

Six Steps To The Future: How Mass Customization Is Changing Our World

Edward J. Fern, MS, PMP (Time-to-Profit, Inc.)

1. What is Mass Customization?

In 1980, Toffler¹ made the first reference to “de-massified production.” At that time, few of the technologies required for mass customization had developed to the extent required. By 1992, Davidow and Malone² described the structure of an enterprise capable of supporting the new business model. In 1993, Pine³ coined the name “Mass Customization.”

Mass customization is the ability to satisfy the particular needs and wants of individual customers at prices below those of mass produced products and services that only approximate the wishes of many customers in large market niches.

Mass customization requires six core competencies:

1. Eliminating Customer Sacrifice
2. Modular Design and Integration
3. Supply Chain Management
4. Lean Production
5. Process Organization
6. Multi-project Management

Multi-project management has the job of tying the other competencies together in response to the needs and wants of individual customers. In the new world of mass customization, every sale is a project. Smooth and efficient satisfaction of customer demand requires smooth and efficient project management. Delivery of customer value becomes the responsibility of process teams who must continuously and quickly re-align their own activities to meet unique requirements. Decision-making, responsibility, and accountability are entrusted to teams, not to individuals. Management focus is on process improvement while personnel management is placed in the hands of process teams acting collectively.

2. Booksurge.com

Booksurge.com entered the books-on-demand business reluctantly. The intention of the principals was to become a publishing house. Their differentiator was to be their ability to make publishing a quick, easy, and relatively painless experience for authors. To achieve those goals, they felt it would be necessary to minimize their own investments in inventory, warehousing space, tracking systems, and personnel to manage, pick, and ship books.

Early in their development, the Booksurge executives approached each of the printing companies that made claims to offer books-on-demand, i.e., the ability to quickly and economically produce books in response to customer orders in quantities as small as a single copy. What they eventually learned was that none of the printing houses was truly a books-on-demand printer. Instead, they were micro-printers. They had the ability to produce one-hundred, or fifty, or even twenty-five books at costs that made business sense. None of them, however, could do just one.

¹ Toffler, Alvin, 1980, The Third Wave, William Morrow, New York.

² Davidow, William H. and Michael S. Malone, 1992, The Virtual Corporation: Structuring and Revitalizing the Corporation for the 21st Century, Harper Business, New York

³ Pine, B. Joseph II, 1993, Mass Customization: The New Frontier of Business Competition, Harvard Business School Press, Boston

To the people at Booksurge, this meant that an order for a single copy of a book would require the printing of at least twenty-five copies: one to fill the customer order and twenty-four they just didn't need. Certainly they had no desire to pay for, store, and track the unsold copies. Nor did they want to build a business process for determining, in response to a new order, whether it could be filled from inventory or would require that yet another batch of books would be required.

Somehow, Bob Holt, president of Booksurge.com, and his partners missed the clear implications of their efforts. Since they had investigated every avenue and found that nobody could do what they wanted, they failed to come to the obvious conclusion that what they wanted was impossible. Instead they launched their own crusade to prove that they could do what more experienced and better funded companies could not do. While this is only anecdotal evidence, it may be that this stubborn refusal to face reality is a requirement in mass customization as it is in other forms of innovation. You may hold the evidence of Booksurge's success in your hands.

You may now read a book that was produced within forty-eight hours in response to a customer order. It will not sit in a warehouse, accumulating dust and mildew, waiting for a buyer. Instead of tying up several thousand dollars in inventory, its publisher will have invested its cash in making you aware that the book was available. Moreover, there will never be an economic reason for this book to be "out of print." So long as storing a few megabytes of data is affordable, this book can be reproduced at any time another reader wants a copy.

Booksurge offers publishers and authors a wide variety to features. Each is priced to produce a profit for Booksurge. There are no "loss-leaders," no "package deals," and no 'bundling." Instead, the customer is free to pick and choose among a variety of pre-press options and a plethora of marketing support choices. The customer pays only for those pieces that make sense for their particular situation. In no case is the customer asked to make the sacrifice of taking an unnecessary service in order to get a necessary one.

Every service that Booksurge offers is supported by a documented delivery process. Both the quality and the timeliness are assured by a consistent, repeatable production and delivery process. Some services are supplied through outsourcing. Text editing is performed by qualified individuals, often English professors, who receive their assignments and do their work by way of an Internet interface. Book formatting, the process of manipulating the text into its final appearance, is carried out in India. Booksurge will customize its offerings to the needs of individual customers, but it does not offer what it cannot do both well and profitably.

Booksurge processes are carried out by teams. Both quality and timeliness objectives are established and team performance is measured against these clearly defined goals. Incentives reward team, not individual, performance. The results are phenomenal. Quality and timeliness success are both above 99.999 percent. When rare failures occur, teams are motivated to find the causes and design and implement measures to prevent their recurrence.

The single flaw in Booksurge's stellar performance is their sales operation which has been plagued by high personnel turnover. Sales is managed as an individual rather than a team effort. Booksurge must now address the question, "is our sales problem a result of our failure to hire the right people or a failure to design a process that can be carried out by ordinary people."

Booksurge's books-on-demand is a sensibly superior solution for publishers. The benefits are:

- Cash customarily tied up in inventory is freed for promotion. Funds need not sit in a warehouse accumulating dust and mildew.
- Cash customarily consumed by warehouse space and personnel is conserved.

- Forty-eight hour order turn-around is clearly superior to what conventional distributors are offering.
- Revised editions of books need not be timed to release after the inventory of the current edition is sold.
- Because books are produced to fill reader orders, returns are minimal.
- The “back list” becomes obsolete. There is never an economic reason for books to be “out of print.”

The value of the ability to publish revisions to a book should not be underestimated. In 1989, The Free Press published Schnaar's⁴ *Megamistakes*. Inspired by Naisbitt's⁵ *Megatrends*, Schnaars intended to discredit the predictions of futurists, including David Sarnoff who, in 1956, presented a paper entitled “Twenty Years From Now: A Forecast.” Schnaars reported that Sarnoff was right on only about twenty-five percent of his predictions and that, among his errors, was a prediction that Soviet Communism would fall. The Berlin wall fell before the book was published and, by June 12, 1990, Russia had formally declared its State Sovereignty, bringing the Soviet Union to its end. Mercifully, *Megamistakes* is out of print, though the dropping of a single sentence might have extended its life. In 1990, it would have taken months to make that revision. Today, it could be the work of a few days.

In the mass production paradigm, the costs of carrying inventories of pieces, parts, and finished goods were ignored. Delay was an inescapable part of accumulating sufficient orders to justify the set-up costs required for production runs. Standardization was employed to increase volume and reduce unit cost. Focus was on designing products with the broadest possible appeal. Success was easily measured in terms of market share because profitability was a function of volume. Marketing was about selling the goods and services that suited the tastes of the average member of a market.

In the mass customization paradigm, inventories are anathema. In fact, cash-negative inventories are often the source of working capital. Time has become the precious resource. Production systems deliver both low cost and high flexibility. The market niche has been replaced by the particular customer and success is measured in market fragments and the diversity of variations that can be offered. Marketing is about selling personal service and memorable experiences.

3. Dell

In Time-to-Profit Project Management,⁶ Ed Fern noted a press release issued during Comdex, the huge personal computer show in Las Vegas, Nevada..

NEW YORK, November 11, 1998 - As part of its strategy to extend its leading market share position, Compaq Computer Corporation (NYSE: CPQ) today launched a massive direct sales and marketing effort in the U.S. to deliver the utmost in customer choice and value to growing businesses who prefer to buy direct.

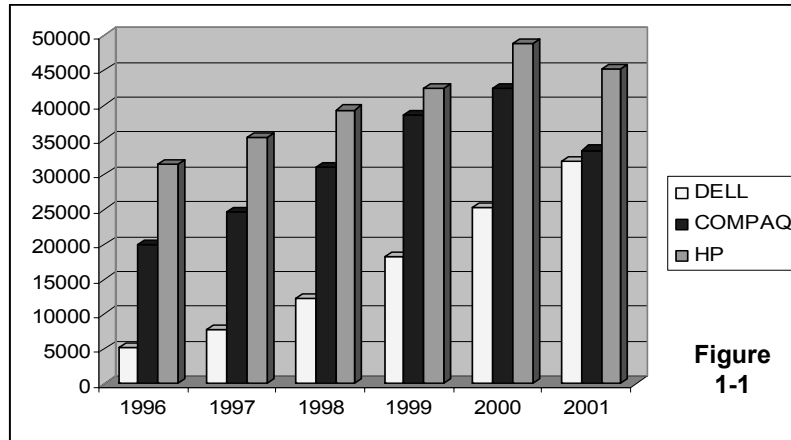
Integral to this effort, Compaq redesigned the economics of its channel and reseller distribution model to give customers the best of both worlds - a robust direct program offering outstanding value and a complementary reseller program harnessing the strength of the Compaq reseller network by providing the relationships and value-added support customers expect.

⁴ Schnaars, Stephen P., 1989, *Megamistakes: Forecasting and the Myth of Rapid Technological Change*, The Free Press, New York

⁵ Naisbitt, John, 1982, *Megatrends: Ten New Directions Transforming Our Lives*, Warner Publications, New York

⁶ Fern, Edward J. 1999, *Time-to-Profit Project Management: A Primer for Project Managers in Commercial Product Development*, Time-to-Profit, Inc. Mission Viejo, California

Fern's book compared Compaq to Dell Computer and pointed out that Compaq's new marketing strategy was likely to put Compaq, "... in the awkward position of competing with their own distribution channels, the retail outlets, on which they are dependant for most of their sales volume."



Like Compaq's executives, Fern's attention was focused on a difference between two approaches to distribution. Like a deer in the headlights, both Compaq and Fern failed to notice what was going on behind the flashy lights.

Dell was doing many things well and their distribution model was only the most visible aspect of a superior business model. By May 3,

2002, Compaq ceased to exist as a separate company. Figure 1-1 depicts total revenue for Dell, Compaq, and Hewlett Packard from 1996 through 2001.

On May 3, 2002, Compaq and Hewlett Packard merged. The new stock symbol is HPQ. While there are real differences between these companies, there is also substantial duplication.

Elimination of that duplication will, doubtless, have the positive effect of reducing costs. All the things we know about economies of scale and synergistic efficiency tells us that this new company will enjoy substantial advantages over Dell in a market that focuses more on price than on feature and function.

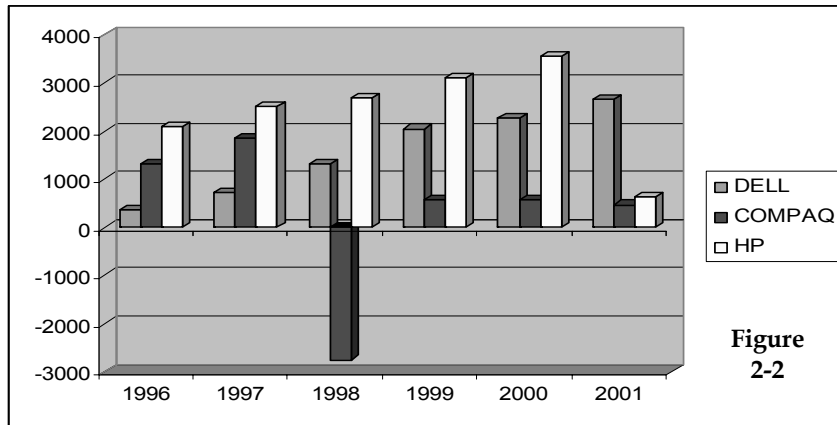
Unfortunately, all these things we knew are no longer true.

The merger may well also have the effect of reducing revenues, a trend already in evidence in the pre-merger performance of both companies. Buyers will view the new company with curiosity and uncertainty for some time. The Hewlett family staged a valiant effort to prevent this merger. This too will certainly make buyers tremulous.

Even without these encumbrances, however, it seems likely that Dell's revenue growth will continue to outpace and eventually surpass that of HPQ. Both Hewlett Packard and Compaq are built on a business model that Dell has rendered obsolete. As we shall see, the functional organizations, integrated design technologies, indirect marketing methods, and mass production techniques that have built so many successful companies can, just as easily, bring them down.

Nevertheless, Compaq alone is still larger than Dell and the post-merger combination of Compaq and HP is generating revenue at two-and-a-half times the rate of Dell. But, revenues do not tell the whole story. Figure 1-2 depicts earnings for the three companies.

Compaq's "awkward position" with its retailers lasted only moments. Most of them made short work of boxing up their Compaq inventory and shipping it back to the factory. Compaq lost \$2.8 billion in fiscal 1998.



The open question is, “Why, having bitten the bullet in 1998, hasn’t Compaq been able to compete effectively with Dell?” The answer is mass customization and the explanation of that phenomenon is the work of this new book.

What Compaq’s executives called a

“massive direct sales and marketing effort” was an attempt to imitate the most visible difference between Compaq and Dell. Indeed, building direct relationships with end users is essential to the crucial mass customization source of value. It is this relationship that allows the mass customization company to identify, and ultimately eliminate, the need for its customers to make sacrifices.

What Compaq’s executives missed was that their “massive effort” to put a new face in front of the customer could not achieve its purpose unless they also made an even more massive effort to completely rebuild the company behind the face. Mass customization companies are very different from mass production companies in more ways than we are able to count. The number of differences is growing every day. In fact, it is the ability of mass customization companies to re-invent themselves every day that makes them such devastating competition for the juggernauts of the past.

While we cannot begin to enumerate the innovative variations and complexities that have been used successfully by mass customization companies, we are able to define six skill sets that are not only common among mass customization firms but that would seem to be necessarily common. The six skills that seem to be required for mass customization to be successful are:

- the ability to identify and satisfy the needs of individual and unique customers,
- the ability to integrate the world class products of others into their own customizable product or service,
- the ability to provide suppliers with a stake in their own success
- the ability to eliminate inventories and the waste of effort, space, and capital they represent
- the ability to organize “competents,” skilled individuals, into empowered, self-managed work groups
- the ability to balance resources across multiple projects to achieve program success

Compromise is at the core of mass production. For the sake of economies of scale, mass production must design its products and services to appeal to markets that have large numbers of customers whose needs and wants are similar. If most of the potential customers for a new luxury sedan will want cruise control, then cruise control will be “standard” equipment and every customer must pay for it, whether they want it or not. If I’d like to have a special sound system installed in my new car after I’ve taken delivery, I’ll probably have to pay the dealer an extra fee to remove the “stock” sound system built into every car. Mass customization satisfies the particular needs and wants of individual customers. Moreover, it does this at prices below those of mass produced products and services.

Mass production thrives in a vertically integrated environment. Until the government intervened, Henry Ford had assembled a vertically integrated value chain that stretched from the Mesabi Iron Range through Lakes Superior and Huron to Detroit, and then on to company owned and operated dealerships across the nation. The tin Lizzie was Ford from start to finish. It came in "every color as long as it was black." Not long ago, a new Toyota was only 25% Toyota while a new General Motors car was still 47% GM.⁷ Customers demand that the increasingly complex products and services they buy be the combination of precisely the pieces they perceive to be the best in the world, no matter who makes them. Successful mass customization companies specialize in designing interfaces that allow "best in class" products and services to blend seamlessly into an experience tailored for a specific customer.



Mass production depends, for its efficiency, on a standard design that can be repeated consistently until every benefit of the learning curve has been identified, isolated, and exploited. Ensuring the lowest possible cost of each and every component requires adversarial relationships, both between and with suppliers. When asked how he felt rocketing into space, an astronaut once replied, "All I could think of was that all of the hardware underneath me was manufactured by the low bidder."

In an age of super-abundance, it is seldom the low price of components that contributes most to the value of the products and services that customers are willing to pay for. Instead, buyers are interested in the total cost of ownership over the full life-cycle, including the cost of disposing of our product when they have extracted its value. Because this is true for customers, it must also be true for their suppliers and for the suppliers of those suppliers. Now the successful company must be concerned with the impact its suppliers' products will have once they are incorporated in their own products. An auspicious benefit of giving suppliers this benefit is reduced, or eliminated, inventories. Dell has now reduced inventory to four days requirements. That means it turns over its entire inventory about 91 times each year. For Compaq, the number is about fourteen and for IBM, about ten. Chapter Five will detail implementation of value chain management and its new mentality for both managers and knowledge workers.

Reduced inventories also enable "lean production." Lean production is an assembly-line manufacturing methodology developed originally for Toyota and the manufacture of automobiles. It is also known as the Toyota Production System. The goal of lean production is described as "to get the right things to the right place at the right time, the first time, while minimizing waste and being open to change". Engineer Ohno, who is credited with developing the principles of lean production, discovered that in addition to eliminating waste, his methodology led to improved product flow and better quality.

Instead of devoting resources to planning what would be required for future manufacturing, Toyota focused on reducing system response time so that the production system was capable of immediately changing and adapting to market demands. In effect, their automobiles became made-to-order. The principles of lean production enabled the company to deliver on demand, minimize inventory, maximize the use of multi-skilled employees, flatten the management structure, and focus resources where they were needed.

The elimination of inventory, coupled with rapid manufacturing and delivery, becomes a key source of capital for the mass customization company. Dell Computer recently had only four

⁷ *Fortune*, September 5, 1994

days sales in inventory and 69 days worth of sales in accounts payable. That means that the average item in Dell's inventory will be sold over 17 times before it is paid for once. Because Dells' receivables are only 29 days' sales, Dell enjoys the use of about \$ 3.4 billion of other people's money.

Companies may be organized hierarchically in one of two ways. Functional organizations arrange people in clusters based on their function role in carrying out the enterprise's business. In companies like General Motors, organizations we find marketing, sales, engineering, manufacturing, finance, and a myriad of other departments that house specialists in some aspect of the discipline for which their department is named. A recent innovation, an attempt to cope with the escalating pace of change in business, has been the projectized company. In even very large companies like Boeing, nearly every employee is assigned to a project team and, when their project is completed, they must either be moved to another project or laid off.

A growing number of companies are adopting a hybrid approach, with some employees arranged functionally and others in a projectized environment. This arrangement allowed Northrop Grumman to navigate the treacherous development path of the FA-18 Super Hornet. This project was "on hold" for over a year between completion of the prototypes and turn-up of production. Without a functional organization to house and occupy hundreds of project personnel, the team could not have been held together.

Achieving the breath-taking speed required to reduce inventories to four days while delivering custom tailored products to fill \$ 85 million of customer orders every day requires, among other things, split second decision making at multiple levels of logistic, technical, and organizational complexity. If Dell was organized like Compaq, taking just one minute to make a decision would cost Dell \$59,000 in revenue and over four-thousand dollars in profit. Hierarchical organizations are simply too time-consuming. Time makes all the difference.

Instead, in hundreds of new generation mass customization companies, decisions are made by trained, diverse, and empowered teams whose members report to each other. Teams, not individuals, are charged with responsibility, authority, and accountability for entire business processes that cross traditional functional boundaries. These processes are invented on the fly to satisfy a customer. Then they are re-invented, just as quickly, to meet a different set of requirements for a different customer.

Resource allocation methods typically work well in environments where candidate projects are predominantly independent of one another, aside from the competition for resources. In mass customization, however, the effort required to satisfy the needs of one customer is often highly interdependent on what is being done to satisfy requirements for many other unique customers. Each project is likely to place demands on resources also being used to satisfy requirements in many other projects, to depend for its success on the outcome or progress of other projects, and to provide valuable input to still other projects. Optimizing a massive number of projects, as must be done in mass customization, can be overwhelmingly complex.