

011-713

**PRODUCT RELATED SERVICES AND THE PRODUCT DEVELOPMENT
PROCESS – A PRELIMINARY ANALYSIS AND RESEARCH PROJECT OUTLINE**

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POMS 20th Annual Conference

Orlando, Florida U.S.A.

May 1 to May 4, 2009

Abstract: The importance of services to the overall success of manufacturing companies is growing significantly due to increasing competition and the resulting decrease in profit and demand. Besides that, services play an important role in the success rate of products, given that it helps customers to obtain the expected product performance. Even though in the last decades the movement toward the incorporation of services to the offers of manufacturing companies has gained both academic and professional attention, very little has been done in order to understand how services related to products are developed. This paper is a preliminary investigation on how services related to products are affected by and relate to the product development process and is conducted through a literature review. As a result, the paper presents a research proposal. Further work will involve mapping out different services and characteristics related to products and the outcomes and activities of the product development process that might impact such services.

Key-words: product-related services; new product development process; customer support; manufacturing companies.

1. Introduction

Services are everywhere and are the major sector in the modern economy. In developed countries, services contribute to 63% of GDP and 68% of the labor is employed in this sector (CIA, 2008). It has grown significantly since the beginning of the past century and is today the dominant sector in the American economy.

The growth of services, however, is not only related to the traditional service sectors, such as education, health and finance. More and more companies are looking at the aspects of services related to their operation (Hoffman and Bateson, 2001).

Most manufacturing companies offer various services that can be limited to the traditional services, such as after-sales or may include some that are not typical (Mathieu, 2001) such as product performance guarantees. The importance of services to the manufacturing sector is being discussed by several authors (Zeithaml and Bitner, 1996; Wise and Baumgartner, 1999; Goffin and New, 2001; Oliva and Kallenberg, 2003; Brax, 2005, Neely, 2007) and based on diverse aspects, such as economic, competitive advantages and market requirements approaches (Oliva and Kallenberg, 2003), for example. Several labels have been used to describe the services provided by manufacturing companies, such as: product support, industrial services, product-related services, after-sales services, product-services, customer support. In this paper, the term product-related services will be used to designate the services offered to support the product during its life-cycle.

Many aspects of product-related services are influenced by a product's design (Goffin and New, 2001); however, the relationship between these two subjects has not been widely

explored (Goffin, 1998). Gebauer *et al.* (2008) states that product-related services can be either developed during the product development process or during the product use.

Considering the relationship between the product development process and product-related services and that it is not adequately understood, the objective of this paper is to outline a research plan to analyze how product-related services are influenced by the new product development process.

2. Theoretical background

The background for the development of this study lies on the following two subjects: the new product development process and product-related services. It presents a brief description of the new product development process, providing an overview of the models used to describe such process, its phases, activities and outcomes. The concept of product-related services is also explored in order to identify the key aspects for the empirical research, as well as a classification of services is presented based on different perspectives.

2.1 The product development process

The product development process presents several characteristics that differentiate it from other processes, such as: high uncertainty and risks associated, the initial decisions are difficult to change, the basic activities follow an iterative cycle, generation and handling of a high volume of information and multiple requirements have to be addressed during the process (Rozenfeld *et al.*, 2006). It is a complex process and presents several interrelated activities and technical interfaces and shall encompass the market, the value chain and internal requirements.

During the product development process a market opportunity is transformed into a product available for sale (Krishnan and Ulrich, 2001) through a set of activities (Rozenfeld *et*

al., 2006) executed in a logic way and in a sequential or parallel order (Denker *et al.*, 2001). It also includes the feedback with information either from production or the product use (Ulrich and Eppinger, 1995). In general, the product development models organize the activities in phases (or stages). According to Rozenfeld *et al.* (2006), these phases are determined by the delivery of a set of results that will become the elements of the project.

As stated by Engwall *et al.* (2005): “over the past decades, rules, guidelines and procedures for managing product development have been increasingly packaged into formalized management models aimed at prescribing project execution”. Some models are aimed at describing the process; others focus on the development process as a whole, while others focus on the product development itself (Formoso *et al.*, 2002). The authors add that there are still models that provide methods and tools to support the product development management.

The initial models defined the process as a linear system, with discrete and sequential stages, while the recent models consider that the process progress through stages, but with overlaps and feedback loops (McCarthy *et al.*, 2006). Some of the models that are divided into phases are the models from Clark and Fujimoto (1991); Cooper (2001); Ulrich and Eppinger (1995) and Rozenfeld *et al.* (2006).

Even though the reference models for managing the product development process differ from one another, most authors agree on the basic steps of the product development. The model proposed by Rozenfeld *et al.* (2006) was chosen as a reference for the analysis of the product development process (NPD). The model was selected for being a recent and more comprehensive model, that encompass the concepts of other models and it is not so generic. It is addressed mainly to durable goods companies, with emphasis in mechanical and manufacturing technologies. It is also important to address that for the present research, the differences from one model to another wouldn't impact in a significant way the results of it.

The model is divided in the macro phases: pre-development, development and post-development. The macro phases are also divided into the following phases: product strategic planning, project planning, informational design, conceptual design, detailed design, manufacturing preparation, product launch, product and process follow-up and product discontinuing. A summary of the model is shown in Figure 1.

| Macrophase | Phase | # of activities |
|------------------|-------------------------------|-----------------|
| Pre-development | Product Strategic Planning | 8 |
| | Project Planning | 14 |
| Development | Informational Design | 10 |
| | Conceptual Design | 15 |
| | Detailed Design | 17 |
| | Manufacturing Preparation | 14 |
| | Product Launch | 13 |
| Post-development | Product and process follow-up | 4 |
| | Product discontinuing | 7 |

Figure 1 – Macro-phases and phases of New Product Development Process.

The main results of each phase are listed below, in accordance with the model proposed by Rozenfeld *et al.* (2006). The two main results from the product strategic planning phase are the following documents: product portfolio (that describes the project and contains the start date of the project) and the project charter (first document that refers to a specific project in the company). In the project planning phase, the project charter is used to develop a detailed project plan with targets, costs, activities, etc. In the next phase, informational design, the product target specifications are defined containing the requirements and qualitative information about the product. In the Conceptual Design phase, the solutions to meet the

target specifications are generated and analyzed so that in the detailed design the selected solution is developed, generating the final specifications. In the manufacturing preparation phase the manufacturing process are developed and approved. Finally the product is launched in the market.

2.2 Product-related services

The importance of services to manufacturing companies has grown in the last decades and has been discussed by several authors (Vandermerwe and Rada, 1988; Goffin, 1998; Wise and Baumgartner, 1999; Mathieu, 2001; Oliva and Kallenberg, 2003; Windahl *et al.*, 2004; Brax, 2005; Gebauer *et al.*, 2008). Several approaches have been adopted and many different terminology to refer to product-related offers, such as “*servitization*” (Vandermerwe and Rada, 1988; Ren and Gregory, 2007; Neely, 2007); “integrated solutions” (Sheperd and Ahmed, 2000; Davies, 2003; Windahl *et al.*, 2004), “product-service systems” (Mont, 2002; Morelli, 2003) or in general referred as the “transition to services” (Wise and Baumgartner, 1999; Mathieu, 2001; Oliva and Kallenberg, 2003). The concepts differ from each other, but when analyzed from an offer perspective and considering specially those related to the manufacturing companies, they are very similar. The same happens to these offers, where several labels are used to describe the services provided by manufacturing companies, such as: industrial services, product-related services, after-sales services, product support, product-services, customer support.

These services can be related to different stages of the product life cycle and present different characteristics and a value proposal for the customers. Some examples of such services are: acquisition, installation, training, operation, inspection services, repair, maintenance, upgrades, documentation, customer consulting, availability of spare parts,

warranty schemes, decommission, etc. (Goffin and New; 2001; Oliva and Kallenberg, 2003; Gebauer, 2008).

In general, services perform an important role in manufacturing companies, because, among other things, they help the customer to integrate the product and get from it the expected result (Mathieu, 2001; Kumar and Kumar, 2004). They help to reduce the uncertainty associated with the product purchase and increase the utility and availability of the product (Araujo and Spring, 2006). For these reasons, services are essential to assure customer satisfaction (Goffin and New, 2001) and the success of new products (Cooper, 2001).

From a broader perspective, other reasons can be mentioned that emphasize the importance of services, such as: facilitate product sales, increase customer loyalty, create growth opportunities in mature markets, balance the economic cycles with different cash flow (Brax, 2005), differentiate from competitor's products, increase the revenue and in general, services have greater margins than products (Anderson *et al.*, 1997, Davies *et al.*, 2006). Moreover, the company can benefit from the know-how and the access to information and still be able to keep the knowledge and create a mechanism to gather information from about the use and performance of the products.

2.3 Classification of product-related services

There are different ways to classify a company's offers. In this section, different perspectives will be applied in order to classify the offers and provide with a guideline to categorize and map them. The classification was divided in six perspectives, bases on the prevailing characteristic. The six perspectives are: application, nature of the offer, the time of the offer, purpose and nature of the interaction.

Regarding the product **application**, the most used and accepted classification is the one that differentiate industrial from consumer products and services (Wind, 1982).

Kotler (2001) proposed five types of offerings based on the **nature** of a company's offer, that go from the pure product end to pure services, that are: pure tangible good, tangible good with accompanying services; hybrid; major service with accompanying minor goods and services; and pure service. Another aspect that could be considered in this perspective is the proportion between products and services that may vary from case to case within the company and even along time for the same solution (Morelli, 2002).

Homburg and Garbe's (1999) classification considers the **time of the offer** in relation to the product purchase, dividing the services in pre-purchase, at-purchase and after-sales services,

Considering the purpose of the offer, the following approaches could be considered: Mathieu (2001) classifies the services in three categories: customer service, product-services and service as a product. Customer service mainly refers to technical support services and, in general, the price of such services is embedded in the products price. Product-services will support the use of the product and can be offered separately. Services as a product refers to offers not related to the company's products and would support products from competitors or the customer activities.

Wise and Baumgartner (2003) present four business models for the transition of manufacturing companies to services: embedded services, comprehensive services, integrated solutions and distribution control. Except for the distribution control, the offers resulting from such models could be compared with the typology proposed by Mathieu (2001). The integrated solutions could refer to all three categories proposed by Mathieu (2001), while the embedded services could be considered either as a breakdown of customer services as a product-service.

Based on the **nature of the interaction** with the customer, the services can be classified as transaction based or relationship based (Oliva and Kallenberg, 2003).

Transaction based services occur on a event basis and there is no long term commitments or contracts. On the other way, for relationship based services there is an agreement to provide the service and, in general, the terms are agreed. For this types of services, service providers assume a higher risk that, on the other hand, gives the customer better cost predictability.

Table 1 presents the above mentioned classifications.

Table 1 – Classifications of the offers.

| Perspective | Classification |
|-------------------------------------|--|
| <i>Application</i> | Consumer Industril |
| <i>Nature of the offer</i> | Pure tangible good Tangible good with accompanying services Hybrid Major service with accompanying minor goods and services Pure Service |
| <i>Time frame</i> | Pre-purchase At-purchase After-sales services |
| <i>Purpose</i> | Customer service Embedded services Product-services Service as a product |
| <i>Nature of interaction</i> | Transaction-based services Relationship based services |

3. Research Proposal Outline

This section outlines the next steps for the development of the research and the preliminary results are going to be presented at the POMS conference.

In order to analyze how product-related services are influenced by the new product development process, the main objective was broken down into the following secondary objectives:

- 1) Identify the different types of product-related services and its characteristics;

- 2) Analyze the causal relationship between the product development process and product-related services.

A case study will be conducted in order to provide the necessary information for to perform the analysis. The case study allows a deeper understanding of relationships that would not be possible using different methods and emphasizes a detailed contextual analysis (Campomar, 1991). For this reasons and considering the exploratory nature of this research, the case study is the method selected.

The case study will be based on a single unity in order to perform a deeper investigation. The unity selected shall be a manufacturing company that offers a variety of product-related services regarding its characteristics and the time it is offered in the life cycle of the product. This will provide with data diversity and a broader range for analysis. Also the unity selected shall have a structured product development process.

In order to gather the information from the unity of analysis, the following instruments will be used: semi-structured interviews, document analysis, and direct observation. Public information from the company will be also used. Table 2 summarizes how each instrument will be used during the research.

Table 2 – Data gathering instruments.

| Activity | Research instruments | Information source | |
|---|--|--|--|
| | | Internal | External |
| Unity of analysis characterization | Document analysis; semi-structured interview | Product portfolio; interview | Company's web page; product catalog; publications |
| Understanding of the company's product development process | Document analysis; semi-structured interview; direct observation; informal conversation interview; process description documents | Interview; Institutional presentations | Publications |
| Identification of product-related services and its characteristics | Document analysis; semi-structured interview; direct observation; informal conversation interview; process description documents | Interview; Institutional presentations | Company's web page; product/services catalog; publications |

With the information from the case study about the product development process, its activities and outcomes and the company's product-related portfolio and characteristics, the data will be analyzed in order to generate the conclusions. The analysis will consist of the following steps:

- 1) Case description: describe the case, highlighting the most important information and insights;
- 2) Panel data analysis: consolidate and organize the data about the company, the product development process and the product-related services;
- 3) Analogy with the theory: identify the similarities and differences between the company's product development process and the model select from the literature;
- 4) Define the causal relationship between the product development process and product-related services. In this step, the product-related services characteristics will be analyzed against the product development process activities and outcomes in order to define the causal relationship between them.

Figure 2 presents an overview of the research.

4. Concluding Remarks

Several indications can be found in the literature of the importance of services to manufacturing companies, in many different aspects. Even though some authors refer to the relation between the definitions of product development process and services requirements, the subject has not been extensively studied. The objective of the research is to explore this relationship and analyze the impacts of the decisions taken during the product development in the services, providing an overview of the causal relationship between them. The research in

still on its early stages and no relevant conclusions can be made at this point. More relevant results from the case study and the data analysis shall be presented at the conference.

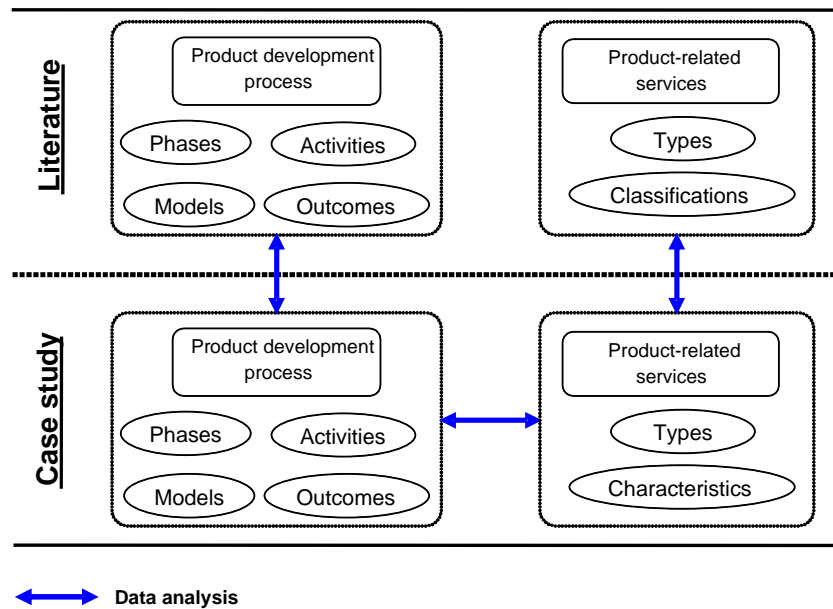


Figure 2 – Research outline.

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