Mass Customization
A Technology Boost for the
New Software Allows Manufacturer

listen to the conversations echoing through the halls of the Harvard Business School and you will hear the refrain: “Customers today don’t want more choices, they just want what they want.” B. Joseph Pine III applied the term “mass customization” to this trend when he published a book (Harvard Business School Press) of the same name in 1994.

At its simplest, mass customization means providing highly customized products at the lower price of the mass produced goods at twice the speed as in the past. In the era of mass customization, the ability to add a price premium for high levels of customized products is minimal. Yet, if you do not provide the special service that your customers demand, your competition will. In markets like construction, characterized by standardization of product (industry specs, government dictates, etc.), vendors differentiate themselves through service, technology and responsiveness to customer requirements—in short, mass customization at the point of sale.

Delivering winning solutions in the era of mass customization means knowing more about your products and competitive advantages earlier in your sales cycle, managing that information better and faster than your competition and delivering customized product configurations when and where needed—all at globally competitive prices.

The Technology Is Here
A new type of software application, known as product configurators, has emerged to support this competitive trend. Product configurators enable manufacturers to build product models that incorporate engineering rules, assembly instructions, cost data and cross-product compatibilities—criteria commonly used to build sales configurations and generate proposals and quotes. Properly implemented, a configurator acts as a silent engineer, working in the background to support sales and proposal campaigns. It “knows” which pieces fit with others, dependencies among product components, rules of structural integrity, and best cost/performance characteristics of your product. Basically, it gathers all the information that was once trapped in the memories of your best technical employees.

From quality providers of home improvement systems to large-scale interior designers, the need to bring costs down to levels dictated by mass production methods while providing custom products demanded by the market is driving innovation in staffing, process and technology. Today, the state-of-the-art methodology delivering this capability is generative technology—a process that captures engineering rules, business practices, manufacturing methods and product components and encodes them in software that can then iteratively generate both standard and custom variations of basic product configurations. Generative technology replaces the search and guesswork of configuring highly customized complex orders with a methodology based on stored sales and knowledge. It enables users to join the ranks of “knowledge-based companies” in ways that would be prohibitively expensive and cumber-
at the Point of Sale: Home Improvement Business

to Give Customers What They Want

some with traditional procedural programming languages.

Used by an Industry Leader

With 1993 revenues of $120 million, Everest prides itself on delivering high-quality windows, doors and conservatories with guaranteed customer satisfaction. Its U.K. sales force of approximately 750 independent contractors is trained to represent the corporate culture and execute an efficient sales methodology. Everest is regarded by both its customers and competitors as the high quality, “top shelf” provider in its market, with the ability to offer custom-fit products produced with a unique and durable construction and timely order turnaround.

Everest’s line of replacement windows consists of more than 300 basic styles with dozens of options for each. Even simple replacement windows contain more than 200 individual components. Moreover, Everest’s focus on replacement rather than new installations, combined with a variety of architectural styles, means that every installation is highly customized.

In addition to custom windows and doors, Everest is renowned for its conservatory (sunroom) product line. This specialty product promises sales growth at double the rate of windows and doors. To harness the revenue potential, Everest needed to streamline its methods of selling specialty products.

Technical Challenges

Quotation and manufacture of custom windows and conservatories presented a distinct set of problem. Namely, how to assure quality, timely delivery and reasonable profit, given the distance between the point of sale and manufacture. Historically, an Everest representative would perform a site assessment with the customer, take measurements and deliver a quote. The quoted price was a function of size. The salesperson’s measurements were not always accurate, however, so Everest would deploy a force of “surveyors” to visit each sales site and validate measurements. The cost of any differential between the quoted and actual measurements was absorbed by Everest. The problems with this process included the fact that sales convention rates were often less than optimal, margins were often placed at risk to close orders within a short sales cycle, manufacturing costs were substantially above desired levels and delivery timelines were often twice that desired by the customer.

Inaccurate measurements affected more than price and delivery schedules. Everest faced additional challenges in reconciling its sales data and manufacturing operations. Some of these challenges included minimizing the number of cuts and welds in an assembly; ensuring that transoms between neighboring windows matched; and calculating and configuring the size and strength of hinges, support stays and springs to accommodate the function and weight of opening windows.

Everest’s product design differs from their competitors’ products in that Everest uses a supporting structure that
can then be clad using window and door modules chosen by the customer. Everest used to use Computer-Aided Design packages for window and conservatory design, but had limited success in automating fit and variation. Early in Everest’s attempts to automate the process, it became apparent that traditional technologies left out important and labor-intensive pieces of the puzzle. For example, CAD packages captured the form of the basic product configuration but did little to integrate with manufacturing processes; an internally developed configurator grew into a maintenance challenge as the number of possible combinations increased exponentially each time new products were introduced; and the unique structural components of each installation drove a process that essentially resulted in the redesign of each configuration.

**Generative Technology**

Like most manufacturers, Everest found itself unable to meet the challenges of business development in the 1990s by simply adding staff. Everest required innovative applications of new technologies in order to move the quote and proposal process closer to the customer and respond to the demand for custom configurations.

Everest chose a product family known as The ICAD System® from Concentra, a software company in Burlington, Mass., that specializes in automating sales and engineering processes. Concentra’s generative technology captures a customer’s product definition in a model that contains both logical and functional attributes. Upon entering the customer’s unique requirements, the Generative Model generates any number of product configurations from this single model-complete with cost information, geometry to automate drawings, bills of material, product visualizations, assembly instructions, tooling paths and other valuable manufacturing data. Furthermore, the product configuration and all associated sales and manufacturing information can be generated in minutes, not weeks.

The Generative Model encapsulates the engineering intent behind the geometric design-including form, fit and function. For example, it understands both dimensions and load factors, and can generate designs complete with ad-
equate structural supports and documented impact on foundations. The combination of geometric and non-geometric information in a Generative Model makes it an extremely powerful tool for automating the proposal, manufacturing and delivery processes.

Manufacturing engineers can create and evaluate new product configurations quickly by changing the input specifications. Or they can modify product families, by extending or changing the product description. This liberates sales and support personnel from time-consuming engineering tasks, such as repetitive calculations or creating drawings, and allows more time for consultative selling. More importantly, it enables repetitive and rapid generation of custom configurations yielding extraordinary advantages over traditional configuration methods.

Everest’s new generative technology-based sales engineering process has yielded unique strategic benefits: more accurate proposals earlier in the sales process, reduced losses from misconfigured orders, rapid introduction of new product families, reduced product development costs and increased sales efficiency.

**When Change Is Good**

For Everest, the most pressing problem fixing the door and window group was delivering correct product configurations on time and at budget. To facilitate the conversion to generative technology, Everest formed an internal task force consisting of representatives of MIS, manufacturing and logistics support. Concentra consultants were added to the small internal team and began a process of “excavating” buried knowledge and encapsulating it in a Generative Model that would run on a UNIX workstation.

Everest found it could feed surveyors’ data directly into the Generative Model as input specifications. The Generative Model could then configure the appropriate window components, accurately determine where to cut the support members, configure all supporting hardware and generate shop documents. These documents consist of a complex set of shop floor instructions, drawings and labels for each window component. These labels instruct manufacturing personnel how to miter each
piece, where to cut, how many channels to leave on each component and which materials to use.

Within one year of the initial implementation, the window configuration system was so successful that Everest extended its use to the rest of the company’s window and door product line. Within 18 months of the initial implementation, the old configurator was retired and the Concentra system assumed configuration responsibility for the entire product line.

To date, all of Everest’s configuration work has taken place in the back office. As Everest looks toward the future, it plans to bring the configuration process to the point of sale. Concentra’s next generation sales configuration system, Selling Point®, will enable Everest to take the Generative Model to the customer via a laptop, which can display Everest’s custom-tailored marketing information, remotely access enterprise-wide information (cost, scheduling, availability), perform design and engineering calculations, generate configurations and proposals and deliver all benefits of the UNIX-based
system. Everest’s salespeople will be able to perform a customer needs assessment, generate configurations from direct customer specifications, interactively perform product line and pricing “what ifs” with the customer, generate a proposal at the point of sale and produce valid order entry and documentation.

Everest and Concentra have developed standard, quantifiable benefits from the new computer software, including a 90 percent reduction in software maintenance effort directly related to generative technology; a 95 percent reduction in the effort to engineer new product families; the elimination of model-to-model design inconsistencies; the elimination of most margin risk, because all products are now configured with accurate cost information up front; a reduction in order underpricing, previously estimated at 15 percent or more of orders; and 3-to-1 productivity improvements in the development of manufacturing inputs, including costed bills of material, cutting instructions and production of shop floor labels.

Everest has gone beyond a major milestone in its evolution to fully automate sales and engineering processes. Adding generative technology to Everest’s already formidable arsenal of computing technology enables them to maintain market leadership, increase profitability and support the tagline, “Everest Fit the Best.”