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Driving innovation through ambidextrous service provision — long life cycle products in manufacturing contexts

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ABSTRACT

The aim of this paper is to explore the possibility that continuous improvement rather than radical innovation in the case of long life-cycle products can be consistent with both economic growth and the market drive towards sustainability in some circumstances. Sustainability within this context is defined in terms of extending the new product development (NPD) process to encapsulate cost and waste reduction by continuous incremental innovation and servicing of existing products. Ambidexterity is introduced as the enabler of sustainable service provision within this context. The paper discusses a conceptual framework for driving innovation through ambidextrous service provision and provides an illustrative case to support it. It contributes to the innovation and sustainability literature through acknowledging the importance of both exploration and exploitation within NPD processes, integrating this with sustainable service provision, and with particular reference to Product Service Systems (PSS).

1. Introduction

The aim of this paper is to explore the possibility that continuous improvement rather than radical innovation in the case of long life-cycle products can be consistent with both economic growth and the market drive towards sustainability. Sustainability within this context is defined in terms of extending the new product development process to encapsulate cost and waste reduction by continuous incremental innovation and servicing of existing products (Alting and Legarth, 1995). Service provision is traditionally related to aftermarket, it is however evident that the service component termed, servitization of manufacturing, is growing in many product-centric firms (Baines et al., 2007) and goes beyond these standard aftermarket engagements. In heavy engineering firms, innovation is often related to new product introduction or manufacturing processes and they struggle with service innovation (Kindström and Kowalkowski, 2014).

To explore this challenge, the research question guiding this paper is “In what way can the new product development (NPD) process be refined to ensure sustainable servitization of long life-cycle products within manufacturing environments?” Addressing this question adds to a body of knowledge related to the development of product-service systems. The contribution supports a conceptual framework where we introduce a novel term “ambidextrous service provision” demonstrating how both innovation and sustainable service provision can be inte-

grated with the NPD process.

The paper is structured as follows: a background literature is reviewed in Section 2 to support the development of a theoretical proposition related to ambidextrous service provision within NPD. Literature related to Product Service Systems (PSS), product stewardship, product life cycle, innovation, product development and ambidexterity is introduced. This supports the development of a conceptual framework that expresses how sustainable service provision can be integrated within the NPD process. This theoretical proposition is developed in Section 3 with an integrative framework that systematically links NPD and PSS with long life-cycle product development. The framework is then applied to an illustrative case in Sections 4 and 5 ties up the analysis with some tentative conclusions.

2. Literature review: building the theoretical framework

Service innovation traditionally emphasised development of new service offerings and concepts such as aftermarket service provisions and customer-oriented options (Kindström and Kowalkowski, 2014). To achieve a unified service provision framework firms cannot simply develop one new service after another but need to combine manufacturing innovation with service innovation (Gallouj and Savona, 2009). This requires an integrated approach that merges new services and innovations in other elements of the business model and value network

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in order to create and capture new value (Nenomen and Storbacka, 2010). It is therefore unsurprising that notwithstanding proven opportunities within service provision for long life-cycle products, the proportion of manufacturing companies making profit through servicing is low (Gebauer and Fleisch, 2007; Kastalli and Van Looy, 2013). Understanding this phenomenon presents a significant research gap especially as manufacturers become more interested in adding value through service provision (Tukker and Tischner, 2006). The following sections unpack components related to Product Service Systems (PSS) to include sustainability, lifecycle design and product stewardship, innovation and new product development.

2.1. Product Service Systems (PSS)

Product Service Systems (PSS) is an overarching term to describe service provision as a methodology and has been defined as “a system of products, services, supporting networks and system solutions that have the potential to minimise environmental impacts of customer needs and wants” (Mont, 2001, p 3), extending the traditional functionality of products by incorporating additional services. For customers, PSS means a shift from buying products to buying services, sharing some of the risks and responsibilities conventionally associated with ownership to the supplier (Mont, 2001). At the same time, the manufacturer improves competitiveness by offering service solutions that ensure the product is continually improved in terms of usage, design and reliability (Baines et al., 2007). Through processes of continuous improvement PSS solutions have a positive economic effect but also have a potential to minimise environmental impact through improved productivity and reducing waste (Pham and Thomas, 2012).

Adopting such an approach is required to convert a firm from product to a service-centric system, encompassing a value proposition that optimizes the customer's business operations (Liu et al., 2014). Such business models have the potential to generate a spiral of revenue growth when the product-service provider has the ability to control the cost of the entire value system (Tukker and Tischner, 2006). This can only be achieved, if the manufacturer invests in service specific resources and capabilities (Kastalli and Van Looy, 2013). In order to prolong a product's life, this stage includes design of maintenance and serviceability. This incorporates technical service strategies that embed flexible individualisation and product enhancement according to individual customer demand. Such technical services contribute to higher productivity and reduce investment costs (Aurich et al., 2006). Total cost of the product is reduced as a result of technical, process and customer knowledge, while know-how and capabilities remain with the manufacturer (Brady et al., 2005). Incremental innovation extends the life of the product, reducing development time and risk. The process is ongoing and in line with current and future customer requirements (Pham and Thomas, 2012).

There are various forms of PSS; the case below is that of a product-oriented PSS where the selling of the original product can be bundled with additional after-sales service such as maintenance, repair, recycling (Baines et al., 2007, P.5). In PSS systems, the manufacturer is motivated to continue to improve the product over time, offering value in use. This can be explained from a sustainability perspective, reducing environmental impact as well as providing the manufacturer with a differentiated product that improves through continuous incremental innovation (Baines et al., 2007; Spangenberg et al., 2010). Incorporating a PSS competitive strategy encourages the manufacturer to focus on delivering knowledge intensive products and services. Such services encapsulate product, process and customer knowledge enabling customization and higher quality (Baines et al., 2007).

By engaging in service activities, the manufacturer becomes better informed of customer needs and in so doing presents possibilities to increase and improve the product offering to the customer (Kastalli and Van Looy, 2013). Integrated PSS solutions increase value to the customer through lifetime and life-end services bundled with products,

thereby changing the focus of the value proposition from manufacturer to solution provider by focusing on services (Manzini and Vezzoli, 2003; Gebauer and Fleisch, 2007). This requires supply chain collaboration during the new product development process, beginning at the product design stage and continuing through to the end of the products life (Liu et al., 2014; Doualle et al., 2016); a system of interacting parts that include people, technology and businesses (Chesbrough and Spohrer, 2006). Despite the fact that services can generate higher margins than products alone, it would seem that managers are not fully convinced, partly explaining reluctance to exploit the opportunities of PSS (Gebauer and Fleisch, 2007).

Nevertheless, PSS strategies can be compelling as manufacturing firms find ways to increase involvement externally with customers and partners, as well as modifying internal relationships across business functions (Galbraith, 2002). Accordingly, PSS is a system that requires early customer involvement and can involve changes in organizational structures of the manufacturer (Mont, 2001). According to Kastalli and Van Looy (2013), over a third of large manufacturing firms offer services (see also Gebauer and Fleisch, 2007). The results of studies on performance can be mixed, though Neely (2008) suggests a U shaped relationships between servitization and performance; positive results re-appearing when there is a critical mass of services achieved and size of the service portfolio increases (Fang et al., 2008).

2.2. Product Service Systems and sustainability

Product Service Systems (PSS) increase customer value by provision of cradle-to-grave product/service offerings (Reim et al., 2015). Such total solutions require firms to adapt from goods to service focused business models (Lightfoot et al., 2013). PSS has been described as a special form of servitization, extending the traditional functionality of a product by incorporating additional services, in order to fulfil need, demand or function (Tukker and Tischner, 2006). PSS represents a path towards sustainable resource use (Stoughton and Votta, 2003) and may resolve sustainability problems by encapsulating economic, environment and social components (Lee et al., 2012).

From an environmental perspective, product oriented services contribute to reduce environmental impact in terms of product usage and increase resource productivity. At the same time, the integration of environmental considerations must be prioritised and considered in the development of the new product (Westkämper et al., 2000). Closed loop practices can include preventative maintenance and retrofitting initiatives early in the product development process (Alting and Jørgensen, 1993). From this standpoint, service may be viewed as systemic, comprising interacting parts where value is created by configuration of resources, people and technology (Chesbrough and Spohrer, 2006). The effectiveness of the NPD depends on sound collaboration with supply chain partners, starting with the design and continuing to the end of the products life cycle (Spangenberg et al., 2010). This responsibility extends both up-stream and down-stream (Manzini and Vezzoli, 2003; Alting and Jørgensen, 1993). Life cycle design and product stewardship become key issues, where decisions concerning structures and properties are considered and adjusted throughout the NPD (Liu et al., 2014). These linkages are demonstrated in Fig. 1.

Much of the literature relating to PSS emphasises how PSS might address social sustainability, for example impact at local level through technical service support could help to secure knowledge intensive jobs, improvements in workplace health and safety would support worker wellbeing (França et al., 2017; Pham and Thomas, 2012; Aurich et al., 2006; Brady et al., 2005). Wider objectives within the sustainability debate are also considered in terms of how to address complex social challenges such as ways to tackle poverty through provision of affordable products, accessible services, improved public infrastructure and “equitable access to the world's resources as a kind of human right to resource use” (Spangenberg et al., 2010, p 1486).

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