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Design Opportunities in Service-Product Combined Systems

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Abstract

This paper aims to examine recent research issues related to the integration of service and product in view of industrial design. Further, it attempts to identify new opportunities for further research regarding "product-servicization" vs. "service-productization".

In the continued efforts to provide the users with fuller experiences, one major trend is the blending of products and services.

Much existing research seems to either present cases or propose frameworks regarding the 'connection', rather than 'integration' between products and services. Broadly, two major approaches seem to exist in this area: 1. product-servicization, 2. service-productization. The former generally indicates adding more services to existing products, whereas the latter generally refers to making services tangible and/or visible in the form of a product. However, findings of an extensive literature search conducted for this study suggest one important deficiency in dealing with service issues around the product: the 'integration' between the actual product design and service elements for supporting new service-product system. That is the rationale behind this research, an attempt to investigate the possibility for the integration of product design and service factors which could be embedded in the design of product itself in new service-product system.

This paper is largely based on qualitative research. New design research opportunities are identified by qualitatively analyzing relevant literature, synthesizing the information and presenting some cases to support the main argument of the research.

Design-led Service-Productization is not, and should not be re-arranging deck chairs on the Titanic. Rather, it should bring practical and tangible design issues related to new service-product system. Findings suggest that this approach could provide a new model of new product development integrated with a service scheme, which is a more proactive approach than "product-servicization". Further development of this research could lead to establishing a framework for the Design-led Service-Product Integration.

Keywords

Product-servicization; Industrial design; Service; Product; Integration

1. Introduction

Kuczmariski & Johnston (2005) claimed that one emerging trend in service development that continues to grow is that blending of product and services into a "full experiences", rather than standing as individual entities. In the light of the trend, the product-servicization movement which refers a marketable set of products and services is becoming increasingly important to academics and practitioners (Sheth J.N. & Sharma A., 2008). Moreover, the service-productization approach which provides the service more or less 'product like' can stimulate the service company to produce new innovation (Valminen K. & Toivonen M., 2007).

Although there are much research and debates related to products and services, there seems to be one important deficiency in dealing with service issues around the product in terms of design: the 'integration' between product design and service elements for supporting new service-product system. The product-servicization and service-productization models seem to have different reasons for this: the role of service being 'subordinate' to product in the former; the notion of 'product design' being almost entirely absent in the latter. This point is further elaborated and the opportunities for Design-led Service-Productization are presented through a new conceptual model.

This paper attempts to identify new opportunities for product design in two different approaches to combining service and product, viz. product-servicization and service-productization. Furthermore, this research aims to:

- examine recent research issues related to the integration of service and product in view of industrial design;
- identify new design opportunities in the integration of service and product.

Following methodology, the two different approaches of product-servicization and service-productization are discussed. It also includes the difference in the notion of "service" when applied to product-servicization and service-productization in order to clarify the concept of each approach. Then, cases including the water purifier with maintenance service and the KTF's mobile communication service are presented to explain the characteristics of the two different approaches and identify design opportunities. Two bicycle rental systems are examined and discussed as a possible model to apply the new service-product integration approach which can be proactively led by design. As a result, the research suggests a new integration model of service and product, named 'Design-led Service-Product Integration'.

2. Methodology

This paper is largely based on qualitative research. New opportunities are identified by qualitatively analyzing relevant literature, synthesizing the information and presenting some cases to support the main argument of the research. Preceding studies in the field were extensively reviewed in order to define the terms "product-servicization", "service-productization", and the notion of "service".

Cases were used to illustrate different approaches to service/product combination and support the main argument. For detailed examination of

service/product models, observation and in-depth user interviews with open-ended questions as well as expert interviews with semi-structured questions were conducted for all cases, except the KTF's case for which only user interviews were used. The reason for this was that the 'insider' information for this case was well presented in a journal (DMI Review, winter 2008) and their website.

Visual ethnography with an image capturing device was used to identify the user behaviour and analyse it against the intentions of the service scheme for the cases of the Coway's water purifier with maintenance service and the bicycle rental systems in Yuseong, Daejeon city. This was reinforced with in-depth interviews including a narrative study with the users for their experience and satisfaction. A narrative study would be a good method to contextualize individual's experiences and expressions on this kind of system of service and product. This view is supported Creswell (2007), who maintained that the narrative study may have a specific contextual focus.

Interviews with the experts who designed the product and/or involved in the system development were also carried out to identify the system development process and the design's role in it. An interview is appropriate method to collect historical information and elicit views and opinions from the participants (Creswell, 2003).

3. Approaches to Service/Product Combination

The key concepts discussed in this paper are product-servicization and service-productization.

Before discussing the concept of the two approaches, it is important to note that the concept of 'service' in them is different. As defined by Smith (1997), the service concept is 'the bundle of goods and services that are sold to the consumer and their relative importance'. Despite its frequent usage, little has been written about the service concept itself and its important role in service design and development (Goldstein et al., 2002). Nevertheless, it is generally accepted that service is intangible and experience-oriented (Clark *et al.*, 2000; Johnston and Clark, 2001; Radford, 2004; Kuczmarshi *et al.*, 2005; Kundu *et al.*, 2007). Within such boundary conditions, the service concepts in the two approaches differ in role and scope. The service in product-servicization denotes benefits or values 'added-on' to the existing product, such as the maintenance service for changing filters on a water purifier. However, the service in service-productization adds values by providing tangibility to the intangible, such as making a piece of software or a consulting service as a tangible product, e.g. as a well-defined package or a report.

With this difference in the notion of 'service' between the two approaches, the concept and characteristics of product-servicization and service-productization are described in the next sections.

3.1 Product-Servicization

The concept of product-servicization is often referred to as 'Product Service System (PSS)' in manufacturing and product design field. PSS refers to "a marketable set of products and services capable of jointly fulfilling a user's need", as defined by Mont (2002). Other similar terms include "product service

combinations", "product-to-service", "integrated product-service offerings", "integrated product and service engineering", and "servicizing" (Sundin, 2007; Lindahl *et al.*, 2007).

Mont (2002) and Lindahl (2007) maintain that not only could product-servicization satisfy a user's individual needs by providing additional services, but also improve other issues such as sustainable production and consumption for environment and society such as cleaner production, cleaner technologies, waste minimization, recycling approaches, and eco-design by considering the product life cycle. Although this could contribute to enhancing user's satisfaction and manufacture's profit with additional service, most services are produced and consumed during the use-phase. The 'product lifecycle' they refer to seem to be extend to only the development phase, rather than the whole life cycle including planning, design, development, consumption, use and disposal. As a result, the service elements considered in product-servicization are much more related to the use of the product, rather than creating a totally new service scheme. Post-production services such as point of sale (POS), advice for operation, maintenance services, and take-back services are regarded as important service factors in this area. Therefore, the notion 'service' in product-servicization refers to intangible benefits or values 'added-on' to existing products.

Frambach *et al.* (1997) identified that product services are additional services and benefits supplementing the tangible product in order to make product differentiation, and these services are relevant to the sale or after the sale of a product, including guarantee conditions, financial and/or operational leasing possibilities, and technical assistance. The services are classified as 1) transaction related, 2) relationship related, 3) usage related, and 4) purchase related services.

Williams (2007) classified service factors into three main categories: 1) product-oriented services (e.g. maintenance contract, advice and consultancy), 2) use-oriented services (e.g. leasing or sharing), 3) result-oriented services, (e.g. mobility).

Through different classification they both seem to agree that most services in this area are product-oriented. Subsequently, sales and after-sales services are mainly discussed as their service features. For example, regular visiting maintenance service (service) can enhance the experience or usability of the water purifier (product) in product-servicization.

3.2 Service-Productization

The term 'service-productization' usually refers to making the service offering more or less 'product like', i.e. defining the core process and its outcome so that they become more 'stable' and 'visible' (Valminen, 2007). Service concept in this approach is usually more schemeful than in product-servicization. The very nature of intangible services makes it difficult for the customer to comprehend and/or recognize the value, because customers cannot perceive it by sensory means. For this reason, productization of professional services in the current form is accomplished largely by associating tangible features with intangible service offerings, such as the form of

personnel, collateral, methodology, pricing, facilities, or other attributes (Radford, 2004). Service-productization puts emphasis on the 'delivery' of service, thus tangible media of the service can be a good way for productization. In short, making the intangible service visible and stable in various ways is the key to service-productization.

According to Kundu (2007), key characteristics of service in service-productization are intangibility, perishability, non-ownership, inseparability of production and consumption, and variability. Needs of customers may be taken into account as small variations in the core service, or through modularization. Different combinations of modules can satisfy the customization systemically (Valminene, 2007). In this area, technical information system, financial scheme, advice, and consulting service can be appropriate examples.

For instance, when the consulting firm provides their intellectual professional advice by the form of strategic model and methodology, types of model and/or methodology (product) can help the client to understand the value of intangible results (service).

4. The Cases

The cases presented below demonstrate the concept of product-servicization and service-productization and were used to identify new opportunities for industrial design. The selection criteria for cases included:

- suitability to demonstrate the concept of the different approaches (product-servicization / service-productization);
- opportunities for product design in the combined system of the service and the product.

Coway's water purifier with maintenance service was selected for product-servicization; KTF's mobile communication service with promotional products was selected for service-productization.

The bicycle rental system in Yuseong, Daejeon city revealed yet another approach to dealing with combining service with product. In this approach the link between service and product was the strongest and intertwined. This could be a model for service-product integration and offer great opportunities for design. The case was selected for its potential to utilize design as a powerful medium through which the service scheme can be realized and improved, and the product designed especially for the service.

4.1. Case of Product-servicization: the Water Purifier_Coway

The Coway's case represents a typical product-servicization model.

In S. Korea, the 'water purifier' combined with 'rental system and the regular visiting maintenance service' is very popular and a successful business model. Segye News (2007) reported that Coway had about 55.7% share in the S. Korean water purifier market in 2007. Their success was 'caused' by a strong marketing based on a rental system with maintenance care service (Cho, 2004). Before launching the service-based business model in 1998, customers thought that a water purifier was very expensive and hard to manage in their homes. Particularly, changing filters regularly was a tedious task for many users.

However, the rental service with maintenance care system for the water purifier changed customer's conservative mind. The sales figure for the Coway's water purifiers shot up to US\$881.7m in 2003 from US \$95.5m in 1998 (9 times over 5 years), thanks to the rental strategy with maintenance care system (Kim, 2007).



Figure 1. Planner and Maintenance Service (source: <http://www.coway.co.kr>)

Coway offers the 'Cody (Coway Lady)' service, a regular visiting maintenance care program (Figure 1). If the customer purchases the water purifier (product) on rental basis (service in use-phase), 'Codies' regularly visit the customers in their homes at least once every two months during the contract period, and carry out maintenance service. The maintenance service includes informing of the product's state, changing filters, disinfecting the internal and external parts and advising on possible further products to buy according to the customer's needs. After carrying out maintenance service, the 'Codies' take back the waste material such as used up filters. Jung *et al.* (2007) claimed that the regular visiting maintenance system is used as a kind of 'emotional marketing' by the company, and customers can get an 'emotional satisfaction' through face-to-face maintenance service.

In the user interview, many customers remarked that the regular visiting maintenance care gives them great satisfaction and trust the hygienic state of their water purifiers. Once the rental contract expires, customers can take the ownership of the product or return it to the company depending upon the contract. They don't need to worry about buying, installing, maintaining, and disposing of products and associated consumables. The company takes care of all that, leaving their customers to enjoy a care-free use of the product. This is very successful in S. Korea, and the customers are delighted with it.

The rental system with the maintenance care service is a product-oriented service. This may represent a good opportunity for product design, because the product itself is the source of service. However, this model simply adds services (rental and maintenance in this case) to an existing product (water purifier). Although this system was a great success in the market, it was closer to a 'connection', rather than 'integration' between product and service. The 'Cody' service is simply extra benefits 'added-on' to the existing water purifier, and the product is the substantial factor. The rental system with maintenance service can be applied to other products such as an air purifier, a coffee

machine and even a car. It is not specially designed for the water purifier. Even the very design of the water purifier mainly involves the hardware rather than service schemes and delivery. In this case, it is hard to create a new service-product system, because this approach attempts to add supplementary services to the existing product. This might be a weakness of the product-servicization approach in terms of design opportunities.

4.2. Case of Service-Productization: Mobile Communication Service _ KTF

KTF is one of the representative mobile communication companies in S. Korea. KTF reported that "KTF made an incredible record of 9 million subscribers in 3 years and was selected as the top mobile telecom by leading business publication Business Week in June 2002 as one of its top 100 IT corporations. KTF commercialized SHOW in 2007, its WCDMA brand, and accumulated 3 million users by December 2007, thus becoming the true number 1 in the WCDMA market (KTF, 2007)."



Figure 2. KTF's SP Materials – Product Design (source: <http://www.ktf.com/>)

As mobile communication service is intangible and it is hard to make unique differentiation through technology, establishing special brand identity to their users and providing new types of service packages are most important. On the service side, KTF released Multipack - the world's first icon-based multi-media download service, and provided various packages of service modules such as DOSIRAK (music download service).

From 2004, KTF claimed "Design Management" as their management philosophy, and they are trying to concrete their service and fulfil customer's individual needs by CI, product design (SP material), KTF gallery 'the Orange', the agent and the member plaza. Among these elements to make their service tangible, customers much prefer products (SP material) to other elements. As their product design, they launched the good time umbrella, good time support tools, the good time diary, and the good time colour & motion cube (Figure 2). Especially, the good time umbrella was very popular with young female customers. It was sold out during short event period, so that

many customers who could not attain the umbrella asked the agency when they could get it again. Owing to these efforts, KTF won the Korea Design Best Award in 2006 and Good Industrial Design (GD) Best Award in 2006 as the first IT service company.

However, these products are promotional material for the service, rather than a product designed for mobile communication service. The difference of the KTF's products compared to others is the application of the company's logo and graphic patterns. The umbrella, diary, and support tools represent the company's identity with their logo and patterns. The same products can be used by other companies who may not have anything to do with mobile communication. Therefore, as with the Coway's case, this is a 'connection' between service and product, rather than 'integration' of them.

4.3. Service-Product Integration: Bicycle rental system in Yuseong, Daejeon city

Yuseong, Daejeon city started to boost the use of bicycle as new public transportation system from 2003. The Yuseong district office has constructed the road only for bicycle about 440 km. Furthermore, the Yuseong district office decided to provide the public bicycle and kiosk system to increase the use of the bicycle in 2008.

This kind of attempt encouraging the use of bicycle has already existed in other cities like Songpa, Seoul city. In 2007, Songpa run the public "Conscience bicycle" system with two hundred bicycles. The bicycle in this system had yellow colour to be distinct from other bicycles (Figure 3).



Figure 3. the "Conscience Bicycle" System in Songpa, Seoul (source: <http://www.newsis.com>)

Citizen could lend "Conscience bicycle" from the public unmanned kiosk, and then they had to return it by themselves without any regulation. As a result, this system failed within three months, because half of the bicycles had been stolen and the others were used only restricted people without returning. The reason why the bicycle rental system in Songpa failed was that products including the bicycle and the unmanned kiosk were not enough to support the service scheme. They were not specially designed for the new system, and just painted in yellow colour. It did not have any locking or chasing devices to

protect the bicycle and maintain the system. All factors were responsible to user's conscience. In this case, there was the service scheme (the bicycle rental) to be supported by special products (a bicycle, an unmanned kiosk). In this light, it would be very good opportunity to utilize design as a powerful tool for the new service product system, although it was not realized.

In contrast, Yuseong understood the importance of products for the system and conducted benchmarking on successful other city's bicycle rental system, such as Vélo'v in Lyon, France. Therefore, they employed product design in the development process. Products supporting the rental system consisted of a kiosk including a new software program, bicycles, and RFID readers attached to streetlight (Figure 4).



Figure 4. the Bicycle Rental System in Yuseong, Daejeon

Yuseong developed new computational system with RFID (Radio Frequency Identification) to operate the rental system and chase the bicycle. RFID readers attached to not only the kiosks but also streetlights every 40 m to detect the bicycle's location. User can lend the bicycle with the existing transportation card from the unmanned kiosk. The system adapted the existing card to connect the bicycle with a bus or a subway, so that users did not have to issue a new card for the bicycle rental system. The bicycle rack and the vending machine, and the bicycle were also specially developed or modified for the rental system. The symbol and the colour of the Yuseong district were also applied to the bicycle to distinguish from other bicycles, and it has locking device and RFID chip. Moreover, the rack has a locking device with a RFID reader specially designed for the bicycle, and it informs the locking condition by lighting buttons. In this case, new service scheme (the bicycle rental) is well supported by the specially developed products (a bicycle, a vending machine including a new software program, a rack, a RFID reader) than the Songpa's case. Moreover, the service and products has intimate relationship. As a result, the combination of the service system and the products not only made a unique identity but also fulfilled user's individual and/or common needs.

The integration of the service and the product in Yuseong's case is much stronger than Songpa's case. However, the system concept did not exploit the potential of design to the full. The reason was that design was only

employed in the later part of the development, after the service scheme and technology parts were decided. In fact, the district officer in charge of the project (the bicycle rental system) regarded the role of design as being merely dealing with colour or exterior housing for the various devices used for the service scheme. As a result, the system was designed without considerations for the latent needs and lifestyles of potential users. For example, the response of one male user revealed that men would seldom use the public bicycle because it had a basket put on it making it look 'girly'.

5. Design-led Service-Product Integration

As discussed previously, product-servicization is a product-oriented approach. It means that this approach might be more suitable than service-productization for product design. However, the service concept in product-servicization is supplementary to the existing product. These service concepts mainly include sales and maintenance service for products. Therefore, product-servicization seems to be not suitable for developing a new product as a core vehicle for service delivery. Rather, design opportunities in this approach may lie in re-designing the product to best deliver the add-on service.

On the other hand, service-productization is more service-oriented approach than product-servicization. The present model of 'productizing' the service only attempts at making the service visible and stable mostly through 'intangible' products such as methodology and pricing. In the case where this model does include a tangible product, it bears no fundamental relation to the delivery of service, such as short-term promotional products (see 4.2). Design opportunities in this approach may be found in the 'packaging' of the intangible service.

In Yuseong's bicycle rental case, the service is not 'added-on' to the existing product. The service scheme was established first. Subsequently associated products such as the bicycle, bicycle rack, RFID reader and vending machine were modified or newly developed for the service. The relationship between the service and the product in this case was much intimate than product-servicization. Therefore, this could represent a new model of integrating service and product. The current model, as in Yuseong's case, establishes the service scheme first and design product later to fit the service. This model could be greatly enhanced by designing the service and product together by taking into consideration the potential user's needs, desires and lifestyles, with the requirements for service and product interacting with each other in development. A new model of service-product integration can be proposed from the industrial designer's point of view. This could be named Design-led Service-Product Integration (DSPI). This new model utilizes the products as a core vehicle for service delivery with the service designed with the use of the product in mind, simultaneously (Figure 5).

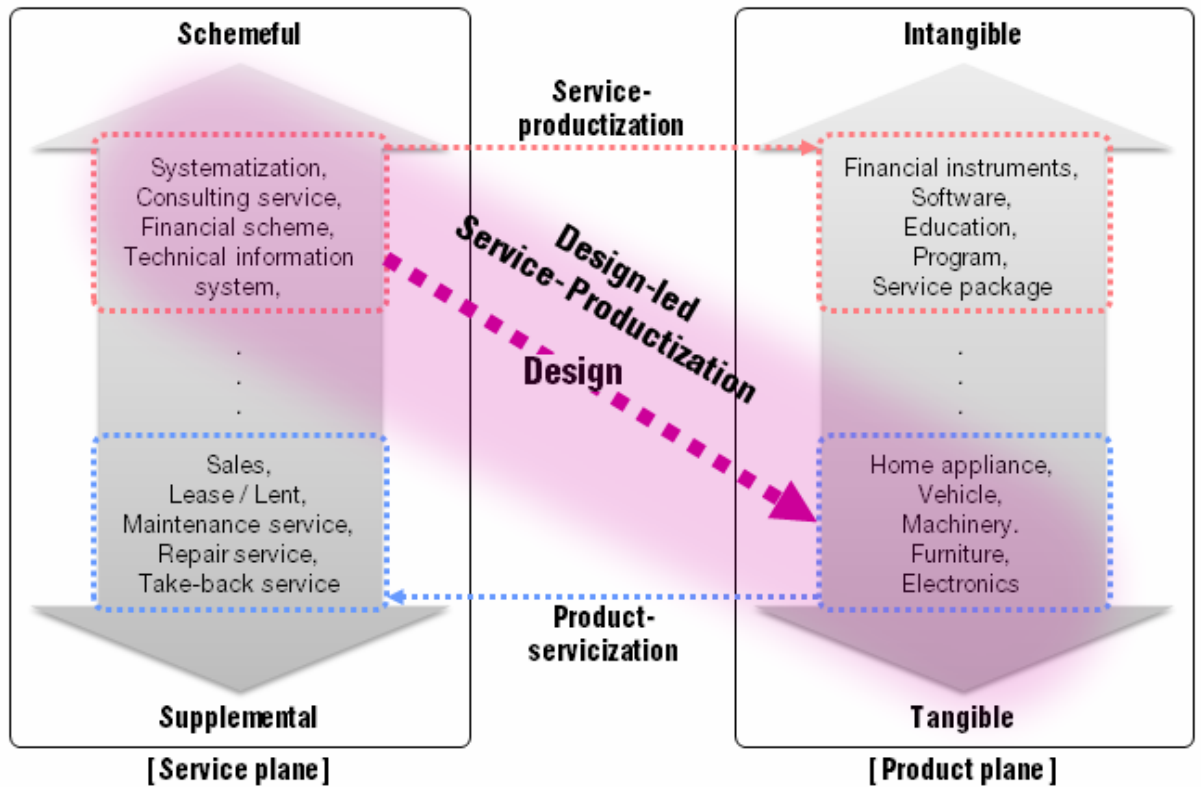


Figure 5. Service & Product Planes in systems of service and product

Figure 5 shows the model of DSPI. DSPI is an integrated system for service schemes established and delivered through products by means of design. In other words, both the service scheme and the product to deliver the service can be designed as a single, integrated design process for perfect match, which in turn will result in an integrated service-product system. This could be the most appropriate approach to new service-product system development, since the product acts as a core vehicle for service delivery in DSPI.

The DSPI can be a proactive approach to developing new service-product system by making the product central to delivering new service schemes, and designing the product in such a way that it becomes a perfect fit for the service delivery. In turn, service is also designed with the use of the product in mind.

David Carter (1991) of DCA, one of UK's leading design consultancies, admitted that they were reduced to mere 'housing designers' when they were invited to design the London Underground ticket machine and gate since all the mechanisms had been already designed. Their very late participation forced them to limit their job to 'wrapping' of the machines. DCA could not change the mechanical parts to reflect upon the user's needs since almost all of engineering parts were already completed without due considerations for those who would use the machine (Figure 6).

The account above strongly advocates that design should be employed right from the planning stage of the service scheme, through to systems development to product design for true integration of service and product.



Figure6. London Underground Ticket Machine (source:
http://www.300million.com/images/tube-barriaz_9cb916.jpg)

7. Summery & Conclusion

This paper examined the various issues related with services and products. In addition to the two existing models for combining product and service, product-servicization and service-productization, the research revealed a third model for integrating service and product and attempts to find new design opportunities.

According to Kuczmariski *et al.* (2005), one major trend continues to grow is the blending of products and services into a "full experience", rather than standing as individual entities. In this context, the designer's role has expanded from dealing with product design to embracing service design. As the boundary of service and product is becoming blurred and attempts are made to combine them, designers have to not only consider the product development process itself but also understand the holistic service-product system context.

In conclusion, the Design-led Service-Product Integration model is an attempt to find new design opportunities in the contextual dynamics between service and product. Furthermore, it aims to integrate a new service scheme and specialized products delivering the new service concept. For designers, it can be a new challenge to broaden designer's activities. Designers can capture the user's complex social and cultural needs in a dynamic context, and propose new type of service-product system with their abilities to contextualize and visualize the service concepts. With this model, the designer's role can be extended from dealing with the traditional product development process to integrated service and product design.

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