Mass customization is a paradox-breaking reality that combines the unique products of craft manufacturing with the cost-efficient manufacturing methods of mass production. When discussing mass customization, it is helpful to distinguish between variety and customization. Variety provides choice for customers and may thus substitute for customization, but it does not provide the ability for the customer to specify the product. Specification is accomplished through customer involvement, and earlier customer involvement facilitates greater customization. Past research has indicated that modularity is key to achieving customization at or near mass production costs, but manufacturers must choose between different types of modularity that are used at various stages of production. Thus, this paper classifies mass customizers based on the point of initial customer involvement in the production cycle and the type of modularity employed. It logically follows that manufacturers that do not involve the customer in the design process or do not employ modularity should not be considered mass customizers.

The different types of modularity are described in the diagram to the right. Component sharing and cut-to-fit modularity require that components be newly designed (to be integrated with existing modular components) or changed in order to produce the end product; therefore, these types of modularity must be implemented during the design and fabrication stages at the start of the production cycle. The other types of modularity combine standard modules without alteration during the assembly and use stages at the end of the production cycle.

Modularity bounds the degree of customization possible for the product and distinguishes mass customized products from those that are purely customized. The relationships of the point of customer involvement, degree of customization, modularity type, and stage of the production cycle are seen in the diagram on the next page.
Based on the preceding discussion, the typology to the right was proposed. Although *fabricators* have a strategy similar to pure customization because of their early customer involvement, they employ some modularity to gain commonality of components. With *involvers*, customers are involved early in the process, but unlike fabricators, no new components are designed or modified. An example of an involver is Andersen Windows, which provides a tool to help customers develop the specific design of their windows, but products are assembled from an existing set of components. *Modularizers* incorporate both customizable modularity in the later stages of the production cycle and non-customizable modularity in the early stages. This approach does not provide maximum customization opportunities because customers are not involved until later in the production cycle. A furniture manufacturer using a modularizer approach might use component sharing in the design of common (non-customized) sofa frames, and later in the assembly stage, customers could use component swapping to specify a fabric from a prescribed list. *Assemblers* provide mass customization by using modular components to present a wide range of choices to the customer. Their operations resemble mass producers, except that the customer is involved in specifying the product. Assemble-to-order manufacturers can be considered mass customizers if customers specify products from a predetermined set of features.

Data from 194 plants was analyzed based on the above conceptual framework and compared the four groups on process choice, process control, AMT usage, and financial performance. Although both high and low performers practice mass customization in each of the groups, assemblers (on average) display significantly higher performance than modularizers and fabricators, and involvers also exhibit relatively high performance. The fact that companies implementing modularity in the later production stages exhibit higher performance suggests that those mass customizers that are closest to mass producers in manufacturing approach are most likely to reap the benefits of mass customization.