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# POSTPONEMENT IN LOGISTICS STRATEGIES OF GLOBAL SUPPLY CHAINS

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## ABSTRACT

The paper aims to present postponement strategy as a crucial element of logistics strategies of today's global supply chains. The article presents the history of postponement, characteristics of this concept, types of postponement and important information about its implementation in global supply chains. The paper also contains guidelines for future research on postponement concept.

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## INTRODUCTION

Over the few last decades supply chains have evolved from traditional, forecast-driven push to demand-driven pull systems. Competition in today's global market takes place between whole supply chains (Christopher 1998). The dynamics of changes in consumer preferences triggers the need to build responsive supply chains, especially in luxury goods sectors, which also include the automotive sector. Large number of product variants, of which the customer chooses only one option, forces chains coordinators to carefully plan supply, production and distribution. Action planning becomes complex due to the large number of different assortment positions associated with the production and the places of origin and destinations of materials and finished products. For this reason, global supply chains are implementing postponement as one of the main elements of their logistics strategies (Feitzinger, Lee 1997).

Of course, postponement is not a new direction in creating logistics concepts. It had been present in literature and business practice for a long time, but has gained greater popularity and attention only recently. The postponement was already mentioned by Alderson (Alderson 1950) in the 50s and Bucklin (Bucklin 1965) in the 60s of the 20th century, but according to the Council of Logistics Management, the first signs of implementation of practices similar to the postponement were already present in the 20s (Yang, Burns 2003). Alderson had a special role in popularizing postponement. He mentioned it in the context of marketing. He stated that the postponement may help reduce operating costs and make the product portfolio more attractive to the customer at the same time (Alderson 1950). Next, in 1965 Bucklin claimed that postponement is targeted on shifting the risk of changing demand volume from retailers, dealers, wholesalers, and manufacturers to suppliers while delaying the flow of materials and at a later stage - finished products (Bucklin 1965). Therefore postponement was introduced initially as a marketing strategy to reduce the risks and uncertainties related to rapidly changing demand. The main objective was to delay the creation of time and space utility (Yang B., Yang 2010).

The development of postponement concept occurred in last decades, but it was very slow. It gained popularity only in recent years. Still in 2003, Yang and Burns wrote that the postponement was then in infancy stage and was not a major element of the logistics strategies of global supply chains (Yang, Burns 2003). Today, it has already been a key component of their strategies.

This article aims to present the concept of postponement as an essential component of global supply chains strategies. In order to accomplish the goal, the paper was structured into several sections. Firstly, postponement strategy is presented. Secondly, types of postponement in the context of company's portfolio specifics and customer demand are detailed. Next, part of the paper concerns implementation process, its sequence, main focus areas and constraints.

In the end, the conclusions are drawn from the results of literature review and the implications for the further research are indicated.

## POSTPONEMENT IN LOGISTICS STRATEGIES

The most important element of supply chain management in an uncertain environment should be keeping track of even weak signals that may disrupt chain operations. Early information about changes makes it possible to address the disruptions and improve chain management, for example, by changing the production and logistics strategy in certain fields (such as procurement) (Yang B., Yang 2010). An important feature of today's supply chain strategies is to strive to increase the level of flexibility while maintaining a high level of competitiveness, which is achieved by low prices and high quality products. Low prices in turn mean the need to maintain low operating costs, especially variable costs. Supply chain flexibility can be achieved through the use of multi-skilled workforce, versatile equipment and companies' integration in the whole supply chain. Only then is it possible to adjust the chain to last-minute changes.

Flexibility built on the mass customization approach is created using three solutions concerning the processes. These are as follows: postponement, resequencing and

standardization (Feitzinger, Lee 1997). Postponement means to shift the point of product differentiation according to customer requirements for – possibly – the last part of the production process. Resequencing in turn means a redesign of the production process to allow assembling the parts that cannot be varied by the customer in the initial stages of the process. Standardization of processes lies in the arrangement of activities making up the process and determining the order and content of the tasks in the process. These three elements ensure the effective implementation of the mass customization concept in production processes carried out even for a completely different car models produced especially on smart, production lines, able to switch to different configurations. In this way flexibility of supply network (agile supply network) is built.

Postponement strategy is therefore a derivative of the concept of mass customization. Product differentiation should occur at the latest possible point in the value chain (Feitzinger, Lee 1997). This of course requires configuring the supply chain accordingly to ensure the maximum efficiency of information flow and consequently, the movement of goods. Postponement therefore is presented as delaying actions in the value chain until they register real information from the market. Implementation of this concept results in blurring the supply chains of these activities, which have been otherwise strictly defined. Also, the responsibility for creating value for the customer becomes blurred. Postponement strategy is also often seen as a practical method of supporting the implementation of mass customization (Lampel, Mintzberg 1998). It should also be clearly stated that the main objective of the implementation of the postponement strategy and mass customization is to protect the supply chains against Forrester effect (bullwhip effect).

The reduction of logistics costs is often one of the purposes of implementing postponement (logistics costs according to Davis and Sasser represent approx. 10% of the final price of the product) (Davis, Sasser 1996). This was in the cases of first implementations of this concept.

Feitzinger and Lee in 1997 described the use of postponement in the strategy used by Hewlett-Packard (Feitzinger, Lee 1997) manufacturer of computers, printers and medical machines. It was one of the forerunners of the implementation of this concept. In 1994, after an analysis of production and distribution strategies, HP decided to introduce groundbreaking changes in logistics management of personal computers. Modularity, build-to-order (BTO), mass customization and postponement proved to be the perfect solutions for the implementation of the offer consisting of a number of computer models. BTO strategy was introduced in all business units in 1995, and as a result HP offered customized computers faster and cheaper than market competition (Feitzinger, Lee 1997). This example became a proof for the simultaneous production of highly customized products and maintaining low operating costs, especially variable costs related to the components.

## TYPES OF POSTPONEMENT

Originally postponement was introduced in order to reduce the operations risk in supply chains (to reduce the amount of unsold finished products in the sales network), in particular, to reduce the risks and costs in the area of product differentiation. This ap-

proach has been extended to form of several mixed strategies, in which determination should be made to what extent the strategy will be based on postponement, and to what extent on speculation (mass production). Speculation is seen as a push approach, and postponement as a pull-approach in logistics management (Shapiro (1984)). Grey and white rectangles in Figure 1 separate not just speculation and postponement, but also standardization and customization. The make-to-stock (make-to-forecast) strategy is typical for a full speculation strategy (no postponement), while make-to-order is the manufacturing postponement described in the next paragraphs, and engineer-to-order is in fact a full postponement (product development postponement). Pure speculation is connected with product standardization, lean approach, globalization of operation and centralization of processes. In turn, pure postponement is related with customization, agility, localization and de-centralization.

The first step to implement postponement in formed strategy is to reduce the uncertainties of the process, since the processes are areas most easily affectable (see Figure 2). Frequently two processes are compiled into one, while certain processes are carried out simultaneously or resequenced. The main objective is to create functional integration of processes. Usually centralizations of inventories (where postponement is formed in place of utility) are introduced and delayed deliveries in different places in the chain (postponement is formed in time of utility) are implemented. Then, the foundation for the subsequent phases of the postponement is formed. Typically, at this stage, the delay in the assembly is introduced (e.g., in the automotive industry) using the modular design of products.

The second step to implement a full postponement is to reduce supply uncertainty. Suppliers provide the generic base products, components or services, which are necessary for the implementation of postponement strategy. Suppliers are often associated with the manufacturers' development of product portfolio as well as individual products.

The third and final step is to reduce uncertainty of demand, which requires, of course, focus on clients. Not all goods should be provided and delivered to customers at the same level of service - sometimes customers are not willing to wait for the product, while at other times, waiting time does not matter to them. Therefore, the portfolio will not consist solely of customized products, but they will play a very important role in the sale. The implementation of such a system requires a cross-functional and cross-organizational integration in the supply chain. Then it is possible to effectively reduce all kinds of uncertainty. According to B. Yang and N. Burns, only the implementation of all three steps will allow flexible supply chain maintaining low costs ((Yang, Burns 2003).

Modularity in the production development or production cycle, mentioned above, is a key indicator of the degree or type of postponement provided (Yang, Burns, Backhouse 2003). The level of modularity determines the choice of the postponement variant that should be implemented (see Figure 3). In the case of high modularity, product development or production postponement should be implemented. It would be the best solution to divide the manufacturing process into separate stages. If the modularity level is low, then attention to the level of uncertainty should be paid and the purchasing postponement or logistics postponement should be selected (Yang, Burns, Backhouse 2003).

Figure 1. Postponement strategies
Source: Yang, Burns 2003; Lampel, Mintzberg 1998.

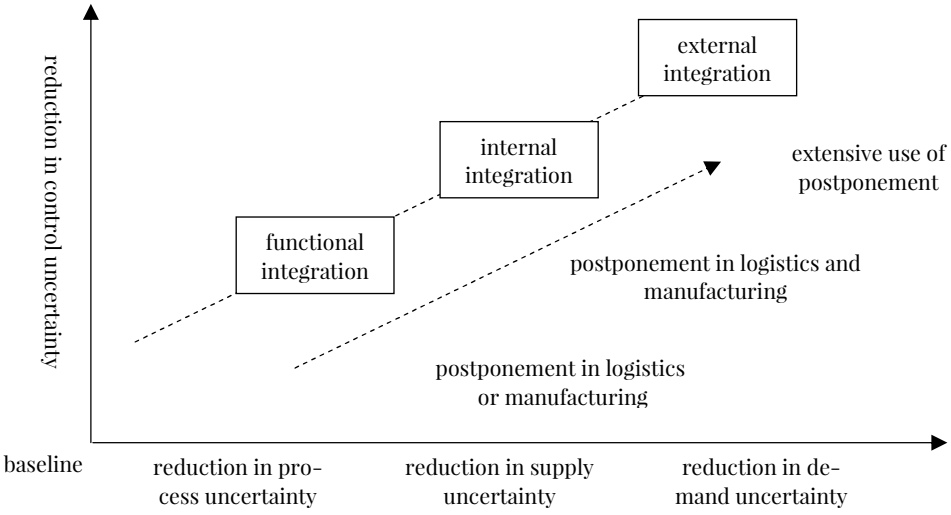


Figure 2. Postponement types and uncertainty
Source: Yang, Burns 2003.

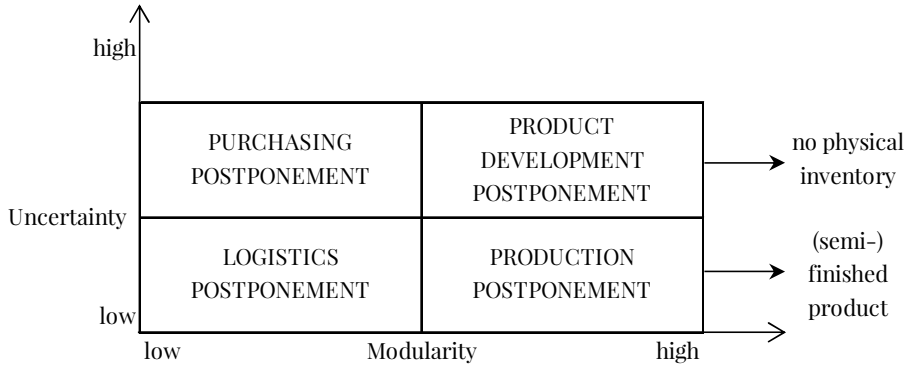


Figure 3. Types of postponement
Source: Yang, Burns, Backhouse 2003.

J.H.Y. Yeung, W. Selenium, Z. Deming and Z. Min introduce another limitation in choosing the appropriate scope of postponement implementation. They propose to introduce specific solutions in the field of postponement depending on the level of chain balance:

1. If supply chain is balanced (no single actor is more important than others), speculation or logistics postponement or production postponement should be implemented.
2. If supply chain is unbalanced, purchasing or product development should be introduced (Yeung et al 2007).

If there is no dominant link in the supply chain, it is difficult to determine postponement in the early stages of product development or ordering supplies. The chain is not controlled by any leader and therefore postponement, if it occurs, should be implemented in the final stages of creating the product value. In addition, the flow of information is much more prone to distortion, which greatly hinders the retrograde planning when information about demand and customer preferences is available.

On the other hand, if the chain is controlled by the leader, this dominant company can impose certain roles to individual members of the supply chain and then controls all or a majority of them. Then it is easier to assign certain tasks in the value chain and it is possible to get greater benefits from the implementation of postponement. The earlier process in the chain, which is connected with a product, the greater the improvement of matching the offer to the customer's requirements. It is important, however, for the flow of information in the chain to allow for fast forwarding of messages about demand within the whole chain. What matters is also the ability to re-plan chain activities in an emergency situation of changes in the structure or level of demand.

## IMPLEMENTATION OF POSTPONEMENT

The ideal level of postponement implementation is when the whole cycle from ordering materials through production to delivery to the customer is planned when the customer places an order (full postponement strategy). But even here caution should be exercised - often companies offer possibility to change the decision by the customer even a long time after ordering. Accordingly, the problem of planning of the supply chain is more difficult to solve (Yang, Burns, Backhouse 2003). In addition, the decision to introduce postponement strategy is a decision made in five main areas of the company: marketing, research and development, manufacturing, distribution and finance, so the implementation process is much more complicated than it seems to be (Feitzinger, Lee 1997).

Additionally, there are two main areas, which have to be clarified in terms of the postponement implementation in the supply chain before deciding on the scope of implementation of this concept:

1. postponement and outsourcing - which activities the company (or supply chain) carries out by itself and which it outsources to external companies; what outsourced activities should be postponed, and how to establish cooperation in this area (e.g., packaging, final assembly, even entire production process),
2. postponement and capacities - sometimes the manufacturer is squeezed out of the flow of goods in the postponement implementation. Manufacturers try to keep some of the key operations in their facilities even if they do not carry them out themselves. In the supplier zones structured as condominiums or consortiums, suppliers are working at the manufacturer's plant, even using their own resources, however, are controlled by the manufacturer. An important aspect of planning supply chain operations in the postponement strategy is to manage capacity, in particular capacity planning. First of all, resources or assets should be properly allocated. A good solution is to create leagile supply chain (lean means companies

operating with little spare capacity, while agile means that the maximum capacity of the supply chain is higher than average demand).[1]

B. Yang and N. Burns propose implementing the Pareto rule to the postponement strategy. They argue that 20% of capacities will generate 80% of products. These capacities should be used for non-postponable activities, and the rest of the company or chain capacities should be used for the postponement strategy ((Yang, Burns 2003).

Postponement strategy is used to move the decoupling point (DP) closer to the end user. The location of the DP (in some research results: POD - point of differentiation) in the supply chain significantly affects the growth of chain competitiveness (Vanteddu G., Chinnam 2014). The key to success of the supply chain according to van Hoek et al. is to find the optimal mix (balance) between standardized upstream activities in the supply chain and postponed activities downstream the chain (until customers' orders are received) (van Hoek 1997). Decoupling point is often identified with the order penetration point or customer decoupling point. The optimal DP will vary with market conditions. It is a balance between the type of product, market, production process, and inventory. It also regulates the nature of postponement strategy (Yang, Burns 2003). Given the volatility and many characteristics of demand postponement may form several points in a supply chain (Yang, Burns 2003). Often, DP is intuitively determined in the supply chain to separate the delayed actions from the non-postponable ones.

The success of postponement implementation depends on the competitive environment. First of all, the level of uncertainty of actions should be analyzed to appropriately adjust the level of postponement implementation to the specifics of a given entity. Of course, in the case of high predictability of demand and other market conditions, the benefits of postponement implementation are much lower than in the dynamic, unpredictable, chaotic markets.

B. Young, N. D. Burns and C. J. Backhouse describe what factors contribute to the effective implementation of postponement. The exchange among them is as follows (Yang, Burns, Backhouse 2003):

- marketing issues:
  - high sales fluctuation,
  - short product life cycles,
- product issues:
  - customization,
  - commonality,
  - modularity,
- production process issues:
  - process decouplability.

Program of implementation of such a concept should be based on (Feitzinger, Lee 1997):

- modular design of the finished product so that the same modules can be assembled in different versions of the product or other products,

[1] Lean and agile are not compatible - what is a waste in lean, is essential for agile. See in: Mason-Jones, Naylor, Towill (2000).

- modular design of the production process so that its sub-processes will be able to interchange with each other and resequenced, if necessary, and the implementation of the same sub-processes in the same order for the production of various products,
- such supply network planning to meet two postulates as follows:
  - network must be able to provide components for various plants at low cost,
  - network must be flexible and responsive to meet the needs of the customer (taking orders for very various products) and quickly provide customized products to the customers.

The success of postponement is in first place in the modular product architecture. In the early stages of product design, information about the real demand may not be available because a significant portion of customer preferences have not occurred yet. Often, there is also a problem of selecting specific technology among several similar technologies. The choice will later have an impact on the final result of product sales. A lot depends also on the manufacturer's cooperation with suppliers. In the case of postponement at Toyota, the responsibility for design and technology is largely shifted to suppliers. Suppliers also provide new ideas to Toyota, which examined the proposals of particular suppliers, compiled them with available market information, and made a choice.[2]

Implementation of postponement is also associated with many problems, such as, for example:

- aversion to change - recognized in top management, employees, business partners in the supply chain,
- low effectiveness in flow of information - supported by weak technology or because of wrong design of information flow network, bottlenecks appearance etc.,
- unwillingness to give up part of the capacity for make-to-order operations; unwillingness to work with an unstable demand (periods of shortage of working hours, overtime periods).

## CONCLUSIONS

Postponement is a response to the growing uncertainty in business environment about customer demand. It allows the operation of supply chains based on real market needs. One enterprise or whole supply chain can simultaneously use different types of postponement strategy depending on the product or family of products, which they offer.

Postponement is based primarily on the short term planning and forecasting, which is made in the basis of accurate and reliable information. First of all, the flow of information from the market to the company, and in fact - the whole supply chain is important in determining the scope of postponement. This area should be dealt by logistics information. Development of the Internet resulted in postponement strategy implementation becoming possible. Quick access to information about actual market needs has led to rapid response to changes in the supply chains.

[2] It is called co-designing and co-investing. See also in: Ward et al (1995).

The higher the uncertainty of demand, the greater the benefits from the implementation of postponement. However, various companies are able to react differently to specific types and areas of uncertainty. They must take into account their strategic capabilities. Therefore, they implement different types of postponement.

The implementation of postponement strategy is impossible without implementation of the concepts that support it. They are modularity, commonality of production, mass customization and just-in-time. The combination of these elements provides a good chance of increasing efficiency of supply chains and sales profitability.

After reviewing the literature, the author identified some crucial unexplored research areas that should motivate academics and practitioners to further explore the subject.

Some companies focus on implementing the strategy only in one area or manufacturing process, others are implementing it across the organization. Both situations should be analyzed and the outcomes obtained as a result of these implementations should be compared.

Despite many papers about postponement strategy implementation, no complete analysis is available of postponement in the case of bottleneck resources management and combining postponement with other logistics concepts, especially new ones (modularity, commonality). Researchers should definitely look at implementing the strategy of postponement in the various phases of the product lifecycle. These are also areas that should be more popular in the research of logistics and production areas.

No appropriate study is available, either, which concerns issues of information flow system design in the context of different variants of postponement strategy. Nowadays there is need to research this area in the context of the whole global supply chains, especially in the most dynamic and uncertain sectors, like IT or automotive sectors.

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