



# Fast production for order fulfillment: Implementing mass customization in electronics industry

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## Abstract

Modern means to improve efficiency in manufacturing are quite diverse. However the traditional cornerstones are those still to pursue. Scale, cost, quality and time in a row are the targets and also paradigms where business is managed. Mass customization is one of these modern means to achieve these goals. It is customizing product to individual customers and producing those with principles of mass production. The key issue in it is customer focus. Fast production means delivering products to customer faster than the lead-time of the whole manufacturing process in order to satisfy customers. This can be achieved utilizing standardized methods and modularized product structure. This paper addresses to review elements of mass customization for fast productions systems. Based on theoretical cornerstones a model is created. It is generated from Finish electronic industry based on large development project entity with several manufacturing companies.

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## 1. Introduction

Davis (1987) has presented an idea of producing high volume products to meet the needs of individual customers. Pine (1993) wrote about Mass Customization—the new frontier in business competition. Mass customization is customizing product to individual customers and producing those with principles of mass production. The key issue is customer focus. This means constructing the products, organization, manufacturing systems

and concepts in order to fulfill the needs of strategic customers (Anderson and Pine, 1997).

Fast production means delivering products to customer faster than the lead-time of the whole manufacturing process. This can be achieved utilizing standardized methods and modularized product structure. However, this requires changes inside of the company (Table 1). The fundamental idea behind mass customization and modularization is that the order penetration point is delayed as late as possible. This means that modules can be processed alike as long as possible. In other words modules are produced as mass production and after order penetration customized towards customer needs. Hoover et al. (2001) has also introduced order penetration point (OPP) and

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Table 1

Effects of fast production system in order to implement concept of mass customization (Pine, 1993; Tseng and Jiao, 1996; Anderson and Pine, 1997; Kess et al., 2001)

Function	The need of change and description
Product development	Shorter time in product development with component based standard modules. Product Creation and combination based on customer needs.
Marketing	Utilizing product configuration in defining customer needs and delivering products. Fast response in order-delivery to customer.
Demand-supply chain	Shorter lead-time and defining customer delivery time. Fast product customization into customer needs. Networking module vendors and submitting demand information to the network.
Manufacturing resource planning Production	20% modules and components to pull control (normally 80% volume). Shorter lead-time. Utilizing pull control in production management. Standardizing production process. Traceability and quality control in critical processes. Advanced planning and scheduling in vendor network.
Organization and continuous improvement	Multicompetence organization and learning organization. Teamwork.

value offering point (VOP) to compare the time and created value from order to delivery. Time from customer order to delivery is only the time of customization. The critical point is in designing the products and processes (Feitzinger and Lee, 1997).

For example Pine (1993), Anderson and Pine (1997) and other scientists have presented theories for the adaptation of mass customization and some case elements for implementation. However, these theories do not give any specific answers to implementation of a mass customization system especially applied to fast production. Therefore, the purpose of this paper is to present a model for fast production systems and mass customization in electronics industry from manufacturing approach. The model is based on theoretical findings and experiences achieved during the Pro Electronica project entity carried out in northern Finland, 1995–2001. The paper contains some descriptive features, but it is a generic base for normative applications.

**2. Elements of mass customization**

Pine (1993) has pointed out four essential elements in mass customization. There must be

standardized elements, components, or modules together with linkage system. The system should be used with a tool in order to match the customer needs for standardized components predefined in the system. An inventory or database of modules will be kept for recognition of the components. Pine (1993) also introduced major differences of mass customization vs. mass production in Table 2.

That leads us to the question how these goals are possible? Shortened lead times are basically attained by use of standardized methods and modules of:

- Development Use of standardized product modules designed to meet customers' requirements
- Production Pull controls systems vs. push control system
- Marketing Sale of standardized modules defined by large scale of customer needs
- Delivery Product modules batches in pull

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