SUPPLY CHAIN POSTPONEMENT AND SPECULATION STRATEGIES: HOW TO CHOOSE THE RIGHT STRATEGY

by

Janus D. Pagh
The Technical University of Denmark
Visiting scholar at The Ohio State University

and

Martha C. Cooper
The Ohio State University

Effective management of a supply chain includes thinking creatively about how to integrate and perform logistics and manufacturing activities. Postponement and speculation strategies offer opportunities to achieve delivery of products in a timely and cost-effective manner by rearranging the conventional production and logistics structures, which are often designed and managed autonomously.[1] Supply chain advancements have frequently been achieved by reducing risk and uncertainty through the employment of sophisticated forecasting techniques, with a low degree of cooperation and integration between the manufacturing and logistics processes. By employing the concept of postponement and combining it with a holistic view of the supply chain, a small number of best practice companies, some of which serve as examples in later sections, have managed to increase the performance of their firms and the supply chain as a whole.[2]

Few substantial efforts have been made to operationalize the theory of postponement and speculation (P/S) in a way useful to managerial decision making.[3] This article identifies generic supply chain P/S-strategies, and provides manufacturing and logistics managers with a diagnostic and normative framework for selecting P/S-strategies. Focus is placed on the downstream part of the supply chain, from factory level to end customer.

THE CONCEPT OF POSTPONEMENT

The concept of postponement has a long history of practical applications, as well as academic literature. Practical application of the concept can be traced back to the 1920's.[4] The first detailed empirical descriptions appeared in the 1960's.[5] In the literature, the concept was originally proposed by Alderson[6] and later expanded by Bucklin.[7] The logic behind postponement is that risk and uncertainty costs

are tied to the differentiation (form, place and time) of goods[8] that occurs during manufacturing and logistics operations. To the extent that parts of the manufacturing and logistics operations can be postponed until final customer commitments have been obtained, the risk and uncertainty of those operations can be reduced or fully eliminated.

The notion of manufacturing postponement is to retain the product in a neutral and noncommitted status as long as possible in the manufacturing process.[9] This means to postpone differentiation of form and identity to the latest possible point.[10] The notion of logistics[11] postponement is to maintain a full-line of anticipatory inventory at one or a few strategic locations.[12] This means to postpone changes in inventory location downstream in the supply chain to the latest possible point.[13]

Two key and very well known contributions to the concept of postponement are the results by Cooper, and Zinn and Bowersox.[14] Cooper identifies four different supply chain postponement strategies for global brands. These are the bundled manufacturing strategy, the unicentric strategy, the deferred assembly strategy, and the deferred packing strategy. In the key work by Zinn and Bowersox, five different types of postponement strategies are identified. Four different strategies of form postponement (labeling, packaging, assembly and manufacturing) which, when combined with time postponement, constitute the five postponement strategies. In a later discussion section, the strategies outlined in this article will be examined in relation to Cooper's, and Zinn and Bowersox's postponement strategies.

The converse concept of postponement is speculation, which holds that changes in form, and the movement of goods to forward inventories, should be made at the earliest possible time to reduce the costs of the supply chain.[15] Speculation makes it possible to gain economies of scale in manufacturing and logistics operations, and limit the number of stock outs.

The remainder of the article is structured into four sections. In the first section, four generic supply chain P/S-strategies are identified and described. The second section will examine different decision determinants suited for selecting a P/S-strategy. A managerial tool, the Profile Analysis, that can be used to select the most appropriate P/S-strategy, is presented in the third section. The fourth section compares and contrasts the presented framework with two key works on postponement by Cooper, and Zinn and Bowersox.[16] Finally, this is followed by a brief conclusion.

IDENTIFICATION OF GENERIC SUPPLY CHAIN P/S-STRATEGIES

A 2x2 matrix presented in Figure 1 identifies four generic supply chain P/S-strategies, by combining manufacturing and logistics postponement and speculation. The matrix will be referred to as the *"P/S-Matrix"*. The four strategies are: *the full speculation strategy, the logistics postponement strategy, the manufacturing postponement strategy, and the full postponement strategy.*

FIGURE 1

THE P/S-MATRIX AND GENERIC SUPPLY CHAIN P/S-STRATEGIES

		Logistics	
		Speculation *Decentralized inventories*	**Postponement** *Centralized inventories and direct distribution*
Manufacturing	**Speculation** *Make to inventory*	**The full speculation strategy**	**The logistics postponement strategy**
	Postponement *Make to order*	**The manufacturing postponement strategy**	**The full postponement strategy**

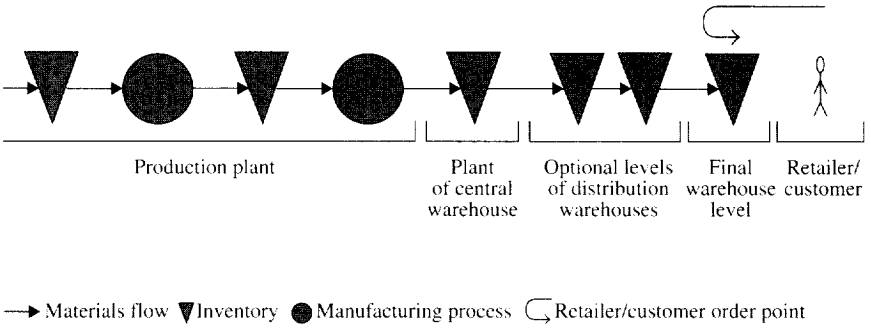
The rows of the matrix represent whether manufacturing postponement or speculation is employed, and the columns whether logistics postponement or speculation is employed. The various strategies have several inherent advantages and disadvantages. Some of these, together with a short description of each strategy are outlined below. The discussion of advantages and disadvantages is primarily based on costs and customer service[17] as evaluation parameters.

The full speculation strategy

This strategy is traditionally the most often used by companies.[18] Based on inventory forecasts, full speculation of all manufacturing and logistics operations is practiced. The retailer/customer order point is positioned at the lowest level downstream in the supply chain. All manufacturing operations are performed prior to the product being differentiated by location. The product is stocked close to customers, and distributed through a decentralized distribution system; see Figure 2.

FIGURE 2

ILLUSTRATION OF THE FULL SPECULATION STRATEGY



An illustrative example of employing this strategy is Xerox.[19] Since 1990, Xerox has been working on integrating the supply chain from supplier to end customer. A main result of the work was three envisioned integrated supply chain P/S-strategies, based on the identification of three different supply chain P/S needs. One of these needs was for Xerox's standard commodity products (plug-and-play products like small workstations, small copiers, telecopiers, etc.). These products are now both fully manufactured and distributed in anticipation of future demand. Commodity stocks are held close to customers, since short delivery time is a vital order-winning criterion. This strategy is similar to the full speculation strategy described above.

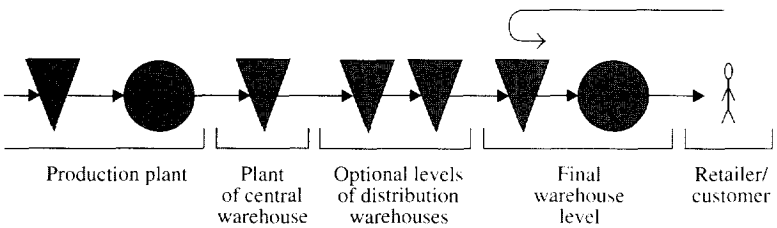
The consequences of employing the full speculation strategy are difficult to generalize. Some points are, however, rather obvious. Full manufacturing and logistics economies of scale can be achieved, since products can be both manufactured and distributed in large lot-sizes.[20] As a result of the decentralized inventories, the inventory investment will be high, the highest of all four of the P/S-strategies. Further, obsolete products and transshipments may occur.

The manufacturing postponement strategy

In this strategy, the final manufacturing operations, whether it is light manufacturing, final assembly, packaging and/or labeling,[21] are performed at some point downstream in the supply chain, after the product, to some degree, has been logistically differentiated. Furthermore, these final operations are deferred until a customer order has been received. This is illustrated in Figure 3, where the retailer/customer order point is positioned prior to the final manufacturing operations. The first stages of the manufacturing process are centralized and inventory initiated. This strategy could also be named the post-factory manufacturing strategy, as described by Schary and Skjøtt-Larsen.[22] Full anticipatory logistics are applied, since products and/or components are distributed and stocked throughout a decentralized distribution system, in anticipation of future customer orders.

FIGURE 3

ILLUSTRATION OF THE MANUFACTURING POSTPONEMENT STRATEGY



One of the first, and now classic, examples of this strategy was to postpone the color of paint to the retailer/customer level. Rather than holding a wide variety of premixed colors, retailers began to stock paint in a neutral color, and customize the final color upon specific customer orders. This of course, dramatically reduced the retailers' number of necessary stock keeping units (SKU's).[23] Another example is Hewlett-Packard's employment of decentralized final customization of their DeskJet printers for the European and Asian markets. Instead of fully customizing the DeskJet printers at the factory, HP decided to postpone the final manufacturing operations (power supplies, packaging, and manuals) until the local distribution centers.[24] It is now only necessary to manufacture, distribute and stock (at the local distribution centers) one kind of DeskJet printer. The final customization, at the local distribution centers, is now based on customer orders. As a result of the decentralization of the final manufacturing operations, manufacturing cost has increased slightly, but the number of SKU's and the safety stock have dropped. Furthermore, the total manufacturing, shipping and inventory costs were reduced by 25%.[25]

The manufacturing postponement strategy can be successfully applied when it is vital to have inventories close to customers, and to the extent that no specialized manufacturing capabilities (e.g. technological or knowledge based) or highly restrictive economies of scale, requires that the operations are performed centrally.[26] The impacts of employing this strategy are several. The variety of differentiated products moved and stocked in anticipation of sale can be reduced,[27] while providing a full assortment. Further, the effect is a reduced total value of inventory and a simplification of the inventory planning and management. On the other hand, the costs and complexity of customer order processing, most likely, will increase. For the manufacturing operations performed downstream in the supply chain, economies of scale will be reduced, as in the HP DeskJet case. Logistics economies of scale will, most likely, not change much.

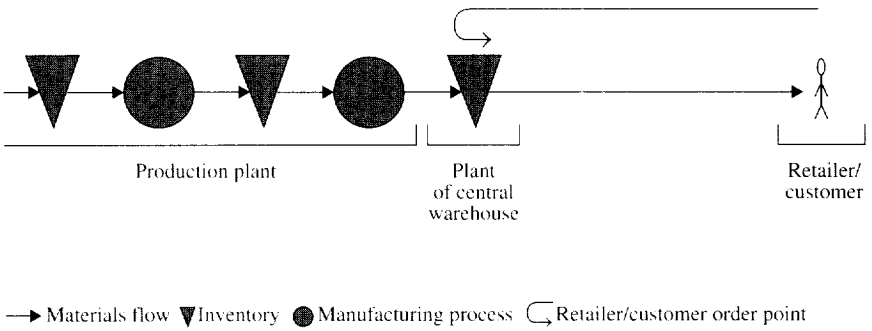
Application of this strategy has increased considerably.[28] Many third-party providers are now capable of performing operations such as labeling and packaging, and in some cases even light manufacturing and final assembly, and even at a very competitive price and quality. Therefore, many companies have decided to spin-off such operations,[29] and thus employ a manufacturing postponement strategy. But as Schary and Skjøtt-Larsen stated, separation of manufacturing stages emphasizes the importance of coordination between the separated stages.[30] The decision then becomes a trade off between cost savings from postponing final manufacturing stages and increased costs because of increased coordination and lack of economies of scale from separating stages.

The logistics postponement strategy

In this strategy, manufacturing is based on speculation, and logistics is based on postponement. This is carried out by direct distribution of fully finalized products from a centralized inventory to final retailers/customers. Figure 4 illustrates that the retailer/customer order point has been moved upstream to the plant or central warehouse level. All manufacturing operations are inventory initiated, and performed prior to the logistics operations. The logistics operations are purely customer order initiated.

FIGURE 4

ILLUSTRATION OF THE LOGISTICS POSTPONEMENT STRATEGY



Applications of this strategy have increased during the last few years.[31] For example, in a study by Abrahamsson, three Swedish international companies (Atlas Copco Tools, Sandvik Coromant and ABB Motors) have changed their supply chain P/S-strategy from a full speculation strategy (stocking fully finalized goods in each European country) to a logistics postponement strategy.[32] Among other things, the change of P/S-strategy has resulted in increased on-time deliveries of complete orders, shorter and more reliable lead-times, reduced inventory costs, constant transportation costs, and faster introduction of new products in the assortment.

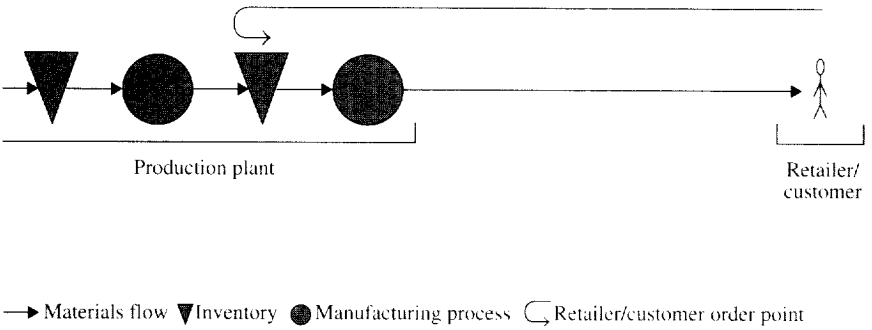
By employing this strategy, the anticipatory nature of logistics is reduced or completely eliminated, since products are distributed directly to retailers/customers. The centralization of inventories reduces the amount of stock required to offer high in-stock availability,[33] but shipment cost may increase due to smaller shipment sizes and faster modes. Finally, manufacturing economies of scale are preserved.

The full postponement strategy

This strategy represents the highest level of postponement application among the four P/S-strategies. Both manufacturing and logistics operations are customer order initiated. In order to shorten delivery time or utilize manufacturing economies of scale it may be beneficial, in some cases, to perform some of the early manufacturing operations in anticipation of customer orders. This situation is illustrated in Figure 5, where the retailer/customer order point initiates the last stage of the manufacturing process.

FIGURE 5

ILLUSTRATION OF THE FULL POSTPONEMENT STRATEGY



An example of employing this strategy is the Danish company Bang & Olufsen.[34] B&O manufactures, distributes, and sells high-end television and stereo systems to a global market with emphasis on design and quality. Based on orders from retail stores, specifically expressing the single customer's unique wishes (units, models, features, colors, sizes, etc.), final assembly and packaging are performed at the production plant, and products are shipped directly to the customer or retailer. Before changing to this strategy, B&O employed the full speculation strategy, resulting in high inventory levels and a slow-response delivering process. Another example is Xerox's fully customized and complex network products that are sold in low volumes. The supply chain P/S-strategy for these products is to fully postpone all operations and only manufacture and distribute the products upon received customer orders.[35]

The result from employing the full postponement strategy is low manufacturing inventory costs and reduction of inventories in the distribution system. Economies of scale will probably only exist in the anticipated stages of the manufacturing process. Logistics economies of scale will most likely be reduced, however recent studies indicate that logistics economies of scale can be maintained.[36]

In the above sections, four generic supply chain P/S-strategies and their general implications have been described. The implications are summarized in Figure 6.

FIGURE 6

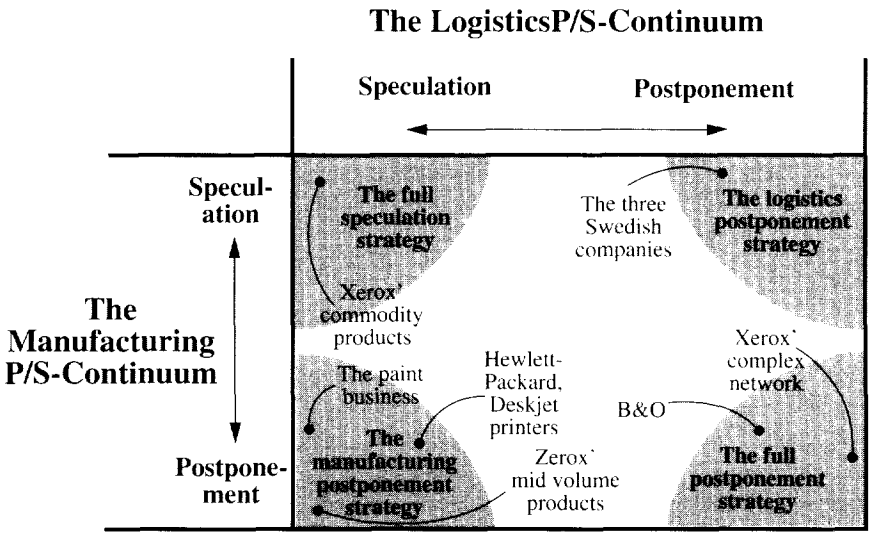
THE P/S-MATRIX, AND IMPLICATIONS RELATED TO EACH GENERIC SUPPLY CHAIN P/S-STRATEGY

		Logistics	
		Speculation	**Postponement**
Manufacturing	**Speculation**	• Low production costs • High inventory costs • Low distribution costs • High customer service	• Low production costs • Low/mid. inventory costs • High distribution costs • Low/mid. customer service
	Postponement	• Mid./high production costs • Mid./high inventory costs • Low distribution costs • Mid./high customer service	• Mid./high production costs • Low inventory costs • High distribution costs • Low customer service

The strategies are end points in a two-dimensional continuum, where each dimension ranges from a full postponement strategy to a full speculation strategy; see Figure 7. In between the four generic supply chain P/S-strategies, a wide range of hybrids exists, which results from mixing together aspects of two or more generic supply chain P/S-strategies. In order to match their specific P/S needs, companies can employ hybrid P/S-strategies.

FIGURE 7

GENERIC AND CONTINUUM OF HYBRID P/S-STRATEGIES, AND POSITIONING OF THE CASE-EXAMPLES



The interesting and inevitable question for managers is: which supply chain P/S-strategy should I use? This question can only rightfully be answered by identifying the supply chain P/S needs. In the following section, the discussion will move on to assess some of the decision determinants that should be considered when identifying the P/S needs and selecting a P/S-strategy.

IMPORTANT DECISION DETERMINANTS

Which decision determinants should be considered when identifying the P/S needs and selecting a matching P/S-strategy? For some companies, it is the structure or constraints within the manufacturing and logistics system, or it may be the product itself and the way it is designed. For others, it is the market and demands from intermediaries and final customers. However, for most companies, the P/S needs are determined by a combination of all three categories, and, accordingly, all three should be considered.[37] Each category comprises a number of decision determinants. In this article the following important determinants will be examined: product life cycle, monetary density, value profile, product design characteristics, delivery time, frequency of delivery, demand uncertainty, economies of scale, and special knowledge.

The product

The *life cycle* of the product, and each stage of the life cycle, are significant for selecting an appropriate P/S-strategy. In the manufacturing, marketing and logistics literature, consensus seems to exist on dividing the life cycle of a product into a series of four distinguishable stages: introduction, growth, maturation and decline.[38] The supply chain P/S needs change across stages of the product life cycle, and consequently different P/S-strategies should be employed.[39] The focus in the first two stages is primarily on customer service,[40] and some degree of anticipatory manufacturing and logistics will likely be appropriate. In the two final stages, a P/S-strategy that minimizes risk, uncertainty, and costs would likely be preferable.[41] As a result, P/S-strategies from the upper-left corner of the P/S-Matrix in Figure 1 will be more appropriate in the first two stages, and strategies from the lower-right corner more appropriate in the two final stages.

The *monetary density* and *value profile* of the product are, likewise, two important decision determinants. Monetary density expresses the ratio between the dollar-value of a product and its weight and/or volume. Since products with high monetary density are expensive to store, but relatively inexpensive to move, it will likely be beneficial to postpone the final logistics operations.[42] In general, the higher monetary density, the greater benefit of applying logistics postponement, and vice versa. The value profile refers to when and how much the product increases in value throughout the manufacturing and logistics process.[43] The value profile of a product should also influence the choice of P/S-strategy. If the major proportion of the product's total value is added in the final operations of the manufacturing or logistics processes, it presumably is beneficial to postpone these operations.

Product design characteristics should strongly influence the choice of P/S-strategy.[44] For a standard product, the risk of speculation is limited. For a highly customized product, some degree of postponement will presumably be beneficial. Cooper identifies three different product characteristics to be important:[45] 1) is the brand global, or is it country specific? 2) is the formulation (such as electrical standards, color, size and software) common to all markets? and 3) are peripherals, such as labels, packaging and instruction manuals, common to all markets?[46] Very different P/S needs result from combining these product design characteristics, and hence different P/S-strategies should be preferred.[47] Standardized and narrow product lines should employ a strategy from the upper-left corner of the P/S-Matrix. The opposite seems to be more appropriate for a specialized and broad product line.

The market and demand

Perhaps the most important determinants for selecting a matching supply chain P/S-strategy are the needs of the final customers and intermediaries. Logistics is a primary means through which customer value is created and delivered to the final customers.[48] Several logistics decision determinants that create customer service/value have been identified that would influence the choice of P/S-strategy. It is not, however, the purpose here to comment on all; yet it is meaningful to examine a few.

The *relative delivery time* and the *relative delivery frequency* are two closely related and important determinants. The relative delivery time refers to the average delivery time to customers, in

proportion to the average manufacturing and delivery lead-time. The relative delivery frequency refers to the average delivery frequency to customers, in proportion to the average manufacturing and delivery cycle time, for the same product. If customers demand a high relative delivering frequency and/or a short relative delivery time, it will likely be appropriate to employ some degree of manufacturing and/or logistics speculation. Therefore, a P/S-strategy from the upper-left corner in the P/S-Matrix presumably should be employed, and vice versa for low delivery frequencies and/or long delivery times.

Another important decision determinant is the degree of *demand uncertainty*. Based on the predictability of products' demand patterns, Fisher has found that products can be classified into one of two categories.[49] Products are either primarily functional, with a low demand uncertainty and long life cycle, or primarily innovative, with a high demand uncertainty and short life cycle. If the uncertainty is high, the risk of speculation will also be high. Therefore, for primarily innovative products, it will be appropriate to postpone the final manufacturing and logistics operations, and vice versa for primarily functional products.[50]

The manufacturing and logistics system

Lastly, it is crucial to acknowledge the constraints within the manufacturing and logistics processes. Two constraints seem to be especially important to most supply chains. To the extent that large *economies of scale* exist or *special knowledge* is needed in the manufacturing and/or logistics processes, some degree of speculation might be beneficial.[51] Consequently, a P/S-strategy from the upper-left half in the P/S-Matrix presumably will be more appropriate to employ, and vise versa.

In this section, several decision determinants have been described. These are not exhaustive. Nevertheless, they do provide insight into some of the aspects that manufacturing and logistics managers should consider when selecting a P/S-strategy. Based on the determinants described above, a managerial tool for selecting the most appropriate supply chain P/S-strategy is presented in the following section.

THE PROFILE ANALYSIS: A MANAGERIAL APPLICATION

Companies need to have a comprehensive understanding of the implications for supply chain performance as different P/S-strategies are chosen. However, when companies choose a P/S-strategy, they often fail to incorporate and evaluate the trade offs, and subsequent implications. Likewise, as the P/S needs change, companies may not recognize that the mix of trade offs embodied in the currently employed P/S-strategy are often relatively fixed, and will remain so unless the strategy is modified.

The main purpose of the Profile Analysis is to assist managers in the process of selecting the most appropriate P/S-strategy, and to identify how the alignment between determinants and P/Sstrategy can be improved. Thus, the Profile Analysis is both descriptive (AS-IS) and normative (TO-BE). The Profile Analysis is a two-step procedure as follows[52]:

1. Select supply chain decision determinants

Select the relevant decision determinants to use in the Profile Analysis; see Figure 8 and Appendix 1. When selecting determinants, it is essential that the selection is based on each determinant's relevancy for choosing the best P/S-strategy. Ballou asks the question: can a satisfactory scope of decision determinants be established that will capture the comprehensiveness of the decision without burdening the decision process with unnecessary details?[53] If the number of selected determinants is too extensive, it will blur the importance of the essential determinants. On the other side, an insufficient number of determinants will not reflect the complete P/S needs, and can result in an inappropriate mismatch between needs and strategy. Many companies may not fully appreciate the complexity of the supply chain, and thus only base their P/S-decision on a limited and often insufficient number of determinants.

FIGURE 8

THE CONCEPT OF THE PROFILE ANALYSIS

Some important P/S-decision determinants			Generic P/S-strategies			
			The full speculation strategy	The manufacturing postponement strategy	The logistics postponement strategy	The full postponement strategy
Product	Life cycle	Stage	Introduction	Growth	Maturation	Mat./Decline
		Volume	Low/Med.	Med./High	Med./High	Low/Med.
		Cost/service strategy	Service	←	→	Cost
	Product characteristics	Product type	Standard	←	→	Customized
		Product range	Narrow	←	→	Wide
	Value	Value profile	Initial stages	←	→	Final stages
		Monetary density	Low	Low	High	High
Market and demand		Relative delivery time	Short	←	→	Long
		Delivery frequency	High	←	→	Med./Low
		Uncertainty of demand	Low	←	→	High
Manufacturing & logistics		Economies of scale	Large	Small	Large	Small
		Special capabilities	Yes	No	Yes	No

2. Profiling and analysis

Profile the supply chain P/S needs in relation to each of the selected determinants, as illustrated in Figure 9. The profile visualizes the degree of alignment between the P/S needs and the generic P/S-strategies. The selection of a P/S-strategy is a trade-off among determinants. The straighter the profile, the better the alignment with one P/S-strategy. The hypothetical profile illustrated in Figure 9 has a relatively straight profile, and is consistent with the "logistics postponement strategy". By predicting how the supply chain will change in the future, it is possible to examine the robustness of the P/S-strategy. Will the P/S-strategy still be in alignment with the needs in the future, or is it sensitive to changes and likely that it must be modified?

FIGURE 9

USING THE PROFILE ANALYSIS;
A MAINSTREAM PRODUCT HAS BEEN PROFILED

Some important P/S-decision determinants			Generic P/S-strategies			
			The full speculation strategy	The manufacturing postponement strategy	The logistics postponement strategy	The full postponement strategy
Product	Life cycle	Stage	Introduction	Growth	Maturation	Mat./Decline
		Volume	Low/Med.	Med./High	Med./High	Low/Med.
		Cost/service strategy	Service	←	→	Cost
	Product characteristics	Product type	Standard	←	→	Customized
		Product range	Narrow	←	→	Wide
	Value	Value profile	Initial stages	←	→	Final stages
		Monetary density	Low	Low	High	High
Market and demand		Relative delivery time	Short	←	→	Long
		Delivery frequency	High	←	→	Med./Low
		Uncertainty of demand	Low	←	→	High
Manufacturing & logistics		Economies of scale	Large	Small	Large	Small
		Special capabilities	Yes	No	Yes	No

It is important to emphasize that most companies operate a portfolio of products and markets, and that the supply chain may be different from combination to combination. This will presumably require that each combination is analyzed separately. Cooper stated that it is important to recognize that some companies will have not just one supply chain P/S-strategy but multiple strategies. This

is most often the case when a company is a member of several supply chains and manages several product groups.[54]

An illustrative example of employing multiple supply chain P/S-strategies is Xerox.[55] As described earlier, one of the main results of Xerox's work on integrating the supply chain was the implementation of three different P/S-strategies, based on the identification of three different supply chain needs. The one end of Xerox's product/market spectrum is the fully customized and complex network products that are sold in low volumes. These products employ the full postponement strategy. The other end of the spectrum is the standard commodity products (plug-and-play small workstations, small copiers, telecopiers, etc.). These products use the full speculation strategy. In the middle of the spectrum are the mid-volume product types. These products employ a manufacturing postponement strategy. Thus, Xerox has identified several different P/S needs and consequently the need for several different P/S-strategies. Another illustrative case is Volvo GM.[56]

For the best performance of the supply chain, it is essential that the P/S-strategy fit the P/S needs. The barriers to accomplishing that are the realities of designing and managing supply chains. It is highly complex, involves long-term decisions, and possibly large and fixed investments. Hill stated that "in many instances though, companies will be unable or unwilling to take the necessary steps to provide the degree of fit desired because of the level of investment, executive energy, and time-scales involved. However, sound strategy is not a case of having every facet correctly in place. It concerns improving the level of consciousness a company brings to bear on its corporate decisions. Living with existing mismatches or allowing the level of fit to deteriorate can be strategically sound if a company is aware of its position and makes these choices knowingly."[57] The Profile Analysis can provide increased awareness, and allow a conscious choice among P/S-strategies.

Based on the above, the Profile Analysis provides managers with a tool to identify: the supply chain P/S needs; the supply chain P/S-strategy that provides the best mix of trade offs; the degree of alignment between P/S needs and P/S-strategies; and the robustness when anticipating changes in the supply chain needs.

DISCUSSION

In this section, the concepts of this article are compared and contrasted with the key works by Cooper, and Zinn and Bowersox, in terms of approach and P/S-strategies. Cooper[58] identifies four different supply chain postponement strategies for global brands based on "yes" and "no" answers to questions related to different product characteristics; see Figure 10. Zinn and Bowersox[59] identify five different postponement strategies; four different strategies of form postponement (labeling, packaging, assembly, and manufacturing) plus time postponement.

FIGURE 10

THE BASIC CONCEPT OF COOPER'S KEY WORK

		Formulation: Is formulation common to all markets?	
Product characteristics		No	Yes
Peripherals: Are peripherals common to all markets?	Yes	Bundled manufacturing strategy	Unicentric strategy
	No	Deferred assembly strategy	Deferred packing strategy

Source: James C. Cooper, "Logistics Strategies for Global Businesses," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 4 (1993): 12-23.

Cooper's four postponement strategies are strongly related to the five postponement strategies identified by Zinn and Bowersox, and the strategies identified in this article. However, some important differences exist. Zinn and Bowersox's labeling and packaging postponement strategies correspond to Cooper's deferred packaging strategy. Similarly, Zinn and Bowersox's assembly and manufacturing postponement strategies closely relate to Cooper's deferred assembly strategy, since they mainly differ in the degree of warehouse assembly that occurs. Clearly, all of these postponement strategies are strongly related to the manufacturing postponement strategy identified in this article. They primarily differ in the degree of form postponement employed. Therefore, these postponement strategies can fit within the manufacturing postponement strategy. The fifth postponement strategy identified by Zinn and Bowersox, time postponement, is closely related to the unicentric strategy identified by Cooper, and to the logistics postponement strategy identified in this article.

Further, the bundled manufacturing strategy identified by Cooper, which does not have an obvious equivalent to the strategies identified by Zinn and Bowersox, is strongly related to the full postponement strategy identified in this article. The aim in both strategies is to retain product commonality as far downstream in the manufacturing process as possible. This leaves the full speculation strategy that neither Cooper, or Zinn and Bowersox include as a strategy option.

An interesting point, when comparing and contrasting Cooper's, and Zinn and Bowersox's key works with the concepts outlined in this article, is the extensiveness of decision determinants incorporated in the models. Cooper solely bases his identification of supply chain postponement strategies on product characteristics, whereas Zinn and Bowersox incorporate a wider range of determinants, including demand, demand uncertainty, product value, number of brands, and number of package sizes. In the Profile Analysis, the managers decide the number of determinants, and most importantly, it is a trade off between comprehensiveness and level of detail in the analysis, as described earlier.

In summery, the P/S-strategies identified in this article are similar to the strategies identified by Cooper. However, Cooper solely considers product characteristics as a determinant. On the other hand, Zinn and Bowersox consider a wider range of decision determinants, but do not include the possibility of employing postponement at the production plant level.[60] These similarities and contrasts make the key works by Cooper, Zinn and Bowersox, and the concepts presented in this article, mutually supporting, and thus together further operationalize the theory in a way that is useful to managerial decision making.

CONCLUSION

In conclusion, this article provides insight in three key areas. By using the P/S-Matrix, four generic supply chain P/S-strategies have been identified. The strategies do represent distinct and realistic supply chain P/S-strategies, as the empirical examples cited in the article indicate. Second, important P/S-decision determinants were proposed. Finally, a descriptive and normative tool (the Profile Analysis) was presented for selecting the most appropriate supply chain P/S-strategy. In short, the article provides managers with a framework of generic supply chain P/S-strategies, and a diagnostic tool to assist in the selection of a P/S-strategy for supplying products.

Many companies have identified a need to improve their processes for manufacturing and delivering products. One way of doing that could very well be to eliminate the inconsistency between the P/S needs and the P/S-strategy. Eliminating the inconsistency is not easy, but as Fisher stated "the reward - a remarkable competitive advantage that generates high growth in sales and profits - makes the effort worth it."[61]

NOTES

[1]Christopher Gopal and Gerard Cahill, *Logistics in manufacturing* (Business One Irwin, Homewood, Illinois, 1992), p. 68; and Martha C. Cooper, Douglas M. Lambert, and Janus D. Pagh, "Supply Chain Management: More Than a New Name for Logistics, *The International Journal of Logistics Management*, Vol. 8, No. 1, 1997, pp. 1-14.

[2]Donald J. Bowersox, "Lessons Learned from the World Class Leaders," *Supply Chain Management Review*, 1:1(1997), pp. 61-67.

[3]James C. Cooper, "Logistics Strategies for Global Businesses," *International Journal of Physical Distribution and Logistics Management*, 23:4 (1993), pp. 12-23; and Walter Zinn and Donald J. Bowersox, " Planning Physical Distribution with the Principle of Postponement," *Journal of Business Logistics*, 9:2 (1988), pp. 117-136.

[4]Global Logistics Research Team at Michigan State University, *World Class Logistics: The Challenge of Managing Continuous Change* (Oak Brook, IL: Council of Logistics Management, 1995).

[5]See e.g. Stanley H. Brewer and James Rosenzweig, "Rhochrematics," *California Management Review*, 2:3 (Spring, 1961), pp. 52-71; and R. Cox and C. S. Goodman, "Marketing of House Building Materials," *The Journal of Marketing*, 21:1, (July 1956), pp. 36-57.

[6]Wroe Alderson, "Marketing Efficiency and the Principle of Postponement," *Cost and Profit Outlook* 3 (September 1950).

[7]For a historical perspective regarding the concept of postponement, see e.g. same as references Notes 5 and 6, Wroe Alderson, *Marketing Behavior and Executive Action* (Homewood, IL: Irwin, 1950); Louis P. Bucklin, "Postponement, Speculation and Structure of Distribution Channels," *Journal of Marketing Research*, 2 (February 1965), pp. 26-32; Louis P. Bucklin, *A Theory of Distribution Channel Structure* (Berkeley, CA: IBER Special Publication, 1966). For further information regarding postponement, see e.g. same as Note 3; Donald J. Bowersox and David J. Closs, *Logistical Management: The Integrated Supply Chain Process* (New York, NY: The McGraw-Hill Companies, INC., McGraw-Hill Series in Marketing, 1996); Martin Christopher, *The Strategy of Distribution Management* (Butterworth and Heinemann, The Marketing Series, Professional Development, 1992); Renko I. Van Hoek, Harry R. Commandeur and Bart Vos, "Reconfiguring Logistics Systems Through Postponement Strategies," *Proceedings of the Twenty-Fifth Annual Transportation and Logistics Educators Conference*, October 20, (1996), pp. 53-82; Douglas M. Lambert and James R. Stock, *Strategic Logistics Management* (Homewood, IL: R.D. Irwin, 3'rd ed., 1993); Philip B. Schary and Tage Skjøtt-Larsen, *Managing the global supply chain* (Handelshøjskolens Forlag, 1996); and Louis L. Stern and Adel I. El-Ansary, *Marketing Channels* (Englewood Cliffs, NJ: Prentice Hall Inc., 4'th ed., 1992).

[8]Bucklin 1965, reference in Note 7.

[9]Bowersox and Closs, p. 472, reference in Note 7.

[10]Bucklin 1965, reference in Note 7.

[11]Logistics postponement is also referred to as geographic and/or time postponement, see e.g. Bowersox and Closs, p. 472-473, reference in Note 7.

[12]Bowersox and Closs, p. 473, reference in Note 7.

[13]Bucklin 1965, reference in Note 7.

[14]Same reference as Note 3.

[15]Bucklin 1965, reference in Note 7.

[16]Same reference as Note 3.

[17]With customer service we mean product availability and delivery time.

[18]Zinn and Bowersox reference in Note 3.

[19]This illustrative case is also based on Robert C. Camp and Dan N. Colbert, "The Xerox quest for supply chain excellence," *Supply Chain Management Review*, 1:1(1997), pp. 82-91; and a case-example in Christopher, p. 216-227, reference in Note 7, originally written by M. Stenross and G. Sweet of Xerox Corporation, USA.

[20]Bucklin 1965, reference in Note 7.

[21]Zinn and Bowersox, reference in Note 3.

[22]Schary and Skjøtt-Larsen, p. 86, reference in Note 7.

[23]Charles Scott and Roy Westbrook, "New Strategic Tools for Supply Chain Management," *International Journal of Physical Distribution and Logistics Management*, 21:1 (1991), pp. 23-33; and Bowersox and Closs, p. 472-474, reference in Note 7.

[24]Tom Davis, "Effective Supply Chain Management," *Sloan Management Review*, (Summer 1993), pp. 35-46; and Hau L. Lee and Corey Billington, "The Evolution of Supply-Chain-Management, Models and Practice at Hewlett-Packard," *Interfaces*, 25:5 (September-October 1995), pp. 42-63.

[25]Edward Feitzinger and Hau L. Lee, "Mass Customization at Hewlett-Packard: The Power of Postponement," *Harvard Business Review*, (January-February 1997), pp. 116-121.

[26]Bowersox and Closs, p. 473, reference in Note 7.

[27]Bowersox and Closs, p. 473, reference in Note 7.

[28]Global Logistics Research Team at Michigan State University reference in Note 4; Prabir K. Bagchi and Tage Skjøtt-Larsen, "European Logistics in Transition, some insights," *The International Journal of Logistics Management*, 6:2 (1995), pp. 11-24; Donald J. Bowersox, Patricia. J. Daugherty, Cornelia L. Dröge, Dale S. Rogers, and Daniel L. Wardlow, *Leading Edge Logistics: Competitive Positioning for the 1990's*. (Oak Brook, IL: Council of Logistics Management, 1989); James C. Cooper, Logistics Futures in Europe. An executive summary. Cranfield School of Management (1994); and Lisa L. Ellram and Martha C. Cooper, "Supply Chain Management, Partnerships, and the Shipper - Third Party Relationship," *The International Journal of Logistics Management*, 1:2 (1990), pp. 1-10.

[29]Robert C. Lieb, Robert A. Millen, and Luk N. Van Wassenhove, "Third-party Logistics Services: A comparison of experienced American and European Manufactures," *International Journal of Physical Distribution and Logistics Management*, 23:6 (1993), pp. 35-44.

[30]Schary and Skjøtt-Larsen, p. 78, reference in Note 7.

[31]Cooper reference in Note 28; and Bagchi and Skjøtt-Larsen reference in Note 28.

[32]Mats Abrahamsson, "Time-based Distribution," *The International Journal of Logistics Management*, 4:2 (1993), pp. 75-83.

[33]David H. Maister, "Centralization of inventories and the - Square Root Low," *International Journal of Physical Distribution*, 6:3 (1976), pp. 124-134; and Bowersox and Closs, p. 475, reference in Note 7.

[34]Schary and Skjøtt-Larsen, reference in Note 7.

[35]Same reference as Note 19.

[36]Same as reference Note 32, p. 82; and Schary and Skjøtt-Larsen, p. 206-207, reference in Note 7.

[37]Bert Vos and Edwin van den Berg, "Assessing International Allocation Strategies," *The International Journal of Logistics Management*, 7:2 (1996), pp. 69-84.

[38]Robert H. Hayes and Steven C. Wheelwright, "Link manufacturing process and product life cycles," *Harvard Business Review*, (January-February 1979), pp. 133-140; Chester R. Wasson, *Dynamic Competitive Strategy & Product Life Cycles* (Austin Press, 3rd. edition, 1978); and Bowersox and Closs, p. 62, reference in Note 7.

[39]Wasson, reference in Note 38.

[40]Philip Kotler, Marketing Management; Analysis, *Planning Implementation and Control* (Englewood Cliffs, NJ: Prentice-Hall, 7'th ed. 1991); and Bowersox and Closs, p. 62, reference in Note 7.

[41]Same reference as Note 40.

[42]Cooper reference in Note 3; Schary and Skjøtt-Larsen, p. 134, reference in Note 7; and Michael Browne and Julian Allen, "Logistics Strategies for Europe," *Logistics and distribution planning, Strategies for management*, edited by James Cooper (Kogan Page 1994), p. 123.

[43]The value profiles are similar to the concept of flow models described by Theodore M. Farris II, "Utilizing Inventory Flow Models with Suppliers," *Journal of Business Logistics*, 17:1 (1996), pp. 35-62.

[44]Same references as Note 3; and Schary and Skjøtt-Larsen, p. 57, 131 and 315, reference in Note 7.

[45]Cooper reference in Note 3.

[46]The outlined product characteristics are very similar to the ones outlined by Hirotaka Takeuchi and Michael E. Porter, "Three Roles of International Marketing in a Global Strategy," *Competition in Global Industries*, by Michael E. Porter, (Cambridge, MA: Harvard Business School Press 1986), pp. 111-146.

[47]Cooper reference in Note 3.

[48]See e.g. Carol J. Emerson and Curtis M. Grimm, "Logistics and marketing components of customer service: an empirical test of the Mentzer, Gomes and Krapfel model," *International Journal of Physical Distribution and Logistics Management*, 26:8 (1996), pp. 29-42; and Daniel Innis and

Bernard J. La Londe, "Customer service: The Key to Customer Satisfaction, Customer Loyalty, and Market Share," *Journal of Business Logistics*, 15:1 (1994), pp. 1-27.

[49]Marshall L. Fisher, "What Is the Right Supply Chain for Your Product?" *Harvard Business Review*, (March-April 1997), pp.105-116.

[50]Same as reference Note 49, p. 114; and Zinn and Bowersox reference in Note 3.

[51]Bowersox and Closs, p. 473, reference in Note 7.

[52]This procedure is based on the principles in Terry Hill, *Manufacturing Strategy* (Boston, MA: Irwin, 1994), pp. 129-130; and same as reference Note 49.

[53]Ronald H. Ballou, "Reformulating a Logistics Strategy: A Concern for the Past, Present and Future," *International Journal of Physical Distribution and Logistics Management*, 23:5 (1993), pp. 30-38.

[54]Cooper reference in Note 3; and same as reference Note 49.

[55]Same reference as Note 19.

[56]James A. Narus and James C. Anderson, "Rethinking Distribution, by Sharing Resources and Capabilities, Companies Can Meet their Customers Most Extraordinary Needs," *Harvard Business Review*, (July - August 1996), pp. 112-120.

[57]Hill reference in Note 52.

[58]Cooper reference in Note 3.

[59]Zinn and Bowersox reference in Note 3.

[60]Cooper reference in Note 3.

[61]Same reference as Note 49.

ABOUT THE AUTHORS

Janus D. Pagh is a Doctoral Candidate at the Department of Industrial Management and Engineering at The Technical University of Denmark. He holds a B.S. in Industrial Management and Engineering and a M.S. in Logistics from The Technical University of Denmark. Since the beginning of 1997 he has been a visiting scholar at The Ohio State University, Department of Logistics and Marketing. His current area of research is supply chain management and integration of manufacturing and logistics strategies and structures.

Martha C. Cooper is Professor of Marketing and Logistics at The Ohio State University. She holds a B.S. in Math/Computer Science and a M.S. in Industrial Administration from Purdue University. Her Ph.D. is from The Ohio State University. Her research interests include supply chain management, partnership and other inter-firm relationships, the role of customer service in corporate strategy, international logistics, strategic planning for logistics, and cluster analysis.