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A dynamics-based approach to solutions typology: A case from the aerospace industry

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ABSTRACT

The process of servitization for manufacturing firms has been studied to help improve understanding as to how manufacturing firms can combine products and services in order to provide business solutions for their customers. Several proposals as to a typology for business solutions have been made. Typologies proposed are static in nature rather than dynamic. The aim of this paper is to propose a typology of the dynamic solution process, taking the aerospace industry as an appropriate context of analysis. A qualitative and exploratory research is adopted, using a case study approach. A triadic approach is applied in the selection of cases in order to capture the multi-actor base element of the network and solution dynamics. The data reveals four different time-based categories of business solution: 1) solutions before manufacturing; 2) solutions for manufacturing; 3) solutions for product performance and 4) solutions for innovation. This paper has theoretical and managerial contributions by presenting a typology for business solutions as a variable combination of products, services and developments over time.

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1. Introduction

Over the last decade (Oliva & Kallenberg, 2003; Salonen, 2011; Teboul, 2006) research has claimed that market complexity is forcing traditional product-manufacturing companies to change their position in the goods-services continuum by continuously expanding their offers into the service business. This process of transition from product to services in B-to-B markets is called servitization (Jacob & Ulaga, 2008). This is all the more in true in the case of complex systems provision such as to be found in the aerospace industry. Servitization captures certain aspects of the complexity of the business. This notion of servitization has naturally led to the development of solution offering. Recent years have seen a plethora of research production focusing on different angles of approach to solution (Nordin & Kowalkovski, 2010; Storbacka, 2011). In spite of the fact that numerous studies have approached the understanding of the process of business solutions adopting a network approach, authors such as Briscoe, Keränen, and Parry (2012) and Ng, Parry, Wild, McFarlane, and Tasker (2011) affirm that more emphasis must be placed on dynamics rather than a state.

The research presented in this article seeks to explore this issue and answer the specific question: How typify the dynamic process for

solutions framed by multiple actors? In order to investigate this gap, the aim of this paper is to propose a typology of the dynamic solution process, taking the aerospace industry as an appropriate context of analysis. We apply a triadic approach in the selection and analysis of cases in order to capture the multi-actor base element of the network and solution dynamics (Choi & Wu, 2009a, 2009b). A case study approach is adopted. Individual triad cases are assembled to feed an umbrella case taking the solution integrator – FAB – as focal player. The dynamics at play are not only those of triads taken individually, but rather those between triads, taken from the perspective of a solution business integrated approach. The results of the case studies are then presented and discussed collectively.

The paper first summarizes on the state of the art regarding servitization, solution and project/market shaping in order to set the scene and identify gaps in the literature. Research method based on case studies and triadic units of analysis is then discussed. Finally the results of the case studies and suggestions regarding a typology of this dynamic process are presented and discussed. Four types of solutions are identified in dynamic terms and theoretical implications are explored.

2. Servitizing, solutioning and shaping

From the mid-1990s onwards companies in all kinds of industries – including such businesses as aircraft manufacturers – who have traditionally made and sold standalone products or systems have shifted their strategies (Nordin & Kowalkovski, 2010). Manufacturing

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companies have in fact developed the capabilities and organizational structures required to combine physical components and services provided by a variety of internal and external suppliers (Davies, Brady, & Hobday, 2006; Wise & Baumgartner, 1999). This greater service orientation is commonly referred to as 'servitization' (Jacob & Ulaga, 2008; Vandermerwe & Rada, 1988). Interest in servitization is attributed, in part, to firms attempting to develop new revenue streams from services to accompany traditional product offerings (Davies, Brady, & Hobday, 2007; Kowalkowski, Windahl, Kindström, & Gebauer, 2015; Oliva & Kallenberg, 2003; Wise & Baumgartner, 1999). The provision of servitized offerings is also considered a new source of competitiveness in the marketplace (Gebauer & Friedli, 2005). This trend towards servitization, however, provokes major organizational changes (Artto, Valtakoski, & Kärki, 2015) including, for example, changes to the sales force (Ulaga & Loveland, 2014). According to Davies et al. (2006), providing the resulting customized solutions requires organizations to reconfigure around specific customer needs.

The development of servitization has led many companies to adopt a service-oriented approach and to offer comprehensive customer solutions. Indeed, today, "across industries and markets, firms marketing products and services are increasingly offering solutions" (Nordin & Kowalkowski, 2010, p. 441). A solution is usually understood as an integrated combination of products and services aiming to solve the customer's problem (Storbacka, 2011; Tuli, Kohli, & Bharadwaj, 2007). Customers expect a solution to include processes directed at understanding their requirements, customizing and integrating products, deploying them, and supporting them on an ongoing basis (Oliva & Kallenberg, 2003; Tuli et al., 2007).

Various classification terms exist within the extant literature that describes the different types of solution offerings that manufacturers may provide when deploying a servitization strategy. Some authors (Mathieu, 2001) distinguish the elements of a solution on the basis of the direct recipient of the offer: On one hand there are the services supporting the supplier product (SSP) which "ensure the proper functioning of the product and or facilitate the client's access to the product", and on the other hand there are the services supporting the client's action (SSC) which "support particular initiatives and advance the mission of the customer organization". SSCs are thereby differentiated from SSPs by an involvement which is ever more downstream of the supplier's actions with notably services supporting the client centred on the design of the application during R&D, services supporting the client during the production phase, and services supporting the client during the commercial phase. In the field of capital goods, Oliva and Kallenberg (2003) have completed this distinction between constituent elements by classifying the service across two dimensions: 1) the nature of the direct recipient, which takes us back to the distinction introduced by Mathieu (2001), e.g. product oriented services vs. end-user's process-oriented services; 2) the temporal logic implemented in the offer e.g. transaction based services vs. relationship based services. The combination of these two dimensions leads Oliva and Kallenberg (2003) to define four types of services which constitute the solution offering: based installed services (transaction based and product oriented); maintenance services (relation-based and product oriented); professional services (transaction-based and end-user process oriented); operational services (relationship-based and end-user process oriented).

Such classifications are generally content to assume a simplistic linear trajectory from product support services through to advanced services in the form of solutions (Kowalkowski et al., 2015). Some recent research attempts to remedy this state of affairs. The meta-theoretical research conducted by Oinonen and Jalkala (2013) on 57 studies published between the years 1999–2013 provides a better structuration of solutions. According to this research, only offerings that consist of integrated products and services and that are at least at some level customized and developed in a customer-need oriented way should be labeled as solutions. However, solution literature still lacks the dynamic dimensions (Biggemann, Kowalkowski, Maley, & Brege, 2013) which would

help to distinguish between different types of solutions (Nordin & Kowalkowski, 2010) and avoid the errors made in the name of this solution principle. Few studies investigate distinct solution process stages and, frequently, they tend to adopt limited views of solutions as linear processes (Sawhney, 2006; Tuli et al., 2007).

The representation of a solution as a long and complex process leads to investigate its evolutionary character (Biggemann et al., 2013). Similar to a project, a solution is not a piece of data, nor a predetermined form with which the actors can play. According to Miller and Lessard (2000), a project usually gives rise to a long process of co-creation in which the different actors participate to a greater or lesser extent. Project shaping thus is an activity which takes place throughout the project and involves many reconfigurations of the project (Cova & Salle, 2008). In the same vein, a solution might be seen as a continually evolving construct, a co-construction of the actors involved who ensure that their preoccupations and ideas are taken into consideration. In their study of the global mining industry, Biggemann et al. (2013) unveil the dynamic, emergent, nonlinear nature of co-created solutions, in which the interests of the parties change during the process. Indeed, only a few solutions arrive at their successful, predefined destinations. In the same way as innovation processes, solutions proceed through multiple steps, from idea generation to final implementation. This idea of co-construction applies throughout the whole solution process and at every type of decision.

The focus here is the importance of shaping practices, meaning activities that take place throughout a solution process—from generation to implementation—and which normally lead to a host of (re)configurations. By using the frame of the four phases of project temporality, Cova and Salle (2011) identify several shaping practices that highlight the dynamics of a project. This kind of framework could also help in understanding the evolutionary character of the solution process. Biggemann et al. (2013, p. 1089) emphasize, also, that the impact of solution shaping practices is not limited to a sole client-supplier relationship but could affect a whole industry: "A solution affects the customer-supplier relationship, which also influences other relationships and determines how competitors (i.e., other customers and suppliers) and other actors react. The introduction of a customer solution, in particular a novel one, may spark changes in the activities of competitors that want to influence the market in their favor and enhance their own market position. What starts as a possible solution to a specific, predefined customer problem can evolve to take on much wider scope, creating a new market space and changing the competitive environment".

A linear, essentially dyadic process would seem then, according to the literature to date, to be insufficient and incomplete to understand solution dynamics. Storbacka and Nenonen (2011), through a case study on non-welded piping solutions, indicate that firms can actively alter market configurations by engaging in what they name "market scripting" practices: "offering market propositions that illustrate their view on how the market should be configured and engaging actors in activities aimed at creating a shared market view" (Storbacka & Nenonen, 2011, p. 255). Similarly considering solution dynamics as a supplier-led or customer-led – or even supplier/customer led process would appear to have limitations. Indeed, previous research has suggested that "solutions marketing, seen through a market-shaping lens, is not simply a question of handling solutions for customers. It calls for a broader approach and handling of the market and market dynamics, going beyond the dyad" (Spencer & Cova, 2012, p. 2). Adopting this perspective, "market solution" is defined as a reciprocal market shaping process: the solution process influences the shape of the market, whilst at the same time being influenced by forces at play in the market (solution for the market and solution by the market).

It follows then that the characterization of solution dynamics requires identification and consideration of steps and associated multi-actor motivations and involvement down this market-shaping process involving solutions, and going indeed beyond the provision/acquisition

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