

# Value co-creation in early stage new product-service system development

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## Abstract

The need to develop systems that comprise medical equipment and services to improve healthcare service efficiency and availability has become a pertinent concern in developed countries, as governments continue to focus on controlling healthcare expenditure. This research intends to explore value co-creation with multiple stakeholders at early stage new product-service system (PSS) development in regulated industries such as the medical equipment industry.

This paper identifies the literature gap of stakeholder involvement in the process of new PSS development and compares the identified gap with the experience of industry practitioners. The fields relevant to the research focus are described and the characteristics of a new PSS are proposed as the basis of the research. This paper concludes with an initial proposition, that there is a need for an holistic approach to new PSS development and to have early multiple stakeholder input.

**KEYWORDS:** new product development, new service development, product-service system, value co-creation, stakeholder involvement

## 1 Introduction

The medical equipment industry is large and growing with a market size of over \$300 billion internationally (Hansen, 2009). Three of the five largest medical equipment markets in the world are in Western Europe, namely Germany, France and the United Kingdom. Despite weak economic growth, on average, leading markets in Western Europe have a forecast of 3.4% compound annual growth through to 2016. On the one hand, an aging population in developed countries would likely sustain this growth. On the other, governments in developed countries such as the United Kingdom are focusing on containing healthcare costs. This may motivate hospitals to invest in efficient healthcare services (Espicom Business Intelligence, 2011). Medical equipment manufacturers who provide services on top of designing and making equipment may be in a position to help.

The primary motivation of this research is to address a perceived need for an holistic approach to new product-service system (PSS) development in the medical equipment industry, which will be elaborated in the following two sections. In this research, PSS refers to the integrated solution that is “a marketable set of products and services capable of jointly fulfilling a user’s need” (Goedkoop et al., 1999: pp.18). In this paper the literature on PSS development is summarized, and preliminary findings from exploratory interviews with practitioners reported. The research focus, approach and intended contributions is then summarized, highlighting the research gap being addressed.

## 2 The literature gap

A review of literature has highlighted the importance of taking an integrated approach to developing complementary products and services, and of involving customers early in the development process. In this section, the literature on new product-service system development and stakeholder involvement is reviewed, highlighting the gaps in the literature.

### New development process – product, service and PSS

New product development (NPD) is a well-researched field. Starting from the 1980s, much effort has been spent in the structuring and improving of the idea-to-launch process (such as Booz, Allen, & Hamilton, 1982; Cooper, 1988, 1993, 2008), as well as the identification of NPD success factors (such as Cooper & Kleinschmidt, 1987, 1995). Screening and selection of NPD ideas is another popular research area. Methods have been proposed for the evaluation, prioritization and portfolio management of NPD projects (such as Lint & Pennings, 1999; Cooper et al., 2001; Fredberg, 2007). How internal and external factors may impact the choice of NPD processes and tools has also been examined (such as Tidd & Bodley, 2002; Iamratanakul et al., 2007).

NPD studies have been extended to new service development (NSD) research since the late 1980s. However, instead of proposing NSD frameworks, most of these studies focused on examining the similarities between factors contributing to new products and new services success in various industries (such as de Brentani, 1989; de Brentani & Cooper, 1992; de Brentani & Ragot, 1996). In the 1990s, researchers enlarged the scope of NSD research from service feature to service delivery processes, and explored the interaction between service providers and customers in value co-creation (such as Edvardsson & Olsson, 1996; Johne & Storey, 1998). In terms of involving customers in the development process, Alam & Perry (2002) have proposed a framework for financial service products. However, NPD and NSD comparison studies continued into the mid-2000s (such as Nijssen et al., 2006), before the interest in new PSS development began.

From the mid-2000s, high-level frameworks for new PSS development have been proposed. Most of these are built upon models and techniques developed for NPD, NSD and technology management. Theories and practices in engineering and marketing disciplines are drawn on. For example, An et al. (2009) adapted the 1960’s product design approach of quality function deployment (QFD) (Akao, 1990) to develop an integrated product-service QFD for the mobile communications industry. Shimomura & Arai (2009) have extended Shostack’s (1984) service blueprint for early stage service design, with the enablement of Service Computer-aided design (Service CAD) software. Juehling et al. (2010) borrowed ideas from technology roadmapping (Phaal et al., 2004) and service engineering (Tomiyama,

2001), and proposed a staged development process for automobile after-sales service products. In addition, Yang et al. (2010) utilized the e-commerce lifecycle model for new PSS development.

In spite of the growing interest in a systematic approach to service development, with the exception of a few studies (such as Hara et al., 2006; An et al., 2008), most proposed frameworks continue to treat products and services as separate components. Many of the proposed NSD process models are designed for stand-alone services – services that do not require customers to have the right-of-use of a product that can be stocked, such as investment advisory services and freight services (such as Alam & Perry, 2002). Otherwise, the models are designed for narrowly defined services that manufacturers provide as an extension, such as after-sales services (such as Aurich et al., 2008). For those that explored new PSS development, the proposals are too high-level to guide industrial practitioners (such as Kowalkowski & Kindström, 2009; Tan et al., 2009). In sum, the currently proposed frameworks fail to truly join the development of products and services as an integrated system in an holistic approach.

### **Stakeholders and new product/service development process**

The concept of stakeholders has been explored since the 1960s (Freeman, 1984). Management, economics and policy literatures have examined the definition and classification of stakeholders (such as Freeman, 1984; Mitchell et al., 1997; Bryson, 2003). There have also been theories and methods proposed for the evaluation of the strength of stakeholders' preferences (such as Freeman, 1984; Bryson, 2003; Kipley & Lewis, 2008; Williams & Lewis, 2008), as well as processes proposed to integrate stakeholder interests into enterprise planning (Freeman, 1984; Bryson, 2003; Susniene & Vanagas, 2007a,b).

As this research intends to explore value co-creation with multiple stakeholders, that is not only those who have legitimate claims on the company (Donaldson & Preston, 1995), a more encompassing definition of stakeholders is more suitable. Therefore, Freeman's definition of stakeholders is adapted: stakeholders are any groups or individuals who can affect or are affected by the value of the new product-service system (Freeman's 1984: pp25). The concept of value is a well-debated topic that is beyond the scope of this paper. In short, for this research, the value of a product, service or PSS will be referring to its "value-in-use", which is the utility derived from the application of skills and specialized knowledge (Vargo et al., 2008) in the production and delivery of products and services.

With regards to the investigation of stakeholder involvement in NPD/NSD, most of the studies focused on one particular stakeholder group – the customers. At the strategic level, Moller et al. (2008) have proposed that 'congruence' of service innovation strategy between service providers and customers would most likely result in NSD success. Taking the perspective of the relationship between customers and manufacturers, Lagrosen (2005) has put forward an NPD model that varies the approach of customer involvement according to the depth of the customer-manufacturer relationship.

At the process level, there appears to be no consensus of how customer involvement impact on NPD/NSD success. Some researchers have shown that lead users' involvement is important for NPD/NSD success (von Hippel, 1976; Herstatt & von Hippel, 1992; Oliviera & von Hippel, 2011). Some others have found customer involvement improves internal operational measurements such as innovation speed and technical quality, but not market performance (Carbonnel et al., 2009). At the other extreme, a study in Russia has found that

customer involvement in NPD did not have any impact on the results (Smirnova et al., 2009).

Very few studies have examined the involvement of stakeholder groups other than customers in the NPD/NSD processes. Smirnova et al. (2009) have found that involving external research organizations is beneficial in their Russian case study. O'Sullivan (2006) have concluded that there is no best way to manage the interactions with suppliers, albeit supplier involvement in NPD is important.

Thus far, a review of stakeholder involvement literature has revealed a lack of studies in the accommodation of multiple stakeholder interests in the NPD/NSD process. Of the studies that have examined stakeholder impact on the development process, very few have investigated the involvement of stakeholder groups other than customers or lead users.

### 3 The industry view

A series of exploratory interviews using open-ended questions has been carried out. The primary aims of these interviews were to inquire about the practitioners' views of the manufacturer providing services and products, the need of an integrated approach to NPD/NSD and the involvement of stakeholders in early stage NPD/NSD. The interviewees work in various business lines of a global health care equipment manufacturer and service provider. They are approached for their direct involvement in developing new product, service or solutions in the past five years, and their general industry knowledge and management experience. Figure 1 summarizes the findings. The experience shared has covered PSS where the product element is equipment or software.

Function / Role in NPD/NSD	Case Context	Practitioners' view on:		
		Manufacturer providing services & products	Need of an integrated approach	Stakeholders involvement in early stage NPD/NSD
Service Engineering	General view, not product/service specific	From packages of products and services, to an integrated product with embedded service features	One process, with service engineering being part of product engineering	Involve field service team (the internal customer) in product design discussion before the design is fixed
Software Service Engineering	General view, not product/service specific	Product and service teams work closely together to support the product lifecycle	NPD has review points with service engineering	Involve field service team who has direct customer contacts at an early stage to provide feedback to product features list
Product Marketing	General view, not product/service specific	From services that complement products, to solutions that contains products and services elements	Need to have a solution view	Involve both product and service management, marketing and sales at the early stage of idea conception and system features definition

Service Sales	General view, not product/service specific	The business is moving towards a service business	Much needed as NSD is more ad hoc than NPD	Consider at early stage the target market's demographic trends, environmental trends, regulatory, legislation, health & safety, etc.
Service Operations	Specific to a NSD that is embedded in a product	Offer services that differentiate and improve productivity	Design service features in new product	Involve service and product technical and engineering teams at the proof of concept feasibility
Service Design	Specific to a NSD that is embedded in a product	Develop services that has a market demand in order to stay competitive	NSD needs product engineering as the service features are integrated with the product	Involve development teams of different parts of the solution and the early adopters in the field service team at early stage
Service Technology	Specific to a NSD that is embedded in a product	Take advantage of an existing capability and include service as part of the portfolio to differentiate	Important to involve product engineering in NSD as service and product features are integrated	Involve service marketing, service management early and product engineering (subject matter experts) earlier and deeper
Product Engineering	Specific to a NSD that is embedded in a product	Take the view of product life-cycle cost, promote the importance of service features in products	Product engineering takes a driving role in NSD	Product engineering to take a more aggressive role in NSD, and involve field service team to identify needs
Software Product Engineering	Specific to a NPD that is part of a PSS	No comment on this aspect	Use cross-functional teams including marketing, sales and services	Involve marketing, product management and visionary customers at early stage
Solution Development	Specific to a new PSS development	No comment on this aspect	Service is enabled by product (a technology) in the solution developed	Involve patients, customers, customer leadership, company's commercial and technology teams early

**Figure 1 Responses from exploratory interviews (April - September 2011)**

Responses from the exploratory interviews support the need for an holistic approach to new PSS development. Moreover, the interviewees have repeated the importance of including interests from multiple stakeholder groups, not just the customers, at an early stage of the development. Most of the interviewees commented that certain stakeholder group(s) should have been involved earlier or deeper in the development process, revealing the practical need for improvement in early stakeholder input in new PSS development. Furthermore, the interviews have provided some insights into how different the opinions are with regards to the manufacturer providing services in addition to products. Although the interviewees are from different business segments and geographical regions, these initial findings may be limited to this manufacturer.

## 4 Research focus, approach and intended contributions

This sub-section first presents the research focus and unit of analysis, which is then followed by the approach and intended contributions.

### Research focus and unit of analysis

The literature contributing to the area of multiple stakeholder engagement in a new PSS development process comes not only from several different fields of study. The following fields are identified: NPD/NSD process, servitization/product-service system (PSS), marketing and strategy. Figure 2 captures some examples of the relevant literature within each of the four fields, and their contributions in the context of this research interest.

Field	Examples of relevant literature	Main contributions in the context of this research interest
NPD / NSD process	Booz, Allen, & Hamilton, 1982 Cooper, 1993 Johnson et al., 2000 Alam & Perry, 2002 Tidd & Hull, 2003	Standard process frameworks in NPD/NSD Insights into the evolution and motivations of NPD/NSD processes
Servitization / product-service system (PSS)	Chase & Garvin, 1989 Goedkoop et al., 1999 Davies et al., 2006 Baines et al., 2009 Ericson & Larsson, 2009	Rationales for servitization Definitions of PSS Proposals of transition strategies for manufacturers
Marketing	Webster & Wind, 1972 Lovelock, 1983 Shostack, 1984 Anderson & Narus, 1995 Vargo & Lusch, 2004	New definitions for service The concept of value-in-use How companies could approach new service design
Strategy	Mendelow, 1983 Vandermere & Rada, 1988 Porter, 1996 Kim & Mauborgne, 1997 Mitchell et al., 1997	Theoretical perspectives of how stakeholder interest might influence a company's strategic planning Tools in strategy formation and stakeholder analysis

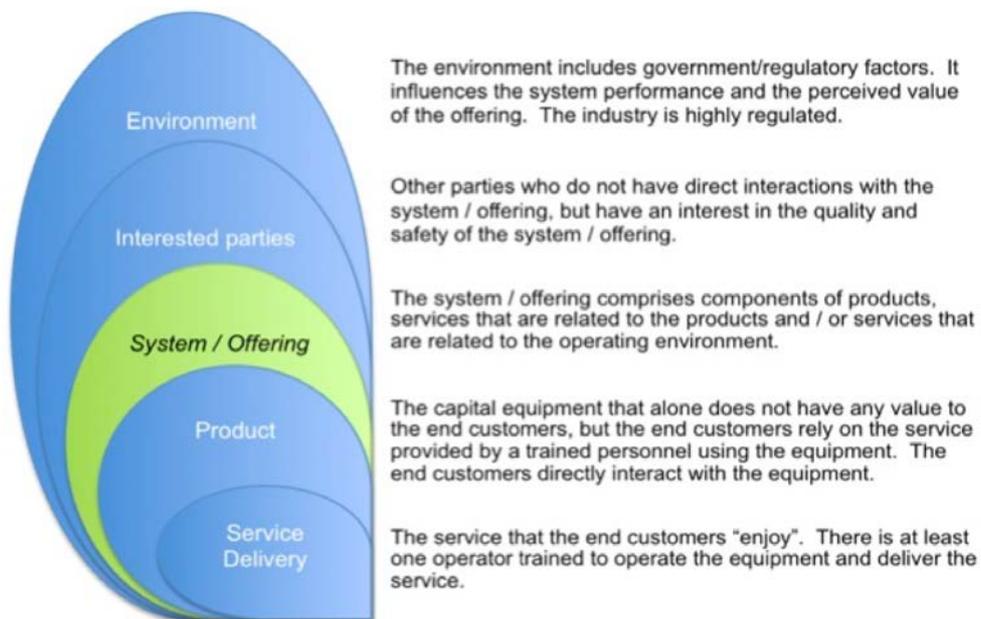
**Figure 2 Examples of relevant literature**

Figure 3 depicts where the focus of this research lies, which is within the intersection of these fields represented by a four-corner star in the diagram.



**Figure 3 Relevant fields and research focus**

The unit of analysis in this research is the “System / Offering”, which is shown in *italics* in Figure 4. As seen in Figure 4, the factors influencing the requirements of the system/offering are: the environment, the interested parties, the system/offering itself, and its product and service delivery components.



**Figure 4 Characteristics of factors influencing the unit of analysis**

Based on the initial review of NPD/NSD literature (such as Cooper, 1993; Johne & Storey, 1998), the process of NPD/NSD could possibly be generalized into five stages: ideation, feature design, development, testing and launch & post-launch review. The scope of this research is the second stage of “features design”, where stakeholder interests are transformed into feature specifications. Here, “transformation” is defined as the process of making sense, translating, prioritizing and incorporating stakeholder interest in the design and development.

### Research approach and intended contributions

In order to collect information on the interactions among different stakeholder groups in the early stage new PSS development process, a case research approach is planned. Workshops and observation will be considered, supplemented by data from project documentation. Other case(s) from non-medical equipment industries may also serve as an early test for the generalizability of the research.

This research intends to contribute to the field of new product/service development in terms of how to co-create value with stakeholders by proposing an integrated process of managing stakeholder interest in early stage PSS development. It also intends to deliver practical guidelines for managers of new PSS developments in regulated environments such as the medical equipment industry. The study also aims to clarify the relationships among the factors influencing the requirements of a new PSS (system/offering).

## 5 Conclusion

This paper provides a summary of the perceived gap in the literature of NPD/NSD, PSS, marketing and strategy to address the need for managing multiple stakeholder interests in early stage new product-service system development in the medical equipment industry. Though limited to the experience within one global manufacturer, the initial exploratory interviews have provided support to the identified literature gap. This research intends to contribute to both NPD/NSD in terms of value co-creation with stakeholders, as well as to provide practical guideline to new PSS development managers.

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