Challenges for increasing component commonality in platforms

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Abstract

Many companies have adopted a platform strategy to handle the trade-off between variety and standardized components in their work of developing products. Previous research has shown that a platform strategy can achieve a lot of benefits, such as shortened development cycles, reduced needs for testing, and economy of scale in producing larger numbers of reduced sets of components. However, the literature is limited in describing challenges related to platform implementation. This paper reports on a study performed within a multinational firm in the automotive industry, which is pursuing a higher commonality among its platforms.

Our findings include descriptions of eight challenges to an implementation of a platform strategy. One such challenge is that a high commonality does not only risk brand distortion when marketing the product; it may also cause brand distortion on the component level in after-sales. Another challenge is that for commonality, development does not always start from scratch; a project manager pursuing increased commonality might need to involve other projects, but the commonalization might affect components already in production and after-sales. Thus, there is need for methods to make cost-benefit analyses covering the life-cycle on the component level of the platforms in development, production, and after-sales.

Keywords

platforms, commonality, brand distortion, challenge, product development

Introduction

Many companies constantly increase the variety of their product offering, at the same time as they face decreasing product life-cycles (Bullinger, Fremerey, & Fuhrberg-Baumann, 1995). To deal with this increasing product variety, many companies have adopted a platform strategy (Meyer & Lehnerd, 1997; Krishnan & Gupta, 2001), in order to handle the trade-off between variety and standardized components (Sköld & Karlsson, 2007). For example, a survey done a couple of years ago showed that 64% of the largest manufacturing companies in Sweden have a platform strategy (Persson, Trygg, & Åhlström, 2006; Pasche, Persson, & Löfsten, 2010).

Platforms and platform development can have different meanings for different companies, but are generally used to facilitate the sharing of components and other assets across products and product families (Halman, Hofer, & van Vuuren, 2003). According to Meyer and Lehnerd (1997) a platform is a set of components that are physically connected as a stable sub-assembly, and are common to different final products and models. With a platform strategy, a company can achieve benefits such as reduced product development lead-time and development cost (Robertson & Ulrich, 1998; Muffatto, 1999). For example, parts/components that have been developed for one product do not have to be tested when included in other products (Robertson & Ulrich, 1998). Another benefit to gain is economies of scale since larger volumes of common components will be produced (Robertson & Ulrich, 1998; Muffatto & Roveda, 2002; Labro, 2004). Component commonality also have positive effects on inventory levels, and inventory cost (Labro, 2004), as well as it can result in improved quality and easier quality control (Lyly-Yrjänäinen, 2008). Gaining these benefits is related to the company's ability to develop different products sharing a lot of common components, in other words to develop a platform consisting of products having a high degree of commonality.

Literature contains several historical success stories about platforms and platform development (Halman, et al., 2003). These are about companies and describe the benefits they have gained from a platform strategy, for example Sony with Walkman and HandyCam video cameras (Uzumeri & Sanderson, 1995), Black & Decker with power tools (Utterback, 1994; Sanchez & Mahoney, 1996) and Kodak's cameras (Robertson & Ulrich, 1998).

According to Meyer and Lehnerd (1997) a platform strategy refers to a number of products that share, i.e. have common, components. Hence, one part of implementing a platform strategy is about developing a number of products having a high degree of commonality, or increasing the degree of commonality between already existing products. The previously mentioned survey among Swedish manufacturing companies showed that these companies, on average, started to implement a platform strategy in 1987, that is, more than 20 years ago (Pasche, et al., 2010). Even though some companies have such long experience of working with platforms, the literature is still limited in describing how to actually implement a platform strategy. With a few exceptions (e.g. Robertson & Ulrich, 1998; Sköld & Karlsson, 2007) the literature is also limited in describing challenges, risks and problems related to platform implementation; for example, from present literature it is not obvious what challenges will arise when increasing commonality. A better understanding of the challenges for commonality could be expected to support both the decision-making for firms considering implementation of platform strategies and the management of such strategies in the firms that already have implemented them. Hence, the purpose of this paper is to identify challenges for increasing commonality between platform-based products.

The paper is organized as follows. First the literature on the meaning of a product platform is reviewed, and then different views of what a platform is, its benefits and some of the platform challenges. Next the employed methodology is described. The empirical findings are then presented and analysed. Finally, conclusions are drawn regarding challenges for increasing commonality between platform-based products.

Theoretical background

In this chapter we first elaborate briefly on the definition of a platform. This is followed by a review of different views of what a platform is, and its benefits. Next, we discuss some of the platform implementation challenges, especially the trade-off between commonality and distinctiveness.

Product platforms are nowadays used in almost every industry (Sawhney, 1998), as a way to facilitate the sharing of components and other assets across products (Halman, et al., 2003). An often-mentioned definition of the term platform is the one by Meyer and Lehnerd (1997). They define a product platform as "... a set of subsystems and interfaces that form a common structure from which a stream of derivate products can be efficiently developed and produced".
But, the meaning of a product platform is not only limited to the physical aspects of a product; it may, for example, also imply sharing processes or distribution channels or marketing efforts (Muffatto and Roveda, 2002; Meyer and Utterback, 1993). Meyer (1997) mentions platforms and commonality in production processes, where the focus is on commonality of production tools, machines and assembly lines. A more comprehensive view of different types of platforms has been given by Robertson and Ulrich (1998). They describe four different categories of platforms, which are:

- Components: The part designs of a product, the fixtures and tools needed to make them, the circuit designs, and the programs burned into programmable chips or stored on disks.
- Processes: The equipment used to make components or to assemble components into products and the design of the associated production process and supply chain.
- Knowledge: Design know-how, technology applications and limitations, production techniques, mathematical models, and testing methods.
- People and relationships: Teams, relationships among team members, relationships between the team and the larger organization, and relationships with a network of suppliers.

The purpose and scope of this paper concern the above-described component category. Therefore, in this paper the focus is on common components – or commonality – between products in a platform.

With a successful platform strategy, a company can gain numerous benefits; current literature mentions, for example, reduced product development lead-time and development cost (Robertson & Ulrich, 1998; Muffatto, 1999). Platforms also increase product life-cycles, since new customer demands can easily be met by developing derivate products (Wheelwright & Clark, 1992; McGrath, 1995). A large number of components can be kept unchanged when developing the new product. This means that platforms make it easier to have more frequent product launches (Robertson & Ulrich, 1998) and that platforms increase a company's strategic flexibility (Meyer & Utterback, 1993).

However, there are also challenges in implementing a platform strategy. For example, one has to be aware that it is a large investment and that it will take time before the savings are actually gained. McGrath (1995, p. 44) argues that: *"some companies confuse platform development with the development of the initial product and are surprised when the first*

product is not financially justified". The benefits from a platform strategy will not appear immediately; they will take some time to materialize. McGrath (1995, p. 44) further argues that "*Investments in new platforms cannot be justified on the planned success of a single product, but rather need to be evaluated on the expected success of all the resulting products that will be based on that platform".* This statement also argues for the need for a long-term perspective in implementing a platform strategy.

Implementing a platform strategy also involves balancing the trade-off between commonality and distinctiveness (Robertson & Ulrich, 1998; Lundbäck & Karlsson, 2005). Customers care about distinctiveness, and that they can have a product meeting their needs – not about how many components the product is sharing with other products (Robertson & Ulrich, 1998). Commonality, on the other hand, is important for the company since the cost for product development, manufacturing etc. is dependent on the number of parts that are common in a set of products (Robertson & Ulrich, 1998).

There is, as mentioned, a challenging trade-off between commonality and distinctiveness. When increasing the number of common parts for two products, these products will become less distinctive. In other words, there is a risk for product cannibalization (Labro, 2004). However, the nature of this trade-off can be influenced (Robertson & Ulrich, 1998). Depending on what parts/components of a product are shared, it is possible to achieve a high level of commonality without sacrificing distinctiveness (Robertson & Ulrich, 1998). To balance commonality and distinctiveness becomes even more difficult if the platform includes several different brands (Sköld & Karlsson, 2007).

According to Robertson and Ulrich (1998), platform planning is about creating a product plan, a differentiation plan and a commonality plan. The differentiation plan should contain the dimensions of the product that are meaningful to customers, and the commonality plan describes to what extent different products share common components. Robertson and Ulrich (1998) also mention that there are often organizational forces that hinder the balancing between commonality and distinctiveness. Therefore, it is important that these plans are developed cross-functionally, including at least the marketing, design, and manufacturing functions of the company. Halman et al. (2003) also argue for cross-functional work when developing platform-based products, since there will be trade-offs between different organizational functions that need to be managed. For example, Sköld and Karlsson (2007) identified a strong platform resistance from the brand management part of a company, because the platform is associated with commonality.

Method

An exploratory study regarding challenges for increasing commonality between platform-based products might investigate a phenomenon that is not often discussed in the industry. Hence, in-depth interviewing is suitable, as it allows for following up on cues during data collection (Easterby-Smith, Thorpe, Jackson, & Lowe, 1991). Furthermore, as the interpretation work requires a rich understanding of the context, we collected data from a single firm using the Insider/Outsider Team Research method (Bartunek & Louis, 1996) inviting representatives from the firm into the research team.

The research was conducted at the R&D function in a multinational manufacturing company within the automotive industry. The company has several brands as a result of acquisitions.

Each brand is managed by a brand subsidiary responsible for manufacturing and sales, and the brand subsidiaries have their offices in different countries. The R&D function is common to all brands and its distributed organization is co-located with each of the brand offices. Our data collection was conducted at the Swedish office of the R&D function, which also is co-located with the office of one of the brands.

Data were collected during six separate interviews, each conducted by two researchers, using an interview guide. The interviews lasted between 60 and 120 minutes. Three of the interviewees were project managers and thus worked as implementers of the commonality strategy of the organization. Two were line managers and champions of the commonality strategy. One interviewee was a line manager responsible for portfolio management.

To ensure validity, a number of steps were taken. Firstly, all interviews were performed by two researchers and they were subsequently transcribed, all to ensure transparency in the research team as regards the data. Secondly, as the research was performed according to the Insider/Outsider Team Research method (Bartunek & Louis, 1996), one member of the R&D function was included in the research team. Apart from participating in the data collection and the interpretation, this insider helped our research by providing rich background descriptions of the company as well as providing prints of policies and other documents. Thirdly, all interviewees were invited to a seminar, where the results of our study were reported and discussed.

In order to increase generalizability, findings of challenges that were either specific to the organizing of the company, or specific to the technologies of the products, were excluded.

Our study can be regarded as a single case study, and the generalization of its results can serve as a falsification of the hypothesis that implementations of a commonality strategy would have no drawbacks. The case of our study is the commonality strategy, while its interpretations are multiple as many product development projects are subjected to it. Thus, also by interviewing a number of project and line managers, we cover a larger number of development projects, as all interviewed project and line managers each have insights into several past and current projects.

Results

In this organization, several product development projects are run simultaneously. A majority of these projects deliver changes and improvements to existing products of the different brands. A small number of projects have the larger scope of delivering new products. Our data include descriptions of a set of coordinated projects (a program) that delivered several new products to two brands at the same time.

A high commonality of a specific component indicates that it is used in a large number of products, and consequently, that only a small number of other components offer the same or a similar function. A finding of our study is that any given function of a product could be under development in a project, be in production, and be in use by customers.

Thus, the directive for a project (or a set of projects) to reach high commonality for a certain component could mean that concurrent projects need to coordinate their requirements for this component. If the scope of the commonality improvement includes production, the projects need to require a change of similar components in production. Finally, in order to increase commonality by reducing the number of different components in stock in end-services, the projects would need to require the substitution of a number of similar components in use in products already sold and now being used by customers.

The eight challenges identified in this study are reported in Table 1.

	Commonality challenge	Description
1A	Increased weight of components and products	An increased commonality of any specific component between different products means that a specific component has to be designed based on the toughest requirement; hence it will often be over-dimensioned, or over-specified, for simpler products. Thus, a high-commonality component would typically be heavier, leading to high-commonality products being heavy. In cases where an increased product weight is negative, this would be a drawback of commonality.
1B	Increased cost of components and products	Similar to the finding above, a component matching the toughest requirement would typically also be over-specified and hence more expensive, leading to a high-commonality product also being more expensive. A more expensive product would lead to reduced margins of profit, which are a challenge to commonality.
2A	Brand distortion on product	Our data confirm the earlier finding by Robertson and Ulrich (1998) that full commonality would involve brand distortion regarding the function and design of the products, making manufacturers reduce commonality among components important for brand distinction such as the product body and covers.
2B	Brand distortion on after-sales	Brand distortion may also be caused by differentiating product cost and parts cost by brand; a premium brand would mean high-cost products, and typically high-cost replacement components (and vice versa). However, for products (such as cars and trucks) where the customers can access components that need replacement, a customer seeking replacement for a high-commonality component would be served by replacing the component with parts from the low-cost brand. Thus, a brand distinction of function and design, but also a brand distinction for replacement component costs, would serve as a challenge to commonality.
3A	Coordination cost	Our data confirm the earlier finding by Robertson and Ulrich (1998) that work to increase commonality between projects leads to increased time and cost spent coordinating and standardising (e.g. discussions, hierarchical referrals of unresolved conflicts of interests, etc.). Thus, a project set to increase commonality would typically be more expensive, and would deliver later, than a project working without the directive to increase commonality.

3B	Costly decision-making on higher levels in the organization	When the work of increasing commonality by coordinating and standardising needs to be performed (or its conflicts of interests need to be resolved) at higher hierarchical levels of the organisation, managers working on these levels are typically more busy and more costly than are managers working at lower levels. This means that work aimed at increasing commonality at the modular level (such as change of supply voltage) would be even more expensive and time-consuming.
4A	Production change cost	A reduction of number of components/parts typically leads to a production change cost. Increasing the component commonality in a platform sometimes means that components also need to be replaced in products that are already on the market, and in current production. It might be costly to make changes in already existing products, as such a change would require documentation. It might also require testing of products that are foreign to the project team, requiring the project to coordinate testing at other sites. The overhead cost of the project performing this change, or the reformation of the team that once developed the foreign product, is a challenge to commonality.
4B	Article change cost	Similar to the challenge above, a reduction of the number of existing components of the same or similar functionality would create a cost in the end-services.

Table 1. Commonality challenges

Discussion

A major implication of the findings of our study is that commonality is a quality of a firm that requires efficient and systemic monitoring. When a firm is organized into development, production, sales and after-sales, the task of increasing commonality is assigned to development projects, and work would also need to be done by production (4A; see Table 1) and after-sales (4B). The benefits, however, would typically not be in development, but in production and after-sales. Thus, a project would investigate whether to make a certain component in its scope common to the same function in products in other concurrent projects, and to the same function in products in production and on the market.

A cost-benefit analysis of a commonality proposal would need to investigate the consequences of the proposal over different organizational units, scanning the life-cycle of the commonalized component, the components it would replace, and the full product – recognizing that components might be in production and in use on the market, thus influencing after-sales. When a product is composed of thousands of components, each such investigation must be efficient, as the work of estimating the benefits would cause a cost that must be minimal. Our findings also include the fact that there is a coordination cost due to the work of reaching an agreement among several stakeholders, some of whom might not be connected with the commonalizing project.

The inherent uncertainty in the coordination costs (3A and 3B) constitutes a risk for each development project that recognizes the opportunity of increasing the commonality. The main interest of the project manager is to comply with budget and delivery dates, and to ensure delivery of a product (or product change) to a satisfied project principal (Pinto, 2002). Thus, a project manager would find the project facing less risk when an evaluation finds that there is no profit in commonalizing a certain component. We argue that this self-interest needs to be recognized by those implementing and monitoring commonality strategies.

One of the challenges which were identified is that a high-commonality product would be more expensive (1B), because the common components need to match the toughest requirements. A similar challenge is that a high-commonality product would be heavier (1A). Both 1A and 1B need to be considered as they would negatively influence the performance and cost of the complete product. But even though the product cost might increase with commonality, the total cost from a company's overall perspective can decrease. This is in line with a study by Lyly-Yrjänäinen (2008) who found that these common, over-specified, components actually had lower costs than the product-specific ones. This is because increased component commonality has the potential to decrease a lot of the indirect costs – e.g. logistics and storage costs in production, service documentation for spare parts etc. Hence, when implementing a platform strategy it is important that the way of calculating costs, and especially the costs for product variety, is adapted so that it is not working against an increased component commonality.

Two of the identified challenges (2A and 2B) are about the risk of brand distortion caused by an increased commonality. The first challenge (2A) is in line with previous literature (e.g. Robertson & Ulrich, 1998): the more common components, the less product distinctiveness. But for the development and the production of the product, it is possible for the company to manage this trade-off between commonality and distinctiveness. As Robertson and Ulrich (1998) argue, it is possible to achieve a high level of commonality without sacrificing distinctiveness. To what extent the distinctiveness is affected by an increasing commonality depends on which components are shared. Taking a car as an example, sharing components that are not visible for the customer – e.g. underneath the car – would not decrease the distinctiveness; whereas if sharing visible components (e.g. on the instrument panel), the distinctiveness would to a larger extent decrease. However, a finding from our study (2B) shows that this is more challenging when it comes to future repair of the product and replacement of components. In products where the customer can access the components that need to be repaired, he/she will probably try to replace a component in a product from the high-cost brand with the component for the low-cost brand. When it comes to repair and replacement of the components, the customer might buy the spare-part components directly from the supplier, not from the OEM company, and in that case choose the cheaper component.

Conclusion

The divide between the theoretical implications and the implications for practitioners is difficult to mark, since much of the theory produced regarding the topic of product platform commonality is intended to be of practical use.

Any theory set out to guide practice needs to be actionable (Argyris & Schön, 1974), and as such it must also incorporate the challenges awaiting its implementation. The theory of

platform commonality has so far produced a great momentum making many organizations adopt it (Sawhney, 1998). Our paper gives evidence of the existence of challenges to the implementation of a commonality strategy, and has confirmed the existence of four previously known challenges as well as identifying four new ones. These eight need to be considered by commonality strategists. Moreover, we have presented evidence that qualitative methodology consisting of interviews together with interpretation is sufficient to identify such challenges. Further inquiries are necessary in order to extend our map of different challenges and increase our understanding of them.

Our study has additionally clarified that a commonality strategy affects the whole life-cycle of components in development, production, and after-sales. There is a need for efficient methods that can calculate the entire costs and benefits when making commonality design decisions.

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