

Chapter 1

Trade-Offs: Stamp 'Em Out

Please use your imagination while we engage in a bit of a time-warp. It's the year 1975, and we're attending a seminar on quality management. (Yes, we know that many of you were in grade school in 1975, or weren't even born; that's why you need to use your imagination.) Here's what the speaker is saying:

*“Yes, it's possible to increase quality but in order to do that, you'll need to tighten up your specifications, do more inspection, have more scrap, do more rework, and pay more to get higher grade materials from your suppliers. All of these things will increase your costs. Increased costs will squeeze your gross margins, so you'll be tempted to raise prices. In doing so, you might price yourself right out of your market. Therefore, a critical strategic decision that you must make is this: **how much quality can you afford?**”*

That's what the speaker is saying. Now be honest when you answer this question: Would you have said “phooey” and got up and walked out of that seminar? I wouldn't have. And I don't think that most of you would have, either.

Let's use our imagination again: it's the present time and we're in a seminar and the speaker is saying the same thing; he's telling us about the inherent conflict between quality and cost. How many of us would get up and walk out? My answer: somewhere between 90 and 99 percent. Why? Because today we know the speaker's message is false. Thanks to the total quality revolution, we know that higher quality and lower cost move in the same direction. As quality goes up, costs go down. We now know that ***there is no inherent trade-off between quality and cost.***

Crank up your imagination one more time. We're in another seminar in the present time and the speaker is saying:

There is a trade-off between the level of your finished goods inventory and how well you can provide high customer service – on-time and complete shipments to your customers. The laws of statistics apply here, and they can't be repealed. The bell-shaped curve says that as you get closer and closer to 100 percent customer service, the amount of finished inventory necessary to do that gets higher and higher.

Some of us might walk out, but far fewer of us than with the quality discussion. Many people believe in this trade-off and operate by it. Now let's fast-forward to the year 2025 and imagine the speaker is saying the same thing. By then, most of us would disagree strongly and would probably get up and walk out.

A major objective of this book is to enable you the reader to view the trade-off between customer service and inventory in much the same manner as you view the quality/cost trade-off. **The customer service/inventory trade-off has been muted; it's going away.**

Saying it another way, the customer service versus inventory trade-off can be – and is being – eliminated in many companies. More will follow. More and more companies – even those whose product lines are expanding quite a lot – are recognizing that they don't need tons of finished goods inventory to provide shipments to their customers that are complete and on-time, virtually all the time, and to do that with short lead times.

Let's cover one more trade-off: the one between vast product variety and quick response. Conventional wisdom has said that you can have a wide variety of finished products or, on the other hand, you can ship very quickly. The more products you have – the more versions, variations, styles, colors, models, and so forth – the longer it will take on average to get them produced and shipped. Well, **the trade-off between wide variety and quick response also is going away.**

The Tyranny of *OR* – The Harmony of *AND*

Trade-offs represent what's been called *the tyranny of OR*. “You can have high quality *OR* low cost; you can't have both. You can have high customer service *OR* low inventories; you can't have both. You can have wide product variety *OR* quick response; you can't have both.”

We propose that you replace the tyranny of *OR* with *the harmony of AND*, as in: “You can have high quality *AND* low cost; you can have high customer service *AND* low inventories; you can have wide variety *AND* still be highly responsive. You can have it all.” See Figure 1-1.

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| Figure 1-1 | |
| <p>The Tyranny of <i>OR</i></p> <p>You can have:</p> <p>High quality <i>OR</i> low cost</p> <p>High customer service <i>OR</i> low inventories</p> <p>Wide product variety <i>OR</i> quick response</p> <p>“You can have one or the other.”</p> | <p>The Harmony of <i>AND</i></p> <p>You can have:</p> <p>High quality <i>AND</i> low cost</p> <p>High customer service <i>AND</i> low inventories</p> <p>Wide product variety <i>AND</i> quick response</p> <p>“You can have it all.”</p> |

The key to getting there – to eliminate or at least significantly reduce the trade-offs – is *process*: how things are being done. It takes superior processes to make these kinds of transformational changes. The quality revolution of the 1980s and 1990s didn't happen because people sat around wishing that quality would go up and costs would go down. They used tools – processes – such as statistical process control, six sigma, poka-yoke (mistake proofing) techniques, and many others to achieve breakthrough results: increasing quality while shrinking costs.

Similarly, to break through the customer service/inventory trade-off, processes will play a central role: to balance future demand with supply, to shorten lead times, to reduce order quantities, to “disentangle” product options, and more. Using these kinds of processes has enabled a growing number of companies to ship on time virtually all the time – with little or no finished goods inventory.

Order Fulfillment Strategies

The Order Fulfillment issue gets at the question: “where do you meet the customer?” What do you do when a customer order arrives?

Make-to-Stock

What do you do when a customer order arrives? If you say, “we pick it and ship it,” that’s a *make-to-stock* strategy. Products are produced to a forecast of some kind, put into finished goods inventory, and await customer orders. Prescription pharmaceuticals are one example of make-to-stock products; the products are produced and put into inventory, then shipped to distributors and retail druggists, and following that go to the end consumer.

Make-to-Order

What do you do when a customer order arrives? If you say, “we buy the special material needed for the job, fabricate the components, and put the product together,” that’s a *make-to-order* strategy. Production is normally not started until the customer order arrives. Aircraft manufacturers are make-to-order. The product, a Boeing 767 for example, is essentially designed: a fuselage, two engines, two wings, and a tail section. You can’t order a 767 with four engines. On the other hand, customers – the airlines – have a great deal of latitude in specifying avionics, seating configurations, galley placement, and so forth.¹

¹ An extension of make-to-order is the *design-to-order* strategy, sometimes called *engineer-to-order*. Major parts of the product are not even designed until order receipt. Products in this category include spacecraft and equipment for oil refineries and paper mills.

Finish-to-Order

Sitting between the make-to-stock and make-to-order strategies is one called *finish-to-order*. It's like make-to-stock in that a substantial amount of production is done before receipt of the customer order. On the other hand, it's similar to make-to-order because the product is not finished until the customer order has been received.

The essence of finish-to-order is to do much of the purchasing and production *prior to* receipt of the customer order, and then finish the product based on what's been specified in the customer's order.

Another related term is *assemble-to-order*. We prefer finish-to-order because it is broader and more inclusive; assemble-to-order carries with it the connotation of piece-part, fabrication and assembly type of manufacturing. Finish-to-order applies to those kinds of companies, as well as those making food, packaging materials, toilet articles, and so forth. We see the term *blend-to-order* used in the chemical industry, while Dell Computer refers to it as *build-to-order*. These all mean much the same thing.

One last point regarding finish-to-order. Some companies are so good at this, so speedy in shipping the product after order receipt, that *to the customers* it appears to be a make-to-stock situation. They can't tell the difference. The company can sure tell the difference, though – read on.

Strategies Compared

The make-to-stock strategy has one major advantage and some serious shortcomings. The advantage is that it's quick; the time to fill orders is limited to picking and shipping, typically a day or two.

The disadvantages are serious. They include the need to maintain a finished goods inventory with its costs and its consumption of working capital, the need to forecast at the end item level, the risk of stock-outs and backorders when the forecast is too low, and the risk of obsolescence

Figure 1-2

COMPARISON OF ORDER FULFILLMENT STRATEGIES

| | <u>Advantages</u> | <u>Disadvantages</u> |
|------------------------|--|---|
| Make-to Stock | Very short fulfillment time | High finished goods inventory Need to forecast at end item level Stock-outs and over-stocks when forecast is wrong Risk of products and components becoming obsolete |
| Finish-to Order | Relatively short order fulfillment time Little or no finished goods inventory Can forecast in aggregate detail Flexibility and responsiveness | Often requires bills of material to be structured differently Risk of components becoming obsolete |
| Make-to Order | Lower risk of obsolescence | Long order fulfillment time |
| Design-to-Order | Very low risk of obsolescence | Very long order fulfillment time |

when the forecast is too high. Many people, including your authors, feel that in most cases the disadvantages outweigh the advantages. (These pros and cons are summarized in Figure 1-2.)

The make-to-order and design-to-order strategies have one major advantage and one major drawback. The advantage is a relatively low risk of obsolescence, because the customer requirements are known before the procurement of special materials and prior to production.²

² Some would say that the risk of obsolescence doesn't go away entirely because customers sometimes change their minds, and hence their specifications, after production has begun.

The drawback is a long order fulfillment time; most or all of the work to be done on the product happens *after* receipt of the order. For most industries, this long lead time is a killer. In today's world, the time to acquire the product is usually a critical factor in the purchasing decision.

Lead times of ten or twenty or thirty weeks don't cut it anymore in many parts of the industrial world. However, in some industries, the size and complexity of the products dictate that one of these approaches be followed. To do otherwise could put the company at risk of enormous obsolescence or rework costs.

Finish-to-order seems to be a compromise, a sort of middle-of-the-road approach. Well, yes and no. It certainly "sits between" make-to-stock and make-to-order. However, it can be the best of both worlds: the reduced lead times of make-to-stock together with the flexibility of make-to-order.

Postponement Defined

Finish-to-order has been around for quite a while; the two of us taught it in our workshops twenty years ago under the name assemble-to-order. What's different today is that the finish-to-order approach has been coupled with *speed*. The order fulfillment time changes from *relatively short*, as shown in Figure 1-2, to *very short*, approximating or equaling that of make-to-stock.

Speed is what Postponement is all about. Therefore,

Postponement is Finish-to-Order plus Speed

Postponement means not finishing the product until the customer order arrives, and then finishing it *very quickly*, while adding options and features that the customer has specified.

Typically this means finishing the product, packing it, and shipping it in about the same time that it used to take to pick it, pack it, and ship it. That's fast.

So, you may be wondering, how can a company take an order, finish the product, and ship it so quickly? Well, broadly, you need three things:

the right material,
available capacity, and
effective processes.

If you don't have the right material and components readily available, you can't finish the product quickly. If you don't have enough capacity, you can finish some products quickly but not all of them. Some orders won't get shipped on time, and that's not acceptable. If you don't have the right processes in place, you probably won't be able to finish fast enough and you probably won't have the right amounts of material and capacity.

How to do that – how to have the right material, enough capacity, and effective processes in a variety of different environments – is the primary topic of this book.

A Word About Mass Customization

Right about now, some of you might be thinking: “How does this Postponement stuff tie together with Mass Customization? I remember hearing a lot about that back in the 1990s.”

Mass Customization can be a somewhat vague concept; it's hard to get a crisp, workable definition of it. In perhaps the best known book on the topic, B. Joseph Pine describes Mass Customization as “a synthesis of the two long-competing systems of management: the mass production of individually customized goods and services. The pioneers of this new frontier in business competition are finding that great variety – even individual customization – can be achieved at prices that approach, and sometimes beat, those of mass producers.”³

³ *Mass Customization: The New Frontier in Business Competition*, by B. Joseph Pine III.

The APICS dictionary offers this definition of Mass Customization: “The creation of a high-volume product with large variety so that a customer may specify his or her exact model out of a large volume of possible end items while manufacturing cost is low because of the large volume.”⁴

Well, okay. The common threads running through both these descriptions are those of *variety*, lots of choices, and low cost/price. What’s missing? Answer: *speed*. Speed is a fundamental element in Postponement. Thus, one might tie together these two concepts, Mass Customization and Postponement, in this way:

Postponement is Mass Customization plus Speed

Postponement is Finish-to-Order plus Speed

If you’re looking for a more formal definition of Postponement, allow us to repeat what we said several pages ago:

Postponement means not finishing the product until the customer order arrives, and then finishing it *very quickly*, while adding options and features that the customer has specified.

Benefits from Postponement

Here are some areas of the business positively affected by the effective use of Postponement, first for companies formerly doing make-to-stock.

- *Customer service rises sharply.* Postponement companies have found that they’re able to ship on time virtually all the time, and this in many industries is a substantial competitive weapon. In a 2003 survey conducted jointly by APICS, Cap Gemini Ernst & Young, and Oracle, 91% of the responding Postponement users cited the most important benefits as improved customer satisfaction and decreased inventory (see the following bullet).

⁴ APICS Dictionary, 10th Edition, APICS.

- *Finished Goods Inventory (FGI) levels decrease substantially.* Usually these drops are offset *in part* by a rise in the component work-in-process (WIP) inventories; however, please note the phrase *in part*. We've seen cases where the finished goods drop was *four times* the increase in WIP, and overall inventories decreased by 60% or more. Typically there are far fewer semi-finished units in WIP than there were products in the finished goods inventory. Further, WIP has lower costs per unit because some labor and capacity have not yet been expended.
- *Products can be shipped about as quickly as with make-to-stock.* If not, you're probably not doing Postponement.
- *More product variety can be offered.* Adding new variations of existing products does not require commensurate increases in inventory levels. The classic tension between Sales/Marketing⁵ and Product Development on the one hand, and Operations on the other – over line extensions, “SKU⁶ creep,” and the like – can become quite muted or even disappear. We heard of one company that had an organization they called “the SKU police” to hold down the proliferation in different items. In a Postponement company, the SKU police would be out of a job.
- *The need to forecast at the detailed item, SKU level.* If a given product family of widgets comes in six different colors, in the make-to-stock world you would need to forecast all six of those end products. With Postponement, perhaps by adding the colored components last and finishing the product very quickly, do you need to forecast the individual items? Do you care about which specific models will be sold in blue, brown, chartreuse, or puce? We don't think so. Yes, you'll need to have the colored components available but there are effective ways to do that, as we'll see later.

⁵ Throughout this book, we'll refer to the “commercial” side of the business as *Sales/Marketing*, recognizing that in some companies these are separate organizations.

⁶ Stockkeeping Unit

For companies formerly doing make-to-order, there is one overriding benefit: *speed*. To be able to finish the product very quickly and ship it to the specifications on the customer order can be a significant competitive weapon. In the make-to-order world, time is a competitive variable on a par with customer service in make-to-stock.

Winning Against Offshore Competition

A major, ongoing problem facing American manufacturing has been offshore competition. As we write this, our current number one competitor (some would say *nemesis*) is China. It used to be Japan and Mexico. Now those countries, along with the United States, are losing jobs to China and its neighbors. At some point in the future, Japan, Mexico, the United States, *and* China will probably be losing jobs to some other country or continent. India? Africa?

In the meantime, the offshore problem is serious. China in particular may be our number one competitor for a long time, due to their enormous population, low wage rates, and their rapidly improving infrastructure. So what should we do? How should we compete?

Let's look at three competitive variables – quality, price, and delivery – and ask ourselves how well we can do competitively:

- Can we win on quality? We don't think so. Offshore producers' quality is as good as ours, or close enough that it doesn't make much difference. Quality is a draw.
- Price/cost? We lose big time. The wage differential is simply so great that, for many products, it can't be overcome.
- How about delivery? Here's where we have a shot. Building product in North America for the North American market provides a unique opportunity to outdo the offshore competition on the competitive dimensions of:

1. Shorter order fulfillment time, because the product is not coming from half a world away.
2. Higher customer service/fewer back orders, because the shorter supply chain is less subject to disruptions. Also the detailed, item-level sales forecasts don't need to go out as far and hence are less subject to high error.
3. Lower risk of obsolescence, for the same reason.

Now, combine the three factors above with the following, which result from the effective use of Postponement:

4. Greater product variety: being able to give customers more features, more colors, more choices.
5. A much lower risk of obsolescence because finished products are not put into inventory but are shipped to customers.
6. Reduced reaction time and higher flexibility, particularly important for introducing new products in turbulent markets, to meet changing customer wants, and to capitalize on new technology.

Factors 1, 2, and 3 alone may not be sufficient to overcome the cost disadvantage we face. However, couple them with factors 4, 5, and 6 and you may have a compelling case to keep your manufacturing on-shore – or at least those processes that finish the product. More on this very important topic later.

Who's Doing Postponement?

Now it's time for a quiz. Ready? Name a company that's doing Postponement.

We're confident that a large majority of you said Dell Computer. No, they don't call it Postponement at Dell; as we said, they call it *build-to-order*. But what they do is Postponement as we've described it here. And they probably do it better than any other company in the world.

Procter & Gamble is using Postponement, and it's very helpful in dealing with huge retailers such as Wal-Mart, Kroger, and others. At Procter, they don't call it Postponement either; they call it *Late Stage Differentiation*.

Divisions of Dow Chemical use Postponement and, as we'll see, they ship many of their products in tank cars and trucks. Hewlett-Packard, of course, makes relatively smaller products – computers, printers, and the like – and finishes many of its products in its distribution centers.

Vermeer Manufacturing, a producer of heavy agricultural equipment, has been very successful with Postponement; one of Vermeer's business units makes trenching equipment, which ranges in weight from 40,000 to 245,000 pounds.

Throughout the book, we'll see other examples of companies – in a wide variety of industries, small ones as well as large – using this powerful process.

Coming up next: is your company a candidate for Postponement?