

Product Development in a Platform- Driven Organization

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ABSTRACT:

Platform product development is now widely used to tackle the cost-variety dilemma. In this work, we questioned the planning hypothesis underlying most of the research on platform design. Using an inductive methodology, we analyzed the first phase of a product development belonging to the second generation of a product based on an existing platform. This led to three results. We pointed out the existence of platform design principles. We also brought up how a design based on an existing platform modifies the traditional V-model, which structures the design process organization. Eventually we outlined the question of the platform renewal and its impact on platform's architecture and flexibility.

Keywords:

Multi-project management; Platform Strategy; Design; New product development

INTRODUCTION

Since the mid-eighties, companies face the double challenge of replacing products at an increasing rate along with satisfying more and more specific and diverse customers. These two requirements lead to the multiplication of new product development projects (Nonaka & Takeuchi, 1986; Wheelwright and Clark, 1992). Also, the cost of these developments must be controlled since price is as significant as the product itself for market competition.

Furthermore, the project teams have to deal with the necessity to innovate, in order to put on the market attractive products while keeping under control the risks underlying this type of project. All these properties of the competitive context show the necessity for moving from a management of unique projects leading to “hits products” to the project management in a multi-project environment (Cusumano & Nobeoka 1998).

One of the responses that adopts a multi-product approach and has been deeply studied is the platform strategy (Meyer & Lehnerd, 1997). Works that analyzed this approach in comparison to the mono-project approaches have demonstrated its superiority (Nobeoka & Cusumano 1997). Platform strategy corresponds to the process of identifying and exploiting commonalities among a firm's offerings, its target markets and the processes for designing and producing their products. A platform is the common basis of the individual products of a product family which is the collection of products that share the same assets (Sawhey 1998, Robertson&Ulrich 1998).

There are many similarities between multi-project management and programme management. In a programme, projects form a coherent group that is managed in a coordinated way for added benefits (Murray-Webster & Thiry 2000) or share a common objective (Andersen & Jensen 2003). Following Maylor et al. (2006), the projects in a programme may be represented as a chain of

projects, a portfolio of projects taking place at one point in time or as a network of interlinked projects. This representation is very close to the platform approach because on one considered platform we can have a succession of isolated projects, overlapping development projects or a succession of a group of projects corresponding to different generation of products. In this paper, we are interested in this last configuration. The platform strategy highlights some common issues with the programme management because as Turner (1999) pointed it, programme management includes the management of interfaces between projects. Furthermore a programme management involves the coordinated management of a series on inter-connected projects and other non-project work for the delivery of a specific package of benefits like the management of the technical basis of the platform which is not a project activity.

The concept of building product families based on platforms to create variety economically has been widely accepted in the literature. The question is not anymore about whether to invest in a platform or not but it is about the design of the platform (Cusumano & Nobeoka 1998). Works about platform design are generally based on the preliminary planning of the products which will be developed on this platform and on the capacity to anticipate the technical evolutions to which the platform should adapt as long as it is used (Robertson & Ulrich 1998). The design of a product planned on such a platform consists in reusing the platform components and developing only the parts specific to a new product. Thus, the advantage of platform strategy lies in the possibility to develop a large variety of products during the period over which it is possible to anticipate the needs and the preferences of the customers as well as technological progress. But this preliminary product planning is ineffective in dynamic competing environments where it is not always possible to plan the products. Hence, in some

competitive environments and very dynamic industries, the period during which the product planning and technologies anticipation remain accurate becomes increasingly short and it is common to design products not planned when the platform was initially designed. How then to manage the design of such an unplanned product on a platform at the middle of its life cycle? The analysis of the impact of the platform's existence on these products developments is an important issue because these products are not exceptions and they question the relevance of platform strategy itself. Therefore, in order to follow up the research on multi-project management in general and more specifically on platform design, we chose, in this research, to put the focus during the life cycle of a platform and not at its beginning like it is the case in the majority of the work on platforms. For that purpose, we carried out a field methodology research at a car manufacturer six years after the setting of the platform-based organization. We analyzed the first phase of a product development belonging to the second generation of products six years after the implementation of the platform organization. This analysis led us to three results.

We pointed out the existence of platform design principles, which influence the product development as well as market, economic or technical principles. We also brought up how a design based on an existing platform modifies the V-model, which structures the design process organization. We especially identified the consequences of this modification on the development organization and the coordination of the actors. Eventually, through our analysis of a product design during a platform life span, we outlined the essential question of the platform renewal and the implementation of this decision. We addressed this question through the platform's architecture and its flexibility.

The paper is organized as follow. Section 1 reviews the existing literature on platform

strategy and product design. In section 2, we present the research setting and our methodology. The case is presented in section 3. We then turn to the analysis and discussion (section 4) before concluding.

Product planning for platform design

In an intense and dynamic competitive environment, the reduction of the product life cycle and the increasing variety of customer demands lead firms to offer a big variety of products over time with an efficient use of resources. For that purpose, they leverage investments in design and manufacturing by implementing platform-based product development.

A platform is the common basis of the individual products of a product family which is the collection of products that share the same assets (Sawhey 1998, Robertson & Ulrich 1998). Platform strategy corresponds to the process of identifying and exploiting commonalities among a firm's offerings, its target markets and the processes for designing and producing their products (Meyer & Lehnerd, 1997). This strategy is an answer to the « fat design » phenomenon identified by Cusumano & Nobeoka (1998) as the down side of the heavy weight project management organization. They pointed out that it is useful for firms to overlap chronologically the projects sharing components : in that case the engineers can design components for more than one project. By coordinating chronologically overlapping projects a firm can transfer a design from a base project to a new one and facilitate task sharing among engineers as well as mutual adjustments and communication between the interdependent projects. They show that merging concurrent multiple projects is beneficial for both the speed and the effectiveness of technology leveraging between projects. Several research have showed that implementing the platform strategy increase the launch speed of a new product developed on the platform except in the case of the first product on the platform. In

that case, the development requires more time and cost because it covers also the development of the platform (Halman et al. 2003). Except in this situation, the platform strategy leads to the reduction of the delay of the development, and of the resources necessary to the product development. It leads also to the increase of the quality of the product by using pretested components (Sanderson & Uzumeri 1995).

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The literature pointed out the importance of the strategic planning of the sequence of products that will be developed on the platform in order to design it. Cusumano & Nobeoka (1998) pointed the importance of this strategic planning to transfer component technologies : “it is more efficient for companies to make advance plans during the base project for future reuse of a platform”. Robertson & Ulrich (1998) propose a structured process for platform design based on three plans : the product plan in a first place, than the differentiation and the commonality plans. It is on the harmonization of these three plans that the success of the platform strategy depends

Product Design in a Platform-driven Environment

The leading principle in the design of a product in a platform-driven environment is to decide which components of the product that be developed on the platform basis and which will be the differentiating elements that will be specifically designed for the product. This trade-off is strongly linked to the question of the product architecture. This question (i.e. the way in which the components are organized and interact) is one of the central preoccupations of the extensive literature on

product design processes (Pahl & Beitz, 1996; Wheelwright & Clark, 1992; Ulrich & Eppinger, 2004), as it plays an essential role not only in the intrinsic performances of the product, but also in its evolution possibilities and in design process organization (Ulrich, 1995). Since the mid 1990s, studies of the interest and impact of modular structures have paid particular attention to questions of architecture (Baldwin & Clark, 2000). Platform design has also been the subject of many publications aiming mainly to propose methods to manage the commonality / differentiation dilemma by taking account of technical, marketing/product and economic constraints (Ulrich & Eppinger 2004). However, these studies pay relatively little attention to the design process in a platform-driven environment which is perceived as not being fundamentally modified by the platform approach. This is probably consistent with the static nature of these studies looking into the question of the design of the first-generation platform, i.e. starting from scratch (or almost). However, when seen from a dynamic point of view, the question changes. As Fisher et al. (1999) mention it, *“in most industrial situations, there already exists a portfolio of products and the managerial problem is to decide which components to re-use, which components to replace, which to develop. This problem is complex and deserves further research attention”*. We believe our work contributes to addressing this question of product development in a dynamic platform approach.

CONCLUSION

Analysing the design process of a product on an existing platform at the middle of its life cycle enabled us initially to formalize three platform design principles or design rules. The first two rules emphasize on the reuse of the platform components for the product design planned on this platform and on the struggle against the overdesign that must

remains a constant concern for the people involved in order to the platform strategy gives all its beneficial over principles in the specific case of new generation products planned on the existent platform. This enlightened reuse takes into account economic, technical and strategic issues likely to complexify the course of the design process. These rules are a vector of integration of the platform approach into the design of a single product on this platform. They are brought into play at the same time as product knowledge at the beginning of the product development highlighting that platform considerations take on the same importance as product ones. These rules are backed by very high-placed people in the hierarchy. The design of a product in an existent platform is therefore a real revolution compared with traditional development, because the designers start out with two inputs rather than just one. The traditional V model shifts towards a W model: after an initial exploration of the possibilities for convergence between the specifications of the new vehicle and the existing elements of the platform, a new cycle starts to get these two worlds to converge. This shift has cognitive and organizational consequences on the product development. effects. We proposed a third rule particularly pertinent in the case of the reuse of the platform components on a product in the middle of the platform’s life span. This third rule enlightens the reuse and carry Beyond these principles, our work questions the sustainability along time of a platform-based design strategy. Indeed, whereas this approach appears in the literature as a favoured mean to manage the cost/diversity dilemma, our research invites to moderate this assertion when it comes to consider the life cycle of the platform. Unquestionably platform design makes it possible to control development cost and delivery for the first generation of products. But the conclusion is not as clear as we consider products to be designed later. Indeed, it is not possible any more to plan

formerly the various products that will be designed on this basis. Managing the merging of the existing components and the new product's demands outlines, as we have shown, several questions. The central issue, which we pointed out here, is the issue of the platform renewal and the implementation of this decision. Ongoing research is necessary to create management tools integrating the specificity of the platform design (notably the modification of the design process) and making it possible to evaluate the "optimal" life span of a platform. Two ways of research can be outlined. The first would study, as Robertson & Ulrich (1998), the organization of the necessary planning process in order to reconcile platform design and rapid, and sometimes unpredictable, evolution of the competitive environment. The second would concentrate on the architecture of the platform to make it flexible. Works on the modularity of the products would constitute an extensive reference frame.

The answer to these questions will need a close cooperation between researchers and insiders to combine theoretical rigour and empirical data. Our work, which is limited to one case in the specific context of the automotive industry, is one first contribution. Other studies, in different environments, may answer these essential questions, taking into account the evolution of the international competition and the constraining necessity for the firms to manage, in constantly renewed ways, the cost/diversity dilemma.

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