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THE ANALYSIS OF THE PRODUCT PLATFORM IN THE ELEKTROBUDOWA S.A. COMPANY

ANALIZA PLATFORMY MONTAŻOWEJ W FIRMIE ELEKTROBUDOWA S.A.

Abstract

The paper presents the development trends of modern assembly techniques. It focuses both on the significance of an assembly platform for the ELEKTROBUDOWA S.A. company and the analysis of technological processes of assembly, which costitutes a very important element in designing the structure of a production system. The work analyses the strengnts and weaknesses of assembly platforms. It also gives an overview of the five important stages in designing their structure.

Keywords: *assembly platforms*

Streszczenie

W artykule przedstawiono kierunki rozwoju współczesnych technik montażu. Omówiono znaczenie platformy montażowej dla firmy ELEKTROBUDOWA S.A., jak również bardzo ważny element w projektowaniu struktury systemu produkcyjnego, jakim jest analiza procesów technologicznych montażu. Opisano mocne i slabe strony oraz przedstawiono pięć ważnych etapów w opracowywaniu struktury platform montażowych.

Słowa kluczowe: *platformy montażowe*

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1. Introduction

Many of today's production companies take up the challenge of supplying the market with various products while simultaneously maintaining a small diversity among them. It means that the products vary but the level of difference between them (or their components) is always stable and not very high. To name such a trend, companies use the term 'product families' and develop end products based on a product platform in order to reduce both the development costs of a given product and its launch costs while simultaneously maintaining the diversity of the product and adapting it to market needs. A product family is a group of related products which share common components or subsystems, often described as a product platform, and fill so-called market niches. Therefore, developing a product family design involves typical challenges that we have to respond to while creating an end product and simultaneously taking into account the necessity and complexity of adapting it to a given product platform [8].

2. Product platform definition

Developing a product platform plays an important role for the final product as it shortens the time of its assembly and improves its quality. Such a product meets market needs and, at the same time, can be manufactured at the lowest possible production costs [7].

According to one definition, a product platform is a relatively large a set of subsystems, the components of which are connected with each other to form a stable subsystem and these components are common across different variations of the final product [7].

The main reason why product platforms are constructed is because they allow manufacturing the maximum possible number of final products by using standardised components and various production procedures. This is why adapting a product platform is a process that involves discovering common elements in a given product family such as common functions or operations, parameters, features, components, subsystems, or a sufficient amount of information related to manufacturing a given product family as well as the later adjustment and standardisation of the above mentioned common elements or parameters [10].

Once the usefulness of the platform in manufacturing a given set of final products is recognised, the company can take action which concerns:

a) developing a product family and an appropriate product platform architecture in such a way as to obtain the final product platform that stands out in comparison to others in terms of construction or virtual structure;
b) discovering the limitations to which the components manufactured by the most frequently used platforms are subjected – this also involves:
   – identifying both common modules/subsystems in a given product platform and the mutual dependence between their interfaces;
   – identifying both common components of a given end product developed on the product platform and the mutual dependence between them.

The standardisation of a product platform proceeds mainly thanks to recognising technical elements of a given product platform, its components and subsystems.

This process involves the standardisation of:

a) components of a product platform along with its structure and parameters;
b) subsystems and interfaces;
c) the production process and product platform management etc. [10].

Table 1 shows the strengths and weaknesses of product platforms.

Table 1

Strengths and weaknesses of product platforms, the authors' own compilation based on [4, 5, 9]

Product platforms	
Strengths	Weaknesses
Strategic phase – various products reaching the market faster – entering niche markets – implementing new technologies – lower technological risk Design phase – lower development costs – reusing previously designed components and systems – reusing tried and tested technologies Production management phase – possibility of using the same tools in the production of various products – economical manufacturing – possibility of bulk purchasing of the same subsystems used for manufacturing various products – reduction in warehouse stock – lower quality-related expenses – flexibility in the number of product variants Phase of testing and putting into operation – reduction in the time devoted to testing product launching – shared testing equipment for various products – reduction in the number of certifying tests Phase of operating and maintaining the product – reduction in fixed costs of maintaining products due to their shared functions – lowering costs of staff training – lowering variable costs due to more efficient logistics activities	Strategic phase – restrictions on future investment resulting from the limited range of products manufactured by one platform – risk of the market being monopolised by a company developing the product manufacturing strategy Design phase – the necessity to do research into the technical and economic feasibility of developing a product – extra costs connected with the necessity to design additional product-differentiating components of the product platform – overheads connected with commonality management of the product platform elements Production management phase – increased complexity of product configuration management on the assembly line – increased costs of subsystems and production Phase of testing and putting into operation – increased costs of developing the methods of verifying and validating the product and the product platform Phase of operating and maintaining the product – risk of failure in manufacturing common elements for a variety of end products – increased complexity of operating multi-purpose elements – increased costs of operating subsystems – increased costs of product platform management

3. The significance of effective planning when attempting to use a product platform in the manufacturing process

Plans to use product platforms are increasingly being implemented by companies which try to provide their customers with more tailor-made products while maximising the economic profits of companies. Doing the planning to use product platforms in the manufacturing process is proactively defined as an integrated set of capabilities and related architectural rules constituting the basis for a given group of products. The successful implementation of product platforms in the manufacturing process provides the distinct benefits of lower production costs and enables the appropriate balancing of market needs – this makes it possible for companies to be more competitive in the marketplace.

The benefits of using product platforms in the manufacturing process are most visible in the process of developing an end product. The process of developing an end product on a given product platform begins with defining the overall product strategy in which the elements of a potential new product or platform are also defined. At this stage, key market needs and customer requirements are combined and the underlying capabilities of a product platform give the greatest benefits in the process of balancing a given product platform [1].

Figure 1 below shows the phases of product development.

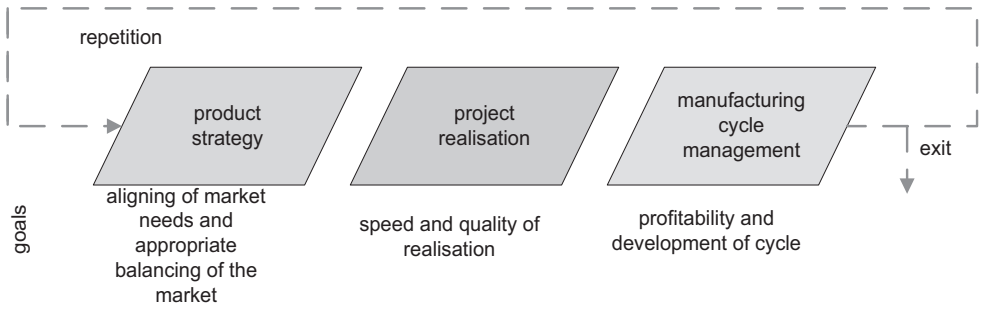

Fig. 1. Phases of product development [1]

Inappropriately planned product platforms result in a number of product development weaknesses in the manufacturing process, such as:

1) limited opportunities to plan the use of product platforms in the manufacturing process, which leads to product discards from a given platform;
2) failure to understand the technical feasibility and the operation of a product platform at a sufficiently early stage;
3) parallel development of both an end product and a product platform, which decreases the chances of balancing the product appropriately;
4) ineffective balancing of the platform see above note and the un-integrated architecture of the end product;
5) limited prospects of investments in product platforms, which is necessary for the future development of the end product;

6) compromise on the functionality of the end product due to the changes made to it, the features of the end product from a given platform are worse because the preset production schedules have to be maintained;
7) it is impossible to calibrate the infrastructure of a product platform which does not facilitate production growth [1].

Inappropriate planning by the company leads to higher capital costs, a slower pace in launching a product onto the market and a loss of opportunities to generate revenue. In order to minimise these weaknesses of the manufacturing process and maximise the value and importance of product platforms in the manufacturing process, a five-step methodology has been developed aimed at planning the use of product platforms in the manufacturing process effectively. This methodology relies upon:

1) a common language and terminology established in advance and used while developing product platforms;
2) specifying a product strategy and the value of it;
3) adapting product platforms to meet market needs;
4) identifying the vector of differentiation among various platforms;
4) developing matrixes of both end products and product platforms [1].

4. Research into product platforms

The research into product platforms was conducted in the ELEKTROBUDOWA S.A. company, which is a leader among Polish power engineering companies. ELEKTROBUDOWA S.A. provides comprehensive construction and installation services, implementing investments for the power sector, the petrochemical and mining industries as well as the turnkey construction of public utility facilities. The company manufactures electric power equipment including medium and low voltage switchgears, power substations and systems (Fig. 2). Being established over 60 years ago, the company has participated in the construction of almost all Polish power stations, thermal power plants and many other facilities all over the world [6].

The importance of using product platforms is becoming increasingly vital in various industry sectors and many companies have to take numerous decisions regarding this matter. The work is focussed on defining the basic architecture of the product platform.

1. **Stage One** – developing the platform as a physical structure of the product.
2. **Stage Two** – grouping operations in order to define the technological similarity or commonality of the manufactured products.
3. **Stage Three** – performing the cost analysis of a product platform.
4. **Stage Four** – defining the specifications of the given product platform. At this stage, an appropriate strategy should be adopted in order to find out about the goals as well as the limitations of a given product platform.
5. **Stage Five** – creating the product platform. This stage involves implementing the action strategy for the given product platform in the company.

The first three stages have already been completed. The authors of this paper are currently working on implementing stage four – this involves defining the specifications of the given product platform. The publications listed below [2–4] contain further information on the first stages of developing the product platform.

Fig. 2. Low and medium voltage switchgears produced by the ELEKTROBUDOWA S.A. company (images sourced from the company's catalogues)

5. Conclusion

In order to effectively utilise the benefits of the product platforms in the manufacturing process, we should start using them at the stage of product development. The five key stages of developing a product platform presented in this paper allow creating the plans of production lines which decrease the cost of developing an end product and give companies products that better satisfy customer requirements.

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