

Editorial

Customer-specific value chain: beyond mass customization?

Mass Customization is a new mode of production and service delivery that has become an integral part of the Global Management Paradigm (GMP) [1]. The term itself was first coined by S. Davis back in 1987 (his book *Future Perfect*). In recent articles, J. Gilmore emphasized the *customer-unique value chain* [2], relating to the effort of overcome the “mass-oriented” thinking and behavior which appear to be dominant not only in the mass-production but also in the mass-customization mindsets. This is similar to the CSVC (customer-specific value chain) term used here.

CSVC is a part of customer-integration efforts within the Global Management Paradigm consisting of a number of interdependent and mutually enhancing practices which increasingly characterize corporate management systems emerging in the theater of global competition.

Globally competitive companies are now less likely to differentiate between their domestic and international operations. For example, Coca Cola has officially dropped its international and domestic divisions. In 1994, T. Turner banned the use of labels like “foreign” or “domestic” in describing the activities of TBS and CNN. Some institutions are belatedly discovering the bandwagon of “international” orientation – at the time when emphasizing such distinction is starting to sound flat, if not meaningless.

There are nine major dimensions of GMP, all of which are currently making significant headway in high-competition economies:

1. The Horizontal Corporation;
2. Business Process Reengineering;
3. Mass Customization;
4. Autonomous Teams or Cells;
5. Customer Integration;
6. Intracompany Market;
7. Supplier Integration;
8. Elimination of Tradeoffs; and
9. Open-Book Management.

The components of GMP are often treated as separately functioning concepts, implementable individually and without regard to their mutually supportive properties and benefits derivable from their synergy. Their systemic effects are qualitatively higher than the individually selective “berry picking” on the fertile hill of GMP.

The experience shows that one cannot isolate and transplant an organic item into a hostile organizational environment – and still hope for success. The fiasco of Quality Circles and TQM within traditional hierarchies or the failure of robotics in unreengineered processes would be good examples.

Mass customization (MC) represents one of the most potent components of GMP, deriving its strength directly from the customer, agile manufacturing, horizontal organization and no tradeoffs between variety, delivery time and costs. However, even MC cannot stand alone and must have its own support net (or infrastructure) reliably co-established. MC can succeed only as an integral part of GMP: it resists uprooting.

New realities

Producing products and services that are perfectly and continuously fitted to the individual customer without any significant cost, quality or time tradeoffs is among the few newly acquired technological and cognitive abilities of the producers. It is also a long-time cherished and often subconscious desire of the majority of customers.

These new realities toll final bells for a number of holdovers from the Jurassic period of business and economics: mass production and mass consumption, of-the-rack/off-the-shelf shopping, standard sizes and measures, alterations, returns and complaints departments and services, division of labor and specialization, “It ain’t my job” attitudes, business forecasting, inventories and warehousing – all rapidly disappearing from business experience.

They are being replaced by more agile, newer concepts and practices: database marketing, self-customization, self-service, high-velocity delivery, Integrated Process Management (IPM) – see [3], Global Management Paradigm (GMP), mass customization (MC), flexibility enhancement, teleshopping, tele-manufacturing, customer-triggered production, customer-specific value chain (CSVC), and so on.

Take traditional marketing – producing ahead of time for the shelf or inventory – which relies on expensive selling, promotion and advertising efforts of mass marketing. Over the years, mass marketing was replaced by market segmentation, then by niche marketing, micromarketing and now database marketing. Ultimately, traditional post-production marketing of products and services will be replaced by a pre-production *marketing of capabilities*. The real challenge is not selling what you have in the inventories, but how to develop, build and deliver what has already been ordered (purchased) by the individual customer.

One thing should become clearer, although it still is puzzling to many: consumers do not want extensive choice and selection, they do not want variety and endless options. *Consumers want what they want*. If I want ivory-grey paint then the mere fact that the retailer stocks 1,500 other paint colors is of no consolation. I am much better off having my colors mixed right there, on the premises, preferably through self-service, according to producer-furnished mixing recipes and store-provided mixers.

Customer-triggered production

Customizing and tailoring to measure is becoming easy. In the garment and apparel industries, all it now takes is a *three-dimensional body scan*, developed by TC² Company in Raleigh, N.C. Within two seconds, precise body measurements and shapes are captured, embedded in a personal profile card and mapped directly onto a cutting pattern of a laser-gun cutting machine in a remote factory. The garment is manufactured within hours and the custom-made clothing delivered to customer's home within days.

Levi Strauss & Co. was the first major producer to introduce (back in 1994) a computer-assisted measuring system for mass-customized women's jeans. This MC pioneering system (Levi's "Personal Pair") now appears to be quite cumbersome, customer-annoying and even obsolete: women still have to try on several pairs of stock jeans with clumsily built-in measure

tapes, men were (and still are) "out of the loop" (even though men abhor off-the-rack shopping much more intensely), the customized pair costs \$15 more, the time of delivery is often more than 3–5 days, etc. The TC² body-scan system shall displace such tentative, half-baked pioneering efforts quite rapidly. The Personal Profile Card (PPC) will become the reverse side of all major credit cards for most goods and services.

It is estimated that about 50% of the Americans still buy and wear the ill-fitting, off-the-rack clothing. The advancement of MC promotes not only a more stylish nation but could help to preserve and even revive the rapidly disappearing domestic apparel industry which is likely to fall victim to protectionism and tariff-based political "solutions". The only long-term solution is via increased competitiveness: MC could certainly propel not only the garment and shoe industries, but all U.S. industries in the right competitive direction.

There are still unionists and politicians pretending to care about the U.S. garment industry and its workers. Yet, direct labor is only 11% of the cost of the garment delivered to customers. Fighting against the "cheap" foreign labor fixates these 11% as the main "playing field" while nobody fights for the MC and the customer. Non-value-added handling *after* manufacturing accounts for 27% of cost: that is where the name of the game is.

The U.S. is about the only country with sufficient rapid-mail and computer-network infrastructures to support reliable MC transformation on a large scale.

Andersen Windows "Window of Knowledge" system now offers about 50,000 varieties of their custom-made windows. Motorola is capable of delivering over 29 million different versions of its personal pager. These are only the beginnings: *continuous variety capability* of sizes, styles and patterns is the ultimate goal.

How does it work? Sales representatives of Motorola use Macintosh laptops to help customers co-design the pager features they want. The laptop software allows the design module to be electronically transmitted (via EDI) to Motorola plant in Boynton Beach, FL. *Within 20 minutes*, an individual customer order is launched down Motorola production lines. Within an hour, it is completed and ready for shipment. The originally mass-produced item has now become fully customized and on a worldwide basis.

Custom Foot at Westport Conn., uses electronic scanners to produce custom-made shoes – in Italy. Fast response capability is obvious: from new fashion-style design to production – within weeks (18

months currently). Lutron Electronics, Coopersburg, Pa., makes custom lighting systems of all shapes, colors and sizes. Individual, Inc. scans 600 news sources to compile a different report for each individual customer. Paris Miki (a Japanese company) in Bellevue, Wash., uses a digital scan of a customer's face to produce a customized eyeglass lens shape to enhance the wearer's appearance. BMW is planning to offer virtual reality "test rides" (with all possible engine combination over all kinds of terrain, worldwide) while the customers design their custom-made vehicle.

Dell Computer Corp. (also Gateway 2000) offers more than 14,000 different configurations of personal computer systems whose production is *triggered after* customer-specific order has been received.

McGraw-Hill, Inc. custom-produces specialized college textbooks, composed by professors from their own sources or from publisher's menu of modules, even in small batches of less than 100 copies. A growing number of progressive publishers now offer similarly customized textbooks. The days of nationwide mass-produced and uniformly-consumed textbooks are over: each instructor will have a different, custom-made book for his students.

In March 1995, The Wall Street Journal introduced the first newspaper ever published for a circulation of one.

In the hotel services business, Ritz-Carlton has advanced the farthest on the road to MC. Personalized, customer-driven delivery of both service and quality utilizes an international reservation system (COVIA) and total employee participation (TEP) to customize according to individual guest's needs and desires. *Customer Preference Profile* is formed and shared worldwide, updated immediately after each check-out, translated into "guest preference pads" and made available to all staff employees.

Ritz employee empowerment is based on two rules:

1. The "1-10-100" rule – what costs you \$1 to fix today will cost \$10 to fix tomorrow and \$100 to fix later on – gives employees the authority to identify and solve customer problems on the spot. No more calling for the supervisor and waiting "for Godot".
2. The "24-48-30" rule – any reported problem will be acknowledged within 24 hours, assigned within 48 hours and resolved within 30 days – enables employees to make changes in the process and "normal" procedures in order to resolve a guest's complaints.

ITT Hartford customizes insurance policies, John Deere Harvester Works customizes planters via its "Vision 21" project, etc. Virtually *all* products and services can and will be mass-customized. Even so-called commodities, although more or less uniform, are differentially delivered, put to alternative uses, individually paid for and consumed in diametrically opposed patterns. What could be "commodities" for speculators, are not necessarily commodities for actual producers and actual consumers. Every product, no matter how uniform, is a part of a product package (product + service) and that package can be endlessly customized.

Take milk and dairy products. Rather than being commodities with artificially induced price wars based on quantity and market shares (forced mass production), dairy products present an infinite variety of flavors, contents, textures and packagings. How do containers stack? How to customize mixed flavors to local habits? Delivery times? Factory price pre-labeling? The opportunities for mass customization are limitless – if we know who our customers are and break out of the mass-production mindset.

Consider the flavors: hours of runs of blueberry production, followed by the runs of strawberry, peach, and all other flavors. Then days of storing, refrigerating, promoting, stretching the "shelf life", etc. Why not insert flavors at the point of consumption – letting the customer customize? This is called *point-of-delivery customization*.

Consider banking, insurance and similar service "commodities". Mass customization means taking a "product" (product/service package) and mold it to *any* individual. Mortgage and bank loans present a good example: rather than prefixing a package and then spending all the time, money and effort for screening and sorting those who do or do not qualify, why not customize these loans to fit each individual's circumstances *precisely*? Like performing financial "body scan"? Then every loan would be different, everybody qualifies and – as Wells Fargo Bank is proving – the cost plummets and competitive performance soars at the same time.

Customers are no longer an anonymous mass of statistically measurable entities with homogeneous desires, but are uniquely distinguishable individuals, forming "markets of one" whose needs and desires must be satisfied. Markets do not buy anything, individuals do. There are no markets anymore, only individual customers. It is therefore imperative that companies embrace efficiency, effectiveness, low costs,

and customization at the same time, with no tradeoffs forced.

Traditional concepts of *Continuous Improvement* and *Total Quality Management* (TQM) also do not amount to Mass Customization, Customer-Specific Value Chain or Global Management Paradigm. They do not explicitly recognize the needs for high-technology enablers (like computers and telecommunications), mandatory horizontal organization (and intracompany markets of autonomous agents), shift from markets to individual customers (individuals rather than statistical “mass”), individually customized products (treating products as statistical “mass”), linking of defect elimination with process reengineering and establishing permanent, cross-functional cooperation around markets rather than products.

Continuous improvement should organically include the concept of radical and discontinuous change. One cannot continually improve mass production, command hierarchy and statistical forecasting while hoping to stumble into mass customization. One cannot continually improve an oxcart and expect to be ready and fit for the internal combustion engine. Some things and processes, at certain stages, should not be improved at all – least of all continually.

Mass-production techniques have pushed companies into standardized, one-size-fits-all design, long product cycles, automated and computerized but inflexible manufacturing, and MRPII-style of planning the raw materials needed to feed the mass-production “beast”.

The *traditional forecasting* is also losing its role in MC. Producers do not have to forecast market demand if they produce only what has already been purchased. Forecasting (like inventory management and buffer hedging) is necessary only in the mass production, i.e., when producing standard and other ill-fitting sizes or configurations for the warehouse or shelf, ahead of the purchase, in a “just in case” fashion. All mass producers remain obsessed with market forecasts.

Computer support

High-technology support is quite useful in implementing and maintaining MC. There are different stages and aspects of MC which need to be computer supported (see [4]):

1. Customers should be able to describe and formulate what they want and their designs accurately translated into engineering and manufacturing orders, all the way down to part numbers. *Graphical Order Configurators*, like “Sales Builder” of Trilogy Development Group, Austin, TX, and ERP (Enterprise Resources Planning) systems like “Oracle Manufacturing” are typical for this stage.
2. Custom orders have to be batched, scheduled and optimized in terms of shop floor resources. This is accomplished through *Real Time Scheduling Systems*, like “12 by 12” Technologies, Dallas, TX, optimizing manufacturing schedules, or “Optiflex” by Optimax, Cambridge, MA, using optimization algorithm for multiresource systems.
3. Real-time scheduling must be combined with modular product design and flexible assembly teams. *Manufacturing Execution Systems* (MES) coordinate and monitor the work of shop-floor teams. Typical support software includes “Factory Operations Executive” (FOX) by IBM Manufacturing Solution Industry Unit, Charlotte, NC, which controls the sequences of operations and queues of materials and links them with ERP systems. Another such system is “Chinook” by EnaTec Software Systems, Cupertino, CA, which is designed to work with MRPII systems, like “Avalon” from Avalon Software, Tucson, AZ.
4. A custom design can force a quick product engineering change, requiring *Product Data Management* (PDM) types of software, like “Product Manager” by IBM-MSIU, Charlotte, NC, which combines MRP with CAD/CAM to keep track of engineering data and documents in order to manage changes. It also integrates with ERP systems like “Avalon”.
5. Getting the right quantity to the right customer in the right form and at the right time, i.e., *Right-on-time* (ROT), requires good logistics and the *Demand-Driven Logistics* at that. For examples, “ESS” by Industri-Matematic AB (IMI), Stockholm, Sweden, creates customer-specific profiles and tracks the flow of product and information to the individual customer to minimize *production-to-ship* time.
6. Mass customizers have to integrate the suppliers, quickly linking manufacturers with the right suppliers via *Supplier Linking* products,

like "Enterprise Integration Network" (EINet) by MCC (Microelectronics and Computer Technology Corp., Austin, TX), which uses Internet-provided services, including security and remittance handling. Also "Agile Manufacturing Information Infrastructure", by ARPA Software and Intelligent Systems Technology office, Arlington, VA, which builds on top of "EINet" to let manufacturers and potential suppliers share information about requirements and capabilities as well as conduct electronic transactions.

The above listing is by no means exhaustive [4] and MC is only now beginning to develop its own substantial software support. But software families of Graphical Order Configurations, Real Time Scheduling, Manufacturing Execution, Product Data Management, Demand-Driven Logistics and Supplier Linking do represent significant steps beyond traditional MRP/JIT products: their integration will make both MC and GMP powerful competitive tools.

Especially "EINet" and the ARPA products for Internet-based infrastructure are going to grow in importance especially since AT&T has now provided *free access* to Internet (including E-mail and the Web) to all Americans with computers and modems. Combined with the U.S. plans to equip every classroom with a computer by the year 2000, information is clearly and rapidly becoming a utility – like water and electricity.

Knowledge beyond information

It is therefore not the information (or access to it) that will differentiate individuals, nations and economies in their competitive strivings. It is the *knowledge as purposeful coordination of action*, the ability to translate information into action. Many display the best cookbooks on their shelves, but only a few can cook. Countless companies have all the information there is and possess all the books ever written on JIT, GMP and MC. But only a self-selected few know how to apply it in practice – only a few know "how to cook". Multitudes worldwide are soon going to have all the information on their fingertips – only a few will ever achieve the knowledge.

Some more progressive companies have already recognized the need for knowledge and its manage-

ment. For example, CLO (*Chief Learning Officer*) is the new executive function and title overseeing the mechanisms of corporate knowledge production, acquisition, sharing and usage. This function has very little in common with the CIO (Chief Information Officer) or any other MIS or IT related functions. The CLO is in charge of action, not of a description of action, concerned about doing and coordination, not about symbolic records, encryption or alphanumeric entombment of corporate experience.

Mass customization represents the producer's view, the production side and the supply-chain vantage point. However, the customer does not care about the "mass" at all: he simply wants what he wants. So, from the customer's viewpoint there is a desire to pull out or bring forth a *customer-specific value chain* (CSVC) out of the many demand chains constituting the fully reengineered network of production processes. Both sides are equally important and both have to be developed.

The Personal Profile Card will unlock and trigger the production process by bringing forth a customer-specific value chain in order to realize the product or service according to customer's specifications. Only the knowledge-intensive companies will be able to customize; not just their products and services, but also the processes leading to them. The goal is not to customize products and services, but to customize the value to specific individuals. Customer-specific value chains and customer-triggered production schemes are the tools.

References

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