Modern Mass Customization – Rule 1: Modularize your People, Processes and Products

by Jordan Reynolds

Following from the post Free to Choose: Mass Customization for Modern Manufacturers, here is the first rule to live by for modern mass customizers.

Companies who wish to optimize their business for mass customization should consider modularity to be a critical imperative. In this case, modularity refers to the use of individual product components, processes and teams that exhibit a consistent and predictable function on their own, but can be combined and arranged into systems that function in new and unpredictable ways. For Assemble-to-Order/Configure-to-Order manufacturers, the product that a customer orders can be thought of as the higher level system, and the individual components of that product can be thought of as modules.

While a new order may call out a product configuration that is entirely unique, each module should consist of a standard component that is managed and manufactured with standard processes and executed by standard teams of people. Orders can thus be considered mass-customized, while the modular components that make up the order can be considered mass-produced. This tactic is central to a manufacturer’s ability to maximize both dimensions of customer centricity and operational efficiency. Manufacturers who do it well can mass-produce for as long as possible, delaying the product differentiation until assembly, shortly before delivery to the customer. Maximizing time spent doing things consistently enables stable supply chains and internal procedures amidst environments of uncertainty.

From an engineering perspective, product modularity requires you to define the internal, hidden functions of each module, as well as the external, visible rules that control how each module can operate within a final assembly. While independent engineering groups may have sovereignty over hidden design parameters of modules that they are responsible for, product leadership should diligently enforce design standards that impact the way modules may interface together.

It’s helpful to think of modular product components as Lego pieces, and the product architecture as a vague suggestion that you see in the picture on the box. If you were designing a set of Legos, what considerations would you make about modularity?

- **Alternation** - Can I replace a given component with another component that has a different structure?
- **Orientation** - Can I reposition a module in 3D space, while maintaining the interface with another module?
- **Placement** - Which physical locations can I move a given module to?
- **Connectivity** - For a given module, which other modules can I interface with?
- **Dependency** - For a given module, which modules are necessary to precede or follow?
- **Adaptability** - To what degree should we allow re-configuration after the initial configuration? Uniformity - Which pieces should be pre-built and standardized with limitations on modularity so that the end product can retain a predictable form?

The type and degree of product modularity that you employ in your product architecture is dependent on your company’s mass customization strategy. While most companies will not offer a level of configurability comparable to Lego kits, these modularity considerations are important if you want to accommodate diverse customer requests.

Equally as important as product modularity is process modularity, and a company’s ability to compartmentalize processes and people along with its product components. To cost effectively fulfill orders in a mass-customization environment, business processes should be identifiable.
at the point of sale, even in cases of a new product variant that has not been manufactured before. To achieve this, manufacturing work plans, logistics procedures, and workforce should be tightly coupled with the product modules that comprise the order.

Each module should have a consistent process and team for procurement, fabrication, packaging, and any other procedures necessary to get it off the shop floor and into the final assembly facility. In practice, this means that a company’s work breakdown structure should aligned with classes of modules in a product architecture, rather than geographical sites, brands or disciplines. While the components of an order may be unpredictable, identifying the processes relied upon to execute the order should be as simple as identifying the modules that are required. This allows production to start immediately, and be executed with repetitious efficiency.

More Rules for Modern Mass Customizers

Modern Mass Customization – Rule 2: Follow the Rules
Modern Mass Customization – Rule 3: Honor the Order, Abandon the BOM
Modern Mass Customization – Rule 4: Look Your Customer in the Eyes
Modern Mass Customization – Rule 5: Brace for Change

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About the Author

Jordan Reynolds
jordan.reynolds@kalypso.com

Jordan is a senior manager at Kalypso.