

# Unique concept of standardization, modularization and customization of products as a strategy of e-business

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## Abstract

Starting from the current economical paradigm – economics based on knowledge, this paper investigates production concept of realization of a complex product within production business system (PBS). The aim of this paper is to find an appropriate production concept which will enable PBS to suitably respond to the challenges of global environment, and in such way provide their survival, growth and development. Those are the reasons this paper analyzes relevant aspects of production concepts of product realization, that is, standardization, modularization and customization of products. Results of the analysis point to cyclic nature, that is, recursion of production concepts of product realization in time. The first production concept was the concept of customization of the products produced in manufacture. The next, more advanced, concept was the concept based on standardization of the product, which widely opened the door to mass production. The next, even more advanced, production concept was modularization of products, which enabled the development of product families in an economic way. Customization of products came back to production scene in a more advanced way, on a higher technological level, since it is now based on new information-communication technologies. Convergence of information-communication technologies enabled integration of all three concepts in a unique production concept standardization – modularization - customization. The above mentioned concept is characterized by production synergy as a result of the integration of its partial concepts.

**KEY WORDS:** production business system, standardization, customization, modularization, strategy, product

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## Introduction

Current economic paradigm of today is represented by *economics based on intensive use of knowledge* (Tapscott, 1996), in which individual product customers are in a specific way directly included in the production process with their knowledge, information, suggestions and ideas, and thereby actively participate in its realization. Mass production of a large number of homogenous products is in such way replaced by mass production of products made upon request of individual customers, which reflect their requests and taste at large. This paper investigates production concept of realization of a complex product within production business system (PBS). The aim of this paper is to find an appropriate production concept which will enable PBS to suitably respond to the challenges of global environment, and in such way provide their survival, growth and development.

## Research Methodology

In this paper, authors present results of conducted theoretical survey of production concepts of realization of a complex product in two different approaches, namely from the historical perspective and from the point of view of characteristics, advantages and disadvantages of production concepts. In that effect, theoretical analysis is used to identify relevant aspects of the concepts of customization, standardization and modularization in the function of realization of a product, such as definition, characteristics, advantages and limitations of the concepts, which determine when and to which extent PBS will apply some of the partial production concepts.

## Theoretical Overview

### **Standardization of products**

Generally, standardization is defined as “an activity in determining regulations for general and multiple use, with regard to real or potential problems, so as to obtain optimal arrangement level in the given context” (Galvin, 2001). It consists of formulating, issuing and application of standards on a national, regional and international level. Standards are the output from standardization activities.

**Standardization of products** is primarily significant for this paper. Standardization of taste, which enabled standardized product design, stands in the core of standardization of products. Standardized product design further enabled mechanized mass production, which then led to mass product distribution. In the scope of contemporary production concept of product realization, standardization is represented in all the spheres of PBS functioning, in other words, we can talk about its almost total horizontal diffusion within PBS.

In a PBS, figure 1, standardization is present at the input of a process, within the very production process, in the management of the process, and also at the output of the process.

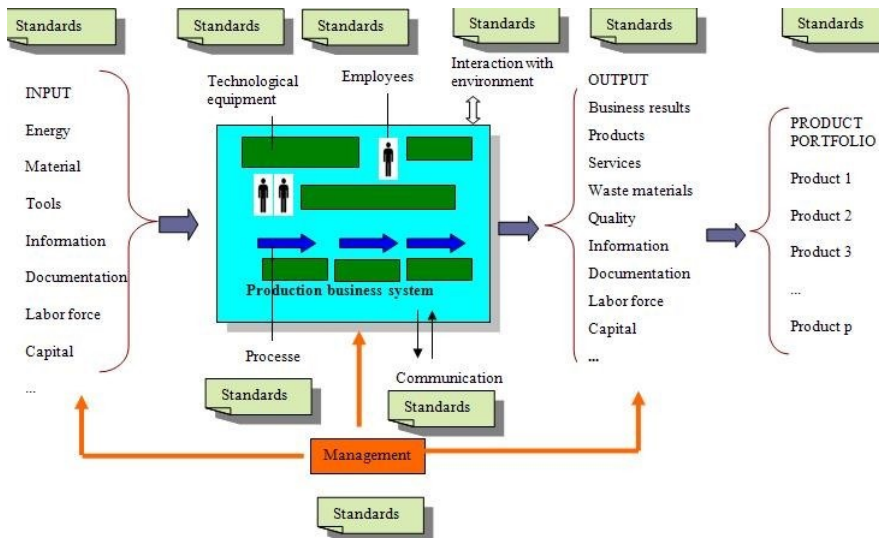


Figure 1: Representation of standardization in PBS

Source: Authors

Standardization of products strongly impels massification of production. Its *advantages* are reflected in the following:

1) *product convenience improvement*: easier access to new markets; shortening the time needed for a product to get to a market; presenting new technologies on the market; interoperability of one's technologies and products with complementary ones; managing financial risk related to innovations; accepting innovations from the customers' part; licencing patents by referring to them in the standards; technology transfer; better estimate of new technologies.

2) *preventing and removing obstacles in the trade, as well as facilitating industrial cooperation*: supporting the development and promoting innovations; ensuring the quality of a product; increasing security and protection of product customers and environment; improving the image and rating of a PBS; improving technical regulative and stimulating national as well as international competition between suppliers in the same economic branch (ISO/IEC, 2007).

Standardization of products has two main *disadvantages*:

1. Standardization of products tends to average customers' needs.
2. Realization of standardized products of mass production has certain irrationalities, especially in the case of registered needs for higher product diversity, that is, development within certain product families.

As a rational concept of overcoming the second disadvantage of standardized production, **modularization of products** is introduced.

## Modularization of products

Modularity is a notion which indicates the level up to which the components of a system can be divided and combined again. Industrial design is of importance for this paper, and from that standpoint modularization can be defined as an activity in which structuring of complex products by using constitutive elements – modules takes place (Miller, Elgård, 1998). The term module (latin *modulus*) identifies either length measure or standard measure for covering proportions. In context of this paper, module is a component of a product which represents an independent functional unit in relation to it and has a standardized interface, as well as interactions which enable configuration of a complex product.

According to (Florent, 2005), *modularization of products is a coherent decomposition of a product in subsystems, made by integrating elements of lower level. These subsystems are named modules and they interact with each other through interface.* Compared to standardized product, modularization demands a different approach in product designing (O'Grady, Liang, 1998). Configuring different product families enables introducing flexible structure of a product, that is, using mutual modules and parts across the appropriate product family (Stan, 1997). In such a way, figure 2, modularization of products leads to the development of a product family.

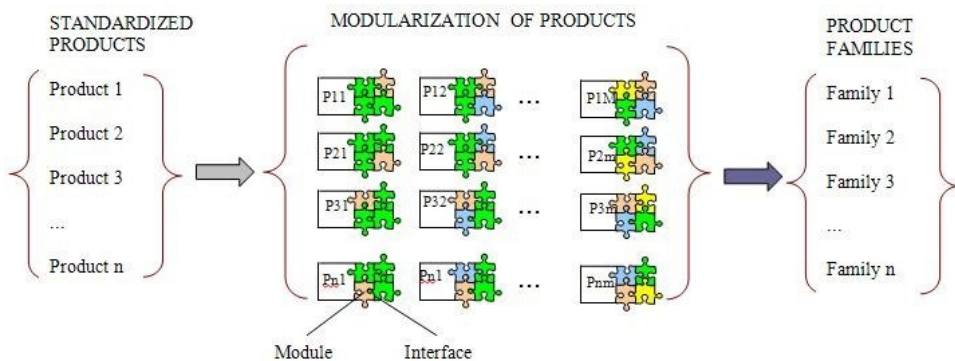


Figure 2: Basic concept of product modularization

Source: Authors

Realizing complex products on modular principle, has its advantages and limitations. The **advantages** are reflected in the fact that modularity of a product makes the complexity of a product manageable; enables parallel work, as well as the fact that it is more tolerant in respect to uncertainties (Baldwin, Clark, 2001). The disadvantages reflects in higher costs, caused by application of modular structure of products.

Industrial standardization largely enabled satisfaction of the needs of customers whose tastes are rather similar. Modularization enabled further increase in diversity of variety of choice for a customer (the development of product family). However, the question remains: what happens with those customers whose taste deviates from what is offered. Overcoming the above mentioned limitation became possible only with intensive development and convergence of ICT. New ICTs enabled the comeback of **customization of products** to the scene, by realizing products in the conditions of mass production, highly standardized and backed up by modularization of products.

## Customization of products

Customization means that product realization is done according to specific customer demands. In contrast to traditionally standardized production, where producers impose their standard products to customers, customized production is flexible, the products are adapted to the very customer's demands. Customized product, figure 3, can be perceived as a product modified according to customer's needs. According to (Sievänen, 2002) "*Customization generates higher product differentiation, which furtherly leads to product diversity increase, and starts with negotiations with the customer on the details of the order, which continue in the course of design, production, and sale of the product.*"

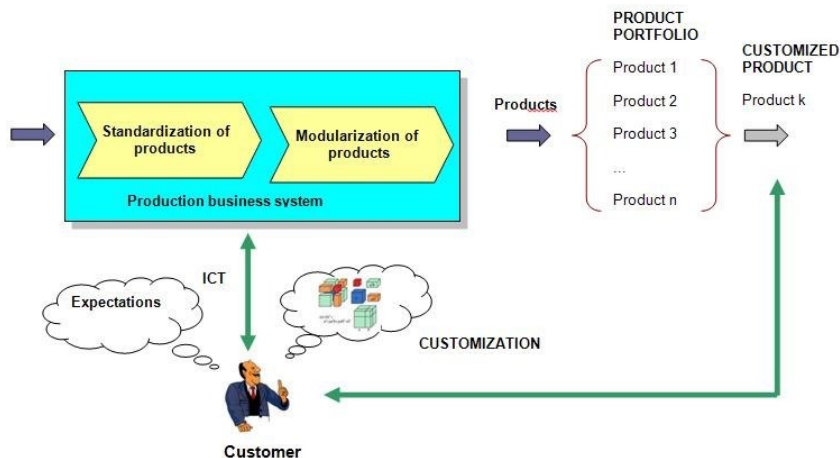


Figure 3: Principle of product customization

Source: Authors

Customization implies that application of standard parts maximizes satisfaction of outspoken customers' demands, and at the same time, it minimalizes technical interventions in the scope of available technical equipment. Thanks to ICT, the producer can establish direct communication with each single end customer, so as to satisfy their specific needs. Customization of products is conducted together with *communication customization*, as well as with *price customization* (Wiegran, Koth, 2000).

Customization occurs in different forms, but the one mostly applied practically is *mass customization* (Stan, 1997), which distinguishes both the advantages of mass production (size economy, continuity), and stability of production process, while paying attention to taste and demands of individual customers. In contrast to the products of mass production, the products realized in the scope of mass customization are put together from wholesale produced parts and modules with the aim to satisfy the needs of an individual customer. Mass customization can be:

(1) *Design customization*, if comprises involving customers in the starting of production process of making the product from the very beginning.

(2) *Manufacture customization*, if comprises the possibility of manufacturing a product which we offer to a customer, design of which is defined beforehand.

(3) *Assembly customization*, if comprises the possibility of assembling the product with beforehand defined number of options, by applying standardized components of the product.

(4) *Distribution customization*, if comprises product in which a customer can customize the package, configuration and location of delivery of the product (Squire et al, 2004).

Customization of products has some advantages and disadvantages.

The *advantages* of customization are as follows:

(a) when PBSs are doing *business in classical way*:

- It can lead to increase in sale;
- It establishes higher intimacy between PBS and a customer; and
- It represents an effective way to obtain valuable information from customers (Sievänen, 2002).

(b) when PBSs are doing *e-business*:

- It can be used for the support of e-business, like attracting new visitors to the website, converting visitors into loyal customers, increasing the income share from loyal customers, focusing sale activities on products with high margin on loyal customers;
- It offers customized messages which PBS uses to inform the customers on special productive-sales conditions, and reminds them on their important dates (birthdays and other dates...);
- It offers additional privileges to customers for bought products;
- It provides answers to personal questions of customers;
- It gives information on the status of product order;
- It enables on-line customer interface;
- It adjusts the level of presenting to a customer;
- It offers target focused advertising for selected customer group;
- It enables dynamic prices that can be adjusted to the current situation by producer;
- It provides customized prices that producer can apply for different customers at any time (Wiegran, Koth, 2000).

The *disadvantages* of a customization of a product are reflected in the facts that:

- Implementing customization in PBS demands additional engagement of human resources, primarily in the scope of engineering activities;
- Customization has little effect in production subsystem, but the time of manufacturing parts and modules, as well as the time for additional inspection increases;
- On PBS level, it most often leads to increase in the price, which negatively affects its competitiveness;
- Precondition for its successful realization is previously applied modular design (Sievänen, 2002).

## Findings and discussion

The first production concept was the concept of **customization of the products**, produced in manufacture, when the customer was obliged to go directly to an appropriate craftsman to get the product they needed (by communicating directly). Then the craftsman would adapt the requested product through individual production to the demands of the customer (e. g. shoes, clothes, furniture, house, and so on).

That concept is gradually replaced by production concept of a **standardized product**, which differs from the previous concept in quantity (mass production), the way of manufacture, price, as well as communication. Enhancement of the quantity of products lowers prices of the products; the market expands beyond the scope of the immediate factory surroundings. Production efficiency is dramatically larger, the advantages of standardization are shown in full, the price of the products is lower, which makes them affordable to a larger number of people, there are different middlemen in the life cycle of a product (wholesalers, retailers, dealers, and so on). This makes communication between the producer and the customer indirect (ANSI, 2011). The practice of manufacturing more complex products in the conditions of standardized products of mass production showed certain disadvantages of that concept, which are especially reflected in the case of needs for higher variety of products, as well as in the case of averaging the taste of customers.

So as to overcome the first disadvantage of the concept of a standardized product, a new production concept – **modularization of products** is introduced. Modular structure of a complex product as a system is made of independent, functional units - modules, with standardized interface and interactions, in accordance with product definition. In such way, the enlargement of choice varieties for an individual customer is enabled.

As to overcome the other disadvantage of the concept of a standardized product in the case of averaging the taste of customers, a new production concept based on intensive development of information–communication technologies (ICT) imposed itself as an adequate alternative. New ICTs made **customization of products** come back (Wiegran, Koth, 2000). In such way, Figure 4, the cycle of production concepts starting from the original customization, via standardization, then via introducing modularization of products, is again closed with the current customization of a product, but on a new basis.

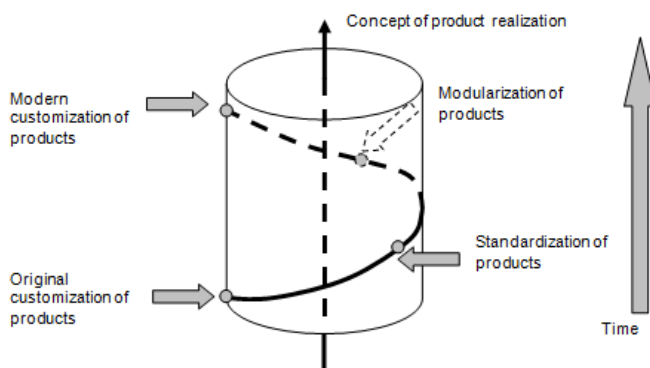


Figure 4: Spiral cycle of production concepts of realization

Source: Authors

## Conclusion

So as to adequately respond to the challenges of global environment, PBSs are forced to find an appropriate production concept. Certain partial production concepts dominated in different periods: standardization, modularization and customization. It was only ICT development which enabled an adequate rounding of production concept of product realization and integration of all the three concepts into a **unique production concept standardization – modularization - customization**.

Dominant production concept of a product realization now becomes the concept of product realization, based on synthesis of standardization, modularization and customization of products, and is characterized by production synergy as a result of the integration of its partial concepts.

In that sense, this paper identifies these relevant aspects of the concept of product realization: definition, characteristics, advantages and limitations. Given that there is no systematized unitary view on integral production concept in relevant literature, this work could represent a **theoretical contribution** in this field of research.

Identified concept of product realization defines when and how much PBS will apply one of the partial production concepts of customization, standardization and modularization of products. The **practical contribution** of this paper is reflected in the fact that it can serve as useful guide in strategic management when adopting future strategies in the field of orientation on production concept.



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