does not necessarily result in the transfer of the ownership of the tangible assets to the customer. The services, in general, are add-on economic activities that help the manufacturer to ensure that the product being sold, either in it own or in a bundle, is able to operate in good condition and deliver its purported functionality. Thus, in this paper, as shown in Table 1, we refer service to as an "economic activity that does not result in ownership of a tangible asset" [2].

Value in Use

'Value in use' is a concept addressed in Service-Dominant Logic Marketing and is seen as 'value co-created with the customer' [24]. This is offered as a new marketing paradigm that moves away from the 'old' Goods-Dominant Logic where value was considered to be embedded in the product. A customer attaches value to a product or service in proportion to its perceived ability to help solve his problems or meet his needs [25]. In this paper, we define Value in Use as "the value of the utility of an integrated combination of products and services delivered by PSS to a customer". Table 1 summaries the definitions discussed and the definitions of the key concepts related to PSS and Servitization that will be used in the discussion in the subsequent sections of this paper.

3.2 Moving Towards Servitization

Servitization was first presented by Vandermerwe and Rada [26] in 1988 in their article entitled "Servitization of business: adding value by adding services". Vandermerwe and Rada suggests to use Servitization as a competitive tool to setting up barriers to competitors, creating dependency, differentiating the market offering and diffusing new innovations. In the recent years, many researchers see Servitization as the movement "on a product-service continuum ranging from products with services as an "add-on", to services with tangible goods as an "add-on" [4, 8, 18]. Some researchers refer Servitization as "Servicification" [10] or "Servicising" [11].

Term	Definition
Product Service System (PSS)	*PSS is an integrated combination of products and services that delivers value in use [1]* **Product Oriented PSS**: *Promoting/selling the product in a traditional manner while including additional services as part of the offering* **Use Oriented PSS**: *Selling the use or availability of a product which is not owned by the customer such as leasing or sharing* **Result Oriented PSS**: *Selling a result or capability instead of a product, such as selling power by the hour*
Products	*Product is a tangible commodity manufactured to be sold, and is capable of falling on your toe and of fulfilling a user's needs -Goedkoop et al. 1999 [23]*
Services	*Service is an economic activity that does not result in ownership of a tangible asset [4]*
Value in Use	*The value of the utility of an integrated combination of products and services delivered by PSS to a customer*
Servitization	*Servitization is the innovation of an organisations capabilities and processes to better create mutual value through a shift from selling product to selling PSS. [4]*

Table 1: General Definitions Related to Servitization

Type of Service Typologies/Models

Table 2. shows a list of service typologies available in the literature. Mathieu classifies the service into two leading groups: Service supporting the product (SSP) and services supporting the customer's action (SSC)[28]. SSP referring to service supporting the supplier's product to ensure the proper functioning of the product and to facilitate the client's access to the product. In SSC, manufacturers explore how services can be used to support particular client initiatives and advance the mission of customer organization [28]. Another interesting concept is Service Factory in which manufacturing personnel and the factory itself share a service mission that extends beyond the basics of reliable, flexible and cost-effective production [29-32]. Factory can play a role of *Showroom, Dispatcher, Laboratory and Consultant* on top on other possible services in distribution and after sales. Likewise, Gebauer and Friedli suggest different service provider' roles, namely, *After Sales Service Providers, Customer Support Providers, Outsourcing Partners and Development Partner* for the manufacturers [18]. In the field of industrial services, Boyt and Harvey distinguish three service categories: *elementary, intermediate,* and *intricate* [13].

As discussed above, many different service typologies and models have been proposed. In this paper, nonetheless, we would like to focus the discussion in examining the role of PSS within Servitization.

Author	*Service Typology*
Silvestro et al. (1992) [27] Schmenner (2009) [8]	*1. Professional Service* *2. Service Shop* *3. Mass Service*
Boyt and Harvey (1997) [13]	*1. Elementary Services* *2. Intermediate Services* *3. Intricate Services*
Mathieu (2001) [28]	*1. Service Supporting Customer (SSC)* *2. Service Supporting Product (SSP)* *Product Service* *Service Product*
Chase (1991) [29] Chase & Garvin (1989) [30]	*1. The distribution Channel* *2. After Sales Service Operations* *3. Service Factory:* • *Factory as a showroom* • *Factory as a dispatcher* • *Factory as a laboratory* • *Factory as a consultant*
Ren & Gregory (2007) [33]	*1. Integrated solutions* *2. Maintenance and repair services* *3. Performance-based service contracts* *4. Operating and managed services* *5. Business consulting services* *6. Quick delivery services* *7. Technical specification services* *8. Design and engineering*
Gebauer & Friedli (2008) [18]	*1. After Sales Service Providers* *2. Customer Support Providers* *3. Outsourcing Partners* *4. Development Partner*
Neely (2008) [5]	*1.Integration Oriented PSS* *2.Product Oriented PSS* *3.Service Oriented PSS* *4.Use Oriented PSS* *5.Result Oriented PSS*

Table 2: Possible Service Models for Servitized Manufacturing

3.3 The Role of PSS in Servitization

Although PSS and Servitization started out as two different research concepts by different research communities, Baines et al. in 2007 has managed to provide a bridge to the two concepts [4]. As shown in Table 1, Baines et al. define *Servitization as the innovation of an organisations capabilities and processes to better create mutual value through a shift from selling product to selling PSS.* Concept of PSS was originated from the Scandinavian in the late 90's and one of the earliest definitions of PSS was given by Goedkoop et al. in 1999 as "a marketable set of products and services jointly fulfilling a user's needs" [23]. The original PSS concept has its roots in industrial ecology with the aim of reducing the consumption of materials and improving sustainability [23, 34, 35]. Linking up with servitized manufacturing concept, the focus of PSS has been shifted from sustainability to deliver value in use and PSS is more often regarded more as a competitive strategy than a tool to reduce environmental impact [1, 3, 4, 8]. Many PSS classifications exist in the literature. For example, Tukker classifies PSS into 8 different types [35]. As shown in Table 2, Neely outlines 5 different options of PSS under Servitization, namely *Integration Oriented PSS, Product Oriented PSS, Service Oriented PSS, Use Oriented PSS and Result Oriented PS* [5]. However, the most commonly used classification consists of basic three models [1], namely, Product oriented PSS, Use Oriented PSS and Result Oriented PSS.

Basically, Product Oriented PSS promotes and sells the product in a traditional manner while includes additional services as part of the offering whereas Use Oriented PSS sells the use or availability of a product which is not owned by the customer such as leasing or sharing. Result Oriented PSS sells the result or capability instead of a product. Typical examples of Result Oriented PSS are "Selling the copying" by Canon and Xerox, "Selling the power-of-the-hour" by Rolls Royce's engine service, "Selling the driving" by car sharing service provider and "Selling the washing" by community laundrette centre.

Baines et al. state that "with a PSS, asset ownership is not necessarily transferred to the customer" [3]. This is generally referring to both the Use Oriented and Result Oriented PSS. While the manufacturers provide goods to the customer, and receive payment with every unit of service or solution they provided, the ownership of the products, can still remain with the manufacturer.

4 ESTABLISHING THE FRAMEWORK OF A PSS COMPETITIVE STRATEGY

4.1 Defining the value preposition of a PSS Competitive Strategy

A PSS competitive strategy, theoretically, should offer a manufacturer the competitiveness to compete in the market. *Competitiveness is the ability to get customers to choose your products or services over competing alternatives on a sustainable basis* [36]. Competitive strategy is a concept that is perhaps most closely associated with Michael E. Porter [37], who expresses it as, *"essentially, developing a competitive strategy is developing a broad formula for how a business is going to compete, what its goal should be, and what policies will be needed to carry out those goals"*

Porter proposes three generic strategy choices, namely, differentiation, cost leadership and focus. As a competitive strategy, the value proposition of a PSS is inarguably to create differentiation for a company. Since the goal of a PSS competitive strategy is to offer integrated combination of product and service solution, another competitive strategic concept that can be used to describe PSS strategy is the "Best Packaged Offering" concept proposed by Baines [38]. Baines proposes competitive strategy concept based on *Best Packaged Offering (Offering the best total solutions to the customers), Best Price Offering (Offering the best total cost to the customers)* and *Best Product Offering (Offering the best product to the customers).* In the context of manufacturing strategy, the other widely used competitive strategy concept is the value preposition model proposed by Treacy and Wiersema [39]. Treacy and Wiersema relate competitive strategy to customer intimacy, operational excellence and product leadership. As the purpose of a PSS competitive strategy is to satisfy customer's needs, its competitiveness depends on whether the strategy can attain "customer intimacy" during implementation.

As a result, based on the above discussion, we would like to propose the following competitive elements for a PSS competitive strategy:

1 **Best Packaged Solution** - Firstly, a PSS competitive strategy offers Best Packaged Solution focusing in delivering the total solutions in a combined package of product and service to the customer

2 **Customer Intimacy** - Secondly, it emphasises on delivering value in use, which focusing in establishing long term customer relationship, provide best customer experience and develop customer intimacy

3 **Differentiation** - Thirdly, it creates a distinct Differentiation and value preposition through the offering of best packaged solution and customer intimacy

A PSS strategy will be a competitive one if a manufacturer able to deliver its competitive elements effectively. The next section we shall discuss on how the competitive elements of a PSS strategy can be evaluated by using traditional manufacturing performance criteria modified to include the new service order winning criteria.

Competitiveness	*Competitiveness is the ability to get customers to choose your products or services over competing alternatives on a sustainable basis - Schlie(1995) [36]*	
Strategy	*The determination of basic long term goals and objectives of an enterprise, and the adoption of courses of actions and the allocation of resources necessary for carrying out these goals. – Chandler(1962) [40]*	
Competitive Strategy	*A broad formula for how a business is going to compete, what its goal should be, and what policies will be needed to carry out those goals Porter(1980) [37]*	
Competitive Strategic Choice (Elements)	**Porter (1980) [37]**	*Cost Leadership, Differentiation, Focus*
	Baines (2009) [38]	*Best Packaged Offering, Best Price Offering, Best Product Offering*
	Treacy & Wiersema	*Customer Intimacy, Operational Excellence,*

Table 3: Summary of Concepts Related to Competitive Strategy

4.2 Evaluating PSS Competitive Strategy Using Manufacturing Performance Criteria

Performance Criteria in Measuring the PSS Competitive Strategy

Skinner points out that a firm's competitive strategy drives its manufacturing strategy leading to operations decisions which has resulted in the desired performance [41, 42]. Platts and Gregory say that manufacturing strategy is formed to achieve business goals and these goals are predominantly defined in terms of competitive priorities, for example, quality, cost and time etc [43]. Chase presents a set of guidelines for measuring service value chain performance while concluding with several propositions linking internal and external customers' satisfaction with factory services (i.e. information, problem solving, sales and support) and traditional indicators of factory performance criteria like cost, quality, flexibility and delivery [29-31].

According to Olouuniwo, who has cited Schmenner (1986), the dimensions to measure service quality are Tangibles Quality - product performance, Responsiveness - Speed in getting back to customer, Recovery - Speed in correcting wrong action, Knowledge - Product + Service Knowhow, Accessibility, Flexibility and Reliability [44]. Thus, a set of traditional product manufacturing performance criteria with the expansion to cover service has been proposed to measure the competitive elements of a PSS competitive strategy. Taking Quality as an example, instead of just measuring the quality of a product, it is now expanded to cover the measurement of quality conformance and reliability of both the product and

service performance; Likewise, Delivery has also expanded to cover service delivery, i.e. *Responsiveness* (the willingness or readiness of employees or professionals to provide service) and *Recovery* (speed in correcting wrong action).

Measuring inputs and outputs of the tangible physical products are relatively easy compared to the measurement of intangible output of the service offering. Measurement of the effectiveness of service, or value in use relies on customer satisfaction, feedback and loyalty, which is rather subjective in most cases. Service quality is perceived and experienced, and relies heavily on the quality of the service delivery personnel [44]. In services, customer will pay only whatever they think the service is worth. Although some quantitative measurement could be straight forward, (e.g. number of service units delivered, customer retention, size of customer base, number of training sessions conducted) the quality of value delivered and customer intimacy level can only be measured by using subjective criteria like customer satisfaction and customer experience[45, 46].

Policies in Delivering PSS Competitive Strategy

Although customer intimacy can be generated through the provision of best packaged solution, it does not automatically resulting in differentiation. Manufacturers need to be able to formulate policies to attain the competitiveness of a PSS competitive strategy. Lee in 2007 has proposed a decision model for manufacturer to link best practices to competitive strategies [47]. As the role of the product is supporting the delivery of services in a PSS, first and foremost, a strategic fit check between the service intend to be offered and the life cycle stages (*Introduction, Growth, Mature* and *Decline*) of the product is fundamental [47]. Second, internal alignment of the PSS competitive strategy with its manufacturing core competency and capability to determine the technology fit, both structurally and infra-structurally (i.e. service driven, customer involvement, product customisation and change management) is essential[4, 8, 47]. Last but not least, how well an organisation can be transformed to support the Servitization plays a vital role in sustaining competitiveness [2, 4, 8]. The ability of a manufacturer to be able to transform itself to support Servitization strategy can be termed "Servitizability".

Servitizability	*The ability of a manufacturer to effectively transform its operations to support the Servitization strategy, both structurally and infra-structurally*

Figure 1 shows the performance measurement system of a PSS competitive strategy and Table 4 summarises performance criteria that are required to measure the competitive elements of the PSS competitive strategy.

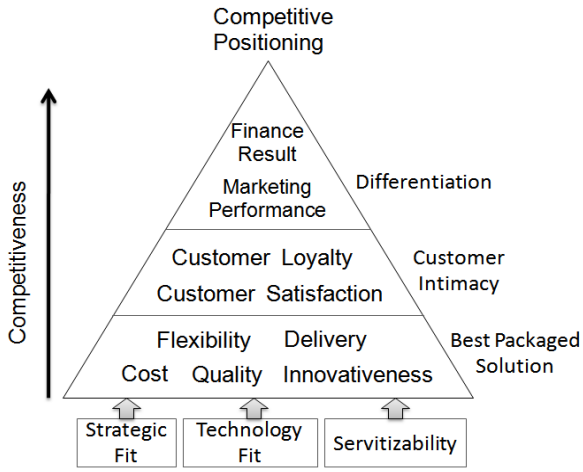

Figure 1. Performance Measurement System of a PSS Competitive Strategy

Competitive Elements	Competitive Dimensions (Performance Criteria)
Best Packaged Solution	*1. Cost (Product life cycle, Service)* *2. Quality (Conformance to specification, Reliability)* *3. Delivery (Responsiveness, Service Recovery, Product Availability)* *4. Flexibility (Accessibility, Level of Product Customisation, Variety of Services -SSP, SSC)* *5. Innovativeness (New Feature of Product and Service,)*
Customer Intimacy	*1. Customer Satisfaction (Acceptance, Willingness to pay)* *2. Customer Loyalty/ Base (no. of returned customer)*
Differentia-tion	*1. Competitive Positioning in target market segments (competitive advantage)* *2. Financial Performance (*Cash flow, Turnover, Profit and Return of Investment) *3. Marketing Performance (Market share, Market penetration, Brand Reputation)* *4. Operation Performance (Strategic Fit, Technology Fit, Servitizability)*

Table 4: Proposed Performance Criteria of a PSS Competitive Strategy

5 ASSESSMENT OF THE AWARENESS OF CONCEPT OF SERVITIZATION AND PSS IN SINGAPORE

5.1 Data Collection Method

In order to understand the awareness of the concept of PSS and Servitization in the Singapore manufacturing industry, we have conducted a simple exploratory study to gather necessary information. The main mission of the study is to gauge the awareness and acceptance level of such the servitized concept before the development of the structure for the PSSE methodology. The study also seeks to understand whether a methodology for helping manufacturing companies in adopting the PSS or service led business model is desirable by the Singapore companies and the preferred delivery mechanism of such a methodology. The exploratory case study was conducted by using semi-structured interview. A total no. of 10 product manufacturers was selected from the

existing client base of Singapore Institute of Manufacturing Technology. The products manufactured by the selected companies represent an evenly distribution along the 4 stages of product life cycle, namely, Introduction, Growth, Mature and Decline. A set of questionnaires has been developed to assist in this study which consists of fundamental questions like "Have you heard of the Servitization and PSS concept?", "Do you think that you can gain competitiveness by providing more services on top of the products that you have manufactured?", "What are the services currently provided by your company?" and "How would you like the evaluation methodology to be delivered?" etc. Section 5.2 discusses briefly on the summary of some of the key findings.

5.2 Brief Summary of the Key Findings

First, product and Service mix offering was unanimously regarded as a potential competitive strategy. Most of the companies interviewed have also long been providing some forms of after sales supporting services like warranty, repair and training etc. to their B2B or B2C customers. Although mostly familiar with the concept of adding services to gain competitiveness, companies in Singapore generally do not heard of the concept of PSS and Servitization. Nevertheless, they did agree that it would be good to develop a methodology to assist the companies to assess whether the adoption of a new product service business model is a competitive one. Majority preferred the methodology to be delivered via facilitator guided workshop which they can seek advices and discuss their concerns with the experts/facilitators. They generally preferred platform to allow participation of key management from the various departments, and to certain extent, the intended customers. Table 5 provides the summary of the key findings.

Finding 1	*Product and Service mix offering is generally regarded as a potential competitive strategy to the Singapore manufacturing company – 100%*
Finding 2	*Companies in Singapore generally do not aware of the concept of PSS and Servitization – 80%*
Finding 3	*Companies in Singapore generally agreed that it would be helpful to develop a methodology that is able to assist company in assessing whether the adoption of a new PSS is a good competitive strategy- 100%*
Finding 4	*Identification of critical success factors, performance killers and other elements affecting the implementation of new service offering is crucial in helping the company to make the right decision of adopting a new PSS strategy - 100%*
Finding 5	*A clear and structured methodology to be delivered via facilitated workshop is generally preferred - 70%*
Finding 6	*Online evaluation tool generally regarded as "not professional enough" and not reliable enough to use it for making important decision as to whether to adopt a new PSS strategy – 60%*

Table 5: Summary of the Some of the Key Findings of the Exploratory Case Studies

6 DEVELOPMENT OF THE PSSE METHDOLOGY

A set of requirements for guiding the development of the PSSE methodology has been developed based on knowledge gained from literature of manufacturing strategy [43, 48-50] concerning the desirable characteristics of a good and practical methodology, and knowledge gained from industry concerning the context and delivery mechanism preferred by the industry through the case studies conducted. Methodologies from the areas of PSS and manufacturing strategy have been selected based on the requirements set to act as the conceptual base to develop the structure of the PSSE methodology [20, 21, 48-50]. The developed PSSE methodology is a seven-staged structural methodology as shown in Table 6.

INPUT ➔	PROCESS ➔	OUTPUT 🕮
Desire to Review Current Strategy ➔	**Stage 1: Scope Issue** – to study and analyse the current product based competitive strategy ➔	*Reason of moving towards Servitization* 🕮
Reason of moving towards Servitization ➔	**Stage 2: Identify Servitization Landscape-** to identify Servitization landscape ➔	*Servitization Landscape* 🕮
Servitization Landscape ➔	**Stage 3: Design PSS Activities** - to design PSS activities ➔	*PSS activities* 🕮
PSS activities ➔	**Stage 4: Review PSS Competitive Strategy** – to review current competitive strategy and assess new PSS strategy and the competitive gap ➔	*PSS Competitive Strategy* 🕮
PSS Competitive Strategy ➔	**Stage 5: Assess PSS Competitive Elements** -to valuate the competitiveness of the PSS elements ➔	*Score of PSS Competitiveness* 🕮
PSS Competitive Strategy➔	**Stage 6: Assess Servitizability of Companies** - To assess the Servitizability of companies ➔	*Score of Servitizability of Company* 🕮
Score of PSS Competitiveness and Servitizability ➔	**Stage 7: Generate PSS Competitive Strategy Scorecard** - To consolidate result and propose future action plan if necessary ➔	*Final Competitive Strategy Score Card and Future Plan* 🕮

Table 6: Overview of the Structure of PSSE Methodology

7 SUMMARY AND FUTURE WORK

This paper presents the background literature review of PSS and Servitization and describes the concept of PSS competitive strategy. Although the outline of the structure of the PSSE methodology have been briefly discussed, the tools and techniques used in each of the stages of the methodology are not covered in this paper. The PSSE methodology is currently under validation with companies in Singapore to test its Feasibility, Usability and

Usefulness. The companies selected for the validation phase are those who have been participated in the earlier round of exploratory case studies described in Section 5. As of the writing of this paper, the validation process is still in progress hence the result is not presented in this paper. The next phase of the research programme is to refine the methodology based on the feedback and results collected from the industry. Final methodology will be developed and validated again with more companies in Singapore. Detailed description of the final PSSE methodology and results will be presented in future publications.

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