Decision support tools for measuring and controlling After-Sales service performance

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Abstract: Companies have progressively realised that complementing industrial goods with the provision of value added services can be an important lever to prosper on those markets affected by weak demand, hard competition and decreasing margins. Among the different forms of service provisions, After-Sales services have acquired a strategic role as a source of revenues and competitive advantage. This transition from products to services calls for the creation of expertise, structures and processes new to the product manufacturer. Companies need to mature the capability to design and deliver services rather than products and a fundamental requirement lies in designing specific and appropriate decision support tools to help companies in monitoring their current and future results and the critical trends of the beneath processes. Goal of this paper is to provide a procedure which allows to develop two decision support tools. A case study is proposed as a means to apply and validate the procedure.

Keywords: After-Sales services, Six-step procedure, Processes, Performance Measurement System, Dashboard, Management cockpit

1. Introduction

The fierce competition coming from the emerging markets, the high rate of technological innovation and the increasing customers’ expectations force industrial companies to shift their traditional product-centric business perspective to a more profitable and sustainable customer-oriented strategy. Since ‘90s companies operating in the western mature markets have progressively realised the importance of complementing industrial goods with the provision of value added services. This trend, called Servitization, is a process where manufacturing companies embrace service orientation and develop more and better product-services with the aim of surviving on the market and enhancing firm performance (Ren and Gregory, 2007). Companies provide the so-called Product-Service Systems, that is, they offer solutions for sale that consist of tangible products and intangible services, which are designed, combined and delivered so that they are jointly capable of fulfilling specific customer’s needs (Mont, 2001; Brandstotter et al., 2003).

Several authors (Oliva and Kallenberg, 2003; Cohen et al., 2006; Baines et al., 2009, to mention a few) have reported the benefits associated with this business especially in terms of profitability, competitive advantage, customer retention and environmental sustainability. One of the most challenging outcomes is related to the profits that selling services may generate: the service market, in fact, can be four or five times larger than the market for products (Bundschuh and Dezvane, 2003) and may produce at least three times the turnover of the original purchase during a given product life cycle (Alexander et al., 2002), contributing to about 40%–50% of the total revenue, and to a profitability of up to 20%–25% (Alexander et al., 2002; McClusky, 2002).

However, although services are thought to deliver higher margins, most organisations find quite problematic to transit from a product-centric view to a more innovative product-service one. A Bain & Co’s survey (Baveja et al., 2004) reveals that only 21% of the sampled companies had experienced a real success with their service strategy. According to a Neely’s survey (2009), 53% of firms which had declared bankruptcy were selling product-services. It occurs that manufacturing companies, especially Small and Medium Enterprises, which heavily invest in extending their service business, increase their service offerings but incur higher costs, and eventually do not achieve the expected correspondingly higher returns (Gebauer et al., 2005; Neely, 2009). This implies that, instead of managing a transition from products to services, product manufacturers fall into the so-called “service paradox”.

Overcoming this hitch represents a major managerial challenge (Oliva and Kallenberg, 2003; Baveja et al., 2004). To properly provide these Product-Service Systems, companies must radically change the way they operate, moving beyond their product strategies and converting them into product-service ones (Karlsson, 2007). They need to mature the capability to design and deliver services rather than products and develop new knowledge, organizational principles, metrics and incentives which firms do not currently possess. In particular, a fundamental requirement lies in designing specific and appropriate decision support tools to help companies in monitoring their current and future results and the critical trends of the beneath processes.

Concerning this purpose, this paper is addressed to After-
Sales (AS) services, a specific category of Product-Service Systems where products are sold in a traditional manner and include, in the original act of sale, additional services to guarantee functionality and durability of the product owned by the customer. These services are usually provided and managed during the middle and end of life phases of a product life cycle, and are devoted to supporting customers in the usage and disposal of the goods (Patelli et al., 2004). This paper aims at providing a Six-step procedure which allows to develop two decision support tools that can support companies to control and improve the provision of their AS services:

i) a dashboard which monitors the current companies’ results through proper and rigorous indicators specifically defined to measure the service performance and to identify the beneath critical processes which need to be (re-)designed;

ii) a management cockpit which assesses the impact of future operational decisions on the performance results of a company and identifies the main levers to manoeuvre and adjust like the knobs on a control panel.

The validity and applicability of the procedure and the development of these decision support tools is tested with one case study.

2. The six-step procedure

To achieve the main outcomes of this paper, a procedure with a series of logical steps to systematically accomplish has been defined (Figure 1). This procedure is made up of repeatable steps that can serve as guidelines and can be followed anytime it is required to support a company in controlling and improving the provision of its AS services. Each step is composed by semi-standardized modules whose application needs to be lightly customized according to the needs of the specific company under analysis.

The first four steps are carried out to assess and monitor the current results of a company (AS-IS state) and they drive the development of a dashboard based on a specific Performance Measurement Systems (PMS) and beneath mapped processes. The last two steps are executed to value the impact that future decisions may have on the current results of a company (evaluation of TO-BE states) and they lead to the development of a management cockpit. More in detail, the steps are defined as it follows:

Step 1 – Identify product-processes relation

At a strategic level, when companies define their business models and the markets they want to address, they need also to identify which type of support processes to handle in accordance with the characteristics of the products they are selling. This step aims at understanding and detecting what is the most suitable typology of assistance support to carry out at the tactical and operational levels in accordance with the characteristics of the products sold on the market.

In particular, a product-process matrix has been identified. Within the product dimension, products can be classified as commodity, conventional, essential or vital according to the specific technical support and different time-frames of interventions (Legnani et al., 2009). On the other hand, the technical support process dimension is made up of:

- passive (or indirect) assistance process - the company provides an appropriate documentation to the customer who is able to autonomously perform the diagnosis, identification and application of the solution;
- collaborative assistance process - the customer autonomously sorts out the problem with the help of an expert through a remote connection;
- turn-key assistance process - the customer is not able to solve the problem and needs the support of an expert who solves the problem. This support can be of two types: off-site, when the company collects the faulty product through its assistance channel, repairs and gives it back to the customer; on-site when the intervention is performed at the location where the defective item is installed.

Step 2 – Map processes

When analysing a company (or a network), understanding and modelling its business processes represent an important starting point (Stadtler and Kilger, 2005). This step gives a basic understanding of the business processes and it lays the foundation for proceeding with the design of a PMS (Andersen and Fagerhaug, 2002). In order to facilitate companies in mapping their AS processes, a hierarchical structure with a detailed description of the main assistance processes and their relative activities has been developed following the formalism adopted by the Supply Chain Council (SCC) in its reference models (Supply Chain Council, 2010). Mapping is carried out exploiting the XCOR methodology, which implies a combination of the different SCC models according to the specific business areas to analyze.

Step 3 – Measure performance

Evaluation of results and identification of corrective actions against defined objectives are elements that cannot be neglected for the success of an organization. For this reason, a multi-levelled set of metrics for the evaluation of the AS service area has been defined using the same semantic structure and formalism adopted by the SCC in its reference models. The PMS is arranged according to two structures: a hierarchical and a process-diagnostics one. Indicators range from strategic measures used to monitor the overall performance of the company to more diagnostic measures used to identify critical processes.

Step 4 – Visualize metrics through a dashboard

Making visible the results achieved by the company and compare them with set target values is extremely powerful to assess the current position of the company and to allow internal and external benchmarks. An easy and user friendly dashboard for the calculation and visualization of the current performance of the company is provided according to the hierarchical and process-diagnostics structures defined at the previous step.
These considerations can be arranged in a management cockpit where the effect that future operational decisions have on the performance of the AS service area can be visible and adjustable like the knobs on a control panel.

4. Case study

The six-step procedure has been applied to a Norwegian manufacturer of farm machineries with the need to control and improve the provision of its AS services. The company provides maintenance and spare parts supply and one of its key issues is to improve and optimize the provision of these services related to the sales of round balers. A round baler standing idle might cause losses for the customers: the harvest season has to be completely exploited and a quick repair has to be assured by the company. This means that, since the company encompasses a series of primary and supporting processes and involves different departments and independent organisations, its goal is to enhance its AS structure in order to increase the profits coming from this business and retain its customers to secure itself with future sales.

Step 1 – Identify product-processes relation

The first step of the procedure proposes to clarify the relation between the characteristics of the products sold by the company and the typologies of assistance support. The analysis has focused on round balers, which are considered the most important and critical products for the company. Round balers have high variable costs and are typical products which need to be promptly fixed when a failure happens, especially during the harvest season.

According to these characteristics, the product-process relation matrix (Figure 2) suggests that the round balers can be classified as essential products. Continuous simulations and what-if analyses are developed to capture the structure of the AS business and to predict aspects of its behaviour, with the purpose of solving a certain problem.

Step 2 – Map processes

Elements of the SCC models (SCOR and of the Assist module of the CCOR model) have been picked up and combined in order to give the most reliable mapping of
the company’s processes which performs when it provides AS services.

Figure 3 – Mapping of the provision of AS services according to the XCOR framework

Step 3 – Measure performance

A standard PMS specific for the needs of the AS business has been defined according to the formalism of the SCC models. It is arranged according to a hierarchical and a process-diagnostic structures. Among all the indicators proposed in the PMS, just those suitable with the company’s strategy and requirements have been selected. In some cases some indicators and definitions have been tailored according to the company’s needs.

Step 4 – Visualize metrics through a dashboard

According to the company’s requirements, a tailored dashboard has been created to display the metrics identified to evaluate the performance of the technical support. The dashboard has been developed using a WAMP (Windows, Apache, MySql, Php) technology and it has been designed in order to upload data from the company’s database, calculate metrics and create synthetic reports to summarize their values and show their trends. The dashboard interface is organized according to the PMS structure defined in step 3. An example is reported in the following figure:

Figure 4 – A view of the developed dashboard

Step 5 – Perform a dynamic analysis

The company needs to test a new strategy to keep down the number of maintenance interventions, especially during the harvest season. Since repair interventions are completely unplanned and difficult to handle, it became necessary to understand the impact of moving towards the additional provision of a preventive maintenance support to be performed with more regularity.

The simulation, based on a SD model, tries to provide some valuable answers. In particular, the SD model has been developed to understand and represent, through the study of the causal relations amid the service metrics, the non-linear relations among all those processes that are involved when providing AS services.

A view of the developed SD model is reported in the following figure:

Figure 5 – A view of the developed SD model

Step 6 – Control the system through a management cockpit

In order to assess how the introduction of preventive maintenance (PM) contracts impacts on the company’s service performance, the analyses have been conducted assuming three different scenarios:

• Scenario A – PM contracts are not applied, either under or out of warranty (it represents the actual situation at the company’s). If there is a failure, it is of corrective nature and it is paid by the company under the warranty period and by the customer out of the warranty period.

• Scenario B – PM contracts are purchased by the customers just during the warranty period. The customer buys a contract for 1 PM intervention whose price includes the cost of the PM intervention and of the replacement of the rotor cutter. If there are other failures during the warranty time, they are of corrective nature and they are paid by the company. Failures out of the warranty period are of corrective nature and are paid by the customer.

• Scenario C – PM contracts are purchased throughout the whole life cycle of the product, both under and out of the warranty periods. The customer buys contracts for yearly PM interventions whose price includes the PM intervention and the replacement of the failed part. If there are other failures, they are of corrective nature and they are paid by the company during the warranty time and by the customer out of the warranty time.

The following graphs report the main results achieved through the simulation. The crucial outcome is that the company gets benefits from the introduction of PM contracts. In particular, the higher the use of PM is, the
higher the company’s service performance is. Limiting the PM just to the warranty period is less convenient than extending it to the entire life cycle of the round balers. Even though following this strategy makes the company incur in higher operational costs (due to the necessity of performing both corrective and PM interventions and, consequently, due to the presence of more personnel who accomplishes these interventions), this is more than balanced by the profit made along the product life cycle (Figure 6 and Figure 7).

Another interesting result regards the reduction of the spare parts backlog. This is due to the fact that PM interventions are regularly scheduled and this reduces the uncertainty in forecasting the desired level of spare parts necessary. Figure 8 shows the trend of the spare parts backlog costs accumulated during the product life cycle for each simulated scenario.

Finally, it is interesting the trend that the costs for the inactivity of the personnel accumulate during the product life cycle. As already mentioned, PM interventions are regularly planned compared to those of corrective nature, thus the working time of the personnel can also be planned and better exploited. Figure 9 shows how the costs of the inactive personnel decreases when the incidence of the PM increases.

5. Conclusions

In several manufacturing industries service is recognised as a key of competitive success. Hence, companies need to move from a pure product orientation to a product-service one. It is proved that this shift is very challenging and it can be very difficult if companies do not develop an appropriate service culture and the capability to design and deliver services in an effective and efficient way. A key issue is to monitor and control all the processes and activities which are carried out to provide a product-service: service measures need to be implemented and applied consistently by all the parties involved in the service network in order to enhance its overall effectiveness. Goal of this work is to contribute to fill this gap. It proposes a six-step procedure to finally develop applicable decision support tools to help companies in controlling and improving the provision of AS services.

The results achieved through this work may be extended and applied to other companies which operate in the service business and have to deal with AS service issues. Companies which do not have a structured organization of their service supply chain processes, do not have a proper PMS or are investing in extending their service offerings, but are incurring in higher costs without getting back the expected returns.

In order to implement this research work a maturity level assessment model has been created (Figure 10).

In conclusion, it can be stated that the application of the procedure has been successful and has led to reach the expected outcomes of this paper.
According to this model, this work can be addressed to companies which deal with AS and are in different maturity levels. More in detail:

- **Measurement stage** - it refers to those companies which have just started to provide AS services, which have a very basic service culture and almost no decision support tools for managing their AS service provision. These companies, which are normally Small and Medium Enterprises, are mainly interested in measuring their current performance results, thus they need a PMS tailored to their requirements and a dashboard to visualize the achieved results.

- **Diagnostics stage** - it refers to companies which have already implemented a PMS to evaluate their current performance and need to make diagnostics analyses on the underlying processes. These companies are interested in having a PMS which reflects critical trends of the beneath processes in order to possibly re-engineer them. They are interested in having a process-diagnostics PMS, a reporting system and a dashboard which visualizes the achieved results.

- **Forecasting stage** - it refers to companies which have already implemented a system to assess their results and they need decision support tools to make forecasting analyses to evaluate, in the near future, the company’s trends. They require a simulation tool to predict the future performance based on their current strategies and a management cockpit to understand which are the variables that mostly affect their results.

- **Innovation stage** – it refers to companies which are interested in introducing new services and are addressed to make innovation. They need a simulation tool which assesses the impact of the introduction of new policies and a management cockpit to manoeuvre those variables that influence the results of these new scenarios.

**References**


