A conceptual framework for Servitisation of the manufacturing companies to deliver Product–Service Systems solutions: A study case of the Indonesian Motorcycle Industry

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A conceptual framework for Servitisation of the manufacturing companies to deliver Product–Service Systems solutions: A study case of the Indonesian Motorcycle Industry

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Abstract. This study develops a framework for the servitisation of manufacturing that covers area of upstream and downstream supply chain to provide a bundling of product and service. An integration of upstream and downstream supply chain is essential to support the Product–Service Systems. However, a research of integrating the upstream and downstream supply chain is still nascent. A Dynamic capability is used as underpinning theoretical framework for this research. Six hypotheses are developed to build the conceptual framework particularly to investigate the relationship between the supply chain capabilities and sustainability performance of Product–service systems in the Indonesian motorcycle industry.
Keywords: Product–Service systems, supply chain capabilities, servitisation, sustainability performance.

1. Introduction

Product–service systems (PSS) can be thought of as the act of integrating products and services or as a market proposition that extends the traditional functionality of the product by embedding these services [1]. PSS is defined as "a business model focused toward the provision of a marketable set of product and service designed to be economically, socially and environmentally sustainable, with the final aim of fulfilling customer's need" [2]. PSS offers many benefits to companies. It provides an integrated solution by delivering a marketable bundling of product–service to customers [3]. This offer creates a differentiation strategy that increases companies' competitiveness [2, 4]. Effective bundling of product–service also increases customer satisfaction [5]. As a result, companies' profitability increases by having the advantage of bundling of product–service offering [2]. Moreover, creating an integrated system for PSS could increase overall resource productivity, and efficient use of resources [4]. This leads to decreasing companies' operational cost [2, 5]. Consequently, PSS has attracted big companies such as Apple, Xerox, Hyundai, LG, KIA, Toyota, Kone, Electrolux, Caterpillar and Panasonic to adopting PSS [5, 6].

Due to the complexity of the motorcycle as product, manufacturers should sell their product as bundling of product and service. Maintenance and servicing are compulsory for automotive product to maintain products' performance. Such service should be handled by authorised service centres that belong to the manufacturer. To improve the performance of manufacturer as producer of the product

and service centres as producer of the service, a collaboration in the supply chain including suppliers, manufacturers and service partners is paramount [7]. An integration of upstream and downstream supply chain (SC) is essential for providing a bundling of product–service [8].

Several dynamic capabilities needed for supporting the integration of upstream and downstream SC in the organisations including: knowledge assessment, partner development, co-evolving, re-conceptualisation and reflexive control from upstream SC and innovative service delivery from downstream SC [9] that directly affect the sustainability performance of the PSS. PSS studies have been explored; however, this area needs further investigation for integrating the upstream and downstream SC. A few studies have explored the model integrating of upstream and downstream SC perspectives in delivering a bundling of product–service [10, 11]. However, their studies have not covered the complete aspects of upstream SC such as logistic integration, information technology integration and collaboration. Therefore, this study develops a framework for the servitisation of manufacturing to provide PSS by investigating the relationship between SC capabilities (upstream and downstream SC) and the sustainability performance of PSS in the Indonesian motorcycle industry.

2. Methods

Theoretical foundation and hypotheses development will be developed to investigating the relationship between SC capabilities and the sustainability performance of PSS. Six hypotheses will be developed to discuss the relationships among seven constructs including sustainability performance, innovative service delivery, reflexive control, re-conceptualisation, co-evolving, partner development and knowledge assessment.

2.1. Sustainability performance

Sustainability performance is defined as the performance that contributes to balancing the profit (economic) and the planet (environment) [12]. Some studies have only used environment aspect in their sustainability performance definitions [13]. However, these have been criticized for not including all three aspects of sustainability[14]. Hassini, Surti and Searcy [15] definition of sustainability performance is described as "the capability to conduct business with a long-term goal of maintaining the well-being of the economy, environment, and society", which is compatible with Elkington [16] that proposes three dimensions of the triple bottom line including profit, planet, and people. The economic performance refers to financial and marketing measurement resulting from sustainability activities that improve the company's current condition [17]. It can be acquired by elevating customer satisfactions with providing bundling of product– service [18]. This added service creates a company's revenue and profitability [19]**.** Environmental performance refers to the capability of the company to reduce waste and minimise the use of hazardous materials [20]. Social performance refers to the impact of sustainability practices on a social aspect such as an image of the company from the stakeholders view point including suppliers, customers, employees, and communities [21]. It can be attained by the provision of more employability in the community [22], improvement of product–service image [23] thus leading to a rising of the company image [2].

2.2. Innovative service delivery

Innovative service delivery is "an inherently dynamic process, which is more dependent for its success than traditional product-centric marketing on continuous adaptation to the evolving nature of customer needs and the technological aspects of provisions" [9]. Kindström, Kowalkowski and Sandberg [9] propose three capabilities related to innovative service delivery including customer-linked service, service delivery process, and orchestrating the service systems. Customer-linked service is the capability of knowing the customers' need [9]. Such capabilities create a close relationship with customers [24]. They include memorable customer service experience [11], differentiation [25], adjustment of service to the product [26], and innovation [27]. Service delivery process is the capability to deliver an integrated bundling of product–service to customers [9]. Arranging service systems is the capability of extending the firm resource, particularly with external parties collaboration, into a new market by proposing a

continuous innovation bundling of product–service [9]. Collaboration with service partners is crucial to maintaining a close relationship with customers [28]. In the motorcycle industry, service means delivering technical expertise that could prolong product's life cycle, for example, service maintenance, technical consulting and extended warranty of the product [29-31]. It decreases the negative impact on the environment [4]. Furthermore, many job vacancies to the social community will be offered as the service need human skills [32]. Accordingly, we can assume that innovative service delivery is positively associated with sustainability in economic, environmental and social perspectives. The above arguments lead to the hypothesis:
H6: Innovative service delivery positively affects the sustainability performance

2.3. Re-conceptualisation
Re-conceptualisation is defined as the capability to improve the supply chain to be more sustainable [33]. It is the key component to achieve a sustainable SC [34]. A general policy by the government such as polution charges, extended producer responsibility on product's end of life, eco-labelling informative policy stimulates the environmentally better products and services [35]. Closed-loop SC is a way of re-conceptualising the SC [34], to deliver social well-being and economic wealth while utilising within the limit of our planet [36]. Closed-loop SC is defined as activities related to refurbishing and remanufacturing a product [37], involving activities identified as reduce, reuse, and recycle [38]. A product's take-back program, maintenance, and advice on efficient use are included as closed-loop SC activities [39]. Closed-loop SC has been empirically tested and found to have a positive relationship with sustainability performance [38]. Frequently, incentives from the government including subsidy, tax exemption and loan encourage a company to implement closed-loop practices [37]. The other way to reduce the burden on the environment through maintenance and repair [40]. The pressure from communities, non-government organisations and government/policy makers lead to more sustainable goals. The above arguments lead to the hypothesis:
H5: Re-conceptualisation positively affects the sustainability performance

2.4. Reflexive Control
Reflexive control is defined as the capability of gathering information, evaluating, and sharing, and consequently aims to control supply chain functionality [41]. The capability to control will ensure the continuity of the companies to achieve their goal by doing continuous improvement of their operational capabilities [42]. Therefore, reflexive control requires more than just the collection of historical financial data but also the persistent monitoring of the functionality of the SC using evaluation of key performance indicators [43]. Moreover, partners' activities are monitored and audited through standards and certification by third parties such as the ISO 14001 or European Union Eco-Management and Audit Scheme [44]. By partners monitoring the system regularly, the total performance can be monitored hence the long-term development can be maintained effectively [45]. The capability of mitigating risk will increase with transparency and monitoring [46]. Mandal et al. [46] confirm that SC controlling activity such as monitoring is associated positively with an environmental objective. Accordingly, reflexive control should be positively associated with sustainability. The above arguments lead to the hypothesis:
H4: Reflexive control positively affects the sustainability performance

2.5. Co-evolving
Co-evolving is defined as the capability of creating new resources consistently by enhancing collaboration within the single supply chain [47]. For example, a new form of resources can be created by the dynamic learning routines based on information sharing among the stakeholders including suppliers, manufacturers and service partners in the SC [47]. Each cooperation and collaboration within SC should be treated as a way to attain continuous learning among the SC to develop new capabilities and performances [48]. Then, co-evolving can be described as the improved collaborations among stakeholders in the SC [33]. Partner-based strategies are new resources as a result of SC collaboration/ co-evolution [49]. The integration of product–service can be acquired through alliances and partnerships

[50]. Long-term collaboration is focused on the capability of the SC to provide spare parts, warranty services, knowledge-intensive services and delivery of PSS to customers [30]. Due to the product–service bundling complex offering, collaboration among stakeholders in the SC becomes the backbone for achieving the SC sustainability goal [51, 52].Accordingly, we hypothesise that:
H3: Co-evolving positively affects the sustainability performance

2.6. Partner Development
Partner development refers to the capability of the strongest partner in the SC to improve the capability of the entire network of SC [53]. Partner development programs help the weakest partner in the SC to achieve the sustainability performance in the SC [43]. PSS is an innovation business proposition that offers an innovative bundling of product–service [54]. Specific capabilities including service development processes [55], capability development [56], and learning [42] are crucial. An enthusiasm to enhance SC overall performance should be demonstrated by all stakeholders in the SC [33]. Partner development programs assist in achieving that goal [57] by knowledge sharing development and partners training [43], for example, educating the service partners in technical expertise related to service and maintenance [19]. Agi and Nishant [58] confirmed in the study of green supply chain management that partner development assistance is needed to achieve sustainability. Correspondingly, partner development implementation is required to promote sustainability. The above arguments lead to the hypothesis:
H2: Partner development positively affects the sustainability performance

2.7. Knowledge assessment
Knowledge assessment is defined as the capability to access and understand the knowledge from SC partners [43]. Defee and Fugate [47] describe knowledge accessing as "a capability held by two or more parties that fosters an understanding of the current knowledge resources possessed by each party". Each partner in the SC should develop its capabilities by accessing and understanding the capabilities from other partners and use them for the benefit of the entire SC [47], which opposes to the traditional learning orientation that emphasises acquiring and absorbing knowledge [33]. Knowledge assessment is essential element to the Triple Bottom Line concept [37], as well as knowledge to deliver a bundling of product–service[59]. Nevertheless, knowledge spread among SC stakeholders including suppliers, manufacturers and service partners would not be possible without the help of technology to deliver the information. Members of the SC must agree on technology integration such as common IT interfaces and shared licensing [44]. Furthermore, knowledge assessment about market and customer knowledge is also beneficial to obtain an insight into customer needs [60] to respond appropriately to market changes [61]. Collaboration by building knowledge with service partners is preferred rather than just delegating the service activities [10]. Kumar, Subramanian and Arputham [38] confirmed that knowledge sharing, learning and acquisition are important capabilities for sustainability. The above arguments lead to the hypothesis:
H1: Knowledge assessment positively affects the sustainability performance

3. Result and Discussion
Working from compendious literature reviews have guided to the development of proposed conceptual model, purposely to answer the main objective of this study. Beske, Land and Seuring [33] represent the upstream SC including knowledge assessment, partner development, co-evolving, reflexive control and re-conceptualisation. Kindström, Kowalkowski and Sandberg [9] represent the downstream SC (innovative service delivery). This study proposed to integrate the upstream and downstream SC by extending the work of Beske, Land and Seuring [33] and Kindström, Kowalkowski and Sandberg [9] as shown in Figure 1.

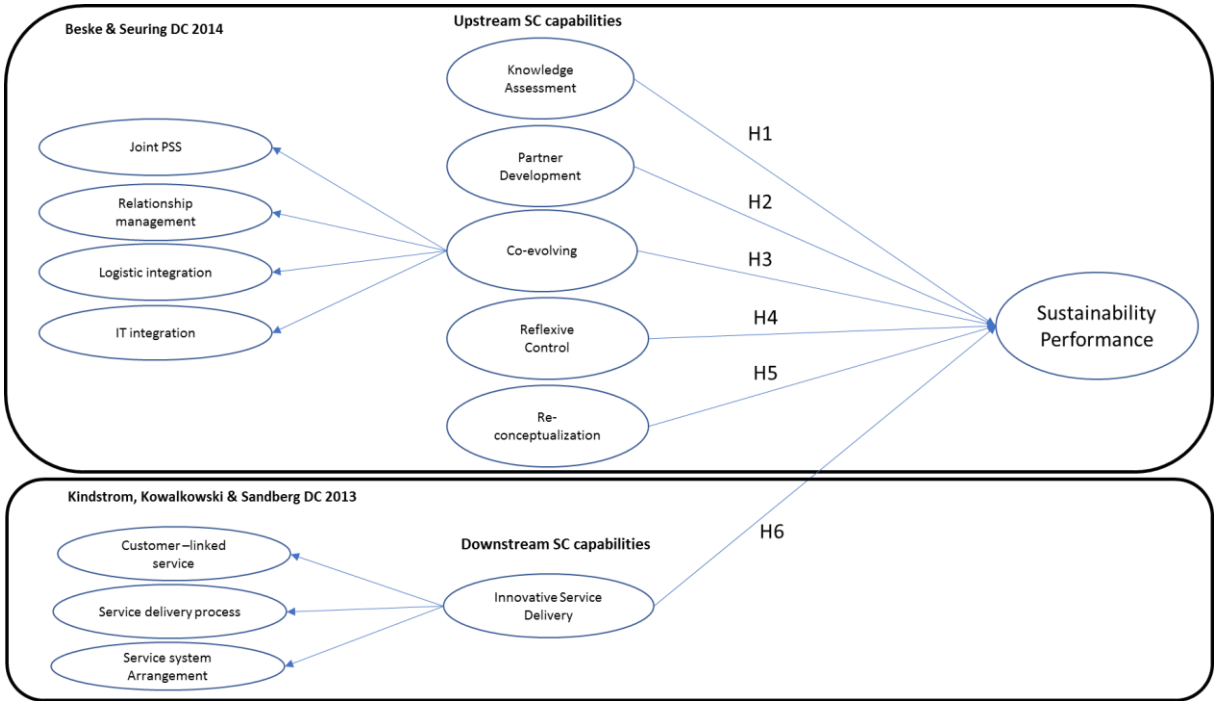

Figure 1. Proposed conceptual model

This study contributes to academic knowledge by enriching the theoretical knowledge of building a conceptual framework for the servitisation of manufacturing companies by investigating the relationship between SC capabilities and sustainability performance of PSS. Current literatures have nascent research on the perspective of both upstream and downstream SC. Therefore, this research aims to examine the integration of upstream and downstream SC with their relationship to the sustainability performance of PSS in the Indonesian motorcycle industry. Filling the gap of knowledge by integrating upstream and downstream SC contributes to PSS organisation knowledge. The result of this study will also be of value to practitioners to have a better understanding of upstream SC, downstream SC capabilities and sustainability performance of PSS in the Indonesian motorcycle industry. This will offer practical guidance for the manager to develop SC capabilities to enhance the sustainability performance of PSS in the Indonesian motorcycle industry.

4. Conclusion

We contribute to develop a comprehensive conceptual framework for servitisation of the manufacturing companies by investigating the relationship between SC capabilities and the sustainability performance of PSS. In this paper, we identified several SC capabilities from upstream and downstream SC. These are knowledge assessment, partner development, co-evolving, reflexive control, re-conceptualisation, innovative service delivery. These SC capabilities are hypothesised positively affect the sustainability performance. However, further research is needed to expand the operationalisation of the proposed conceptual framework.

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