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The benefit of manufacturing postponement in consumer electronics distribution and retailing

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ABSTRACT

Consumer electronics retailers need to balance the demand for high product variety and short delivery times with the need to keep shop inventories on an acceptable level. Postponing the creation of product variants to the shop is an attractive solution to the problem. However, careful evaluation is required to balance the savings in shops with additional efforts in product development and the complexity of maintaining additional supply chain concepts.

The case company is a manufacturer of consumer electronics with over 1200 dedicated retail outlets worldwide. We first interviewed case company management and retailers in different countries. Next, we simulated the complete supply chain, including component sourcing, assembly, warehousing, distribution and retailing. In the simulations, we evaluated different points of product differentiation along with the corresponding supply chain concept.

Results indicate that shop inventory is necessary for high-volume, low-variety products. Manufacturing postponement seems most beneficial when: 1) Customers require a delivery time that is too short to enable ship to order from a central location 2) Product value is high enough to justify additional effort in retail outlets. 3) Product variety is mediocre – not too low and not too high. 4) The retail outlet has low sales volumes. The simulations revealed a potential for inventory savings of 40-80% (average 60%) in retail outlets. Based on simulation results, the case company is now implementing a new delivery concept for high-volume, low-variety products. The intended delivery concept should be considered in product development when deciding the product architecture.

Key Words: *Manufacturing postponement; retail; consumer electronics; discrete-event simulation; case study.*

1 Introduction

Consumer electronics industry is characterised by high product variety, short product lifecycles and decreasing prices (e.g. Fisher, 1997). In retail, product availability is extremely critical, as consumers tend to choose substitutes if one product is out of stock (Christopher, 1998). On the other hand, high product availability requires a large investment in shop inventory (Bowersox and Closs, 1996; Dubelaar *et al.*, 2001). This poses challenges for retailers who need to provide acceptable product availability but keep shop inventories on an acceptable level. An often-suggested solution is to postpone creation of product variety to the latest point possible in the supply chain (Feitzinger and Lee, 1997; Hoek, 2001). The benefits of postponement are reduced need for inventory, increased responsiveness by shortening the final customizing cycle time and reduced complexity in operations (Hoek, 2001). However, manufacturing postponement requires a modular product architecture (Simchi-Levi *et al.*, 2000) that can be more demanding and time-consuming to create compared with an integrated product architecture (Ulrich, 1995). Postponement can also require retail outlets to invest in new equipment (Hoover *et al.*, 2001 p. 55). Consequently, it is important for a company to estimate the resulting supply chain performance before implementing postponement.

The case company of our research is a Danish producer of consumer electronics such as televisions, stereo equipment, loudspeakers and phones. The products belong to the upper price segment in the market, focusing on a unique design and value-added service. The company has a tradition of designing its products to fit with its existing supply chain concept. However, when introducing a new supply chain concept, product designers need to know new demands on product architecture. This paper presents results from a research project with the aim of evaluating supply chain performance of different product architectures.

The paper is organised as follows: The literature review introduces basic concepts and establishes the need for research on the interplay between product architecture and supply chain. The empirical part of the paper reports results from interviews with consumer electronic retailers in three European countries and results from a discrete-event simulation project where operational impact of different product architectures were evaluated. The final section draws general conclusions and reports about implementation in the case company.

2 Linking product architecture and supply chain concept

2.1 Postponement framework

The possible combinations of ways to manage the flows of materials are virtually infinite. However, in configuring the supply chain for a product, one should pay attention to two points: The point where products are allocated for a specific customer and the point where end-product configuration is determined (Vorst *et al.*, 2001).

The product is allocated to a specific customer at the *order penetration point (OPP)* (Sharman, 1984). In a recent review article, Olhager (2003) provides a comprehensive list of issues that a company should consider when locating the OPP. Short delivery time requirement, high volumes and a modular product architecture push the OPP downstream while high product variety and a high degree of customisation require an upstream OPP

location. Bucklin (1965) introduced the term *postponement*, referring to the practice to ship from one centralised inventory rather than many decentralised inventories. Currently, the practice is known as *logistical postponement* (Pagh and Cooper, 1998; Hoek, 2001), and is the same as moving the OPP upstream in the supply chain.

The final product configuration is determined at the *point of product differentiation (PPD)* that is not necessarily co-located with the OPP (Vorst *et al.*, 2001). Moving the PPD downstream in the supply chain is known as *manufacturing postponement* or form postponement (Hoek, 2001).

	<i>Decentralised inventories</i>	<i>Centralised inventories</i>
<i>Make to stock</i>	Full speculation	Logistics postponement
<i>Assemble to order</i>	Manufacturing postponement	Full postponement

Figure 1: Postponement framework (applied from Pagh and Cooper, 1998).

Pagh and Cooper (1998) combine logistical postponement and manufacturing postponement into a framework (Figure 1). Products are made to stock or assembled to order, and inventories are kept either at a central location or decentralised at the different markets. In combination, there are four options ranging from assemble to order at a central location (full postponement) to stocking finished goods at many decentralised locations (full speculation). In this paper we will refer to alternative OPP/PPD combinations (that is, alternative forms of postponement) as different supply chain concepts. We label the concepts in accordance with the framework presented in Figure 1.

2.2 Product design for supply chain

The possibilities to apply different supply chain concepts greatly depend on product architecture. New products should be designed and structured so that they allow good supply chain performance (Simchi-Levi *et al.*, 2000). General principles for designing supply chain friendly products are to use common components, create a modular product architecture and postpone introduction of product variety to the latest point possible in the supply chain (Mather, 1992; Dowlatshahi, 1996; Feitzinger and Lee, 1997; Hoek *et al.*, 1999; Hoek, 2001).

Due to the high interdependence between product architecture and supply chain performance, supply chain implications should already be analysed explicitly in the concept design phase of new product development (Kaski and Heikkilä, 2002). According to Lee and Sasser (1995), design for supply chain principles often result in higher material and direct manufacturing costs. Models are needed to study the complex interactions between cost

drivers like stock-outs, reconfiguration, logistics and inventory. However, the practice of analysing supply chain performance in product development is not as common as one would expect (Novak and Eppinger, 2001). In a recent systematic literature survey of articles published over a period of 5 years in 15 supply chain and operations management journals, Appelqvist *et al.* (2004) found only three reported cases where modelling was used for quantifying supply chain performance of a new product in its design phase. There is an apparent need for more applied research and case studies involving industrial participants (Taylor, 1997; Gubi and Heikkilä, 2003).

3 Methodology

Manufacturing postponement has for long been seen as a promising approach to provide high product variety at moderate cost. Christopher (1998) predicts postponement to be one of the main trends in logistics in the 2000s. However, van Hoek (2001) concludes that surprisingly little research has been conducted on postponement. He calls for more research that:

- takes a complete supply chain perspective rather than a functional perspective,
- considers the challenges of global supply chains, and
- uses methodical triangulation to get deeper insights.

Similarly, in a recent review article on product variety research, Ramdas (2003) concludes that the prescriptive models developed so far often focus on narrow tradeoffs within functional silos, ignoring important interdependencies across decisions. In particular, researchers have not examined empirically the impact of variety on downstream processes such as distribution (Ramdas, 2003).

The objective of our research is to provide quantitative evidence of how decisions on product architecture affect operational supply chain performance. Specifically, we model how a combination of modular product architecture and manufacturing postponement can reduce inventory in retail outlets.

3.1 Research design

In our research, we set out to address the challenges posed by van Hoek (2001) and Ramdas (2003). We worked closely with a Danish producer of consumer electronics. We first collected qualitative data by interviewing managers at the case company and retailers in the downstream supply chain. Based on the interviews, previous work at the case company and insights from literature, we developed alternative supply chain concepts with different degree of manufacturing postponement. The concepts were evaluated using discrete event simulation with data from company ERP systems. Simulation results were then generalised to provide theoretical as well as managerial insights. Figure 2 illustrates the research design.

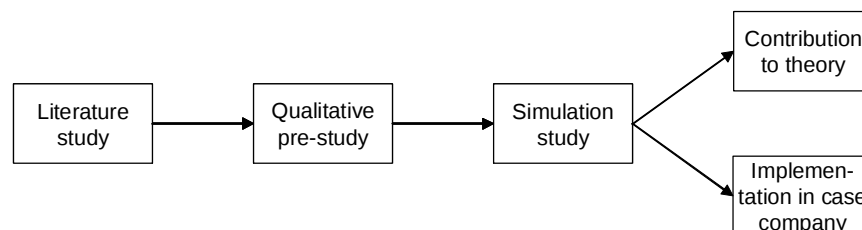


Figure 2: Research design.

The research addresses several of the gaps identified by van Hoek (2001). The simulation model takes a complete supply chain perspective as it spans several tiers from component sourcing to retailing. The retail outlets are located worldwide. Finally, the research triangulates interview findings with simulation modelling. The case also provides an example of supply chain modelling for product design as Taylor (1997) and Dowlatshahi (1999) call for.

3.2 Case presentation

The manufacturer of consumer electronics sells its products through a network of over 1200 dedicated retail outlets all over the world. In the prevailing supply chain concept, the retail outlets are supposed to act as show rooms, not as stockholding points. A customer visiting the outlet can see and try the products and discuss with sales personnel. The products have colour variants (e.g. red or blue), feature variants (e.g. with or without satellite receiver) and country variants (e.g. 110V or 220V).

Based on customer choice, the retailer orders the product from an assembly plant in Denmark. The assembly plant utilises a combined make-to-order/make-to-stock production control approach, where high-volume variants are made to stock and lower-volume variants are assembled to order. Refer to Soman *et al.* (2004) for a discussion on the make-to-order/make-to-stock hybrid approach. Figure 3 shows the two order penetration points in use (OPP_1 and OPP_2). In the framework of Pagh and Cooper (1998), the current control principle is a combination of logistical postponement and full postponement (upper-right and lower-right quadrant in Figure 1).

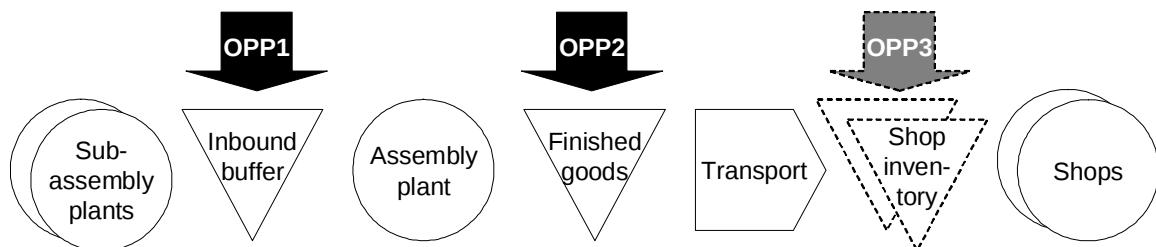


Figure 3: Supply chain of the case company.

Case company management considered the prevailing supply chain concept appropriate for large products with many variants and, consequently, low sales per variant. However, for smaller products with only colour variety, there were indications that this concept was not appropriate. Company management initiated a project to investigate a second concept, where retailers keep smaller, low-variety products in the shop for immediate hand-over to the customer (OPP_3 in Figure 3). The new concept was intended for only a part of the product portfolio, while the present concept would still be applied for the rest of the products.

4 Qualitative pre-study

4.1 Methodology

The first step of the study was to interview representatives of internal units – R&D, Marketing and Operations – and retailers in Denmark (N=2), the UK (N=1) and Spain (N=5). In Denmark, the interviews were conducted in person at the headquarter and in retail outlets.

For UK and Spain, the interviews were conducted via telephone and email follow-up. The semi-structured retailer interviews contained questions about the retailer's current stocking policies, the value of product variety and estimated delivery time expectations of consumers. The interviews were deliberately designed to avoid promoting new delivery concepts, but to induce the retailers' attitude and experience. In the end of each interview, the planned supply chain concept was suggested, in order to get the respondents' comments to it.

4.2 Results

According to retailers, consumers have different expectations to delivery time for different products. Consumers expect to get small, low-variety products with them directly. According to retailers, if consumers cannot get these products directly, they tend to change their mind, buy a competing brand, or try to find the same product at a competing retailer. For more customised products, longer waiting times are accepted. Waiting some time for a customised product gives the consumer an impression that the product is built specifically for her. A practical concern is that a big product such as a TV requires home delivery and installation anyhow.

The following cites presents some responses to the question of how long consumers are willing to wait for products:

Phones are pure "cash and carry". For [a high-class TV] customers can very well wait up to 2 weeks. Customers expect to get other TVs directly, but they accept waiting some time if it's a special colour (Retailer, Denmark).

For smaller products, like [a radio/CD player], [an mp3 player] and phones, customers expect the product right away. For bigger products like [a TV] and [a high class TV], they accept to wait (Retailer, Spain).

[Acceptable delivery time] varies according to product, i.e. phones same day, for [an audio system] and [a high class TV] 7-10 days is OK (Retailer, UK).

When asked about stocking policies, it turned out that in response to customer expectations, retailers were actually stocking most of the low- and midrange products. Retailers felt that they needed to provide instant handover to customers for these products. Contrary to official policy, retailers invested in shop inventory in order to increase sales.

Some retailers had found out a way to create product variety in the shop. They order products in basic colours and with standard features. In addition, they order additional coloured parts and feature modules as spare parts. In this way, it is possible to create product variants in the shop, if the product has a modular architecture. When asked, also other retailers were interested in this possibility to create variety in shops.

4.3 Conclusions

The pre-study showed that shop inventory is a fact. Logistical postponement is not a viable option for low- and midrange product for which customers are not willing to wait. However, postponing variety creation to shops could reduce the need for shop inventory. From a retailer's perspective, three product categories emerge (Figure 4).

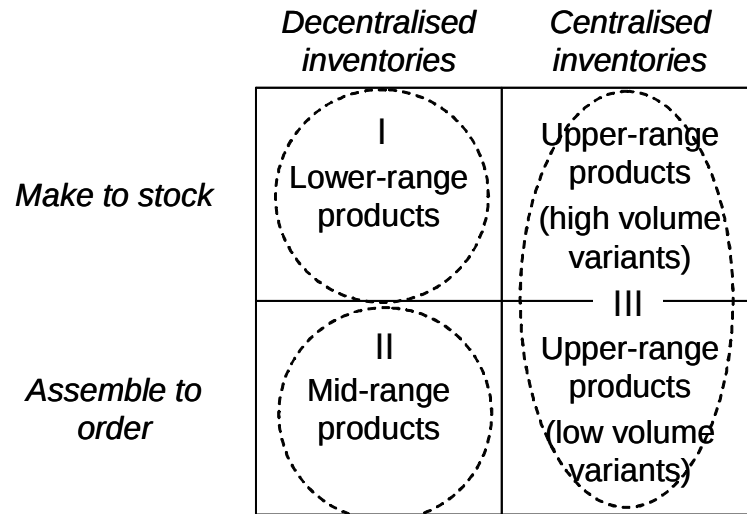


Figure 4: Emerging supply chain concepts.

- I. For the cheapest products like phones, the retailers would in any case keep an operating stock of all colours, and thus postponed assembly is not very crucial.
- II. For the mid range, a manufacturing postponement concept would provide direct hand-over to customers without too much investment in shop inventory. In most of these cases, the final configuration is created by attaching a coloured front cover.
- III. For the upper price segment products, with both colours and feature variants, the customers are willing to wait 1-2 weeks for delivery, and thus the retailers would prefer to order these configurations from the factory, rather than stocking them.

From a retailer perspective, logistical postponement and full postponement provide approximately the same service level, so they are grouped together in Figure 4.

5 Simulation study

The pre-study indicated that the logistical/full postponement concept is appropriate for high-variety, low-volume products in the upper price range. Mid-range products could potentially benefit from a new manufacturing postponement concept. However, as discussed in the introduction of this paper, manufacturing postponement requires a modular product structure that might be costly to develop. In addition, introducing and operating many supply chain concepts increases complexity and requires investments in information systems. The critical question is not whether there are benefits at all, but to quantify the benefits so that they can be compared to additional costs.

In order to study the operational impact of manufacturing postponement on retail outlet inventories, we chose to use discrete-event simulation. This is in accordance with Maloni and Benton's (1997) recommendation to use simulation models as a way to critically evaluate possibilities to improve supply chain performance. A simulation model provides a convenient lab environment for testing the effects of different factors.

5.1 Product

One mid-range product was chosen for simulations. The product is a stand-alone CD-player with radio tuner. The product comes in five colours and eight country variants, which makes it possible to study impact of different kinds of variety. The product has no feature variants. At the time of the simulation project (spring 2003) the product had been on the markets for one year, which means that a sufficient amount of historical demand data was available. On the other hand, many years of the life cycle remained, making it possible to benefit from improvement potential. Finally, the turnover from the product is rather high, making results interesting from business viewpoint.

The bill of material of the product includes about 300 components. The assembly plant handles 16 modules while all subassemblies are outsourced. Of the 16 modules, 7 vary by country and 1 by colour. In total, 33 module variants were included in the simulation model.

5.2 Demand

Order lines from one year were used for demand modelling. The data set was retrieved from the company's ERP system. The data set consists of 11871 order lines including the following information: product variant, country, quantity, ordering date, requested shipping date, confirmed shipping date, and actual shipping date. Figure 5 shows shipments from Denmark by week since the product introduction in the beginning of year 2002. The demand peak in weeks 33-38 is explained by a campaign but also without this peak, the demand is highly volatile. The high season is in the autumn. The trend is increasing throughout the year, which can be confirmed using regression analysis ($R^2 = .43$, $p < 0.01$).

For each week, the difference between expected demand and the observed demand was calculated using regression analysis. The point estimate for distribution of differences is $Normal(0, .406)\%$ of average demand. For the simulations, it was decided to use a fixed average demand that was equal to the average weekly demand for year 2002. Thus, seasonality was omitted from the model, which is motivated by the fact that seasonality is well known and can be anticipated for by all parties. Weekly demands were drawn from the distribution $Average\ demand * Normal(1, .406)$. The weekly demands volumes were converted into order lines by allocating the weekly volume to colours, countries, weekdays, order quantities and shops according to observed distributions. Five demand data sets of 400 weeks each were created using this technique.

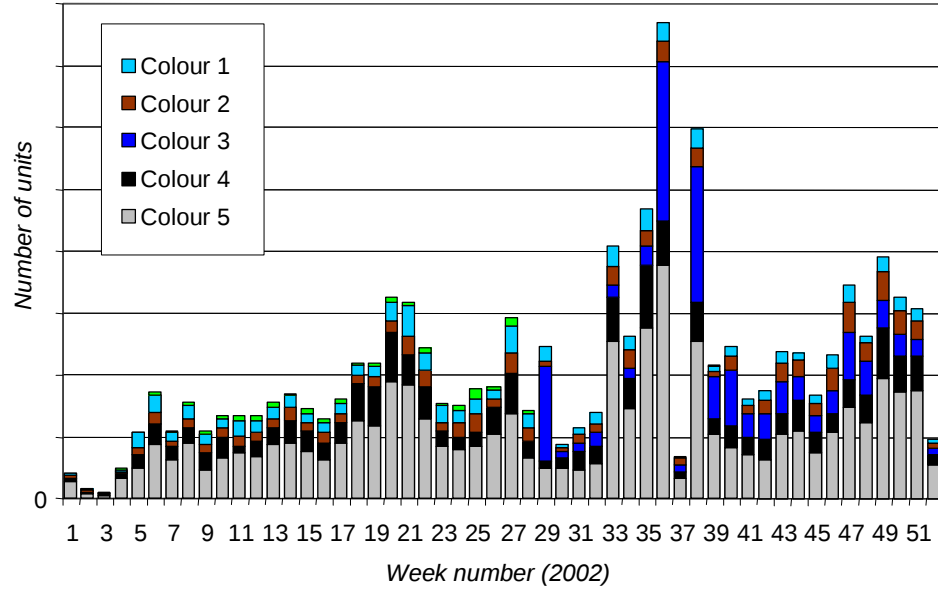


Figure 5: Actual weekly demand for the simulated product in 2002 (shipments from Denmark, $N=11871$ order lines)

5.3 Simulation model

The model contains a supply chain with the following actors: about 1200 retail outlets, 1 finished goods warehouse, 1 assembly plant, 2 subassembly plants and 11 suppliers (Figure 3). Model data was retrieved from company ERP system. Model operation is based on interviews with representatives of the personnel.

For component suppliers, historical delivery performance records were used to determine delivery time distribution and delivery accuracy. Component inventories are managed using a periodical review policy with daily ordering for local suppliers and weekly ordering for other suppliers. The inventory control parameters (expected delivery time, inspection time, minimum lot, rounding value and safety time) were taken from the company's ERP system.

The subassembly plants and the final assembly plant have limited capacity. Products are assembled if there are both parts and capacity available. Products are assembled according to orders either from retailers or from the finished goods warehouse. Orders from retailers are prioritised over inventory replenishment orders. The finished goods warehouse is used as a capacity buffer. If demand is lower than maximum capacity, idle capacity is used for inventory replenishment of some high-volume variants. When demand exceeds capacity, high-volume variants can be taken from stock while lower-volume variants are assembled to order.

Sales of each retail outlet were estimated based on a two-month data set of shipments from Denmark. Customers arrive to the shops according to the demand scheme described in the previous section. If the customer requests a product that is not available on the shelf, the retailer orders it from Denmark. If it is available, the customer gets it directly while the retailer orders the same product as replenishment. This inventory control principle is rather common in low-volume consumer electronics retail.

5.4 Model validation

The model was tuned and validated by comparing such model performance as delivery times, delivery accuracy and inventory levels with actual supply chain performance for year 2002. Figure 6, for example, shows a comparison of throughput time performance of the assembly plant in the model and in reality. The technique is called input-output transformation validation (Banks *et al.*, 1996: 409-411). In addition, the model was reviewed in a structured walk-through with company management.

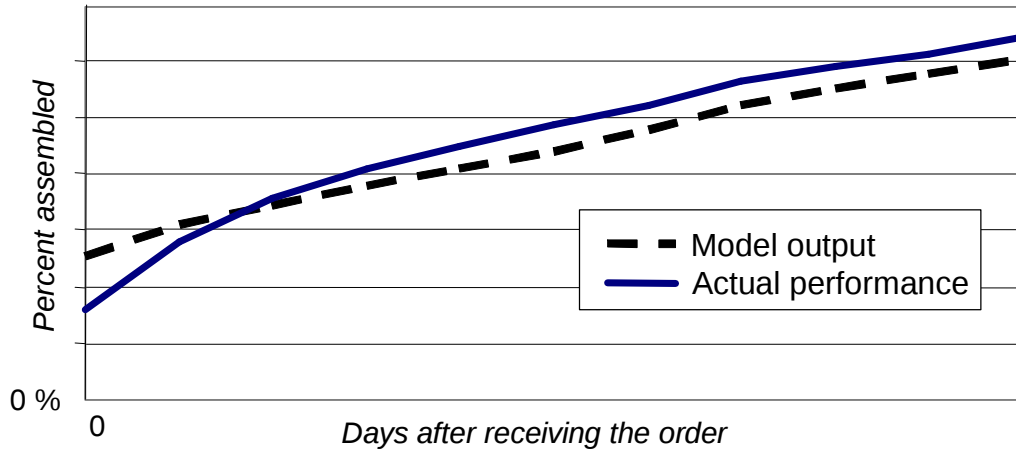


Figure 6: Chart used for validating throughput time performance of the assembly plant.

5.5 Experimental setup

The aim of the simulation study was to measure fill rate versus total inventory for different supply chain concepts. Delivery precision from the assembly plant was treated as a control variable. It was set to the corporate target level: 95% of order lines shipped within 3 days.

Table 1: Experimental setup.

Supply chain concept	Full speculation	Manufacturing postponement	Logistical/full postponement
Customer experience	No waiting	Wait 10 minutes	Wait 1-3 weeks
Shop inventory	Selection of readily assembled units	Blank CD-players + selection of colour fronts	No inventory

Table 1 summarises the simulated scenarios that are named according to Pagh and Cooper (1998). In *full speculation*, retailers keep an inventory of readily assembled units for immediate customer handover. In *manufacturing postponement*, the retailers assemble the final configuration based on customer choice. Finally, in *logistical/full postponements*, retailers order products from the factory.

In all scenarios, the factory ships high-volume variants from a central inventory and assembles low-volume variants to order. For the consumer, full speculation and manufacturing postponement provide direct hand-over. Logistical/full postponement was used mainly for model validation, as the pre-study had shown that it was not appropriate for low and mid range products.

In full speculation scenario, order-up-to levels for shop inventory were set to 5, 6, 7, 8, 9, 10, 12, 14, 16, 18 and 20 units (11 different levels) at each of the over 1200 retailers. In manufacturing postponement scenario, the first simulation run had one blank unit and one colour front in each colour (1 blank + 5 fronts in total). The number of blanks was then increased from 1 to 10 in steps of 1, while the number of fronts was increased from 5 to 20 in steps of 1 or 2. Five replications were run for each inventory level in each scenario. In total, this means $11 \times 5 = 55$ runs for full speculation scenario and $10 \times 11 \times 5 = 550$ runs for manufacturing postponement scenario. Each replication consisted of a 100 day warm-up period and a 1000 day steady-state run. In each run, daily inventory and service level were recorded for each actor. For the over 1200 retail outlets, figures were aggregated by shop size for further analysis.

The same five demand data sets were used for all replications. This technique is known as correlated sampling and provides a high statistical confidence level in scenario simulation (Banks *et al.*, 1996). All results reported below are statistically significant at the $p < .05$ level.

5.6 Results

Figure 7 shows service level as a function of average shop inventory in full speculation. When measured in absolute number of units, a big shop with high turnover needs more inventory than a small shop to provide a specific service level. However, measured as days of supply, a big shop needs less inventory to provide the same service level as a small shop. Note that average inventory is always less than the order-up-to level.

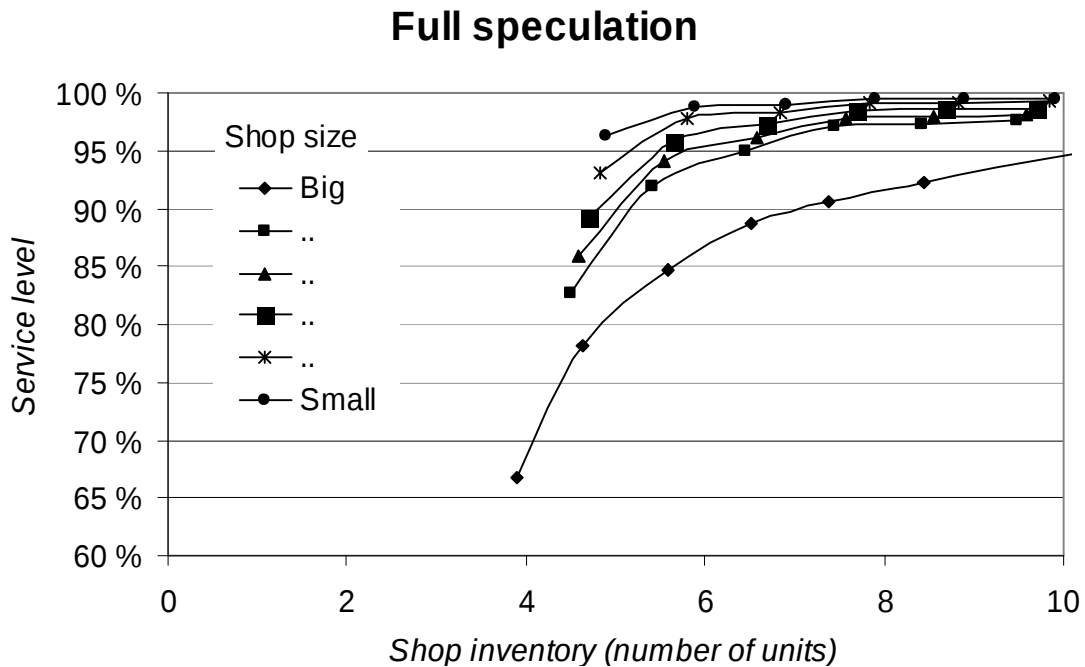


Figure 7: Service level versus inventory for different shop sizes in the full speculation scenario (absolute number of units).

In manufacturing postponement, shops need less inventory to provide a specific service level (Figure 8). “Number of units” is calculated as value of parts, i.e. a blank CD player is 89% and a colour front is 11% of the value of an assembled unit. The curves are not as smooth in Figure 8 because of stepwise inventory increases, i.e. a retailer pursuing an effective stocking policy can improve service level marginally by stocking another cheap front,

but after some limit it is more effective to stock another expensive blank CD player. Also in the manufacturing postponement concept, the investment measured as inventory days of supply is smaller for big shops than for small shops.

Manufacturing postponement



Figure 8: Service level versus inventory for different shop sizes in the manufacturing postponement concept (absolute number of units).

Figure 9 shows a comparison of service level versus shop inventory for different scenarios in a big shop. On average, a big shop can save 40% in inventory investment by moving from full speculation to manufacturing postponement. For smaller shops, the proportional saving is larger, up to 80%.

Comparison (big shop)

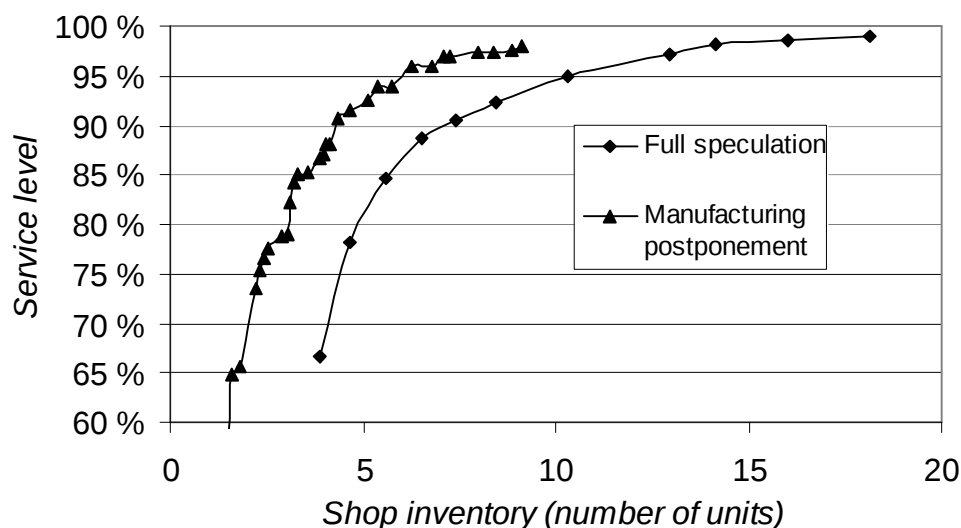


Figure 9: Comparison of service level versus inventory in different concepts for a big shop.

Finally, by multiplying inventory in each shop by number of shops in each size category, it is possible to calculate total supply chain inventory required for achieving any specific service level. Figure 10 shows a comparison of concepts at a 90% service level. The total potential for reduction of supply chain inventory is approximately 60%. Another insight from Figure 10 is that the centralised finished goods warehouse contains only a small fraction of total supply chain inventories. Consequently, development efforts should focus on decreasing shop inventories.

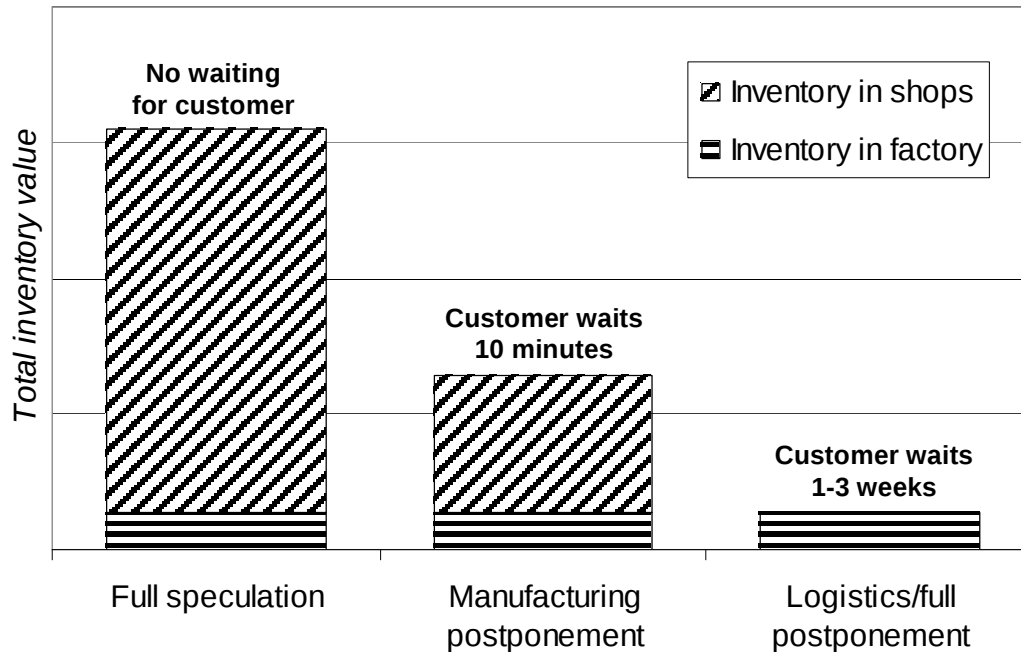


Figure 10: Total inventory investment required to reach a 90% service level.

6 Conclusions

As expected, the case shows that it is possible to save a considerable amount of inventory by postponing creation of variety, as suggested by e.g. Mather (1992), Feitzinger and Lee (1997) and van Hoek (1999; 2001). However, manufacturing postponement is not equally beneficial for all products. It is most effective under the following conditions (Figure 11):

- Customers require a delivery time that is too short to enable ship to order from a central location.
- Product value is high enough to justify additional effort in retail outlets.
- Product variety is mediocre – not too low and not too high. That is, there appears to exist curvilinear relationship between product variety and benefit from postponement.
- Finally, and a bit surprisingly, postponement gives biggest proportional savings in retail outlets with low sales volumes.

Under these circumstances, designing variety into separate modules is beneficial for supply chain performance. As such, modularity can also be beneficial for other reasons (Baldwin and Clark, 1997).

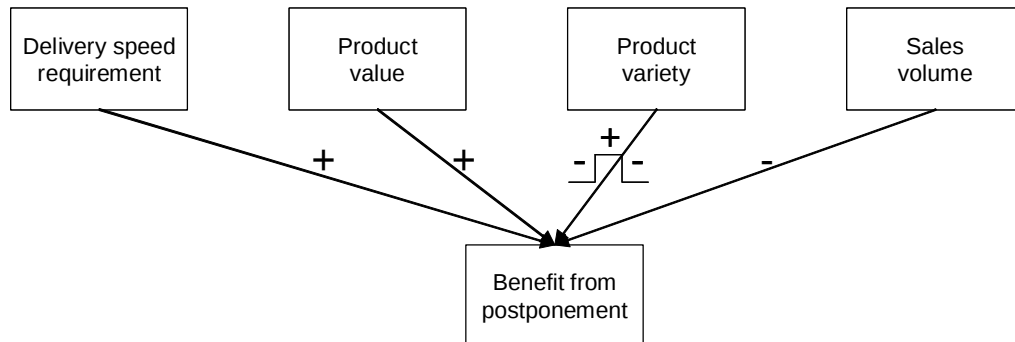


Figure 11: Factors affecting benefit of manufacturing postponement.

Our study also shows that even within one industry segment, customers can have quite different expectations to how and when the products are acquired. The case supports Childerhouse *et al.* (2002) in the observation that the differences in customer expectations for different products might rise a need for implementing different supply chain concepts. Furthermore, while Childerhouse *et al.* (2002) describe only the internal supply chain of one company, our case includes also the downstream supply chain. According to Olhager (2003), a modular product architecture is associated to assemble-to-order product delivery. We suggest that customer expectations should be the starting point. Short delivery time requirement pushes the order penetration point downstream and a downstream order penetration point pushes product architecture toward modularity.

6.1 Limitations

Although the research effort was rather extensive, some limitations should be considered before implementing manufacturing postponement at the case company or generalising the results to other settings.

Showing a potential for savings raises the questions about who will benefit from the saving. In the described setting, the case company bears the cost of developing and manufacturing products while savings occur at the retail outlets, not at the case company. However, as the case company can decide product prices, it has good opportunities to take some of the benefit. Secondly, in a high-clockspeed industry such as consumer electronics, lower total supply chain inventories enable faster technology updates. Thirdly, lowering the investment for retailers makes it economically feasible to establish shops in smaller cities. The idea that a saving in total supply chain cost will ultimately benefit all parties is one of the core statements in supply chain management (Houlihan, 1987)

Postponement can also cause additional cost. Operating multiple supply chain concepts can be complex and costly in terms of information system support. In addition, although no special equipment is needed for attaching colour fronts to the simulated product, this is not necessarily the case for all products. Manufacturing postponement is definitely not feasible for products that require integration testing using dedicated equipment. Such additional costs should be estimated and compared to expected benefits.

When generalising to other industrial settings, one should remember that the division into different focused supply chain concepts was based on the observation that high sales volumes, low product variety and short delivery time requirement tend to be associated. This is not necessarily true in all companies. However, according to the product-process matrix of Hayes and Wheelwright (1984), product volumes and product variety are negatively correlated and Hill (2000) suggest that high volume / low variety products tend to have the shortest delivery times.

The simulations showed that the proportional inventory reductions were greatest for small shops. Also the big shops in the case have rather low sales volumes compared to, say, an average department store. Furthermore, the fact that the retail outlets are dedicated to one brand makes it possible to educate shops personnel to perform light customisation. A corresponding case in a high-volume setting could be a promising topic for further research.

6.2 Managerial implications

For the case company, the simulation project was a success that triggered implementation of a new supply chain concept. The idea had been suggested for a long time but not implemented due to lack of quantitative evidence. According to the new policy, the most likely supply chain concept (Figure 4) for a new product will be decided in a meeting between representatives of operations, product development and product marketing. The meeting takes place once the product concept report for a new product is available. The chosen supply chain concept determines priorities in product design. To retailers, the new concept will be introduced when new postponement-compatible products are released.

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