



# Issues of mass customisation and supporting IT-solutions<sup>☆</sup>

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Received 17 January 2003; accepted 23 July 2003

## Abstract

Mass customisation production is a challenge to the existing production management systems. The opportunity to ensure an efficient utilisation of the production system is reduced due to the *build to order* (BTO) approach which is most often associated with a customisation strategy. Existing software provides little support because they are mostly based on mass production approaches. BTO on the other side has not been subject to the same attention as mass production, and as the problems are slightly different, the techniques of traditional industrial production can only be applied to a limited extent.

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**Keywords:** Mass customisation; Customer-driven manufacturing; Advanced planning and scheduling (APS); Product configuration

## 1. Introduction

A configurator as well as an advanced planning and scheduling (APS) system are discussed in this paper as an important part of competitive advantages of the customisation approach, which increase both the flexibility and speed as well as opportunities to reduce costs for coordination and managing the company and its supply chain.

The paper explains and discusses, a new theoretical and logic of production paradigms influenced by technology evolution. We believe that the classical and static explanation of production paradigms, which is unaffected by technology evolution is not appropriate.

The paper also explains and discusses the administrative processes related to the realisations of industrial customisation by using a configurator and an APS system. For some manufacturers of customised goods, the workload of producing tenders and re-planning to ensure feasibility is becoming a burden. As competition increases, the bid to order ratio falls and as a result bid costs are distributed on fewer orders. As a result manufacturers are interested in producing bids precisely and efficiently. To ensure that these manufacturers apply a mass customisation strategy, the preconditions must be recognised to establish an adequate decision-making platform based on the integration of a configuration and advanced planning systems.

The aim of manufacturing enterprises is to satisfy the customer's demand for products. In most cases, the requirements of the customers are sufficiently homogeneous so that one or a few products can meet the demands of the majority of customers, but this is not always the case. In some cases, the preferences of the

<sup>☆</sup>The paper was first presented at the 2002 APMS Conference held in Eindhoven, The Netherlands.

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customers are so diversified that it is impossible to include a satisfying number of solutions within a fixed mass-produced product-programme. Instead, manufacturers have applied a *mass customisation* approach. With a mass customisation approach products are specified for the individual customer and subsequently build to order (BTO). By using this approach it is possible to adapt the product to fit a very wide range of customers, without maintaining an excessive inventory. The industrial approach to customisation is significantly different from the prevailing production paradigms, mass production or craft production. In the realisation process, the concept is somewhat similar to one-of-a-kind production (OKP) known from heavy industry but without the high manufacturing cost and unstable quality.

Successful achievement of mass customisation has proven to be a management challenge for manufacturers worldwide. Customers demand products, which are cut to fit, but manufacturers, have difficulties in manufacturing profitable solutions. Much too often manufacturers are struggling with cost, delivery and quality of the customised products. The reasons are numerous, but some of them are related to operations management.

The justification for the existence of the BTO manufactures used to be the ability to deliver customised solutions. These solutions offend an increased value to the customers through innovative design and responsiveness to the preferences of the individual customer. Today, traditional mass producers use variation to create into differentiation and thereby move the domain of one-of-a-kind manufacturing. The traditional mass producers are not targeting the market for pure customised products, but are focusing on the market for products adapted to the customer.

Efficiency and reliability is difficult to maintain/preserve in an environment, which is as dynamic and unpredictable as BTO production. In BTO production, there is a large number of variables. It becomes very complicated to apply the traditional tools of operations management. The planning task becomes particularly complex due to the extreme number of elements which must be individually controlled. Every product has to be individually managed through a pull system, which means that every unit will trigger a series of administrative processes including purchasing, validation, specification, documentation retrieval, and especially

re-scheduling. The planning and scheduling must be specified through to component level, which is an enormous task if it is not automated. Consequently, a large number of manufacturers have to abandon detailed planning and scheduling. Instead, important decisions are based on best-case scenarios and intuition, which is associated with a considerable element of uncertainty. To compensate for the uncertainty, large buffers have been introduced and profits have been reduced out by alterations, rush orders, lack of components, etc. The daily focus is on delivering products within a reasonable margin time rather than on sustainable efficiency. These manufacturers' BTO production is full of surprises, which result in late deliveries and high cost. Precise delivery is particular often critical for the customer, but the BTO manufacturers have difficulties in fulfilling promised delivery dates. The product is bought because the customer has or anticipates a need, and the customer often includes the delivery in realisation of plans. Therefore, the unstable deliveries together with one-of-a-kind manufacturing are problematic. If the one-of-a-kind manufacturer shall remain credible, the ability to fulfil an order is essential, but the tools, which can provide sufficient control, are currently not available in a form, which the majority of manufacturers are capable of implementing.

Through a proactive use of the existing data from manufacturing it is possible to eliminate some of the surprises associated with BTO and thereby the number of unknowns is reduced.

The solution presented in this paper will enable manufacturers of customised products to use production data in the sales situation to reduce risk because providing a real time picture of the production load and inventory can be provided and included in the configuration process. By using production data in the sales situation it will be possible to apply common industrial management principals and thereby to improve the utilisation of an already existing production system. This will lead to a reduction of costs and lead-time. The approach is based on the observation from a number of medium sized manufacturers. These manufacturers have all established a differentiation by offering a customisation of complex products.

This paper is structured as follows: In Section 2, mass customisation (MC) a brief survey of MC and levels of customisation in MC, are presented. In

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