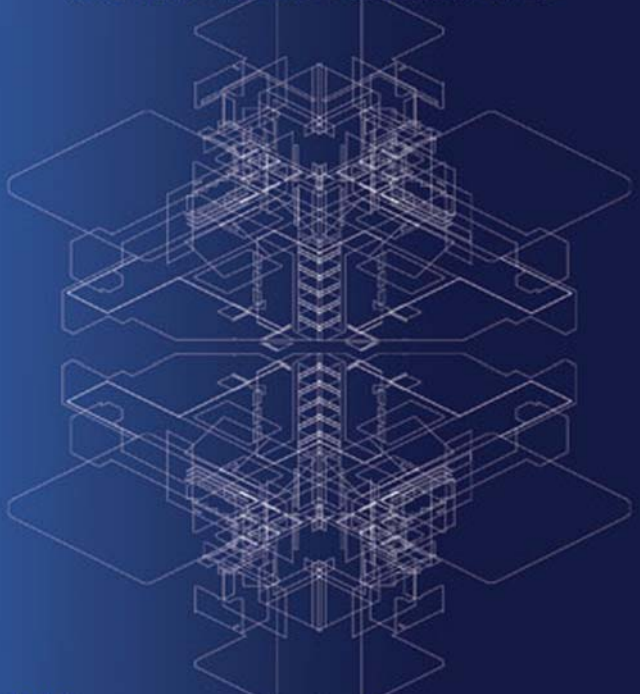
Mass Customization

AN ENTERPRISE-WIDE BUSINESS STRATEGY



David J. Gardner

Foreword by Frank Piller

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“Mass Customization: An Enterprise-Wide Business Strategy” Book Excerpt

How Build to Order, Assemble to Order, Configure to Order, Make to Order, and Engineer to Order Manufacturers Increase Profits and Better Satisfy Customers

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BOOK EXCERPT Table of Contents

Contents

NOTE: This is the Table of Contents (TOC) from the book for your reference. The eBook TOC (below) differs in page count from the tradebook TOC.

Foreword by Frank T. Piller

Today's pressing global economic crisis is putting efficiency and cost-cutting back on the agenda of executives and entrepreneurs worldwide. Yet, cost cuts should not be blindly pursued at the risk of damaging the long-term strategy and value proposition of an organization. Firms pursuing differentiation strategies do not have to turn themselves into cost leaders; what they must be able to do is offer better, cheaper, and simpler differentiation through the creation of a unique portfolio of products and services for each of their customers or groups of customers.

Mass customization is a key strategy to meet this challenge. The term denotes an offering that meets the demands of each individual customer, but that still can be produced with the efficiency of mass production. Or, as B. Joseph Pine, who made mass customization popular with his 1992 book, Mass Customization: The New Frontier in Business Competition, recently said: "Today I define Mass Customization as the low-cost, high-volume, efficient production of individually customized offerings."

In other words, the goal is to provide customers what they want when they want it. Consider the following examples as positive examples of mass customization. BMW customers can use an online toolkit to design the roof of a Mini Cooper with

their very own graphics or picture, which is then reproduced with an advanced digital printing system on a special foil. The toolkit has enabled BMW to tap into the custom after-sales market, which was previously owned by niche companies. In addition, Mini Cooper customers can also choose from among hundreds of options for many of the car's components, as BMW is able to manufacture all cars on-demand according to each buyer's individual order.

Another great example of mass customization is American Power Conversion (APC), a case described by Lars Hvam in a special case study issue of the *International Journal of Mass Customization* (2006). APC sells, designs, produces, delivers, and installs large complex infrastructure systems for data centers, and components for these systems. At the heart of the mass customization strategy of this company is a module-based product range and the use of product configuration systems for sales and order processing. In addition, the company has implemented a manufacturing concept, which involves the mass production of standard components in the Far East, and customer order-based final assembly at various production sites around the world within close customer proximity. The results of applying mass customization principles included a reduction of the overall delivery time for a complete system from around 400 days to only 16 days. Production costs were also significantly reduced. At the same time, the company's capability to introduce new products has increased dramatically. Due to the modular system architecture, new component technologies can be integrated within a matter of days and not months, as was the case before.

What do these examples have in common? Regardless of product category or industry, they have all turned customers' heterogeneous needs into an opportunity to create value, rather than a problem to be minimized, challenging the "one-size-fits-all" assumption of traditional mass production. The concept of mass customization makes business sense in these times. Why wouldn't people want to be treated as individual customers, with

products tailored to their specific needs? But mass customization has been trickier to implement than first anticipated. There is still a large lack of knowledge about how to apply mass customization in practice.

This is where David Gardner's experience comes to the fore. In this book, David has summarized his vast experience in implementing the elements of a sustainable and profitable mass customization system in diverse business settings. He is one of the few individuals in the world that really have researched and executed mass customization thinking in a consistent and pragmatic way. So I am sure that you will benefit tremendously from his advice and reflections to better understand how you can build for your company a full set of mass customization capabilities that will set your business ahead in these tough times.

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Introduction

I've been helping manufacturers implement mass customization since the early 1980s—before the expression "mass customization" was coined by Stan Davis in his best-selling book *Future Perfect* back in 1987. There has been much written about mass customization as a high-level business strategy but far less written about actually implementing mass customization within a manufacturing company.

Some would suggest that you merely need to purchase product configurator software and, voilà, you're in the mass customization business. Hogwash! This would be tantamount to suggesting one can write a great sales letter merely because you have Microsoft Word.

Mass customization is not a departmental challenge nor is it an IT challenge. Mass customization must be approached holistically across the enterprise and even out to the extended enterprise to your dealers and customers. This book will help you understand why this is the case.

In his book *The Strategy Paradox*, Michael Raynor offers the following key insights:

- Companies spend 95% of their energy getting the product and technology right.

- As a consequence, there is little capacity to look at the "business model" question.

Make no mistake about it:

Mass customization is a business model question.

Companies with highly configurable products that thrive in their marketplace need to combine the technical superiority of their products with operational excellence. They need to be able to seamlessly connect the customer to all organizations in the enterprise so the hand-offs from organization to organization resemble the efficiency of an aircraft carrier flight deck.

If your company continually experiences the pain of not being able to seamlessly connect the customer to the enterprise and efficiently drive the order demand across the enterprise, your business is not set up properly. There is a misalignment between what your company needs and what you have.

In company after company, I've seen very bright people work months or years to solve the operational challenges associated with highly customized products without success. It's not merely a matter of buying product configurator software—it's a matter of setting up your entire business to accommodate your highly configurable products.

Who should read this book?

- Anyone who's company faces a constant, uphill challenge with respect to quoting, configuring, and producing highly configured products.
- Anyone who has made an investment in product configurator software and wants to understand why operational efficiencies and profits haven't improved.
- Anyone who would like to get a better understanding of what is required to implement mass customization and the power mass customization has to transform certain industries.

This book has been prepared with discrete manufacturers—companies that produce a product that you can physically touch—in mind. The principles of mass customization can be applied in services (professional, insurance, and financial), process manufacturing, and other industries, but I'll not be touching on those areas.

Chapter

2 Mass Customization Defined

Within the manufacturing world, mass customization is about producing highly configured products with the efficiency of a mass-produced product. Mass customization is also commonly referred to as

- Build to order
- Assemble to order
- Configure to order
- Make to order
- Engineer to order

Please note the use of the repetitive phrase “to order.” This is important. “To order” implies that configured products are made on the basis of an actual order—it is the order that drives the order demand, not a finished goods forecast.

Contrasting mass production with the mass customization paradigm, under mass production, everything about a product is predictable—except for the demand. When a product is produced under the mass production paradigm, there generally is no order—the product is produced based on a forecast. There is no customer at this point. The product has been previously engineered, a detailed bill

of material has been created, prototypes built, and (hopefully) all the bugs and kinks associated with mass producing the product have been worked out prior to going to the marketplace. Any issues related to variation in product configuration have been worked out ahead of time, e.g., color schemes. A customer has no ability to influence the ultimate product that is made available for sale—the customer is merely presented with choices in the retail marketplace.

Some manufacturing companies offer highly customized products under what is referred to as an "engineer-to-order" business paradigm. This means that individual order configurations require significant engineering effort to literally engineer and document the product so the each order configuration can be produced. In some instances, the cost of the engineering effort is born by the customer; in most, it is not.

Mass customization assumes that the engineering effort associated with designing and modularizing a product line has been completed long before an order is accepted. A key, underlying assumption in mass customization is that the company is not hand-crafting individual order configurations. All the engineering and planning concerning what to offer the customer has been made ahead of time to improve the efficiency of producing the customer's order.

I favor an approach I refer to as "customer-driven manufacturing (CDM)." This is an integrated business process for transitioning to mass customization. CDM is focused around the way your customers and sales organization think about your products. The four key aspects of a CDM effort involve

- Bill of material (or product) structure modularization
- Configurator tool development
- Business process integration
- Training

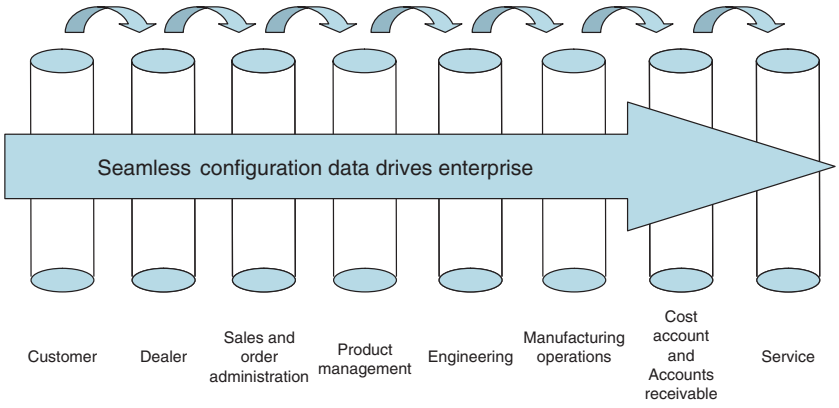
By aligning your bill of material structure in the way customers and your sales team think about the configurability of your products, you eliminate the interpretation errors that often occur during order entry or in the factory. Imagine the efficiencies associated with sales, engineering, marketing, and manufacturing operating with exactly the same understanding of product line. And because the CDM approach is adopted to better serve

your customers, it is far easier to get everyone to embrace such an initiative.

If a manufacturing company is organized to easily accommodate highly customized order configurations across the entire enterprise, great efficiencies can be realized. What does “efficiency” mean?

A company needs to be able to seamlessly drive the business from “quote-to-cash” without incurring multiple rework steps, what I refer to as “start/stop, start/stop.” There has to be a steady flow of progress from the time a quote is generated until the time the cash is collected rather than experiencing a series of rework loops.

From silos to seamless



If a manufacturing company is not set up to seamlessly offer and produce highly customized products to customer expectations, great inefficiencies result that can compromise the financial performance of the business:

- A $1 billion manufacturing company offering highly customized capital equipment generates an operating profit of about 1%.
- Fire/rescue vehicle manufacturers must offer highly customized vehicles yet have low, single-digit operating profits (if they have any profit at all). Some profits stem solely from vehicle financing, not from operations. Quite a few of the top 10 North American fire/rescue vehicle manufacturers have been in or are on the verge of bankruptcy.

- Boeing and Airbus have been at the mercy of a galley manufacturer to produce highly configured galleys tailored to each airline customers needs. Late deliveries of the galleys have resulted in late deliveries of aircraft and delayed revenue recognition. In-process aircraft have had to be pulled off the production line to wait for the galleys creating operational challenges about getting the aircraft back into the production slots.

Dell produces computers built to order. They provide an array of products and clearly explain to their customers what option choices the customer can select from to tailor the product to individual needs.

Dell does a really terrific job. Dell is organized to easily accommodate customized products across the enterprise and the extended enterprise.

What would happen if the Dell product configurator offered configurations that the factory could not produce? Orders would get backed up, customers would have to be notified that the order configuration they placed cannot be built, pricing would change, and the delivery of the end-product would be delayed. In short, chaos would ensue.

Sadly, most companies with configurable products don't have the level of seamlessness and transparency with their customers that Dell does. And, as a result, they routinely experience the problems described above.

Operational Challenges with Highly Configurable Products

Here are some observations that I've made about operational challenges many companies experience with configurable products:

- Engineering is overwhelmed supporting individual order demand.
- Manufacturing lacks the ability to efficiently produce individual orders:

    - Reliance on “tribal knowledge.”
    - Lack of assembly procedure documentation.
    - Items missing in bill of materials discovered during manufacturing process.

- The product (bill of material) structure needs to be simplified and flattened:

    - The product structure must be “add-only.” All too often, the product structure is defined at too high a level meaning that parts and sub-assemblies are often actually deleted in customer configurations only to add others. This overstates order costing and adversely impacts inventory control.
    - The product structure all too often is incorrect in terms of supporting the customer’s actual order configuration requirements.

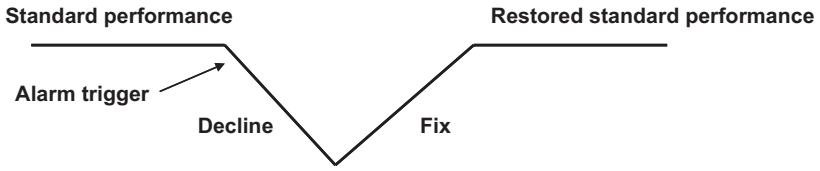
- The customer order configuration process is “people-dependent” rather than “process-dependent” exposing the company to great risk. Too much tribal knowledge is required to configure and produce customer orders. Too much hand-holding is needed to get orders processed through the organization and out to the customer.
- Orders that are not fully configured are prematurely loaded to the backlog causing no end of difficulties related to booking and de-booking orders which compounds production control’s challenge of understanding what is viable in the backlog.
- Customers purchase systems yet receive key components of the ultimate system causing receiving difficulties and challenges reconciling invoices so payments can be made. This is often due to components being shipped from different physical locations and arriving at different points in time.
- Too much critical business information is driven and supported outside normal ERP system in Word and Excel documents, e.g., quotations, forecasting, invoicing, finished goods inventory transactions, packing lists, backlog management, and price lists. There is no systematic, holistic approach to managing all of this interrelated data.
- When people experience problems, they work around them rather than initiate corrective action to prevent the reoccurrence. This is particularly troublesome when new employees take over someone’s existing responsibilities or when someone leaves the company.

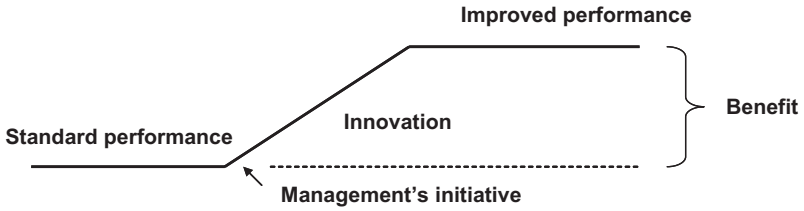
- Frustration and employee burnout is high—this could result in a high employee turnover rate which could threaten company growth.
- Customer frustration grows.
- The sales team is so busy chasing details associated with getting orders booked and the backlog of orders produced that prospective customers must wait and wait for someone to attend to their needs; business is lost to competition.

In essence, most organizations are reactive, choosing to wait for problems to occur so they can be corrected. Dr. Alan Weiss offers the following insights and a diagram from his book, *The Great Big Book of Process Visuals*:

> There is an over-emphasis on problem solving usually at the expense of innovation. If people are constantly trying to fix things, then they are seldom trying to improve things. And most organizations reward the former and penalize the latter (since it's somewhat risky). I use this graphic to demonstrate the difference between the two pursuits.

The first diagram below represents "problem solving" or "firefighting" while the second considers the impact of "innovation" in resolving an issue.





Dr. Weiss suggests that companies seldom have even a 50/50 ratio between problem solving and innovation adopting more of a 95/5 ratio in favor of problem solving. If a company only concerns itself with fixing

problems, the company doesn't get any better. Innovation is required to improve performance.

Many years ago, the chief operating officer (COO) of a company wanted my assistance to help resolve a product configurability problem that he alleged was "killing my company." After investing a modest amount of time with his team, I concluded they weren't serious about resolving their issues and declined the opportunity to assist them. It was only after the third call from the COO that I (reluctantly) offered to do a small project. I should have followed my instincts. The people in the company loved fighting fires. As I anticipated, I could not get people's attention to work on a solution. The COO repeatedly cancelled meetings to discuss the situation as "something came up." The company ended up losing their biggest customer—a customer who represented more than 80% of the company's revenue as it failed to come to grips with its biggest challenge: product configurability.

While this may be an extreme example, it is more representative of the norm than one might think.

About the Author

David J. Gardner is a management consultant, speaker, author, and principal of mass-customization-expert.com. He has over 30 years experience in the design and integration of innovative business process and information technology solutions for “start-up” as well as established companies. He is known for his pragmatism and track record of achieving results for his clients.

David has extensive experience helping companies implement

- Mass customization (build to order, assemble to order, and engineer to order)
- Configuration management systems (part numbering systems, change management systems, and online document control systems)
- Operations strategies and information technology integration

He has held management and senior management positions in Engineering; Manufacturing; Sales, Marketing, and Customer Service, and Product Management.

He joined Tandem Computers in 1979 where he was responsible for Corporate Documentation Standards for Tandem's highly configurable and expandable computer systems.

In 1983, he designed and implemented a Configuration Guide for Dialogic Systems instituting a process that greatly simplified a complex, modular product such that the field sales organization and international customers could easily define their order requirements. This methodology satisfied the product definition needs of sales, marketing, engineering, manufacturing, customer service, and finance. David also developed what is believed to be Silicon Valley's first "online document control system" providing a means to support change requests, change orders, and part number assignment.

David improved the approach for defining highly configurable products at System Industries in the late 1980s by developing a methodology that not only accommodated "new system" orders but also fully addressed "add-on" orders. This company built modular disk and tape storage systems that could be attached to each computer system ever produced by Digital Equipment Corporation. Sixty percent of the employees used the Configuration Guides as a means to validate and order highly configurable and expandable storage subsystems used widely with Digital's computing systems.

In July 2002, David was recruited by one of the world's largest manufacturers of fire and rescue vehicles as Vice President of Product Management to lead an enterprise-wide change initiative to transition the company from an "engineer-to-order" to a "mass customization" business paradigm to

- Reduce the cost and lead time associated with engineering each vehicle to improve company profitability
- Reduce overall SG&A expenses
- Accurately describe the company's product configuration capabilities to better set customer and dealer expectations
- Provide accurate material and labor costs to eliminate "margin surprises"

This project involved

- Restructuring the bills of material into a modular structure to create a standardized set of options that could be custom-configured into highly customized vehicles.
- Leading the development and implementation of a new configurator system to assist the company's dealers with configuring products and generating configuration-specific specifications and quotations.
- Designing and implementing a decision-costing system to provide an understanding of the labor and materials cost for each unique, quoted configuration and to provide a means to better align pricing with actual costs. This data was integrated with the company's ERP system as well as the configurator.

David is a graduate of San Jose State University (BA) and Santa Clara University (MBA). He is also a member of the Society for the Advancement of Consulting, LLC, and has been Board Approved in the area of "Mass Customization Strategy and Implementation." This approval means that the consultant has worked in a specialized area for a considerable length of time; has provided detailed, documented evidence of success directly from clients in that specialty; and has conformed to the Code of Ethics of the society, serving as a thought leader and exemplar in the profession in general and their specialty in particular.

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Getting "Mass Customization: An Enterprise-Wide Business Strategy"
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