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PLATFORMS AND CROSS-ORGANIZATIONAL EFFECTS

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1. Introduction

How do we define platforms and how many platforms do we need in order to run our business? Most companies have a variety of product types and markets with several customer segments. In such a case it can be valuable to get inspiration from Volkswagen's choice of product platforms approach, and most companies do. However, only few companies find it relevant to adopt Volkswagen's definition of platforms without significant modifications or changes. Their conditions in terms of product and supply chain structure are simply different. To most managers, this fact initially creates a great deal of ambiguity regarding the application of platforms. One particular reason for the ambiguity is the lack of a uniform definition of "Platform". For instance, some definitions are narrow while others very comprehensive; similarly, some are either partly external focused or solely internal focused.
Another reason for the ambiguity relates to the justification of applying platforms. It is generally recognized that the motivation for applying platforms has to be sought in other organizational units rather than product development. Most potential benefits of applying platform initiatives seem to be related to the supply chain. Supply chains generally change with a much higher frequency compared to product structures and this introduces a dynamic factor combined with a degree of uncertainty. This calls for a continuous and cross-organizational effort and understanding, which further complicates the discussion.
The simple answer to the initial question seems to be that management needs a comprehensive definition of its own platforms. Each company should create a platform definition that best suits its own products, supply chains, and supporting systems. Examples given in the literature, may at best, serve as template fragments in that effort.
The aim of this paper is to contribute to the discussion of defining, implementing, developing, maintaining, and justifying platforms as a continuous company specific and cross-organizational process.

2. Empirical Perspective

The LEGO Mini Figure celebrated its 25th anniversary in 2003. Since its launch in 1978, 3.7 billion Mini Figures have been produced. Most recently, the two LEGO Mini Figures, Biff Starling and Sandy Moondust, became the first "man" and "woman" on Mars.
The Mini Figure is consisted of 8 elements: 2 arms, 2 hands, 2 legs, a torso, and a hip joint (see Figure 1). It can bend the hip, turn the arms, and grasp tools. Two month after the launch of the Mini Figure Man, its first variant appeared as a Mini Figure Woman. Originally the figures were only decorated with a happy smiley-like face and the elements were one color.

It was, however, obvious that the figure could be customized; hence the early customizations appeared by means of stickers. The stickers were followed by lasting decoration techniques. Due to the addition of different headgears, possibilities for customization became, in principle, endless. During the 1980s the figures got facial expression and in the late 1990s the figures appeared in licensed products like Star Wars and Harry Potter.

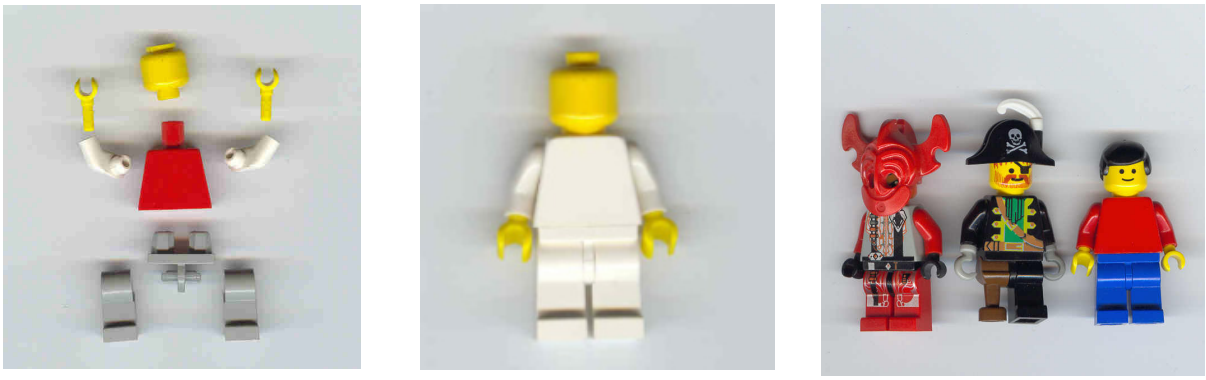

Figure 1. LEGO Mini Figure

The Mini Figure is one of the strongest icons in the LEGO brand and clearly a strong candidate for being covered by, or included in one or more platforms. However, there are several hundreds candidates as well. These candidates cover products, materials, processes, suppliers, supply chains, etc.

There are strong and proven tools to map the architecture of a given product, process or supply chain. However, platform is not identical to architecture. A platform includes one or more architectures; it adds relations and a view of the purpose. Whereas the methods for mapping the architecture are widely described in theory and tested in practical settings, the parallel methods for defining the platforms and specifying the benefits are only emerging. The existence of such methods and theories is a requirement in order to bring the platform thinking from being an interesting philosophy towards becoming a strong managerial tool.

LEGO Company is considering whether platform thinking should be a core competence, which requires confidence about the managerial tools.

This paper is a part of an ongoing action research project at LEGO Company focusing on implementing platform thinking.

3. Platforms and Platform Architectures

Based on our ongoing research we suggest that each company has to create its own understanding and definition of platforms according to the particular internal and external environment. Since the environment is dynamic this has to be a continuous process. The outcome of the process is a number of platforms and a partly formalized way of implementing, developing, and maintaining these platforms.

In this view, the platform becomes a company-specific element, which has mainly inspirational interest to other companies. The fundamental part is the platform architecture, which can be viewed as the template for platform designs [Heikkilä et al. 2002].

The platform architecture template has to be comprehensive and capable of incorporating the many different views that have been discussed in the literature. In this paper we propose the following aspects that a company-specific platform might include in order to be useful in consistent practical work (it is beyond the scope of this paper to argue further for the aspects, we will return to this in a later paper):

- The platform is based on one or more architectures
- It forms a meaningful part of a product or a process
- It includes relevant knowledge at the architectural level
- It serves as a basis for long-term development work

- It serves as a basis for short- and medium-term continuous improvement
- It is based on a partly modular structure
- It specifies internal and external interfaces
- It is specific about where to gain effects

These aspects can be seen as a meta-stage for more comprehensive platform architecture. A specific company can make its own definition, and most importantly, define the process by which it defines implements, develops, maintains, and justifies the resulting platforms. Relevance and strategy determine which aspects and to what extent the specific company would include them in their platform approach.

Some companies choose not to use the term "platform" due to the ambiguity in communicating the term internally. In the late 1990s, part of Philips Company chose to use the term "standard design" instead of platform. This step was taken because the management felt that the term "platform" had become overused, and thereby lost its power. In other companies, platforms are simply defined as "portfolios of standards" with the purpose of indicating the basic content. Some companies choose explicitly to include production processes.

4. Product Platforms and Cross-Organizational Effects

The main benefits gained from platform thinking can be classified within the following areas: reduced development and manufacturing costs, reduced development time, reduced systemic complexity, better learning across projects, and improved ability to upgrade products [Muffato 1999]. Some authors argue that both product performance and the majority of effects on the whole supply chain can be determined when the product architecture is designed [Erens & Verhulst 1997]. For instance, it has been shown that the degree of supplier-buyer relationships can impact the degree of modularization during the product architecture design [Hsuan 1999].

The effects are closely related to the handling of complex systems and the fundamental system theory is the inspiration. This theory states that a complex system can be divided into hierarchies (consisting of few less complex stable components, each of these of a few even simpler components, and so on) that can be analyzed into many independent components having relatively many relations among them, so that the behaviour of each component depends on the behaviour of others.

From a managerial viewpoint the effects is generally considered as potential effects. Applied successfully, platform philosophies and modularization provide a potential strong basis for achieving major competitive benefits along the whole supply chain [Sanchez 1999]. However, realization of the benefits requires extensive coordination among different functional bodies of a company, often leading to the difficulty of balancing commonality with distinctiveness of products.

Product platform has tremendous implications for a company's product portfolio management, in which sets of technologies and products are evaluated in relation to each other. How platform architecture is planned and configured, in terms of the technology composition contained in the subsystems and respective interfaces linking these subsystems, has significant impact on trade-offs between the degree of standardization and customization of product families and respective end products.

Therefore, the platform decisions are among the most important ones a company makes as such decisions may cut across several product lines or divisional boundaries, frequently requiring the resolution of cross-functional conflict and making complex trade-offs in different business areas [Robertson & Ulrich 1998]. At the heart of platform is the organization of components and interfaces making up the product architecture, and the degree of product architecture modularity is dependent on how the components are linked with each other and substitutability of unique components across product families [Mikkola & Gassmann 2003].

The internal interfaces of the process chain and the interfaces between the product architecture and process architecture are described through a number of individual industrial cases [Sanchez 1999].

The fact that is has been possible to classify products' internal interfaces and not the interfaces related to the implementing organization, is partly an indication of high complexity and partly an indication of the need for companies to address specific tasks related to the platform (cf. our introduction part).

Due to the cross-organizational requirements for realizing the potential benefits, only a few companies define their platforms as only comprising the product. Hewlett Packard, for example define their product platform as, "… a set of subsystems and interfaces that form a common structure from which a stream of derivatives products can be efficiently developed and produced, … [and] the combination of subsystems and interfaces defines the architecture of single product" [Meyer & Lehnerd 1997].
This indicates a need to address the supply chain as well as to investigate further the process architectures within the supply chain; the interfaces between them and the interfaces to the product architecture need also be included [Fine 1998].

5. Platform View

Given the requirements of a platform as discussed in Section 3 and the cross-organizational perspectives as discussed in Section 4, it makes sense to view a platform as including a number of interfaced architectures (see Figure 2). The architectures might be product or process related – and they might be internal or supplier related.

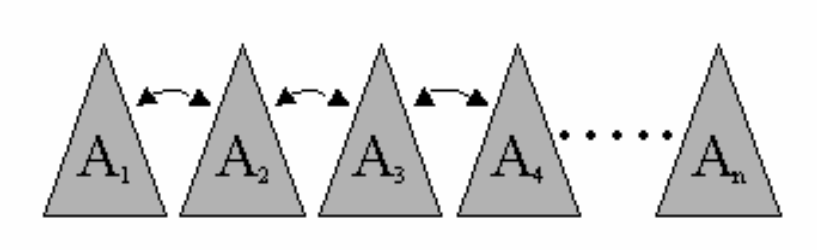

Figure 2. Platform constituted of a number of architectures

The architectures can be treated as "owned" individually by separate organizational units. This feature ensures that the architectures can be developed and updated separately, and provided the interfaces are kept or updated, the platform will keep its purpose.
Some architectures are owned by the individual company and the company has the full control of the development of the architecture. In other cases the architectures are owned by external suppliers and the company has to adapt to the interface requirements determined by the supplier. This is the case with most specialized process machinery.
When we explore this way of thinking to the best known and the most often cited platform – the A-platform of Volkswagen – we often view platform as the physical and structural unit including the suspension, rear axel, brakes, engine, gearbox, etc. However, it might be relevant to remember the painted picture of a pipe by the Belgian painter, René Magritte. Magritte named the picture "Cesi n´est pas une pipe" – it is not a pipe it is a model of a pipe!

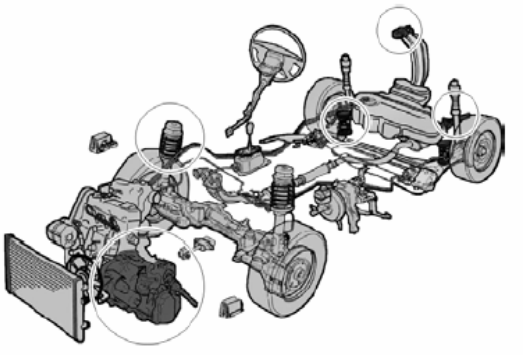

Figure 3. This is not a platform!

The physical representation of the Volkswagen A-platform is not a platform. We miss the most important issue: the included architectures and their interfaces. These architectures and their interfaces are the explanation for the specific physical form, and most important, are the reason why Volkswagen can gain effects in both product development and their supply chains.

In the following we will review the empirical example described in Section 2.

6. Empirical Perspective Revisited

The LEGO Mini Figure platform – or the platform including the Mini Figure - includes architectures related to material, moulding tools, moulding machines, moulding processes, assembly systems, decoration systems, packing, packaging systems, packing, mini figure, building system, design, marketing, etc. Most of these architectures will potentially be a part of other platforms as well.
From a managerial perspective it is important to define the specific platforms that provide the best competitive setup.
In the given case one potential platform could be:

- $\mathbf{P}_{\text{Tools}}$ ($\mathbf{A}_{\text{Elements}}$, $\mathbf{A}_{\text{Tool Concept}}$, $\mathbf{A}_{\text{Tool Design}}$, $\mathbf{A}_{\text{Tool Production}}$)

The platform for tools includes the element architecture, the overall tool concept architecture, the specific tool design architecture, and the tool production architecture. Some elements are considered simple in terms of tools and some are considered complex. Regarding production capacity, there is a need for highly efficient tools for those parts that do not vary and are produced in very high quantities (e.g. the hands and the heads). However, there is also a need for more flexible tools that can fulfil the needs of the elements with high variation and less predictable yearly demand (e.g. the headgears).
The efficiency of the platform can be measured in terms of cost (including quality) and lead time of the moulds.
Clearly the tool platform is just one candidate of many. From a managerial perspective some of the important questions are concerned with:

- The right number of platforms in terms of covering the whole supply chain
- Limited number of platforms to provide sufficient overview and support priority of development effort
- The establishment of a clear organizational ownership
- Organizational effects that have to be specified in a measurable way
- Benchmarking with world-class performance
- Taking advantage of internal as well as external architectures

7. Conclusion

The understanding of platforms, linked in a combined product and supply chain perspective, indicates a need to be concerned with what we can do in terms of inter-architectural interfaces. That is how architectures with different purpose interfaces constitute a competitive platform.
With shorter product life cycles and supply chain integration, companies are pressured to improve their operation efficiency in all aspects including new product development, manufacturing, marketing, and service. Many firms are increasingly aware of the benefits of platform strategies as a competitive advantage. As described by the case of Mini Figure, LEGO aims at extending the platform thinking to include both product and process.
At this moment we acknowledge several tools for mapping the architectures. When it comes to mapping the interfaces between the architectures we have less available tools and methods. Furthermore, we are missing methods that can drive such process as a continuous process focusing on both continuous improvement and radical updates.

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