Towards service-oriented business models: a survey of capital goods companies

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Abstract: New trends for manufactures push towards selling the usage of the product – or even its performances – rather than its ownership. The phenomenon concerning the evolution from a "traditional" business model based on the product sales to new service-oriented business model have been discussed in literature since the '90es (Vandermerwe and Rada, 1988; Oliva and Kallenberg, 2003; Tukker, 2004; Vargo & Lush, 2004; Kowalkowski et al., 2011). Despite this, a limited application of "service-oriented" business models has been observed in the capital goods sectors, especially within SMEs. This is due also to the lack of business model or model-based approach that guides companies in the servitization process: it seems there is a grey area for companies trying to achieve a successful "transformation to services" and to capture and create value through the provision of services, especially in terms of business models (Neely et al., 2011). The main aim of this study, that is a part of a large research project (T-REX) funded by the EC, is therefore to understand how business models of companies that operate in capital goods sector are configured and to analyse the diffusion of service-oriented business models. This paper presents the main result of an exploratory survey that was carried out among 95 European companies operating in the machinery, automation and forklift sectors. To support the empirical investigation, we developed a preliminary research framework, grounded on the Canvas model (Osterwalder and Pigneur, 2010), enriched with a set of variables that we specifically defined in order to describe the business model configuration in servitization contexts. Preliminary results show that business models are in general still product-oriented. Revenue models are dominated by product sales, with a contribution of services close to 20% due to corrective maintenance and spare part sales. Rental or "Pay-per-x" contracts are an almost negligible revenue source.

Keywords**: capital goods, service-oriented business model, survey**

1.Introduction

In the current global economy, manufacturers are under pressure to adapt to an ever-changing business environment. In response to these drivers, new trends have emerged such as the 'servitization' of manufacturing (Wise and Baumgartner, 1999). The servitization can be also seen as a business model innovation of organizations processes and capabilities wherein manufacturing companies make a shift from selling product to selling integrated products and services, with the aim to satisfy customer needs, enhance the company's performance and achieve competitive advantage (Visjnic, 2010; Neely, 2008). Despite this, a limited application of "service-oriented" business models has been observed in the capital goods sectors, especially within SMEs. This is due also to the lack of business model or model-based approach that guides companies in the servitization process. Therefore, this paper has two objectives: a.) to identify the building blocks and the relevant variables that can be used to formalize, structure and analyze service-oriented business models; b.) to empirically investigate the way business models of capital goods companies are configured. This paper, in particular, reports the main findings from a survey carried out within T-REX, a research project funded by the European Commission (EC) that aims to develop and implement, through three industrial application cases, a business platform for capital goods companies whose main elements are a new service-oriented business model, an improved design of the products, and a re-engineering of traditional support services.

The paper structure is the following. The next section provides the research background and describes the research framework of this study. The methodology of the empirical research is presented in section three. Section four describes the main findings from the survey, while conclusive remarks and directions for future research are drawn in section five.

2.Background and research framework

New frontiers in the capital goods sectors are about selling either the usage of the product (e.g. renting, pay-x-use) or the product performance (e.g. pay-x-performance) rather than the product ownership to the customers. The phenomenon concerning the evolution from a "traditional" business model, based on the product sales, to new service-oriented business model, have been discussed in literature since the '90es. The literature

conceptualizes the shift from products to solutions through various terms, such as "servitization" (Vandermerwe and Rada, 1988), "transition from products to services" (Oliva and Kallenberg, 2003), "Product-Service Systems (PSS)" (Tukker, 2004), "service infusion in manufacturing" (Kowalkowski et al., 2011), and others. These views converge into the concept of solutions, which can be defined as innovative combinations of products and services leading to high-value unified responses to customers' needs. As pointed out by Neely, Benedettini and Visnjic (2011) although due to economic uncertainties and strong competition there is an increased interest in extending product life-cycle, it seems there is a grey area for companies trying to achieve a successful "transformation to services" and to capture and create value through the provision of services, especially in terms of business models: in fact, the transformation paths from a product-oriented strategy to a combined product-service strategy are still poorly understood (Tukker, 2004; Martinez et al., 2010). 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). Business models based on the provision of solutions instead of traditional products change the manufacturer's perspective over the costs and revenues arising during the product lifecycle. In particular, new value propositions that address new customer needs by leveraging on a set of resources, competencies and techniques have to be developed. These new value propositions, moreover, entail also integral changes in how partnerships, channels, customer relationships are configured, and, as mentioned before, about how the revenue model is structured. A business model reasoning is useful to successfully leverage, coordinate and align all these potential disruptive changes, as suggested by Baines et al. (2009). By adopting a business model framework, in fact, it is possible to formalize in a holistic way how companies are creating and transferring value to their customers. Moreover, analyzing the new value propositions that could better address customer needs, it is also possible to define the business model configuration that creates and transfers value more successfully. Therefore, the business model concept can be used as a management method helping to comprehend and analyze the current business logic of a company as well as to plan strategic decisions by designing and simulating new business concepts (Osterwalder and Pigneur 2005). Due to the importance of having a clearly articulated business model as early as possible in the new venture creation process (Barringer and Ireland, 2006), the business model has achieved increasing attention from business scholars as well as practitioners: despite this, a common vision concerning the business model concept and frameworks to formalize them is still missing.

In a context where companies find themselves in constant changing in order to give new response to the requirements of more and more demanding customers, the concept of business model is gaining importance. For example, a company can use a business model to identify how its value proposition is delivered in a profitable way through its resources and processes. With that understanding, it can be judged how well the same model could be used to fulfil radically different customer needs and related value proposition, and what they would need to do to construct a new one, if need be, to capitalize on that opportunity (Johnson et al., 2008).

In current times several companies are considering to evolve towards new business models in which the use or the function of a product is sold instead of the product itself (Van Ostaeyen et al., 2011). In these models higher value is delivered to the customer by increasing service elements: the company does not sell only a product but a solution, namely a product-service system (PSS) that could be defined as consisting of tangible products and intangible services designed and combined so that they jointly are capable of fulfilling specific customer needs (Tischner et al., 2002). With regards to this evolution towards PSSs, literature reveals various classifications used to characterized and identify the different typologies of PSSs business model (see for example, Wise and Baumgartner, 1999; Michelini and Razzoli, 2004; Tukker 2004; Kujala et al., 2010; Rese et al., 2012; Storbacka et al., 2013). The classification proposed by Tukker (product-oriented, use oriented and result oriented PSSs) remains the most widely accepted classification of PSS, which is used extensively in the literature (Barquet et al., 2013) and refined or extended in successive studies (Tukker and Tischner, 2006; Cook et al., 2006; Azarenko et al, 2009; Copani et al., 2010; Azevedo and Ribeiro, 2013; Barquet et al., 2013). Nevertheless, in the literature there is no business model or model-based approach that guides companies in the transition process to a more service-oriented company and specifically analyses the different configuration of service-business model.

For the present study we used as a reference the Business Model Canvas by Osterwalder and Pigneur (2010), which is clearly structured and diffused among practitioners. It is constituted by nine elements (building blocks) that are: Customer segments (i.e. groups of people or organizations a company aims to reach and serve), Value propositions (i.e. products and services that create value for a specific customer segment), Channels (i.e. company's interface with its customers), Customer relationships (i.e. types of relationships a company establishes and maintains with specific customer segments), Revenue streams (i.e. revenue a company generates from each customer segment), Key resources (i.e. assets required to offer and deliver the aforementioned elements), Key activities (i.e. activities involved in offering and delivering the aforementioned elements), Key partners (i.e. network of suppliers and partners that support the business model execution) and Cost structure (i.e. costs incurred when operating a business model).

In the T-REX project, we designed a Research Framework (Figure 1), in which the Business Model Canvas has been refined and adapted through the identification for each building block of a set of relevant variables that can be used for analyzing the configuration of each block and their actual service orientation.

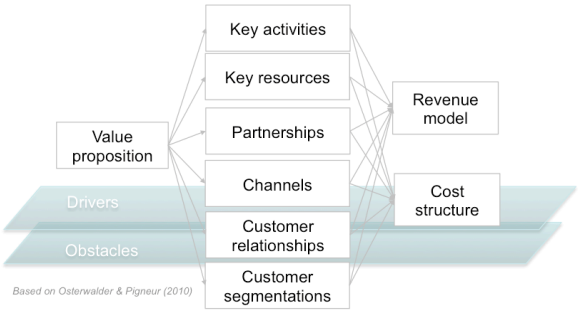

Figure 1: Research framework

3.Methodology

To understand the level of service orientation of business models, an exploratory survey has been carried out on European companies that operate in three main sectors: Machinery, Automation, Transportation. Given the paucity of previous studies with similar goals and background, we opted for an exploratory survey. Exploratory survey research, in fact, is usual in the early research stages of a phenomenon, when the objective is to gain preliminary insights on a topic (Forza, 2002). The survey can help to determine the concepts to be measured in relation to the phenomenon of interest and how to discover new facets of the phenomenon under study. Although exploratory surveys usually do not rely on models and concepts (Forza, 2002), in this project we have developed the research framework aiming to make survey data collection and analysis interpretable. Starting from the definition of building blocks (constructs) and related variables we have made an operationalization by defining a measurement scale and item for each variable. The unit of analysis of the survey is therefore the business model of the investigated companies.

Based on the identification of the three main domains addressed by the project, we have defined the target population as a set of companies from three broad industry sectors: Machinery, Transportation and Automation – these industries include the sectors object of the projects. The research centres involved in the project (IK4-Tekniker, Fraunhofer IAO, University of Brescia) have hence submitted the survey to all the companies in the three sectors with which they have had previous relationships or interactions. The survey has been first designed and validated on a MS word document by the three research centres involved in the project. The English version of the survey has been replicated in an on-line survey editor and then submitted to project industrial partners to assess comprehensibility and wording. The pilot testing of the survey has provided three answers that have led to revise aspects such as terminology and length of the survey. Once validated, the survey has been translated into Spanish, Italian and German languages by creating new versions in the on-line editor. Once translated, the survey has been submitted to selected companies in their mother languages by email (in Italy and Spain), and also as a paper version in Germany.

Answers collected from the three mother languages survey versions have been coded using a "coding map" in order to ensure the consistence and the readability of data collected and then gathered into a comprehensive database in order to perform the analysis. Each answer has been analysed in order to assess its validity and to find out imputation errors. Finally, descriptive analyses have been performed both considering the whole set of answers and segmentations, following criteria derived from contextual variables such as the industry sector in which a company operates.

4.Main findings

The survey was completed by 95 companies. According to "New SME definition" (provided by the EC - 1/1/2005), we classify respondents based on companies size: sample companies are mainly medium and large (Micro 6%, Small 19%, Medium 29%, Large 43%). In general, the sample is characterized by a much greater share of medium and large companies compared with the EU population, where SMEs are predominant. This may be due to two aspects: a.) a strong presence of large companies in Germany, one of the countries targeted by this study; b.) a greater awareness and interest about the topics dealt with in this study by medium and large companies, while SMEs have a lower degree of maturity on service-related aspects. From a geographical point of view, the responding companies operate mainly in Italy (49%) and Germany (32%). The survey has also received 17 answers from Spain and one answer from Finland. The responding companies mainly operate in the Machinery sector (64), either as Original Equipment Manufacturer (OEM) or dealer / integrator of machine tools, packaging machines, textile machines, etc., or manufacturing components such as tools, spindles, pneumatic components, etc. The remaining answers are in the Automation (15) (i.e. robot manufacturers and system integrators), Transportation (8) (i.e. earth-moving machinery and forklifts), and other sectors.

In the remainder of the paragraph, results are presented started with the analysis of how the revenue stream composition in the three targeted industry sectors: in fact, starting from "revenue model" building block, it is possible to analyse the configuration of most relevant variable in other building block, having in mind which are the sector that seems to have already begun the transformation to service, namely that companies that has begun to sell either the usage of the product (e.g. renting, pay-x-use) or the product performance (e.g. pay-x-performance). In particular, in this paper are reported the main finding value proposition, key activities and customer building blocks.

For the analysis and comparison of revenue model in the three sectors, respondents have been asked to quantify how each of six revenue components contributes in percentage to the overall company turnover.

The six identified revenue components are: service contracts (preventive/predictive maintenance contracts), technical assistance, spare parts sales, financing/leasing and product sales.

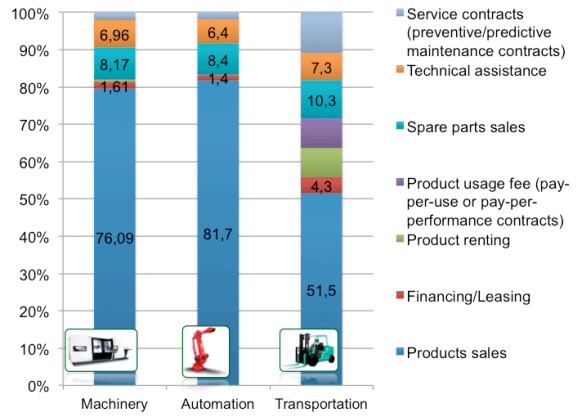

Figure 2: Revenue stream composition

As expected, 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). For what concerns service related revenue components, the most important are spare parts sales and technical assistance while contribution of revenue components related both with advanced services such as service contracts and with new usage-oriented business model such as financing/leasing, renting or product-usage-fee each contribute is overall under 6% of the turnover.

Concerning the value proposition, the survey was structured to investigate the diffusion of different types of services in the three sectors. From the results, 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). The most diffused service among the responding companies is indeed the documentation (only 2% of the companies do not offer it), followed by repair, spare parts provision and basic training, all of them always offered by 66% to 85% of the respondents.

For what concern comparison of service portfolios across different industrial sectors (see Figure 3) some important differences emerge between the three sector, consistently with previous results.

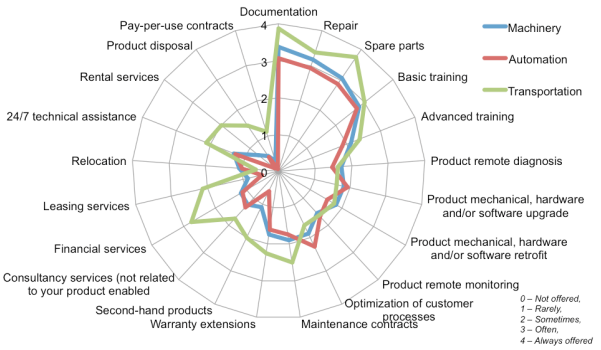

Figure 3: Value proposition – service portfolio

In fact, companies that operate in the transportation sector appear to have a more extended service offering compared to automation and machinery because of the provision of services oriented to extend the product life-cycle (e.g. sell of second-hand products) and to the adoption of new usage- oriented business models (e.g. rental and financial services as well pay-per-use contracts).

Coherently with the objectives of T-REX project, in the key activities building blocks we analyzed three typical practices that could be an enabler of service-oriented business model: service engineering (SE), installed-base monitoring and Total Cost of Ownership (TCO) model adoption.

Concerning SE, results show some interesting results. Although the majority of respondents believe that the importance of service business will increase in future (86% of the total), only 68% of them claim that services are already an important part of their company's business. Responsibilities for the development of new services are well defined only within 45% of the responding companies, as well as other important activities for the development of new services, such as formal processes, defined budget and methods, that are performed only by around 27% of the respondents.

Another important practice for the development of usage-oriented business model that has been investigated as a key activity is the collection and management of products installed base information. Respondents were asked which typologies of data they collect from their installed base, in order to improve the control, the durability and the serviceability of their products. While information related with maintenance activities performed and with products/components failure causes are collected on average on a high percentage of installed base (respectively 51% and 44%), more complex and less easy to collect data such as product usage, performance and health condition are available for a minor part of the installed base.

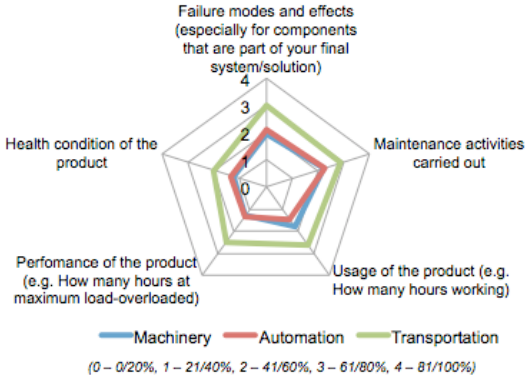

Figure 4: Control over the installed base (data collection)

Figure 4 shows that Transportation companies support their fleet operation and maintenance activities by managing a larger number of data over a larger part of their installed base compared to Machinery and Automation companies.

The last key activity investigated has been the adoption level of TCO among the respondents. Looking at how the awareness and adoption of these kinds of

techniques varies taking into account contextual variables, it has emerged that Transportation companies are definitely more oriented towards the evaluation and use of total cost of ownership of their products.

Last results provided in this paper are those about the criteria to segment customers used by companies. Traditional criteria based on data and information that are easy to collect (revenue generated by customer purchase of products and its geographical location) are the most used. Less common, among the sample, is the adoption of criteria that rely on information that are more difficult to obtain such as profit generated by customer purchase of products or services, although these two criteria are considered very important to support company decision-makers to focus efforts on (the most) profitable customers.

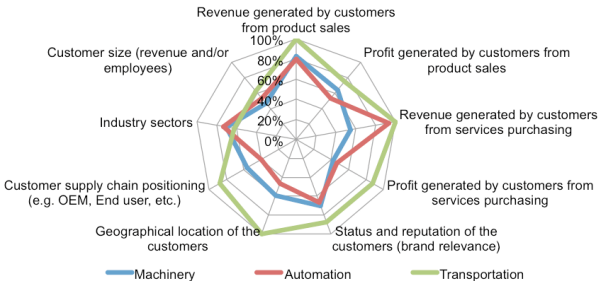

Figure 5: Adoption of customer segmentation criteria

Another interesting picture comes out from the figure that makes clear how Transportation companies are more used to segment their customers with several criteria. Revenues and geographical criteria are adopted by the whole subsamples and an advanced criterion such as the profit generated by customer purchase of services is highly diffused, underlining the attention of Transportation companies to the service business.

Resuming the main finding described above, we can argue that the transportation industry, and in particular the forklift trucks one, is a step ahead the machine tool and robotics in the journey towards new business models. In fact, analysing the revenue model building block, we have observed an adoption of service-based business models, such as rental or pay-per-x contracts and a relevant, in the transportation companies. Moreover, in the offering of these companies, we have observed a wider diffusion of advanced services and that customers are more interested in topics such as the TCO or the minimization of their maintenance costs.

5.Conclusion

This paper is part of a larger research project, funded by the European Commission that addresses the development of service-oriented business models in the domains of Machinery, Automation and Transportation. In this paper through an exploratory survey we tried to define the state of the art of business model configuration of companies that operate in these three sectors. Summarizing findings described in the previous section, we can observe that:

- The adoption of service-oriented business models is low in the studied sectors, in particular with regards to the machine tools and automation, revenue models are dominated by product sales, with a contribution of services close to 20%. However transportation seems to have achieved more experience to go ahead in the journey towards new usage-oriented business models since on average almost half of their revenues come from activities different from product sales.
- Main sources of value for customers are still relate to product-related aspects (e.g. performance, product productivity, minimization of purchase cost, etc.) despite of customer-related ones (e.g. minimization of TCO, improving customer experience, pay-per-x models, etc.)
- Service offerings are still mainly anchored to traditional services even if companies have reached the awareness of its importance. New service business is gaining in importance for the companies, but most of them still have only weak capabilities for new service development with no explicit strategy, responsibilities, budget, formal processes and methods in place.
- Concerning installed base monitoring, information systems and automation have a great unexploited potential. Transportation seems to be in advantage compared to compared to Machinery and Automation companies.
- Companies belonging to Machinery and Automation sectors have little experience on the adoption of TCO models while Transportation has much more experience. Results of the survey show that companies have generally low experience in the adoption/development of TCO model in order to support product sales on a commercial level.
- Customer relationships are still dominated by a traditional approach. Revenues and geographical criteria are adopted by the whole subsamples and an advanced criterion such as the profit generated by customer purchase of services is highly diffused, only Transportation sector.

Finally this paper contributes both to practice and to academic discussion related with business model by having established a set of variables that can be used to describe the business model configuration in a servitization context.

6.Aknowledgment

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