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Product-Service Systems across Life Cycle

Intermixed product and service boundaries: exploring servitization in sheet metal industry

Antonella Meneghetti^{a,*}, Silvia Moro^a, Petri Helo^b^aDPIA - Polytechnic Department of Engineering and Architecture University of Udine, Udine 33100, Italy^bNetworked Value Systems, Department of Production, University of Vaasa, Vaasa, FI 65100, Finland* Corresponding author. Tel.: +39 0432 55 8026. E-mail address: antonella.meneghetti@uniud.it

Abstract

In the sheet metal industry, single machines or more complex production systems are integrated with a software needed to control them. While it is clear both for the company and the client that the machine is a product offered with the related services, the software deserves more attention. In the company where our team has been involved in an action research program, the software is conceived as a product with its related services, but this concept has not been properly transmitted to clients, who don't recognize it and pretend software services for free. In this industry, machinery is linked to its software and both are enhanced by the related services, so the final product-service bundle should be made by four components.

In order to better clarify this concept and illustrate the solutions our research team has identified to promote a complete PSS offer, the four-leg chair metaphor is proposed. The proper value of the whole PSS offer can be transmitted by an effective communication process, supporting sales people with instruments such as predefined packets for software services. Organisational changes should be adopted such as job enlargement for software technicians and cross-training with salespeople. By the former, software technicians, who are frontline employees in direct contact with customers during the training phase, can be transformed into internal entrepreneurs by proper incentives. Since they lack marketing education and sometimes trust of salespeople, cross-training is proposed as an effective way to keep in touch software technicians with salespeople with mutual learning.

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1. Introduction

Servitization refers to innovation of a company to shift from selling physical products to integrated systems combining product and intangible services [1]. The role of industrial services has gained importance among traditional product manufacturing companies as new technologies are emerging for value co-creation [2]. Product-Service Systems (PSS) are Western concepts to differentiate from low cost competitors and combine operational knowledge with physical product deliveries [3].

In this paper servitization in the sheet metal industry is investigated, where some industry-specific issues arise and

deserve further attention. As research methodology, we have adopted the action research approach, which aims both at taking action and creating knowledge or theory about that action [4]. As stated in [5], the relevance of action research is usually guaranteed by working with management on an issue the enterprise itself wants to address. The grounded, iterative, interventionist nature of action research ensures closeness to the full range of variables in settings where those variables may not all emerge at once. The members of the system are no longer merely the object of the study, but participate actively. On the other hand, researchers act as facilitators of the actions and reflection within an organization: their role

moves from detached observers in positive science to actors and agents of change in action research [4].

In the following sect. 2, to better connect with recent studies a brief state of the art is proposed. The product-service issues faced by the company in which our action research has taken place are identified and conceptualized in sect. 3. In sect. 4 some actions to address the problem are proposed, while in sect. 5 organizational changes needed to trigger a complete PSS offer are explained. Conclusions and further research are summarized in sect. 6.

2. State of the art

Product-service systems have been described by a number of recent studies from theoretical and modelling points of view [6], [7]. Adding service products on top of current existing good-dominant product portfolio is not a successful strategy in transition to services [8].

According to literature, actions in a wider perspective is needed in transformation [2]. Certain characteristics from recent studies are:

- The role of information technology supporting the transition is widely accepted [9].
- The co-creation of service and interaction with customer needs to be acknowledged as part of service satisfaction [10].
- Life-cycle approach on products [11] is one approach to change mindset toward operational excellence from selling goods.

According to Gudergan et al. [12] companies have different stages in development and this process can be evaluated by using capability maturity modelling approach. Ultimately the product service system strategy needs to connect the business model and operational business tactics of a company [13].

A common factor for many studies is that the perspective is typically for large scale companies, which have a large installed base, existing service products, and a good geographical presence in many locations [2]. The reason is that these are typically leading companies in the PSS area. Nevertheless, smaller companies in the business-to-business environment have similar needs and not all practices cannot be copied directly. Practices in implementation may vary due to the available resources.

3. The product-service problem assessment

The starting point of our action research can be identified as March 2015, when we entered in contact for the first time with a company operating in the machinery sector. The current offer of the company can be summarized as follows: the firm produces and delivers machines for sheet metal manufacturing (i.e.: punching, shearing, bending, laser cutting and so forth) and its technicians perform the related machine maintenance, both preventive and corrective, according to the service

package chosen by the customer. As it emerges already from the company website, the firm provides its customers with a wide range of possibilities from which to choose for the machinery after sales services.

Each machine or combination of machines (the so-called “Systems”) is moreover integrated with a software, which permits the correct and flexible utilization of the machinery and in most the cases has to be customized according to the customer’s specific needs. The company, in fact, serves customers who operate in many different business segments (agriculture, aerospace, automotive, domestic appliances, industrial vehicles and further more) and who all need specific features for the software they benefit from, therefore customization is an indispensable part of software service. Beside customization, other important software-related services consist of troubleshooting, preventive interventions, enhancements, constant upgrades and so on. All these services are essential and unavoidable for the software, in order to have it continuously updated and well performing from a technical perspective. Generally, there is a transition from physical products towards larger share of intangible services. The objective is to have longer and more stable revenue stream over the system life-cycle.

The firm, however, is currently facing a relational problem with its customers, who are not willing to pay for software service and in many cases they expect it as a free-of-charge benefit associated with the agreement they have signed. This type of service, however, often requires a lot of labor by software specialists and hence cannot be delivered for free. Therefore, at the moment of our involvement in the company dynamics, the management was wondering why such an unpleasant situation arises and asked our research team to investigate the reasons and to possibly propose any viable solutions to the problem.

After several interviews and meetings with sales people and with the sales managers, it came to light that the sales people themselves don’t have a clear idea and a solid experience about how indispensable software services are and how they can be promoted in an appealing way, and this leads to non-precise and ambiguous relations with customers. They admitted the lack of a solid communication process in this sense and pointed at the lack of a clear software service offer as the main pitfall of the organization, as complained also by customers. We could easily verify these assertions surfing through the company website, which doesn’t provide any information about software maintenance and the necessity of an ongoing software development process and doesn’t propose any service solution in respect to the software. While software appears in the products menu together with machinery, it doesn’t appear in the service menu. This often provokes the emergence of a series of misunderstandings between the firm and the customers and the subsequent need of additional meetings and communication flows in order to clarify this inconvenience. Moreover, this kind of criticality can also lead to the customer dissatisfaction, since he realizes afterwards that the agreement doesn’t comprise everything he expected as included in it.

Another important issue to be solved was related to the start-up service offer. With the term production start-up, we mean that particular productive phase in which the customer begins to operate the machines and the software alone, without the support of any specialist, so immediately after the training course has ended and the technician who held it has left the factory. Before the customer begins to work on his own, he typically overestimates his skills and underestimates the need of additional support for the production start-up phase; in fact, he might think the training course suffices to learn what is necessary. Therefore, it is difficult for sales people to promote this service in an early phase, because, until customers themselves don't realize the real need of additional support during the production start-up, they don't trust what sales people say. On the other hand, if the start-up service is promoted from the outset to the customer, he will immediately realize that he will have to incur a further cost, and then he might think that buying from the company is not economically convenient and he will look for a competitor's offer. For all these reasons, the promotion of this kind of service is nowadays a complicated and still discussed issue in the firm, which is committing itself to find new solutions.

Thanks to an ongoing interaction between the company staff (technicians, specialists, sales people, managers) and researchers, it has been possible to infer that, while some product-service system solutions have already been implemented and effectively promoted as for the machinery, the necessity of proposing an integrated product-service bundle related to the software is not clear, neither for the sales representative nor for the customers. This happens most likely due to the nature of the product itself: the software, indeed, requires a series of constant personalization according to the customer's needs, updates, improvements, maintenance, controls and so forth, which are so unavoidable and essential for its correct performance that could be interpreted by the customer as an integral part of the software product itself. From the customer's perspective, indeed, the boundaries between this product and its related services are intermixed, since the service is seen as an ongoing product development. We realized that the overall PSS offer should be characterized by four interrelated elements: the machinery, its related services, the software integrated with the machines, and its related services. Metaphorically speaking, we can compare this situation to a chair, which needs all its four legs in order to be able to have a balance and to bear the weight of a person seated on it (see Fig. 1). At the present state, the offer perceived by clients can be compared to a three-leg chair, which cannot properly function. In the same way, the company needs a clear identification of all the four elements mentioned above, in order to properly communicate the value of its offer to customers.

Effective communication with clients can be regarded as the seatback of the PSS chair: even if it is not strictly needed for chair functionality, it makes the seat more comfortable and appreciable for clients, who can be more inclined to buy it. On the other hand, chair arms contribute to enhance the comfort provided by the seatback: for the company, they represent the levers to internally trigger the whole PSS offer.

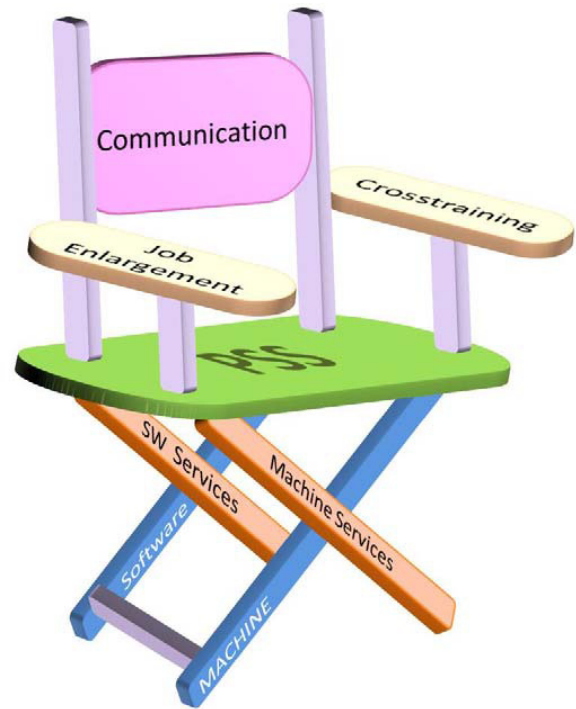


Fig. 1 The PSS chair of the sheet metal industry

After sharing with the management these insights, the next step was to identify possible actions to develop a complete PSS offer, i.e. promoting a "four-leg chair", as described in the following section.

4. Developing a complete PSS offer

Based on our analysis, the most urgent issue to fix was represented by the "missing leg" of the chair: it was necessary to sensitize the organization towards the necessity to create an appealing software-related service offer, in order to gain the balance our chair needs.

With this purpose, we analyzed both the website of companies operating in different business segments and the competitors' ones. We realized that the most popular and efficient means utilized to create Product-Service Systems are represented by service packages. Service packages are offered at different life-cycle stages of the system and can be operated

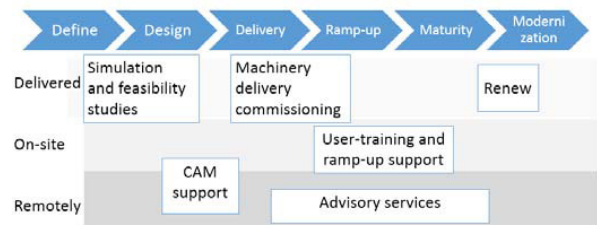


Fig. 2 Product life-cycle and service offerings with delivered, on-site and remote support.

as combined with physical deliveries, on-site services or as remote services offered over the internet (Figure 2).

Hence, we conceptualized and proposed some prototypes. According to how much the customer would be willing to spend, the package would include one or more service options (onsite assistance with different levels of intervention readiness, upgrades, online service –which consists of the remote control of the software parameters) and would cost differently. For instance, three different types of packets have been conceived for custom software, covering one year each: the basic or bronze package comprised an upgrade, onsite assistance after maximum 48 hours and the possibility to choose one customization between the range proposed by the company; intermediate or silver packet included two upgrades, onsite assistance after maximum 48 hours, a package of three customizations between the range proposed by the company and one preventive inspection by the company's technicians; finally the premium or gold packet entailed all the upgrades released, onsite assistance after maximum 24 hours, one customization required by the customer and the possibility to choose between online service and three preventive inspections.

After conceiving the service packets, the following step has consisted of developing a clear and structured communication process in order to convey the offer proposition to the customer. Since the primary tool customers utilize to gather information regarding a company's offer and, possibly, to get in contact with it, is the web, models for a new section in the company website have been developed, by means of a software specifically designed for mock-ups. This section contains all the relevant information a prospect should be provided with regarding standard and custom software and the new related service packets.

Service packages have been identified as an appealing option even as for the start-up phase: the customer may make the decision to buy the package or not after the training course, when he practically notices that he's facing start-up difficulties. Every service package should contain a certain amount of weeks (e.g.: 3-4), which can be extended in a flexible way before it expires. The packet purchase implies that a technician will be alongside the customer's workers to start a process and speed up the production. In the end, the customer is invited to fill in a customer satisfaction form, in order to understand how the service has been performed by technicians and if the customer has been satisfied. Moreover, it can increase customer's feeling that the company really cares of his perceptions and that it aims to improve over time. This kind of packages have already been adopted by many firms, which operate in different businesses, for example software houses, mineral processing, adhesive technology, packaging and filling machines, machine tools design. Furthermore, as it emerged from a benchmarking analysis, also some of the firm's competitors are already offering and promoting online start-up assistance through packets.

If well promoted, start-up service could represent a business opportunity economically speaking and could entail an improvement of the brand image, because of the specialization of the service offering. Also in this case the appearance on the website can highlight the benefits the

customer can gain choosing a packet, such as expertise of the technicians, supplementary training, rapid, safe and productive start, on-time production, savings of time, reduced risk of performance problems and premature failures, reduced total maintenance cost. The two latter benefits can be explained thinking that, if the operators have a professional alongside them from the very beginning, teaching them how to operate in the most correct way, it will be unlikely that they'll commit very severe or even fatal errors which could cause production breakdowns and additional maintenance costs later on.

5. Organizational changes

The new four-leg PSS offer should be supported by an effective communication strategy towards the prospect. For this reason, the communication process has been analyzed together with the company personnel and some clients.

When a client, after having a look at the website, contacts the firm, the real sales process begins. During the first meeting, it is necessary that the salesperson understands what the specific needs of the prospect are and what problems should be solved. According to this, he will propose either a standard or a custom software solution and explain the related characteristics, options, prices, post-warranty packages and so forth. In case the prospect is interested in a custom software, he has to be told not only about assistance packets and upgrades, but also about the possibility to design new customizations or to buy a customization package. The salesperson has therefore to be provided with a precise list of customizations, to know which ones can be delivered for free (the ones that require only little modifications or parameter changes and that probably the competition already delivers) and which ones are grouped in paid packages: all the others need to be specifically designed for a customer and so, of course, they will have a cost. This is a crucial point, since sometimes it happens that, after the agreement has been signed, the customer expects that whatever further customization can be delivered free of charge, but this is not always possible.

As the negotiation proceeds, the possible bonuses, discounts, benefits, trial period are discussed and, after the agreement signature, the installation, training and production start-up phases take place sequentially. At any moment, both during the start-up phase and during production, the customer may ask for more customizations.

Finally, upgrades and post-warranty packages can for sure be implemented. The relationship with the customer has to be periodically kept alive through e-mails communicating current offers, new upgrades, innovative customizations and so on.

If in this case the sales people definitely represented the most suitable resource to interface the prospect, to carry on the relation with him and to promote the software offer, different considerations have been developed as for the start-up service case. As mentioned in the previous section, the technicians who first hold the training course and then perform the start-up service are very important characters for the company and play a crucial role. Indeed, they spend a lot

of time at the customer's plant, they know the customer's business, processes, and needs better than anyone else, and establish a personal relationship with customers and workers.. For all these reasons, it would be possible to claim that these trainers could also be the best sales people for the company, since in most of the cases they managed to gain the customer's trust, which is a fundamental element in a commercial relationship. Therefore, the customer could be more inclined to follow their advice in comparison to the one given by an ordinary sales person, whom the customer sees only once. As the literature of the marketing field confirms, those resources who can't be defined as proper sales agents inside an organization, but who work closely with customers (they are called "frontline employees" or "customer-contact employees") can anyway play a fundamental marketing role [14], [15], [16]. Hence, it would be possible to state that technicians may become the company's first sales people: after holding the training course, they might engage the customer in a production start-up assistance package. They should be the first to interface the customer and only later, when he has already shown interest and is involved in the proposal, a proper sales person could intervene to fix all the contractual issues a technician can't be an expert of. According to literature, the most dangerous barriers that could prevent realization have been identified as follows:

- Why should these people do it, if they are already very busy?
- How can they do it, if they have no sales skills?
- Reluctant sales person syndrome: technicians often perceive themselves as customer advocates and view sales professionals as having an inherent conflict of interest when dealing with customers [17].

The latter issue stigmatizes a situation that we have recognized when talking to technicians; since they typically establish a close relationship with the customer and operators working alongside them, they often feel more "at the customer's side" than "at the company's side", meaning that they wouldn't propose anything they perceive as not so good for the customer as for the company.

To overcome the first barrier, a viable solution has been identified as the development of bonuses and incentive plans, so that a technician may be prone to enlarge his job in order to increase his remuneration. These incentives should be based on precise criteria, such as number of customers engaged, number of hours spent onsite, index of customer satisfaction (surveys, questionnaires). A proper balance should be achieved in order to promote technicians' sale attitude, while preserving customer satisfaction and avoiding unethical behaviors. If, for instance, a technician would earn more only according to the number of customers he engages, he could only care of persuading as many customers as possible, without considering how many weeks a package comprises or whether the customer has actually learnt what he has taught him and is satisfied with the service. Some viable options discussed during meetings with the personnel managers are represented by the chance for a technician to gain a certain percentage per contract he makes the customer sign (in this way he will earn not only according to the number of contracts, but also to the number of weeks a packet covers) or

to earn a certain percentage every few customers and also on the basis of the average of hours he spends onsite (even in this case both the criteria should be respected). Furthermore, a technician can be economically rewarded if he is repeatedly called by customers for assistance and if he has got good grades in the customer satisfaction form. Obviously also recognition and non-economic rewards are important features to stimulate an individual and to make him feel appreciated by the organization he's working for. A constant monitoring and feedback are needed to supervise the technicians' work and to give them clues about how they are operating. If this plan was implemented and if it worked properly, as expected, it could also have an influence on the hiring policy of the firm: in fact, if the technicians managed to expand the company's service business, they would also be busier and it would be useful to have more people doing this job.

As concerns the second barrier, a possible solution has been recognized to be a communication training course attended by the technicians, in order to provide them with the basics of proactive approach to sales, better communication skills, persuasive speech, active listening, care behavior, objections handling and so forth. This course should be held by the sales people of the organization itself. Keeping technicians and sales people in touch would foster the collaboration between internal personnel and mutual trust, and would allow both to learn something from each other. If they established a good relationship, it could be easier for a technician, after engaging a customer, to address him to a sales person and the virtuous circle would be positively closed, adding value to the selling process. Furthermore, cross-training can help to address also the "reluctant sales person syndrome". To overcome it, a change of the technicians' mindset about sales is necessary: what they should realize is that sales professionals provide value to their customers by helping them solve their business problems by proposing proper solutions: they are not in conflict with their customers, they are in partnership with them. All these considerations can be transmitted more effectively by the sales people themselves.

If well incentivized and trained, the technicians would become "internal entrepreneurs", because they would act not only for their own interest, but also for the company's interest, leading the company to benefit from a complete PSS offer.

6. Conclusions

Sometimes products and services can be perceived as having intermixed boundaries, leading to confused PSS offering. In the sheet metal industry, single machines or more complex production systems are integrated with a software needed to control them. While it is clear both for the company and the client that the machine is a product offered with the related services (maintenance, training and so on), the software deserves more attention. In the company where our team has been involved in an action research program, the software is conceived as a product with its related services, but this concept has not been properly transmitted to clients,

who don't recognize it and use software services for free. In the sheet metal industry, machinery is linked to its software and both are enhanced by the related services, so the final product-service bundle should be made by four components.

The results of the case analyzed can be summarized into three main aspects: (1) product offering transition is enabled by software functionality. However, this requires organizational focus change as well as communication with customer, (2) product life-cycle focus requires more knowledge on customer process optimization and general improvements, (3) co-creation aspect of service products can be operationalized by using common targets and metrics, however, this requires approaches to standardize communication. (Table 1)

Table 1. Study conclusions generalized from servitization in sheet metal industry.

Perspective	Product aspect	Organizational change
Product offering	Software functionality	Increased emphasis on software operations
Product life-cycle	Restructuring machine services toward operational expenses	Knowledge needed on customer process optimization
Co-creation	Performance objectives agreed	Need for standardized communication in defining specifications between customer, sales, and operational teams.

This overall concept has been translated into the four-leg PSS chair metaphor for PSS offer (see Fig. 1). To properly sustain the seat (the PSS offer) all the four legs are needed: the machine-service bundle and the software-service bundle, which in turn are linked together. To make the chair more comfortable and attractive for a potential customer, a seat back can be added: this is represented by an effective communication process between the supplier and the client in order to transmit the value of the whole PSS offer and avoid misunderstandings following the agreement signature. The process can be enhanced by supporting sales people with instruments such as predefined packets for software services, which can help to set a proposal with clear boundaries both for sellers and clients. The PSS chair can further improve customer satisfaction and therefore its attractiveness by adding arms, which are represented by organizational changes such as job enlargement for software technicians and cross-training with salespeople. By the former, software technicians, who are frontline employees in direct contact with customers during training, can be transformed into internal entrepreneurs by proper incentives. Since they lack marketing education and sometimes trust of salespeople, cross-training is proposed as an effective way to keep in touch software technicians with salespeople in a mutual learning process.

The considerations drawn for the analyzed case study can be applied to other firms operating in a similar business context, which are trying to adopt a servitized footprint to rejuvenate their offering and are facing similar issues.

The analysed company is now going to apply the PSS chair concept described in this paper and introduce the organizational changes. Further research will therefore follow this implementation phase and revision actions will be based on feedback from the field.

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