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► **To cite this version:**

Sophie Peillon, Xavier Boucher, Sarra Dahmani. GPS: An Architecture to Help Firms Running from a Product to a PSS Offer. Luis M. Camarinha-Matos; Lai Xu; Hamideh Afsarmanesh. 13th Working Conference on Virtual Enterprises (PROVE), Oct 2012, Bournemouth, United Kingdom. Springer Berlin Heidelberg, IFIP Advances in Information and Communication Technology, AICT-380, pp.35-42, 2012, Collaborative Networks in the Internet of Services. <10.1007/978-3-642-32775-9\_4>. <emse-00741277>

**HAL Id: emse-00741277**

**<https://hal-emse.ccsd.cnrs.fr/emse-00741277>**

Submitted on 10 May 2017

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# GPS: An Architecture to Help Firms Running from a Product to a PSS Offer

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**Abstract.** For many reasons (differentiation, duration of the relationship with the customers...) a lot of firms, especially SMEs, are moving from an offer of product to an offer of a product-service. From this point of view, firms need to implement new management rules, in terms of skills and control. In this paper, we propose a framework with three levels of modeling, which aims at providing guidelines to firms that enter in this new paradigm. This framework is based on theoretical investigations on the service concept, and on real SMEs cases.

**Keywords:** Product-service system, process, modeling, skills, decision-making

## 1 Introduction

For the past recent years, we observe that manufacturers of capital goods rely increasingly on services: for much of their corporate profits and revenues, services are compensating the pure activity of manufacturing often delocalized in low cost countries. For many companies, particularly for SMEs whose business is often based on a technological know-how, the move towards a more service-oriented activity remains problematic. In this paper, we propose a process model of the customer-supplier relationship that aims at assisting companies in their efforts towards a servitization strategy. In section 2, we present our approach; in section 3, we propose an analysis of the servitization drivers and we expose a three levels modeling (Generic/Partial/Specific) and finally we present a case study in section 4.

## 2 General Framework

### 2.1 PSS and Servitization

The subjects “functional economy”, “servitization” or “PSS” were first developed in 1988 [1]. Since then, there was an increasing production of scientific documents from U.S. and Western Europe that appear primarily in management literature and business

practice, with authors who tend to differentiate concepts of operations, services and their activity areas [2]. In the "servitization of manufacturing" [1], firms begin to define themselves as specialist in goods or service production, then they focus on supplying associated and closely related services, and finally they take a middle position as offering a "package" which consists of combinations directed to a targeted customer segment, of goods, services, support, self-service and knowledge. Manufacturing companies were always interacting on the services market. However, traditionally, managers tend to see services as necessary to product support in the context of marketing strategies. The main part of value creation was seen as a consequence attached mainly to physical goods and services were taken purely as an «add-on» to product [3]. Since then, there has been a radical change in service production and marketing ways in manufacturing firms. Service delivery is now transformed into explicit strategy with ambition to transform services to a primary differentiating factor in integrated products / services offers [4], [5]. In industries where excellence is based on design and manufacture, originality remains linked to product basically, then, in this case, the PSS developing operation can lead to a path loss rather than gain in innovation terms. Thus, companies must carefully evaluate their capacity to face competition while ensuring their PSS sale [6].

## 2.2 Approach and Aims

We focus on the organizational consequences of implementing a service-oriented strategy, and especially on the changes in the productive system and development of skills related to this transition. The study described in this paper aims at answering this question by mobilizing an approach not only based on literature, but through an exploratory empirical analysis, using examples from the field. We have analyzed the approaches deployed by different companies, and tried to model the concatenation taken, within a common framework (cf. paragraph 3). For this modeling, we focus on customer-supplier relationship. In fact, what distinguishes a product oriented approach from a product-service approach is how to manage the customer-supplier relationship, especially over time. In the first case, relationship is qualified as "punctual" related to the exchange moment of ownership of product, at least in case of a "pure" product approach. In the second case, the customer-supplier relationship grows over time, so it will be necessarily deployed on a number of processes, and these processes' quality will lead service quality (cf. paragraph 4).

## 3 The Servitization Drivers

From both a literature review and our field experience, we identified several key determinants in the company's transition to a service-oriented strategy, which we name "servitization drivers". The transition to services can't be understood with considering only the company itself, but relationship between company and client. Within this relationship, several factors might be considered potentially as service generating. We therefore consider here the customer-supplier relationship, where service-oriented supplier (SOS noted later) is the provider of a PSS. The different

cases of SOS that we could study show that several elements are crucial in the transition from a pure product offer (or where the service is marginal), to a real product-service offer.

### **3.1 Product Use Complexity (UC)**

The first servitization driver is related to the product's characteristics offered by the SOS and specifically, to its use complexity. Indeed, this complexity of use can potentially generate a customer's need of services, concerning its installation, handling, maintenance, etc. We notice this aspect particularly in companies whose main businesses are in special machines design and supply, the complexity is related to the technology embodied in the product (i.e. the special machine) or to the production process of the customer who uses a special machine. The technological complexity of some special machines could generate such needs of fine adjustments, which are not generally mastered by client and provided by SOS. SOS then moves from a product supplier position (selling special machines only) to a product-service offer (in this case special machine + regular settings).

### **3.2 Product Criticality in Customer Process (PC)**

Criticality occurs when the product sold is an intermediate good that client will use in its production process. Thus, it can be either a technically simple element with low added value to final product, but whose quality is essential to final product functioning, or, a more complex product whose quality is essential to client's production process functioning. In both cases, the criticality will generate a need for service, particularly in terms of monitoring, tracking, or logistics. An example related to customer's process is about supplying cutting tools for automotive and aerospace industries. The concerned company intends to move towards service finding that cutting tool is critical in its client's process. Indeed, the poor quality of cutting tool can cause interruption of the customer production chain, which is unexpected. This criticality thus, makes customers aware about necessity of monitoring quality level (especially sharpening) of cutting tool.

### **3.3 Potential Aggregate Supply (AS)**

Given current trend towards multiple product offerings available on market, it becomes increasingly difficult to manage efficiently (turnover, inventory levels ...) the diversity of these offers especially for distributors. A product provider will be able to offer its distributors to manage a more comprehensive service offering by combining essential product with complementary ones. The proposed service can range from simple suggestions to full support of management and ranges evolution on trade and logistics aspects. For example, a crockery supplier may propose services that fit tables. There is emergence of "trade integration" services as in previous decades there

were an emergence of industrial integration activities and for the same reasons of reducing subsets complexity management by customer.

### **3.4 Customer's Nature (CN)**

Which seems essential is the nature of direct customer of the company. Indeed, several types of direct customers seem to be generating services, especially when direct customer is a reseller, service needs may come from the dealer's need to showcase the product and / or optimize its layout in store or warehouse and logistics supply. In this case, the key skills of supplier can move from product to service and then decline on other similar products. When direct customer is a prescriber, he may need services related to adapting product to his customers, and/or training services. For instance, in medical / paramedical domains (orthotics, prosthetics...), the supplier may incorporate into its product offering a service based on a detailed understanding of users end customers to provide a customized product or bespoke.

### **3.5 Customer's Capabilities and Skills (CS)**

The last servitization driver lies in the customer's capabilities or skills availability regarding the use and management of the product sold. Actually, to remain viable, service offering must represent source of specific competitive advantage. If customer doesn't have in-house necessary skills for proper use and management, then SOS may have a competitive advantage to offer the service. Conversely, this means that if the service is easily imitated, competitive advantage is not sustainable. For example, a company initially providing special machines for automotive industry has decided to change its customer segment by targeting food industry. Indeed, in automotive sector, the skills required for mechanical and automatic maintenance are typically owned in-house, while in food industry, customers have little in-house expertise about these skills (the core business is mainly focused on process control). In other words, if competences mastered by customer-company are similar to those mastered by provider, this will threaten the service orientation plan, while the lack of similar skills can be an engine to SOS.

From these five characteristics and their possible combination, stems a more or less important "service potential". The servitization of the supplier company will therefore partly depend on these characteristics.

## **4 A Three Level Modeling of the SOS**

### **4.1 The Modeling Framework and Principles**

The Service-Oriented Architecture (SOA) framework includes several modeling approaches, but all of them keep focused on IT services [7], [8]. As we aim at modeling other types of services, we will use a less IT service focused approach: the

blueprint one, based on three level architecture [9]. This approach is particularly interesting because it makes it possible to show all the components of the service delivery, especially the customer and the SOS internal actors and processes.

The modeling purpose of this work does not consist in creating any new modeling language or methodology. On the contrary we re-use a rather standard modeling method and language, by adapting their use to the servitization focus. Concerning the modeling methodology we refer to the Model Driven Architecture [10], by using the 3 following modeling levels : CIM (Computation-Independent Model); PIM (Platform-Independent Model); PSM (Platform-Specific Model). Concerning the modeling language we use the Business Process Modeling Language [11] available on the Adonis modeling platform, and compatible with BMN. On the CIM level, we suggest a generic model focused on the relationship between the SOS and its customers. This level aims at being generic, that is at being able to modelize every case of customer/supplier relationship. The PIM level describes the same relationship, but from a more particular point of view. Indeed, we assume here that the processes that would have to be achieved by the SOS would be different depending on the main servitization driver. Finally, the PSM level describes the activities that a specific firm has to perform in order to carry out the sub-processes defined PIM level.

The GPS architecture relies on these three modeling levels, named Generic/Partial/Specific. The first two levels are modeled through processes and sub-processes; the last one is built upon an activity model.

**The G-level.** This level aims at describing all the processes required in the customer/supplier relationship in order to deliver a PSS. Its building is mainly based on the literature analysis. We have organized this model in three areas that show the sub-processes that each actor has in charge along the PSS life-cycle (Figure 1).

The top area is the customer one. It shows all the processes needed, in the customer firm, within the framework of a PSS delivery relationship. The down area is the SOS one, showing the internal processes needed within the framework of a PSS delivery relationship. The middle part is the coordination area. In a classic product offer, this coordination area is a classic market area, where the offer and the demand meet each other. In the case of a PSS offer, this classic market area is no more relevant, and a collaborative area is needed, because the PSS has to be co-created with the customer(s). The collaborative area includes three main processes: the customer's needs analysis; the PSS solution delivery; and the follow-up of the PSS performance.

**The P-level.** This level aims at precisising the G one. The idea here is that each general process defined on the G-level could be implemented in a different way according the servitization driver of the SOS, because every servitization driver will lead to specific modeling constraints. For instance, in a servitization driver of a PC type, the servitization lies mainly in the criticality of the product within the customer's activity. This means that traceability mechanisms will be of a great importance, and should be offered through the services added to the product, in particular through IT devices and through an information system. The P-level is of particular usefulness for the SOS, because it can help the company's head and managers in organizing their approach to the new servitization strategy.

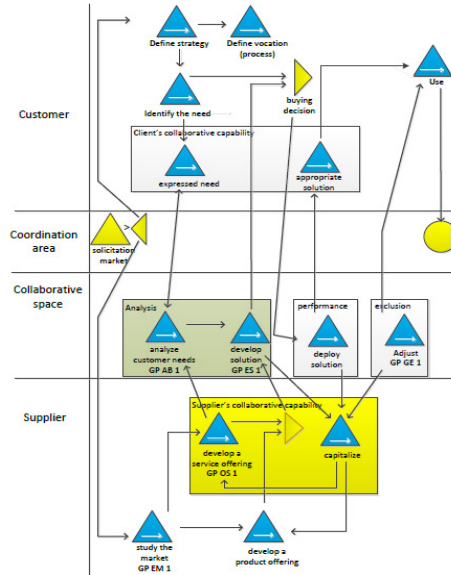


Fig. 1. The overall collaborative process

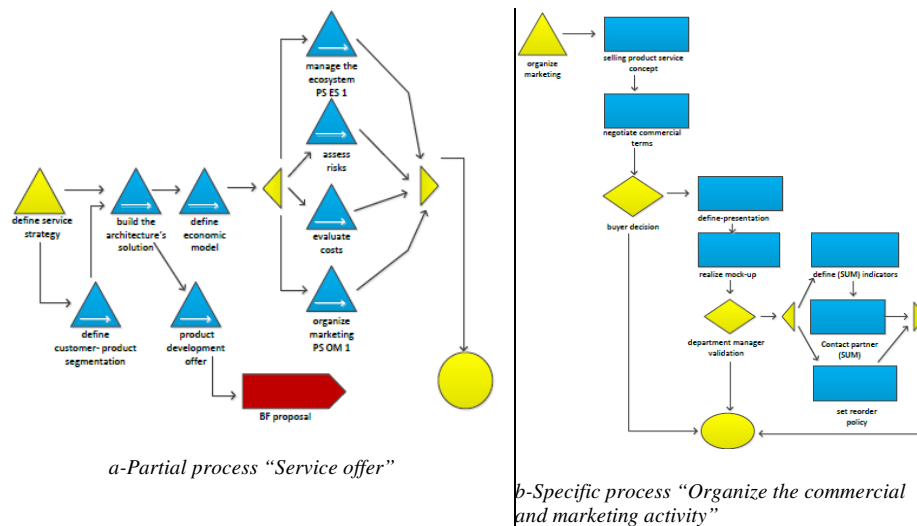
**The S-level.** The last level shows the activities that the SOS has to perform for its PSS strategy. We can consider this level as the most useful one for the SOS’s head and managers, because it aims at helping them solving the operational difficulties they face, and handling their approach of the PSS offer development. Two main difficulties can be highlighted here. The first one lies in the implementation of the PSS strategy which generally leads to the implementation of a new organization, including new activities and new skills. The SOS has then to well identify these new activities and new skills, and then to choose either to develop them internally (through training and/or hiring) or to find them externally (external growth and/or partnerships). The second one lies in the pricing of the new PSS offer. If the SOS might know quite well the costs covered by its product offer, the evaluation of the costs and then of the price of the added services is much more difficult. Here the S-level could be of a great support for the SOS management, as it enables to identify the activities needed, then to better know the costs involved, and to define a price. We have used this GPS approach to modelize an industrial case, which is described below.

#### 4.2 A Case Modeling: The LDN Company

LDN is a small manufacturer of house facilities accessories. These accessories are mainly sold in DIY superstores. In 2010, LDN undertook a strategic reflection which led to identify the PSS strategy as a possible way of growth. The service drivers that have been detected lie mainly on the customer’s (i.e. the DIY superstore) behavior and needs. We are here within a B2B relationship, between a supplier (LDN) and a retailer (the DIY superstore). The customer’s needs identified lie mainly in the

optimization of its offer to the final customer (the DIY shopper). In order to increase the whole accessories department turnover, the DIY superstore is interested in having a comprehensive offer, including logistics aspects. Therefore, the supplier has to offer not only a single product but a whole solution, which includes a range of complementary accessories on the one hand, and complementary services like the follow-up and the delivery logistics on the other hand.

More precisely, LDN undergoes several constraints from its customer, because the distribution process includes two actors with specific goals: the purchasing service of the DIY superstore, and the accessories department chief. LDN has to convince the first one that its global PSS offer is relevant and competitive, and to negotiate with him the quantities, the prices, and the supplying modes. For this negotiation, our S-level modeling can be of a great usefulness. The second actor is a more operational one. He would be mainly interested in the selling performance of the range of accessories, i.e. in the turnover per linear meter. Then, he would like added services such as the setting-up of the range of accessories within the shelves, including advertising aspects, the follow-up and the continued supply.



**Fig 2.** Example of models for the case study

We have thus considered that the servitization driver is mainly of a NC type. The Figure 2.a shows the sub-process "Create a service offer", which stems from the collaborative area "Collaborative capability of the supplier" of the G-level model. The Figure 2.b shows the activities needed by LDN to achieve the process "Organize the commercial and marketing activity", and highlights the constraints stemming from the customer and stated above.

This modeling approach can be used to help LDN in analyzing the processes and skills needed to achieve its PSS offer. Then the company could identify the in-house skills and the skills that must be developed (by hiring or co-contracting).



## 6 Conclusion

Looking for competition factors which could help them to maintain their industrial capabilities, many SMEs are currently developing innovative strategies of product/service coupling. This rather new type of market offer constitute a quite drastic economical and organizational transition for small firms: which kind of service offers should be developed? How should the organization and internal competencies change to provide the adequate quality of service level? To address such issues, this paper has emphasized 2 contributions: first, the identification of the key factors to be considered when developing the servitization potentiality of a SME; second, a 3 levels Modeling Architecture to be used as a support to implement new product-service offer. This research is a work in progress: we currently work at enlarging the panel of firm under study, so as to later improve the conceptual approach and the modeling framework.

## References

1. Vandermerwe, S., Rada, J.F., (1988), "Servitization of business: Adding Value by adding services. *European Management Journal*, 6 (4), pp. 314-324.
2. Baines, T.S., Lightfoot, H.W., Benedettini, O., Kay, J.M., (2009), The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, 20(5), pp. 547-567.
3. Gebauer, H., Fleisch, E., Friedli, T., (2005), Overcoming the service paradox in manufacturing companies. *European Management Journal*, 23(1), pp. 14-26.
4. Oliva, R., Kallenberg, R., (2003), Managing the transition from products to services. *International Journal of Service Industry Management*, 14(2), pp. 160-172.
5. Baines, T.S. and al. (2007), State of the art in product service system. *Engineering Manufacture*, 221(10), pp. 1543-1552.
6. Tukker, A., Tischner, U., (2006), Product-service as a research field: past, present and future, *Journal of Cleaner Production*, 14 pp. 1552-1556.
7. Arsanjani, A., (2004), Service-oriented modeling and architecture, available on <http://www.ibm.com/developerworks/library/ws-soa-design1/>
8. OASIS, (2006), Reference Model for service oriented architecture 1.0, available on <http://www.oasis-open.org/committees/download.php/19679/soa-rm-cs.pdf>
9. Shostack, G.L., (1982), How to design a service. *European Journal of Marketing*, 16(1), pp. 49-63.
10. OMG, (2003), Mda guide version 1.0.1, volume omg/2003-06-01.
11. Karagiannis, D., Junginger, S., Strobl, R., (1996), Introduction to Business Process Management System Concepts. In Scholz-Reiter, B., Stickel, E. (Hrsg.), *Business Process Modeling*. Springer, Berlin et al., pp. 81-106.