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ANTON HELANDER

Impact of Form Postponement on Channel Members' Performance in Paint Business: A Theoretical Approach

ABSTRACT

Recently, form postponement has attracted a great deal of interest. Nevertheless, previous studies suffer from some serious limitations. First, there is little research addressing the influence of different postponement types on the performance of independent channel members. In addition, the focus of postponement discussion has been on logistical issues, and marketing values have not been taken into account. For these reasons, the new defition for form postponement was formulated.

Furthermore, factors which describe the degree of advantages obtained with form postponement in different markets were defined. Moreover, performance factors were divided into three categories: investments, cost economies and marketing values. The paper focuses on postponement solutions in the paint business, assembly and manufacturing postponement. The finding of applications was conducted in cooperation with a Finnish supplier of postponement systems for paint businesses, Tikkurila CPS Oy.

Based on the discussions, a normative framework for the analysis of form postponement solutions in the paint business was built. Despite the focus on paint business, the framework can be used in the analysis of other business fields as well.

Key words: *form postponement, mass customization, time-based competition*

ANTON HELANDER, M.Sc. (Econ.)
Helsinki School of Economics and Business Administration, Department of Marketing, Helsinki, Finland
• e-mail: k22770@kyyppari.hkkk.fi

1. INTRODUCTION

In recent years, increased product variety and service requirements have led manufacturers to finding new product and process redesigns (Lee & Tang 1997). For instance, a supplier of electronic equipment, Hewlett-Packard, has applied postponement principles. Of Finnish manufacturers, Tikkurila CPS Oy supplies postponement solutions for paint manufacturers all over the world.

Several researchers (e.g. Zinn and Bowersox 1988; Lee and Tang 1996) have studied postponement. However, the concept of postponement was first introduced in marketing literature by Alderson (1950, cited by Lee 1994). In Finland, Inkiläinen (1996) discussed the possibilities of postponement.

The focus of this paper is on the impact of postponement solutions on channel members' performance. In contrast to the previous discussions, which have concentrated on global solutions, this paper discusses solutions at country level. Moreover, there is little research related to postponement which addresses the crucial issue of interorganizational relationships in the distribution channel. Zinn (1990) mentioned the importance of this issue, but all other researchers focus on manufacturers' own distribution outlets. Furthermore, an analytical approach to the paint business is taken. Bowersox (1978, 181) and Feitzinger and Lee (1997) only mentioned tinting systems as an example of form postponement. Also, a new postponement solution, miniplant, is analyzed. In general, using Hunt's (1983, 10) three dichotomies model of marketing, the study was normative, concerned the profit sector and had a micro approach.

2. KEY CONCEPTS

This paper discusses the concept of postponement in a broad sense. Thus, time-based competition introduced by Stalk (1988) and mass customization introduced by Davis (1987) are first discussed, because they use postponement as a tool to achieve a competitive advantage (see Persson 1995; Lee & Feitzinger 1997). These two concepts reflect the new market requirements for manufacturers and distributors. Secondly, the concept of form postponement is analyzed. Moreover, definitions for postponement are discussed, including different postponement types and levels.

2.1 Time-based Competition and Mass Customization

Time-based competition refers to "the ability to deliver a customized product within a shorter elapsed time than can competitors in the same market, and is usually measured in terms of delivery lead time" (Handfield 1993). According to Stalk and Hout (1990, 60), time represents

an expanded pattern for corporate success. In addition to the traditional pattern of providing the most value for the least cost, the expanded pattern offers the same in the least elapsed amount of time.

A time-based competitor creates competitive advantage based on three competencies (Persson 1995). First, *time-to-market* is the ability to develop and introduce goods and services more quickly than competitors. Second, *time-to-customer* is the capability of supplying goods and services more quickly than competitors. Third, *flexibility* means tailoring services more exactly according to customer needs than do competitors. Thus, these qualities should be achieved through postponement.

Another market trend, mass customization, is "the capability to produce customized products while achieving the cost benefits of mass production" (Cravens 1994, 213). Pine II (1993, 47) argues that customized products should have a higher price than basic products. Furthermore, Feitzinger and Lee (1997) have developed three organizational-design principles which together form the basic parts of an effective mass-customization program. *First*, a product should consist of independent modules which can be assembled easily and inexpensively. *Second,* manufacturing processes should consist of independent modules which can be moved or rearranged easily to support different distribution-network designs. Further, there are three types of process principles: process postponement (e.g. paint business), process resequencing (e.g. case Benetton), and process standardization. *Third,* the supply network should provide the flexibility to take individual customers' orders and deliver the finished customized goods quickly.

2.2 Form Postponement

As discussed, the key to effective mass-customization is postponing the product differentiation (Feitzinger & Lee 1997). First, it is worth redefining the concept of form postponement. There are two definitions made by the leading authors in postponement discussion. However, these definitions can be considered rather narrow.

According to Bowersox et al. (1986, 57), form postponement is *the concept of retaining the product in a neutral status as long as possible in the manufacturing process.* On the other hand, Garg and Lee (1997, 1) defined form postponement as *the strategy of delaying product differentiation as long as is cost-effective*.

The first definition suggests postponing as long as possible. However, that is not necessarily the case. The second definition argues that by taking into account only the cost factors the most suitable postponement solution can be found. This definition seems to be very production and logistic orientated, in other words, marketing values are not included. The previous section suggested that form postponement is the key to mass-customized products in an effective way. In addition to cost reductions, price increases can be obtained. On the other

hand, if the supply chain consists of independent members, each one should obtain its own part of the additional benefits. Otherwise, compensations between channel members should be determined, which might be difficult to implement. Based on these arguments the author has formulated the new definition for form postponement: *the strategy of delaying product differentation as long as possible in the distribution channel provided that it creates additional benefits for each participant*.

Further, Zinn and Bowersox (1988) introduced four types of form postponement: labeling, packaging, assembly and manufacturing. This paper concentrates on differences between the last two postponement types. Of the other two types, labeling postponement is not often implemented in paint production, because without labels the product type is difficult to determine without opening the cover. However, when the same product is delivered with different brand names to different stores, i.e. private labels, labeling postponement can be used. On the other hand, packaging postponement is not used because it is not practical for fluid products.

Of the two selected postponement types, *assembly postponement* means warehouse assembly to a customer order. The assumption is that a base product with a number of common parts is sold in a number of configurations that are customer specific. The basic distinction between assembly and *manufacturing postponement* is the degree of warehouse assembly. In essence, manufacturing postponement is a complete job-shop strategy. (Zinn & Bowersox 1988)

As mentioned in the foregoing, tinting systems represent assembly postponement in the paint business. The key to postponement was separating the production process into two subprocesses: the production of the base paints and the mixing of the colourants and base paints. The first subprocess is common to all products and the execution of the second step is postponed to distributors' outlets. Instead of making a broad range of different colour shades to meet customers' specific requirements, factories make base paints and use colourants, which hardware and paint stores stock. The retailers use a colour measurement system to analyze a customer's paint sample and to determine the paint-and-colourant mixture that will match it. This innovative process provides customers with an almost unlimited number of consistent choices and, at the same time, significantly reduces the inventory of paint that stores need to stock in order to match every customer's desired colour. Tinting systems can be further divided into manual and automatic machines (Suikki & Jousimaa 1995, 5).

A new postponement type in the paint business is manufacturing postponement, miniplant (see Grundfelt-Forsius 1996). Contrasted with assembly postponement, manufacturing postponement allows postponing not only the colour shade but also the can size, product type and gloss level decisions. Instead of base paints, the manufacturer produces components. Another difference is that, in addition to the colourant dispensing machine, a dosing equipment of paint components is needed at the point of product differentiation. Table 1 shows what is

Table 1. Example of complexity indeces in paint business

Assortment	Miniplant	Tinting	Traditional		Complexity ratio
– can sizes		4	4	Traditional *vs* tinting	2400/240 = 10
– product types		*10	*10		
– shades/bases		*3	*30	Tinting *vs* miniplant	240/15 = 16
– gloss levels		*2	*2		
Total	15	= 240	= 2400	Traditional *vs* miniplant	2400/15 = 160

Notice! Because of simplicity, the calculations do not include the number of colourants.

the difference in complexity between assembly and manufacturing postponement compared to the traditional production. The impact of decreased complexity on channel members' performance is discussed in detail in Sections 4.1 – 4.3.

Lee (1994) introduced the concept of postponement level, which means the relative location of product differentation. According to his categorization, the possible product differentation points are: end of the traditional manufacturing process, factory warehouse, distributors' outlets, in transit or by customer. Of these alternatives, the article focuses on distributors' outlets, including postponement both at the retail and the wholesale level.

According to Zinn (1990), postponement implementation at the retail level presents three major differences when compared to the wholesale level. First, retail locations are typically not owned by the manufacturer or distributing firm, which adds an interorganizational dimension to postponement implementation. Some retailers may favor postponement, others may reject it. In other words, it becomes a distribution channel issue. Thus, implementation of form postponement in the distribution channel requires increased cooperation (Lee 1996). The smaller average size of a retail store compared to a warehouse is the second difference. The throughput in a retail location may be too small for the final configuration of an effective scale. The final difference is the threat of product tampering, which may prevent firms from processing products at the retail level even when it is cost effective.

3. POTENTIAL OF POSTPONEMENT

In the previous studies (e.g. Zinn & Bowersox 1988), factors that affect the advantages obtained with postponement have been described but a holistic view has been missing. In this paper, the factors are discussed in detail. Based on the new definition of form postponement, also some requirements of time-based competition and mass customization have been taken into account. Furthermore, the factors can be categorized into three groups: product factors, logistic factors and demand factors.

Product factors	Logistical factors	Demand factors
* short product life cycles	* high inventory holding costs	* gap between ideal and available products
* high product variety	* long lead times in deliveries	
* products are not substitutes	* high freight costs	* demand for unique products
* high product value	* demand uncertainty (stockout costs)	* high price for customized products

FIGURE 1. Factors that favor form postponement.

As for product factors, an increased number of product introductions, wide product range and short product life cycles favor postponement through the increased value of common components (Kotha 1996; Feitzinger & Lee 1997). In addition, high product value increases the potential of postponement through the capital required for inventories (Zinn & Bowersox 1988). Moreover, postponement is more effective when products are negatively correlated, in other words, they are not substitutes (Lee 1996).

Concerning logistical factors, the value of common components depends on stockout costs, lead time to replenish stocks, and freight costs. As uncertainty, delivery times, and inventory holding costs increase, so do the benefits of standardization. (Feitzinger & Lee 1997) As for demand factors, the gap between ideal and available products, demand for unique products and a price premium obtained with customization favor postponement (Hart 1996). The factors that favor form postponement are summarized in Figure 1.

4. PERFORMANCE FACTORS

Performance factors are divided into three categories: investments needed, cost economies and marketing values. The conventional calculations are based on the investments required and cost economies obtained. However, the marketing values can remarkably increase profitability through price premiums and additional sales. Thus, marketing values should be included in the performance analysis.

4.1 Investments

Zinn (1990) argues that the size of the investment depends on the postponement type chosen and capacity alternatives available. According to him, an approach to computing the impact of capital investment is to include the annual cost of capital in the computation of the cost of postponement.

In the paint business, the price of a miniplant is estimated to be 3–4 times more expensive than large automatic machines. Because of the large investment required, the miniplant is considered suitable only for the wholesale level. On the other hand, the price and capacity of

automatic machines can be ten times higher than those of the manual ones. In addition to investment in dispensing and mixing equipment, colour displays to create the awaraness of available options are required in both miniplant and tinting systems.

4.2 Cost Economies

First of all, transportation costs can be reduced (Zinn 1990). In traditional production, a forecasting error causes inventory misallocations because products are supplied to stores on the basis of sales forecasts, creating stockouts in some stores and overstocks in others. Typical quick fixes in these situations are costly transfers between stores or price reductions of non-cycling products. Through the decreased number of different product types delivered to distributors, it is more likely that a bulk pack can be used in deliveries (Lee 1994).

Moreover, high service level is obtained with postponement because stocking common components does not require a huge amount of working capital. For this reason, stockouts are rare, which decreases the lost margins of the main and related items.

The degree in which final manufacturing can be postponed until a customer order is obtained, the risk associated with inventory accumulation is automatically reduced (Bowersox et al 1986, 57). Advantages obtained from less inventory required are both reduced working capital costs and less shelf-space needed.

Production of standard modules reduces processing costs at the factory through larger batch sizes (Lee & Tang 1997). On the other hand, delayed product differentiation increases working duties at the point of product differentiation. As for other diseconomies, light manufacturing in the distribution channel requires training warehouse labour. Furthermore, according to Feitzinger and Lee (1997), the use of standardized components may increase material costs. Moreover, Zinn and Bowersox (1988) argue that some customers may be reluctant to wait for the time required for the final configuration at the point-of-sale.

4.3 Marketing Values

Postponement in the distribution channel creates many marketing values for manufacturers and distributors. On the one hand, as products are assembled in response to a customer order, the firm can improve customer choice of colours, which allows a broad line marketing effort (Zinn 1990). On the other hand, a decreased number of batches because of standard modules facilitates the introduction of new product lines. With a wide range, the channel members can differentiate from competitors and get away from keen price competition.

In addition, if the final configuration is performed at the retail level, immediate deliveries can be offered because also special products can be stocked. Performance factors are summarized in Figure 2.

Investments	Cost economies	Marketing values
- new processing equipment needed at point-of-product differentiation	+ decreased freight costs + reduced inventory costs + decreased processing costs + service level (fewer stock-outs) - increased material costs	+ customer choice + variety (new product lines possible) + quick deliveries

FIGURE 2. Performance factors of postponement.

5. NORMATIVE FRAMEWORK

The normative framework gives the basic tools for analyzing the impact of postponement on channel members' performance in the paint business. The analysis begins from the finding of possible postponement alternatives based on postponement solutions and postponement levels. Further, the potential of postponement describes product and market factors and gives the backround for the performance analysis. The performance analysis is performed by comparing the postponement types and levels in terms of investment, cost economies and marketing values. With these comparisons, the profitability of each postponement alternative can be measured. Next, size of retailers and wholesalers and channel relationships are taken into account to analyze the possibilities to implement the postponement alternatives. In the end, the suitability of each postponement alternative is evaluated. The framework is illustrated in Figure 3. Next the phases are discussed step by step.

Postponement alternatives are shown in Figure 4. The postponement solutions in the paint business are based on assembly and manufacturing postponement, which were introduced by Zinn and Bowersox (1988). These two postponement solutions are called tinting systems and miniplant in the paint business. Tinting systems are further divided into manual and automatic machines.

Postponement solutions are analyzed at two levels, the retail level and the wholesale level. Miniplant is possible only at the wholesale level because of a large investment and space required. On the other hand, the capacity of manual machines is too low for wholesalers. Thus, the analyzed postponement alternatives in the paint business are: miniplant and automatic tinting machines at the wholesale level; automatic and manual tinting machines at the retail level.

Before the performance analysis, the relevant market issues have to be discussed. These issues can be divided into three categories: product factors, logistical factors and demand factors. High product variety and product value increase the potential advantages which could be obtained with postponement. Concerning logistical factors, long delivery times and high

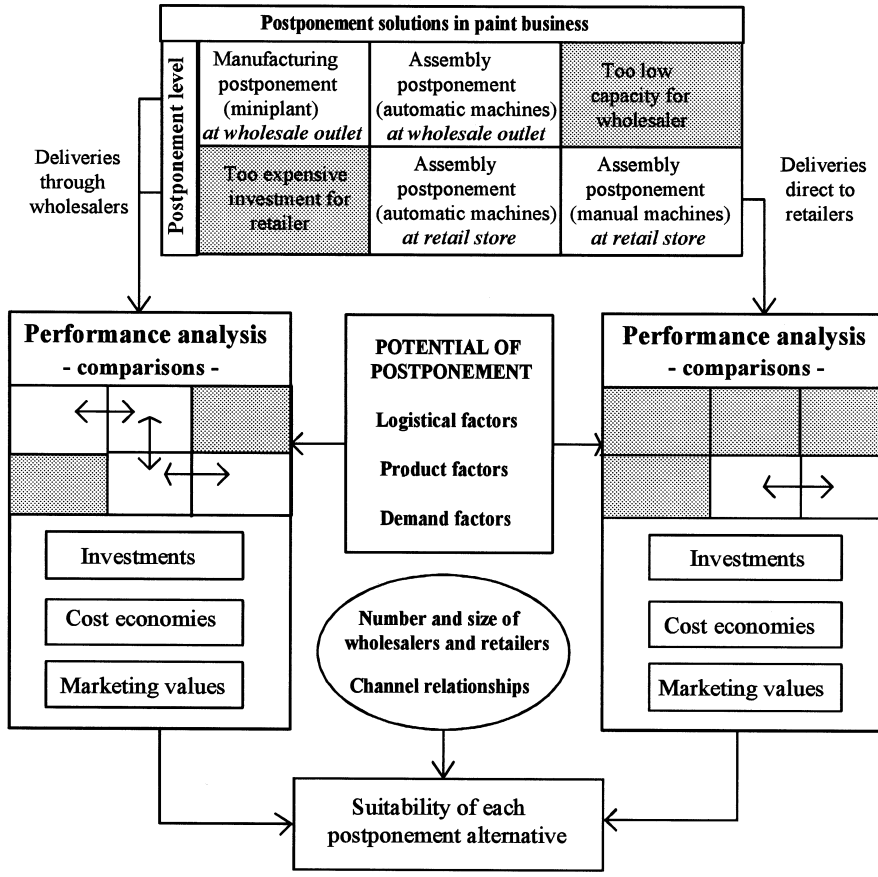

FIGURE 3. Framework for analyzing the suitability of postponement alternatives in paint business.

demand fluctuations favor postponement implementation. As for demand factors, among other factors a high price premium for customized products favors postponement.

5.1 Comparisons

After a careful market analysis based on the three market indicators, available postponement alternatives can be compared with each other. Evaluation of postponement solutions is performed separately both in direct and indirect distribution. In distribution through wholesalers to retailers, the analyzed issues are: miniplant versus tinting systems at the wholesale level (A), automatic and manual tinting machines at the retail level (B), and postponement at the retail versus wholesale level (C). In direct distribution from a manufacturer to retailers only the second point (B) has to be analyzed. Figure 4 shows the comparisons required in paint business. Next the comparisons are discussed in detail.

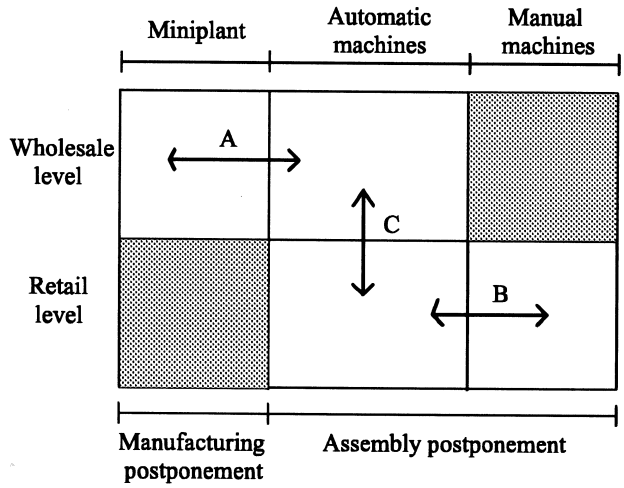

FIGURE 4: Comparisons.

As discussed, the difference between assembly and manufacturing postponement is the degree of delayed product differentiation. As a result, the inventory reductions with miniplant are more significant than those with tinting systems. On the other hand, the investment cost of miniplant is remarkably higher than that of tinting systems. The inventory reductions with miniplant are significant only if there is a need for high stock levels. Thus, any factors that cause larger stocks, for instance a wide product range, demand fluctuations and long delivery times, favor the decision for miniplant.

The main question at the retail level is the choice between manual and automatic machines. In addition to capacity and investment costs, also other factors have to be taken into account. The negative aspects of manual machines are the long time required for dispensing and the risk of human errors. In addition, as automatic systems represent high-tech compared to manual ones, image factors favor automatic machines.

In postponement at the retail level, finished goods inventories do not exist. On the other hand, if product differentation is performed at the wholesale level, some buffer stocks at the retail level have to be kept. In postponement at the wholesale level, the level of inventories depends on which one of the following two alternatives is chosen: build-to-order or build-to-stock (see Lee 1996). This decision relates to the order penetration point, which means the point where activities cease to be forecast driven and become demand driven (Christopher 1997, 89). The large offer of delivered-from-order colours may lead to an increased number of small and expensive shipments between retailers and wholesalers, so-called emergency orders. Moreover, it is uncertain that customers would be ready to pay the same price premium

as in postponement at the retail level for unlimited colour choice if they did not get the paint immediately.

At the end of the three distinct comparisons, the results are combined. The purpose is to determine the ranges in which each postponement alternative would give additional benefits to all channel members.

5.2 Suitability of Alternatives

Determination of an appropriate product strategy requires that the number and sizes of wholesalers and retailers, and present channel relationships, are analyzed. Size of distributors determine the capacity requirements for postponement solutions. On the other hand, reluctance to cooperation may prevent the implementation of a few alternatives (Zinn 1990). If vertical integration exists, the total impact is more important than the profits of each channel member. As manufacturers produce the components for distributors, they play a key role in the beginning. It follows that manufacturers' motives have to be profoundly discussed in the evaluation of different postponement alternatives. Based on these factors and the results of the performance analyses, suitability of each postponement solution for the focus markets can be determined.

6. CONCLUSIONS

The purpose of this paper was to build a basic framework for the analysis of postponement solutions for the paint business. The paper took an analytical approach to previous postponement studies and enriched the discussion with new market trends, mass customization and time-based competition. The concept of form postponement was redefined because the previous definitions were mainly based on cost factors and excluded marketing values.

The theoretical framework gives the basic analytical tools for estimating the postponement types in the paint business, assembly and manufacturing postponement. To a large extent, the framework can be used to analyze the suitability of form postponement for other business fields as well. Naturally, postponement types are business-related. Concerning postponement levels, the framework is flexible: if the wholesale level does not exist in some markets, only the right side of the framework has to be used in comparisons.

Both potential and performance factors are considered to be of importance apart from the paint business also in other business fields. The factors that favor postponement were divided into three categories: product, logistical and demand factors. Based on this categorization, the potential of form postponement in different markets can be analyzed. On the other hand, performance factors were divided into three groups: investments, cost economies and marketing values. As discussed, the marketing values may allow price and sales increases.

The limitations of the paper relate to its focus on the distribution channel. It does not work in delayed product differentiation, which is performed inside the factory only. The use of the framework requires that product differentiation is postponed either to wholesalers or retailers.

Possible further studies should concentrate on applications of the framework for other business areas. The author argues that there are many business areas where postponement as a strategy is under-utilized. By developing the modified versions of the framework for the distinct businesses, advantages of postponement in any business field can be evaluated. ■

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