Teaching Note: Postponement

The first objective of this note is to outline the concept of postponement and its applicability to supply chain management. In outlining the concept of postponement, we will show that this concept works best under specific demand, product, and production preconditions. We will further explore the impact of postponement on company strategy, capabilities, processes, resources and infrastructure. Also, we will outline the type of cost - benefit trade offs involved.

Second, this note will illustrate the postponement concept through a set of examples. In illustrating the functioning of the postponement concept, we will use five examples from a variety of industries. The companies in these examples used different approaches to make postponement work for them. The first three examples show companies who managed favorably the trade offs between the costs and benefits of postponement. These examples include Hewlett Packard, who reconfigured its infrastructure to delay the point in the supply chain where products became differentiated to be able to better match supply with regional demand; Motorola, who redesigned its production process by delaying the point in which the most expensive module of the product was made part of the customized product; and a Large Chemical company, which changed the customer-supplier relationship to enable the full benefits of the concept to happen. Then we will show through the example of a large consumer electronics company how the trade off between the costs and benefits of the postponement concept can be negative when the benefits to the customers do not exceed increased product cost. In the end, we will examine an example of a company where the outcome of the postponement concept introduction is still unclear.

Overview of Postponement

The concept of postponement lies in organizing the production and distribution of products in such a way that the customization of these products is made as close to the point when the demand is known as possible. Postponement belongs to a set of levers used in inventory management to attack the variability of demand and supply. This set of levers can be divided into proactive and reactive. Proactive levers directly attack the causes of variability, reactive levers help to cope with its
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consequences. Together with substitution, specialization, and centralization, postponement is a reactive lever (see Exhibit 1).

**Optimal Postponement Preconditions**

Implementation of postponement works best under certain demand, product and production preconditions.

**Demand Preconditions:**

- *Fluctuation* (e.g. seasonal hikes in demand for ski equipment)
- *Unpredictability* (e.g. demand for high tech products with a short product life)
- *Urgency* - operating on short required order lead times relative to the production cycle (e.g. Benetton would not be able to run its full regular production cycle after finding out which sweater colors sell best in the season)
- *Differentiation* - associated with distinct customer segments that require the company to provide a product line in which the products have different performance characteristics (e.g. different performance, technological or legal requirements on the same product in different countries)
- *Negative correlation* for the products in the product line (e.g. success of one line of printers can have an adverse impact on the demand for the remaining lines of printers)

**Product/product line preconditions:**

- *High product value* - products with high unit value have high inventory holding cost and high cost of oversupply. The postponement concept is best applied if there is one particular component (or step in operations) that has a significantly high value added. It makes intuitive sense to delay it. (for example, in assembling a notebook computer, it would make sense to delay the installment and production of different LCD displays until the last minute rather than the casing of the keyboard since an LCD display is much more expensive than a keyboard casing).
- *High customization* - product lines with highly customized end products usually find it difficult to forecast demand on a product basis. Additionally, it is usually difficult to find alternative uses for them and therefore their cost of
oversupply is high. Because of this, it is important to realize which production step has the most significant impact on customization of the product (point of product differentiation). It makes sense to defer these operations for the products in the product line (for example, in Benetton’s case, it was difficult to forecast demand for each sweater color; once the sweater has been dyed in a certain color, it is virtually impossible to change it; if the color did not sell well, the sweater could not be re-colored).

- **High component commonality / modularity** - component commonality refers to a high degree of shared components across the product line. Shared components result in inventory pooling effects and also shared production process steps. The component commonality can be taken one step further in the modularity concept, which uses sharing of bundles of the components instead of single components.

**Production preconditions:**

- **Balanced process capabilities** - capabilities, such as cost, time, quality and flexibility need to be kept in balance. Delaying the component production until shortly before the demand is known may imply producing in small batches. However, if the set up and changeover cost of the production equipment is high, there is a high level of scale economies in running large batches that would be lost.

- **Availability and quality of the outside suppliers** - in order to serve more flexible production needs, the outside suppliers need to possess similar capabilities in terms of flexibility of deliveries, speed of order fulfillment and quality of service.

- **Availability of information and IT systems** in place - a steady flow of information is needed so that the company can effectively manage the balance between the supply and the demand.

**Postponement Implementation**

Postponement can greatly improve the flexibility capabilities of the firms that employ it. However, the basic operations framework implies that there is a link between capabilities and strategy
on one hand and capabilities and resources and infrastructure on the other hand (see Exhibit 2). Therefore the companies who implement postponement will need to address these links.

First, they need to examine how coherent higher flexibility is with their strategy:

- Does the strategy need to be supported by this new flexibility?
- Is the flexibility position desirable with regard to the customers and competitors?

Second, they need to realign their resources and infrastructure to support the flexibility capabilities.

**Realignment of processes:**

- *order taking* – e.g., companies that used to collect customer orders on a monthly basis will need to shorten the information collection cycle time.
- *purchasing* - more flexible and frequent purchasing operations need to be established.
- *manufacturing* – if the installation of the most expensive components or the point of product differentiation is to be delayed as much as possible, change in the sequence and timing of manufacturing steps may be required.
- *warehousing* – the function of the warehouse under the postponement concept may have to be greatly expanded. Instead of being only a store and shipping location, the warehouse may need to take a more proactive approach and function as an order consolidation and customization center.
- *expedition* - more frequent and flexible deliveries may be required.

**Realignment of resources:**

- *human resources* – all of the product, process and infrastructure changes outlined above will have an impact on the knowledge and skills the employees will need to possess. Order taking and purchasing employees will have to learn to manage shorter deadlines, warehousing employees will have to adopt new skills e.g. in assembling the products and accept greater responsibilities in matching the orders and shipping in time. This, in turn, will have an impact on hiring, training and compensation procedures.
- *supplies* - requirements for suppliers’ reliability and timeliness may be significantly stepped up, which may require supplier switching and consolidation.

**Realignment of infrastructure:**

- *production and warehousing premises* - it may be necessary to reconfigure the plant and warehousing network to have the premises close to the customers or to the distributors.
• production equipment - set up and changeover times will have to be decreased to increase flexibility on the production line.

• information and IT systems - a major overhaul in information systems may be needed, sometimes with a similar requirement on the suppliers and the customers, to provide an adequate support. Vendor managed inventories (VMI) are an example of such a coordinated action.

They may have to address the issue of the product design. Developing new products with robust design may be necessary to achieve standardization and customization at the same time - e.g. HP developed printers that could be connected to both 110 and 220 volt networks. Leveraging component commonality/modularity can be extremely beneficial, especially for the components with long lead times from the suppliers (see Figure 1).

Postponement Evaluation

Before embarking on the changes in its processes and infrastructure, the company implementing postponement needs to evaluate whether the costs associated with it do not exceed the expected benefits (see Exhibit 3).

Postponement benefits:

• Increased sales – by being able to postpone the production to the point when the demand is better known, the company can greatly improve its forecasting abilities and will run a lower risk of losing sales, because the product is not available. Not only can the company improve its performance in its existing business; the newly gained flexibility capabilities can translate into dramatic improvements in meeting the customer requirements, which can attract business that was previously not attainable.

• Lower inventory holding cost
• Lower cost of obsolescence
• Lower scrap cost

There are two sources of these benefits:

• Improved forecasting
• Delaying expensive operations and point of product differentiation – this enables the company to maintain the bulk of its inventories in the cheaper and/or pre-customized form. As a result, company will achieve the benefits of a larger inventory buffer (pooling effect) without having to carry the full cost of it.
Figure 1
Component Commonality

**No component commonality**

- Step 1  Storage 1  Step 2  Storage 2

Whether Step 1 and Storage 1 should be combined will depend on:
- Incremental investment cost for producing common components at Step 1
- Unit cost of Step 1 (exploiting economies of scale or lack of)
- Potential savings due to reduction of inventory at Storage 1
All of these benefits can lead to higher profitability for the company, which may decide to pass a portion of the benefits to the customers in the form of lower prices or higher customer service. However, postponement does not guarantee a win-win situation under all circumstances because of the cost involved.

**Postponement cost:**

Postponement may increase company costs both directly and indirectly.

- **Direct cost increases** can be caused by product or process redesign. For instance, HP printers for dual volt networks mentioned above had higher unit cost than printers that were designed for one network only.

- **Indirect cost increases** can be caused by the changes in the production and distribution processes with the consequent impact on the infrastructure and resources (including labor). This impact is sometimes not limited to the company implementing postponement, but affects the other players in the supply chain. As we will describe in the chemical company example, postponing the process of dying the plastic by letting the selected customers do it resulted in lower utilization of the company’s dying equipment and non-recovery of a portion of the fixed cost.

As these incremental cost increases may be significant, companies implementing postponement may do so selectively - e.g. if a company carries 100 products in its product line, but 5 products represent 90% of the demand, it may decide to focus only on these 5 products.

The postponement concept can be compared to an option and the cost associated with it to the exercise price. Just like it makes sense to exercise only options that are “in the money,” postponement makes sense to implement only if the benefits outweigh the associated costs. But again, similar to options on financial assets, there is a lot of uncertainty involved with regard to the costs and benefits - e.g. implementing postponement can accelerate the learning process and unlock new options, previously unavailable, such as attracting business from the customers whose demands previously could not have been met.

That is why we have outlined in the beginning of the note, as a rule of thumb, certain preconditions under which postponement is more likely to be successfully introduced. Companies that experience a radically different picture in their business - demand with little or no uncertainty, low value of short time to market, low product proliferation, low inventory values etc. - would obviously gain very little from postponement. For instance, if a farmer signs a long term contract to supply all

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1 An American call option is the closest proxy
Postponement

(reducing demand uncertainty) of his or her grain (no SKU proliferation) to a customer at the end of
the growing season (no need for unusual speed) then there really is no benefit to postponement.
However, the strength of postponement lies in its wide applicability as speed becomes a more
important capability. The fact that postponement finds its use in such different situations as high tech
manufacturers and fast food chains is the best proof of this.

Suitability for Companies

In summary, companies that are in industries where it is particularly difficult to match supply with
demand can benefit the most from implementing a postponement system. As mentioned earlier, there
are three characteristics that stand out where postponement can have a large effect: demand
uncertainty, substantial product proliferation, and importance of a quick response relative to the cycle
time of producing the product or service.

Companies that display any of these characteristics are candidates for performance improvement
through postponement. And the more of the characteristics companies display, the better candidates
they are. Today, where more and more industries move towards creating markets of one and where
success is driven not so much by cost or quality but by speed, postponement becomes increasingly
important.

A Quantitative Example: The PC Company

Let’s suppose that we run a PC company that manufactures and sells notebook PCs directly to
users. In order for us to compete with the retail channel, we guarantee our customers that we will ship
on the day we receive their order. This requires that we maintain significant amounts of inventory on
hand to meet that promise.

Our company is just about to introduce a new top of the line notebook to the market. This new
model has 25 different variations based on the same chassis and processor combination. The
variations are driven off of various combinations of software and the amount of RAM in the PC. Our
marketing department has estimated daily demand for each of the 25 variations to resemble a normal
distribution with an average of 100/day and a standard deviation of 100. This variability may actually
be rather low for the PC business so our analysis may underestimate the impact of postponement. For
the sake of simplicity, we’ll assume the same demand distribution for each model, although the
principle holds even with different distributions.

Let’s examine what sort of savings we could achieve if we could postpone installing the software
and RAM until after the order has been received while maintaining that 95% of the PCs be shipped
that day. Without postponement, we can’t take advantage of any pooling of the common basic
Postponement

computer since the software and RAM is preinstalled. This means we must deal with each individual model’s variability. With postponement, however, we only need to deal with aggregate variability of demand.

Without Postponement

\[ \mu = 100/\text{day} \quad \sigma = 100 \quad \text{Service Level} = 95\% \]

Total Inventory needed at beginning of the day = 25 * (\mu + 1.65 \sigma)
= 25 * (100 + 1.65 * 100)
= 6625 units

With Postponement

\[ \mu = 100/\text{day} \quad \sigma = 100 \quad \text{Service Level} = 95\% \]

Total Inventory needed at beginning of the day = 25 * \mu + 1.65 \sqrt{25} \sigma
= 25 * 100 + 1.65 * 5 * 100
= 3325 units

Note: the standard deviation of the aggregate demand (\sqrt{25} \sigma) comes from summing the variances of the 25 distributions and then taking the square root

Here we can see the impact of postponement. In this case, our inventory level is cut virtually in half. If we estimate that each of these PCs costs $3000 for our company, then the reduction in inventory due to postponement is $9.9 million.

Additionally, this simple analysis ignores many of the other positive side effects of lowering inventory such as lower obsolescence costs and smaller space requirements. Its purpose is to show in a very basic way how powerful postponement can be.

Examples

Hewlett Packard

Overview: Hewlett Packard is known as a leader in the application of postponement techniques. One of the areas where they have done this most effectively is in customizing their printers close to the local markets where they are actually being sold. The idea they use is to postpone commitment of a printer to a certain geographic market by producing universal printers and then applying power supplies and labels (the parts that differentiate printers for local markets) at the last stage once
demand is more certain. This allows them to gain pooling effects and therefore, to better match supply and demand.

Traditionally, most computer peripheral manufacturers have built one plant for a major market, such as the Americas, Asia, or Europe and then shipped product from this plant to regional distribution centers (DCs) around that market. In many instances, only one worldwide plant existed with shipments made from this plant to DCs around the world. These DCs provided quick response to customer orders for products and were needed in a major market to reach customers within a certain time window. This supply chain seemed to make sense since there were some economies of scale to having a centralized plant supplying an entire major market.

**Problem:** However, there are certain problems with the traditional system that necessitated looking at the policy again. The first problem is the amount of finished goods inventory that must be carried in the local DCs. Since shipments come from a distant plant, not only did these DCs need to stock a large amount of inventory to compensate for the lead time, they also had to stock additional inventory to handle all of the product proliferation that took place. For example, in Europe, many different versions of a single printer model must be made due to the different power sources and sets of languages. Compounding this problem is the increasing emphasize placed on speed. The lead time from when a customer orders a product to when they received it is being squeezed and HP had to find ways to reduce cycle time while trying to keep inventory costs low. This squeeze on lead times means that postponing back at the plant level is not an option. Local DCs are needed to meet this short lead time demand. So how can the apparently contradictory goals of increasing service and reducing inventory be met?

**Management Decision and Outcome:** The solution, following the postponement philosophy, was to actually build some assembly functions into their DCs. This way, the plant could send generic printers to the DCs and they could be customized there for the local markets. This allowed HP to take advantage of inventory pooling at the DC level which dramatically cut inventory. Certainly, it seemed that this would increase costs since there are economies of scale to these manufacturing processes. However, the decrease in inventory more than made up for the increased cost in creating some assembly functions at the DC level. Essentially, what HP did was postpone the customization of the printer until the printer was actually in the geographic area where the demand was coming from and until orders were more certain. Implementing this type of supply chain is not easy because it takes coordination and investment, but the payoffs can be quite large.
Motorola

Overview: Motorola’s Land Mobile Products Sector/Radio Products Americas Group (RPAG) has recently adopted a postponement manufacturing and distribution strategy for its two-way radio (pager) business. The shift towards postponement allows RPAG to carry more variety without increasing inventory. But on the other hand, the shift in strategy also requires additional investment in its warehouse system.

Problem: RPAG builds radios for many national, regional, and local retailers. These retailers often demand many different varieties in packaging, housing, and frequency because the ultimate end users demand variety. In the past, products would be manufactured to stock from different plants and then sent to the Atlanta DC.

Management Decision and Outcome: The recent shift in strategy is making to order. The most expensive part of the radio, the circuit board, is still manufactured at various plants and sent to the Atlanta DC. At the DC level, pre-manufactured circuit boards are now put in different housing, label, and packaging only after an order is received. With the new strategy, the DC can carry more variations of finished good products without tying up additional money in inventory. Furthermore, customer service also improves because the DC no longer needs to rely on the factory to ship special ordered products. The DC is able to customize packaging for short runs of special products.

However, the new strategy also requires the DC to take on additional responsibilities. RPAG has evolved from a push to a pull operation. Consequently, the DC must now be able to track and move inventory more efficiently to meet customer demands. Thus, RPAG had to install a warehouse management system (WMS) to control the flow of inventories. Furthermore, RPAG also adopted vendor-managed inventory (VMI) for retail customers to better manage its inventory.

The Large Chemical Company

Overview: The polycarbonate business unit of this large chemical company manufactures a high-tech plastic that is used in many applications, ranging from car panels (e.g., Saturn cars) to bulletproof glass to Legos. Just as the applications vary significantly, the needs of the customers vary...
as well. Some customers require ignition-resistant plastic while others require transparent plastic. Many of these needs must be addressed in the manufacturing process through the addition of special chemicals to the mixture. Polycarbonate is not yet a commodity and is priced high relative to other plastics. However, margins are still thin enough that small decreases in cost will lead to large increases in profit. The company is one of the three key players in Europe.

**Problem:** The cost structure of the manufacturing process is higher if you produce many different products. Large set-up costs and run-size drive this higher cost. First, setup costs can be significant for products produced in small batches. The machinery used in the production process must be thoroughly cleaned before another product can be run, or chemicals will interact and the final product will not perform as designed. In addition to setup costs, smaller run-sizes lead to higher costs due to inefficiencies throughout the manufacturing process. Thus, the company is able to produce the same product at a significantly lower cost if it is produced in large-run sizes with minimal setups. Assuming that the pricing in the market is stable and margins are narrow, a small decrease in costs can have a large impact on profit. The company's Europe division wanted to find ways to use postponement in the manufacturing process in order to achieve the cost economies while offering the customers a full-range of products.

**Management Decision and Outcome:** The largest single product manufactured by the polycarbonate business unit was the standard clear transparent plastic. The remaining plastic products varied in units manufactured, but most were relatively small and, as a result, relatively high cost compared to competitors who sold larger volumes. Management felt that the best opportunity for reducing costs was presented by the color compounds. These items were chemically similar to the clear product, but had a dye added in the final stages of the process. Though the dye was added in the later stages, it still required these products to be produced in a separate run. Management contacted key customers and explored the opportunity of selling the clear plastic and the color dye to customers and allowing them to mix it in their molding process. The key was that the dyeing process required certain skills from the customers, and the company found that not all customers possessed these skills. However, a large enough number did that a significant portion of the volume could be sold in this manner.

Customers benefited from the new system by paying a slightly reduced cost. The company benefited by reducing its costs more than what they passed on to customers. By postponing the coloration until the customer uses the product, significant value was created in the value chain. The
company’s manufacturing costs and safety stock both decreased as a result of the new system, and profit margins increased.

**The Large Consumer Electronics Company**

**Overview:** This large consumer electronics company entered the photocopier business in the 1980s, five to ten years after other Japanese copier manufacturers. At that time, other Japanese companies dominated the Japanese market and had considerable market share in the US and Europe. The dealer network was the key to success in this business since products require periodic maintenance and service. As a late comer, the company had difficulty in growing the business. Its world market share was less than 3% in the early 1990s.

**Problem:** Copier machines are segmented mainly on copy speed (copies per minutes, CPM), paper volume (number, volume and size of paper cassettes) and specification (zoom, etc). To establish a strong distribution network, it is very important to hold a full line of products because dealers tend to carry only one or two brands. The variety of products, accessories and consumables increased inventory throughout the supply chain from the factory to sales companies to dealers. Due to low volume sales, the company’s production cost was higher than competitors. Its lead-time was longer because the company had to use a limited number of production lines for a variety of product segments.

**Management Decision and Outcome:** To improve economy in production and lead-time, without reducing product line variety, the company introduced in the early 1990s a modular product design (see Exhibit 4)

- Number of main frames was reduced from seven to three. Two of them were outsourced.
- High durability and speed adjustable (in factory) engines (which determines copy speed and durability volume) were designed for products from a low speed of 15 CPM to a high speed of 40 CPM. The number of engines was reduced from seven to four, and two engines were outsourced.
- Products were separated into subassemblies and accessories.
- Increased common components and consumables across the product line.
- Prices of each product segment were adjusted using product cross-subsidizing
There were four main benefits. First, standardization increased economies of scale in production. Second, it reduced lead-time. Third, it reduced components, work in process, and finished products inventory in the supply chain. Fourth, this increased the variety of configurations and allowed the configurations to be easily customized at the dealer level.

This strategy was not successful, however, in expanding the dealer network and increasing market share. This strategy would have been more beneficial if variety in configuration was important. Although dealers needed variety in copy speed and volume durability, variety in configuration was not critical because most customers’ configuration requirements were similar. Modular design and expandability increased product costs at the highest selling configurations. Moreover, although the company tried to reduce cost by cross subsidizing across product lines, its low speed machines (less than 15 CPM) were not competitive because they had high costs due to their high durability engines. Further, its low speed machines were too bulky for the rapidly growing small office and home office market segment. Finally, lower inventory costs were not persuasively communicated to dealers and was not enough of a reason for dealers to switch from other brands. The company had to modify its strategy and introduced low speed products separately from the modular type product line in the mid 1990s.

**Long Grove Confectionery Co.**

**Overview:** Long Grove Confectionery is a local, family-owned chocolate manufacturer that specializes in designing and manufacturing creative, high-end chocolate products. They sell a significant amount of their product through company-owned stores, though the majority is moved through wholesale channels. The wholesale product is sold primarily through catalogs, mainly the Christmas edition.

The large product diversity, however, has led to some issues that detract from the firm’s potential financial performance. First, they incur costs when left with unused packaging inventory that must be discarded. Second, instead of discarding the product immediately, the unused seasonal packaging inventory is often held until the following year in an attempt to sell the product again to minimize the profit impact. As a result, their marketing effort is somewhat restricted by the necessity to sell leftover products the following year. Thus, LGCC had to develop a system to minimize the cost impact of unused packaging inventory in order to increase profits.

**Problem:** The key driver of their problem is forecasting. LGCC is often unable to accurately forecast the demand that new products are going to generate. Variance from forecast on a single
product can occur on the high side because a single customer (i.e., Bloomingdale’s) will decide to retail a product nationwide or on the low side because a given product may attract only a few small customers. Thus, they often have problems in matching supply with demand.

A second driver of their problem is scale purchasing. LGCC often is not able to place a large enough order with suppliers (i.e., box manufacturers) to obtain a sizeable quantity discount. This will lead to a cost disadvantage relative to larger players and result in a lower profit margin than they could otherwise achieve. When they increase their order size on products that potentially could sell well in order to secure a larger discount, they risk being stuck with unused inventory because sales are lower than forecast.

A third driver of the problem is the unique packaging used in their products. LGCC normally uses very specialized packaging materials to sell their products’ creativity and uniqueness. Thus, the packaging materials are not easily transferable to other products whose performance is exceeding expectations and may need additional packaging supplies in order to meet demand. This results in unused inventory with little alternative value.

LGCC would like to improve its forecasting ability, but the presence of a new management team and old information systems makes it a difficult area to improve in the short-term. In addition, the nature of new products will always create a situation where supply and demand will not be perfectly matched. Thus, management had to develop a program to reduce inventory holding costs and disposal costs.

As a result, LGCC’s costs rise and, thus, profits fall as LGCC incurs excess inventory holding costs as well as any disposal costs from packaging material that is discarded. When they do dispose of packaging materials, the loss is a significant percentage of the total profits generated on the items sold. Thus, the inability to match supply with demand severely impacts profit margins.

This issue affects the revenue side of LGCC’s business as well as the cost side as it is likely that total sales are decreased due to inclusion of under-performing products in scarce catalog space. LGCC’s annual Christmas catalog generates the majority of the revenues for the wholesale business. However, single item performance may vary significantly throughout the catalog or even on a given page. Hot sellers may generate over $200,000 in sales while poor performers may generate less than $2,000. LGCC will often keep the slow selling items in the catalog the following year in order to use the excess inventory in stock. They may market these items “on sale” at reduced prices, but it still requires catalog space. With such a large percentage of revenues generated from the catalog, they could potentially recognize a significant impact on revenues and profit by giving the scarce catalog space to new products or to expand the focus on current hot sellers.
**Management Decision and Outcome:** Management’s developed a plan to use postponement principals to delay differentiation of the product until late in the process. They investigated opportunities to modify the packaging designs for different products to incorporate more standard pieces while maintaining a unique, premium appearance. For example, LGCC historically used specially designed boxes with decorative features imprinted on the box for most items. Under the new policy, the company would use more standard boxes that have specially designed wraps, bows, etc., that can create a similar seasonal feeling and premium appearance for the customer. Thus, by delaying differentiation of the packaging until later in the process, the company would be able to more accurately match supply with demand while applying unused inventory to other products.

The main cost-reduction benefit of the proposed plan is reduced safety stock by holding packaging material in the latest common form. Consider the following example. Instead of holding twenty unique boxes (one box for each item), they can now hold 9 packaging items (3 box sizes, 3 bow colors, and 3 box wraps) common to all 20 products. Thus, they would have fewer items in inventory and less inventory of each item due to pooling effects. Additionally, they may be able to achieve a large discount from suppliers by buying larger quantities of fewer items.

The company would also enjoy a revenue benefit as well. By introducing more standard packaging pieces and better-utilized inventory, the firm will not have to market slow selling items the following year. This should have a significant impact on sales, as the company can focus on the hot existing and new products.

As of the fall of 1997, the program is under consideration and has not been acted upon yet. Management is still investigating the firm’s ability to maintain its premium image and unique product presentation if they move to more standardized packaging options. Though they believe that it will be a benefit once implemented, they want to ensure that they select the right products for the program and that their creative team is able to develop successful products with the new guidelines. Though it should be a success down the road, there are competitive issues that must be worked-out before management changes its packaging processes.

A longer-term step for LGCC’s management is to reduce safety stock and markdowns even further from more accurate forecasts. As the management team gains more experience and the information systems improve, management should be able to develop more accurate forecasts for both existing and new products. This improved forecasting should improve margin by further reducing safety stock and further decreasing the amount of inventory write-offs.
Postponement is a reactive lever for reduction of the demand and supply variability. In employing tools like postponement, the ultimate goal is to improve profitability by better matching supply with demand.
Since implementation of postponement improves the flexibility capability, it has to tie back to company’s strategy on one hand and to be realigned with the processes, resources and infrastructure on the other hand.
Whether or not postponement is a winning proposition to implement depends on whether its incremental benefits outweigh the incremental costs it requires.

**Benefits**
- Higher revenue
- Lower inventory holding cost
- Lower cost of obsolescence
- Lower scrap cost

**Cost**
- Direct cost (product or process design changes)
- Indirect cost (changes in processes, resources and infrastructure)
Exhibit 4
Copier Product Line in 1990 and 1992
Standard Configuration

1980s

<table>
<thead>
<tr>
<th>A4 size</th>
<th>A3 size</th>
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<tbody>
<tr>
<td>8 CPM 1 cassette</td>
<td>10 CPM 1 cassette</td>
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<td>15 CPM 1 cassette</td>
<td>20 CPM 2 cassette</td>
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<td>30 CPM 2 cassette</td>
<td>30 CPM 2 cassette Duplex</td>
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<td>40 CPM 3 cassette</td>
<td>40 CPM 3 cassette Duplex</td>
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<td>50 CPM 3 cassette Duplex</td>
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1990

8 CPM 1 cassette

8 CPM 1 cassette

Main Module
15 - 40 CPM
1 cassette

Duplex Module

Multiple Paper Module

Discontinue

Discontinue

60 CPM 4 cassette Duplex (OEM)