A structured business model typology for product-service systems in capital goods sector

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Abstract: In the current competitive environment, manufacturing companies move from product-centric offerings to services and solutions in order to increase revenues and to build sustainable competitive advantage (Neely, 2008). This transition have been discussed in literature since the ’90es through the investigation of various concepts, such as “servitization”, “transition from products to services”, “product-service systems”, etc. Recent studies shows that a company in order to be successful in this transformation should not only adapt its proposition from product-centric to a product-service system, but also needs to redesign its business model (BM) (Baines et al., 2009; Slepniov et al., 2010; Kindstrom and Kowalkowski, 2014). However, research and anecdotal evidences suggest that manufacturers undertaking such a shift face several challenges (Brax 2005; Alghisi and Saccani, 2014). In particular, little attention has been devoted to the understanding, describing and formalizing the BM of companies that move into services (Dimache and Roche, 2012; Reim et al., 2014). Very little research tries to develop a scheme of analysis of such BM, identifying the relevant features/variables and as well to identify typical configurations of such features/variables according to different PSSs characteristics. To provide a first step into closing this gap, this study, that stems from a large research project funded by the European Community’s Seventh Framework Programme (T-REX) aims to propose a new framework to describe service-oriented BM based on the BM Canvas (Osterwalder and Pigneur, 2010) and to develop a typology of service-oriented BM.

Keywords: Servitization, Product Service System, Business Model, Typology

1. Introduction
In the current competitive environment, manufacturing companies move from product-centric offerings to services and solutions in order to increase revenues and to build sustainable competitive advantage (Neely, 2008; Copani 2014). Notable industrial cases such as IBM, Xerox or Rolls Royce show the rationale and effects of successful shifts from products to solutions. However, research and anecdotal evidences suggest that manufacturers undertaking such a shift face several challenges (Brax 2005; Alghisi & Saccani, 2014) that may lead to the so-called service paradox (Gebauer et al., 2005). To continue maintaining the leadership, it is necessary that leading manufacturers embrace new strategies based on other additional competitive sources of advantage: It is common agreement in literature that services represent one of the main pillars around which these new strategies should be designed (Gebauer et al., 2010; Copani, 2014). Most service literature underlines the potential of services to improve profitability through higher differentiation and thus satisfaction, loyalty, and willingness to pay and due to these reasons the capital goods sector was targeted in the past by researchers as a significant sector for investigating service innovation (Oliva and Kallenberg 2003; Gebauer et al., 2003).
et al. 2005; Brax 2005; Azarenko et al. 2009; Neely, 2008; Baines et al., 2009; Copani 2014). Extending the service business through what has been defined as servitization can lead to generate new, less imitable, competitive advantages and new additional revenues and profits (Oliva and Kalленberg, 2003; Brax, 2005, Neely, 2008; Baines et al., 2009). For these reasons, similarly to what happened in other sectors, manufacturers of capital goods are reorienting their value propositions from selling products to provide solutions (Gebauer et al., 2013). Evidences show that to be successful in this transformation, a company should not only adapt its proposition from product-centric to a product-service system, but also needs to redesign its business model (Baines et al., 2009; Slepniov et al., 2010). Therefore, the required strategic realignment toward services should be mirrored in changes throughout the business model in what might be termed a service-based business model (Kindström, 2010).

This perspective integrates not only the uniqueness or newness of the service but also innovations in other elements of the business model (Toivonen and Tourniinen, 2009), such as the service delivery process, customer interfaces, and the value network (Nenonen and Storbacka, 2010). The moving towards a more servitized offerings is therefore leading to a fundamental change in business models of companies also in the capital goods businesses (Kujala et al., 2010). As a result, the shift from a product-oriented strategy to a combined product-service strategy is a complex concept that seems to be still poorly understood (Martinez et al., 2009). In fact, even though many manufacturers are considering the adoption of a business model in which the use or the function of a product is sold instead of the product itself (Van Ostaeyen et al., 2011), a limited application of these new business models, especially in the capital good sectors has been observed.

To draw a sector-specific picture of servitization, a research combining quantitative and qualitative methods was conducted between 2008 and 2011 at European level (Copani, 2013) among 77 companies. The research shows that service offerings are very spread among these surveyed companies. In fact, 78% of the companies offer on average more than six services and only traditional product-oriented post-sales services (such as technical documentation, ramp-up assistance, product training and maintenance) are common to almost all service providers (Copani, 2014). Moreover this research show, in accordance with Lay et al. (2010), that only 27% of companies declared to offer operational services, 49% financial services and 64% software development services. The percentage of total turnover generated by services was 18%, of which the 8% was directly invoiced, while the remaining 9% was invoiced together with products sale.

A survey carried out among 95 European companies operating in the machinery, automation and forklift sectors presented in Adrodegari et al. (2014) show that product sales still represent the main source of companies’ turnover with an average contribution of 74% (76% for machinery, 82% for automation, 52 for transportation) and that service revenue are still anchored to spare parts sales and technical assistance. Revenue components related both to advanced services such as service contracts and new usage-oriented business models, such as financing/leasing, renting or product-usage-fee, contribute each for less than 6% of the turnover. Moreover, basic services are extensively offered (documentation, repair, spare parts, basic training), while advanced services are only sometimes offered (advanced training, remote monitoring and product remote diagnosis, product upgrade/retrofit, warranty extension and maintenance contracts).

Therefore, empirical research indicates and confirms that servitization in the capital goods sector (especially in machine tools industry and automation) is an on-going process which is not mature yet: successful advanced service innovators seem to be rare exceptions and are generally medium and large sized companies, while the adoption of service-oriented business models is still low.

This is paralleled by the paucity of literature that address the implementation of PSS business models: little attention has been devoted to the understanding, description and formalization of the underlying business model of companies that move into services (Kindstrom and Kowalkowski, 2014).

3. A new PSS business model typology

3.1 A literature overview on existing PSS typologies

The usefulness of a typology in particular depends on its ability to explain the essence of the PSS concept and many academic papers on PSS use the agreed Tukker’s (2004) classification for this purpose (Reim et al. 2014). Anyway, existing literature reveals various PSSs typologies that could identify the different types of business models. For example, Wise identifies four types of PSSs (Wise and Baumgartner, 1999); embedded services, comprehensive services, integrated solutions and distribution control. This classification is based on service content but product ownership is not considered. The concept of product ownership is instead presented in Michelinii and Razzoli (2004) that distinguish between provision of tangibles with included life cycle services, provision of tangibles under leasing arrangements, provision of shared products and function delivery. Tukker (2004) proposes a classification making a distinction between three categories, namely: product-oriented, service oriented and result-oriented. This classification of PSSs is agreed by several authors, which themselves refined it and added further elements (Azarenko et al., 2009; Barquet et al., 2013). Other authors proposed different classifications based on specific PSS elements (see for example Kujala et al., 2010; Storbacka et al., 2013) but Tukker’s classification remains the most widely accepted classification of PSS, and it is used extensively in the literature (Barquet et al., 2013). Nevertheless, the classical PSS typology is affected by some problems that prevent it to capture the complexity of PSS examples found in practice (Van Ostaeyen, et al, 2013): these categories therefore, may be explored further to facilitate the most appropriate categorization of companies (Beuren et al., 2013).
3.2 Description of the PSS business models types

Because the PSS literature has not discussed business models extensively (Kindström, 2010; Meier et al., 2010), a research gap exists that supports the need to develop a better understanding of how service-oriented business models are configured (Reim et al., 2014): in order to provide a first step towards a deeper understanding of service oriented-business models characteristics, starting from the analysis of the literature and empirical evidence of previous research (Adrodegari et al., 2014), we combine different revenue mechanisms and value propositions, to come out with different types that we configure using specific business model element as a landmark. In fact, differently from other PSS typologies proposed in literature (Wise and Baumgartner, 1999; Michelin and Razzoli, 2004; Tukker; 2004), the types presented in our work are described through the well-known business model Canvas and its key elements and can represent archetypal business models that companies can take for moving towards a new (more) service oriented configuration.

![Figure 1: Business Model Canvas (and main elements)](image)

As presented in Figure 1, we first identified two main categories that can group PSS business models:

A. Ownership-oriented business models, in which the product sales are the main source of revenue and services are sold as an add-on of the product, both traditionally and relationally;

B. Service-oriented business models, in which services strictly linked to the usage of a product are the main source of revenue. The ownership of the product is not transferred to the customers. Services are sold through relational contracts with generally medium-long term duration. Add-on services can also be sold on a transactional base outside the contractual agreement.

In the remainder of the paper, the identified five BM types are presented.

![Figure 2: the new PSS BM typology](image)

A1: Product-focused business model

In this BM, the main purpose is to deliver tangible value to the customer. For both customers and suppliers this model appears as the most familiar one as it uses, basically, knowledge and experience that has been gained for many years. Therefore, the supplier can use the traditional business model (product/price) and add value by additional actions. The company can sell a combination of single standard products and industrial services, which are usually not customized, with the aims of improving or restoring the functionality of the product, such as through maintenance and repair (basic field services and inspection). In this BM, the project has no (or lower) responsibility for product lifecycle and transactions are often single and independent from each other. The product business is a core activity for product-centric firms such that a product-oriented core of resources and capabilities: these companies typically invest significantly less in R&D for services than they do for products and IT system are not usually used proactively but only to manage company data. Companies have traditional “tangible” production costs (e.g. resources, time input and cost of capital used) and the revenue is mainly generated from the product sale (“one-off payments”). Sales and after-sales channels are usually separated and services are sold as a deed, such as repair of a broken machine or a training session for operators. Moreover, relationship is sometimes characterized by informality and business agreements are signed directly with the client’s top management. This makes it difficult to formalize the customer relationship through contracts, which are essential for the proper operation of service-oriented business models.

A2: Product and processes focused business model

This business model is similar to the product-focused one: the main difference here is that the company offers services, both in the pre and after-sale phases that aim to optimize customer processes. In this BM, the company might suggest all kinds of optimization for using the product, which in the end can lead to increase processes efficiency and effectiveness. Usually here, service is established as a separate unit in which service are also developed based on specific customer needs, and it is configured as a profit centre. Therefore, employee training is important in order to improve the advice and consultancy capabilities: also marketing/customer segmentation and customer knowledge management activities acquire importance. Generally customer relationships are characterized by informality: business agreements are signed directly with the client’s top
management and this makes difficult to formalize the customer relationship through contracts. In product and process focused business model, it is also important for the company to develop IT systems on product that can assess the impact of the process optimization, collecting information about performance and usage of the product. After-sales channel may be involved by the sales channel in the provision of consultancy services related with customer maintenance activities. Similarly to the product-focused model, sales and service are both transitional and generate two different revenue streams. In particular the main revenue stream is represented by product sales in which here is also included a pre-sales service related component.

**B1: Access-focused business model**

The main difference of this kind of business model compared to the ownership-oriented models is that the customer does not buy the product but pays a fixed regular fee to gain access to it. The company usually keeps the property rights of the product and has the responsibility for its utilization conditions (timely install, maintain, upgrade, etc.) during a given period of time. Thus the provider here also takes responsibility for maintenance, repair and control: for this reason, in this kind of model, the company may perceive an incentive to prolong the product-life and may design the product accordingly. Therefore, services that guarantee the functionality and extend the product lifecycle are offered, such as preventive maintenance, product upgrade, retrofit and revamping. Interaction and collaboration between service and technical office personnel is consequently important in order to guarantee continuous improvement of the product aimed to extend product lifecycle. Product lease/renting has low tangible value for the user, since various costs and activities are shifted to the provider: compensation for the customer can come from the fact that the user no longer needs to bear the capital costs of the product. For these reason, in this BM (likewise B2 and B3) could be used also to reach small companies or companies that are entering the market, which do not have enough capital to purchase new product and will find it difficult to make heavy investments. In access-focused business model changes also the business relation that shift towards a relation-oriented model: thus for provider it is crucial to establish long-term relationships through formal agreements, seeking close relationships with its customers. Human resources acquire importance as a key resource to deliver the new value proposition to the customer: in this kind of business model qualified staff to service the product during its use is needed but, in addition, company has to invest in training also for sales and retail personnel that should promote the new offer, making it more attractive than a product-based option. Fleet management systems become essential and advanced and integrated IT systems can also allow to identify when maintenance should be done, prolonging the product life. Generally, payment may be based on a monthly payment of a fixed rate, which would cover both the product and services that would be made available throughout the product’s lifecycle. Thus, all service-oriented business models (namely B1, B2 and B3) implicate a new revenue model, where the focus is on the definition of new selling parameters primarily driven by customer perceived value creation instead of internal cost. Internal costs have to been understood better than in past: leasing/renting product instead of selling them would increase the company’s costs since it would require high initial capital investments and financial resources become critical.

**B2: Use-focused business model**

The main characteristic of this business model is that the customer does not buy the product or system but pays a variable fee that depends on its actual usage of the product. Despite this, there still remains a clear tangible value for the customer since various activities (e.g. maintenance) are outsourced to the provider. Therefore, the company is responsible for all life cycle costs, which provide a powerful incentive to design a product that in terms of costs is optimized over the life cycle, of which elements can be re-used after the products’ useful life. A very important incentive for the customer in B2 and B3 business models is that the provider feels an incentive to continually improve the product with lifecycle performance. Moreover, here customers focus on the value as a value-in-use that is created (and determined) at the moment of consumption, not value-in-exchange that is added to goods during the production process. Therefore, in this business model, is necessary to design a new value propositions based on the customers business and processes including interactive parameters for assess the value-in-use. Having the customer as co-producer makes the company dependent on the participation of the customer and customer a resource in the marketing process: the value of the relationship with customers during the whole lifecycle of products is therefore critical and the company’s ability to develop close, long-term relationships becomes a prerequisite in this BM (customer embeddedness capability). At the same time, the company has to know in details the customers and partners context that can determine the service-related experience, being up-to-date with our customers’ preferences, needs, problems, worries, interests, usage pattern. In fact, in order to make a clear cost calculation, company has to be able to analyse the behaviour of the user and to collect the product usage and process data: an extensive knowledge over the installed based is a prerequisite in this kind of BM. Therefore, advanced and integrated ICT system (e.g. CRM, PLM, Fleet Management systems, ...) are fundamental in this business model. In particular, health management systems are required to monitor performance and usage condition of the installed base. The development of the Product/Service System and supporting services activities throughout the product life cycle become crucial: in particular, the integration of the development processes of the product and the service will create key process that is crucial to the companies. The company usually has to redesign a new structured business unit and establish organizational roles dedicated to service development, realigning also rewards systems to promote service sales and revenue. A radical change is therefore required also in the organization mind-set: in the transition towards service-oriented business models, a fundamental shift is also required in the organizational
culture and market engagement, which necessitates time and resources. For example, customer service have to be trained to assist new client segment, as well as a new sales channel qualified to demonstrate to clients the benefits of new offer. As mentioned also in B1 model, the payback period is often longer than for physical product sales. Therefore, provider must have the financial resources or receive support from its financing partners to bridge this period. Often a risk premium has to be included for this models and company should develop approaches, which can reduce the liability risks and enhance control over ‘production’ uncertainties. In fact, the more the firm provides solutions and other customized services, the greater its value potential, but also the greater its complexity and risk. For these reasons also pricing capability is needed to change the revenue model and define the correct fee.

B3: Outcome-focused business model

In this BM, the customer pays a fee that depends on the achievement of a contractually set result in terms of product/service usage. Within the company, an adaptable back-office infrastructure with clever ICT systems can enable not only efficient but also higher service levels and company should develop approaches, which may explain the restricted adoption of service-oriented business models. In addition, PSS design methodologies are scarce and this limitation restricts the adoption of service-oriented business models in companies operating in capital goods sectors. In fact, literature shows the lack of specific methodologies providing practical guidelines for PSS implementation. For this reason, this paper is intended to present a PSS BM typology, grounded on a business model framework that can be used as a practical guideline to help companies in capital goods sectors in the journey towards a new service-oriented business model. Using this framework companies would be able to assess where their current business model stands and then define the desired future business model and the necessary next steps. In fact, the identified BM types will be used in the next steps of the T-REX project to define a new business model innovation framework that will support the companies in this transition through the development of a specific methodology and toolkit that have the proposed typology as a landmark. The study conducted is based on the analysis of specific industry sectors and this could limit the generalizability of the findings and the proposed PSS typology. In spite of the proposed targets, the defined five BM types, although comprehensive and detailed, are still merely static representation of a business models and further research is needed to refine and test this typology: identifying the complete configuration of all the identified relevant variables of the business model framework is the objective of the next steps of this research.

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4. Conclusion

In recent years companies operating in capital goods sectors have developed a growing interest in the provision of services supporting the product (spare parts, maintenance, repair, etc.) and the customer’s processes (training, consultancy services, etc.) in order to respond to the increasing challenges from competition. Scholars have developed different PSS typologies, but there is still scarce adoption of service-oriented business models in companies operating in capital goods sectors. In addition, PSS design methodologies are scarce and this limitation may explain the restricted adoption of service-oriented business models. Moreover, literature shows the lack of specific methodologies providing practical guidelines for PSS implementation. For this reason, this paper is intended to present a PSS BM typology, grounded on a business model framework that can be used as a practical guideline to help companies in capital goods sectors in the journey towards a new service-oriented business model. Using this framework companies would be able to assess where their current business model stands and then define the desired future business model and the necessary next steps. In fact, the identified BM types will be used in the next steps of the T-REX project to define a new business model innovation framework that will support the companies in this transition through the development of a specific methodology and toolkit that have the proposed typology as a landmark. The study conducted is based on the analysis of specific industry sectors and this could limit the generalizability of the findings and the proposed PSS typology. In spite of the proposed targets, the defined five BM types, although comprehensive and detailed, are still merely static representation of a business models and further research is needed to refine and test this typology: identifying the complete configuration of all the identified relevant variables of the business model framework is the objective of the next steps of this research.
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