Mass Customization Reference Database

A resource developed by the Mass Customization Research Centre, University of Nottingham, www.mcrcnottingham.org

Issued by Philip Brabazon

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Revision History

Version	Date	Comment
1	August 2003	Original by Philip Brabazon & Jo Bramham
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Contents

Mass Customization reference database

This database has been prepared by the Mass Customization Research Centre at the University of Nottingham. The database summarises reference material of interest to the application and theory of mass customization.

The organisation of the references under subject and topic headings is intended to help find material of most relevance. In addition we have divided the material into Primary and Secondary sources. In our judgement, the material labelled as *primary* provides substantial insight into the subject or topic it is listed under. As far as possible we have provided an abstract for each primary reference.

Secondary material is relevant and important to the subject but it is labelled secondary for one of two reasons:

- Other primary material covers the same ground, or
- It is narrow in its coverage of the subject / topic.

General material

Primary

Books

Mass Customization: The new frontier in business competition
Pine B.J., II.
Harvard Business School Press, 343 pages, 1993.
Shows how companies can mass produce, and individually customize their products and services. The text explains historical context of "mass customization" - the move toward tailoring products to the special interests and needs of individual customers, and provides numerous examples

Markets of one: Creating Customer-unique Value Through Mass Customization
Gilmore J.H. and Pine B.J., II.
Harvard Business School Press, 248 pages, 2000.
This collection of articles focuses on the ways successful companies mass customize their products to build their businesses.

Articles and Papers

Making mass customization work
Pine B.J., II., Victor B. and Boynton A.C.
Harvard Business Review vol. 71, no. 5, pp. 108-119, 1993.
Not just an extension of continuous improvement, mass customization calls for a transformed company. Toyota set out in the late 1980's to use their highly skilled, flexible work force to make varied and often individually customized products at the low cost of standardized, mass-produced goods. Toyota seemed to be well on the way to achieving its goals. Toyota has run into trouble and has had to retreat, at least temporarily, from its goal of becoming a mass customizer. As production costs soared, top managers widened product-development and model life cycles and asked dealers to carry more inventory. They acknowledged that they had learned the hard way that mass customization is not simply continuous improvement plus

The customization-responsiveness squeeze
McCutcheon D.M., Raturi A.S. and Meredith J.R.
Sloan Management Review vol. 35, no. 2, pp. 89-99, 1994.
Presents a framework for determining the extent of a company's `customization-responsiveness squeeze' and choosing appropriate tactics to mitigate it. Range of approaches; Common responses; Tactics; Avoidance of risky approaches.

Customizing customization
Lampel J. and Mintzberg H.
Sloan Management Review vol. 38, no. 1, pp. 21-30, 1996.
Focuses on customization and standardization in industries. Polarization between aggregation and individualization; Logic of aggregation; Continuum of strategies; Customization of perspectives.

The four faces of mass customization
Gilmore J.H. and Pine B.J.
Harvard Business Review vol. 75, no. 1, pp. 91-101, 1997.

Most companies recognize the need to provide outstanding service to customers. However, focusing on the customer is both an imperative and a burden, as customers and their needs grow increasingly diverse. The authors identify four distinct approaches to customization, which they call collaborative, adaptive, cosmetic, and transparent. Collaborative customizers conduct a dialogue with individual customers to help them articulate their needs, to identify the precise offering that fulfills those needs, and to make customized products for them. Adaptive customizers offer one standard, but customizable, product that is designed so that users can alter it themselves. Cosmetic customizers present a standard product differently to different customers. Transparent customizers provide individual customers with unique goods or services without letting them know explicitly that those products and services have been customized for them. When designing or redesigning a product, process, or business unit, managers should examine each of the approaches for possible insights into how best to serve their customers. The four approaches to customization provide a framework for companies to design customized products and supporting business processes. They demonstrate the need to mix the direct interaction of collaborative customization, the embedded capabilities of adaptive customization, the forthright acknowledgment of cosmetic customization, and the careful observation of transparent customization into one's economic offerings.

All yours
Anonymous
Economist vol. 355, no. 8164, pp. 57-58, 2000.
Discusses manufacturers' customization of services. Dell Computer systems and inventories; Requirements of customization, including modular production processes; Express Custom Tailor production of customized menswear; Customer management and exploitation of mass customization.

In the business of Mass Customization
MacCarthy B. and Brabazon P.
Manufacturing Engineer vol. 82, no. 4, pp. 30-33, 2003.
Reports on the introduction of mass customization in Great Britain. Strategic complexities; Time to customize; Difficulties in customization. INSET: ORANGEBOX UK PUTS MC INTO ACTION.

Secondary

Selling uniqueness - Mass customisation: the new religion for manufacturers?
Ross A.
Manufacturing Engineer vol. 75, no. 6, pp. 260-263, 1996.

Future Perfect
Davis S.M.
Addison-Wesley, 1987.

The right stuff: America's move to mass customization
Cox W.M. and Alm R.
Federal Reserve Bank of Dallas, 1998.

Weapon of choice
MacCarthy B.
IEE Review vol. 82, no. 2, pp. 43-43, 2003.
Discusses the nature of mass customization. Applicability in a wide area of manufacturing processes; Ability to provide customized products and services to individual customers or niche market; Implication of mass production economy in manufacturing and logistics.

Case-studies

Primary

Customers as co-designers
Berger C. and Piller F.T.
Manufacturing Engineer vol. 82, no. 4, pp. 42-45, 2003.
Benefits of mass customisation; interaction systems for mi adidas: how does it work?

Mass customisation across the business: part 1
Duffell J.
Control vol. 24, no. 9, pp. 9-11, 1998.
This is the first in a series of four articles looking at the impact of Mass Customization on Sales, Production and in failure analysis both in-house and in the field. This article sets the scene by looking at the term Mass Customization and pints out the business areas needing review in order to respond to the challenge. The articles may provide some insight into the problems seen around a company when trying to offer a wider variety of products.

Mass customisation across the business: Configurators and the internet Part 2
Duffell J. and Street S.
Control vol. 24, no. 10, pp. 14-16, 1998.
This second article in the series on Mass Customization across the business looks at configurator products and their application both stand-alone and over the Internet. It discusses what a configurator is and what are the key features to look fo if your company is considering investing in one.

Mass customisation across the business: Customized production Part 3
Duffell J. and Street S.
Control vol. 25, no. 1, pp. 24-26, 1998.
Having successfully captured an order customized to user requirements it now has to be produced. This, the third, article in the series on Mass Customization across the business, examines the production process. It considers those factors key to efficient mass production of custom products. Many, if not all, of these factors make for efficient production anyway, however, they move from being good practice to essential when handling customer specific orders. Much of the article is based upon the experience of Research Machines plc, the major supplier of IT solutions into UK education, when they moved from build-to-stock to build-customer-order

Mass customisation across the business - Business failure analysis and data mining: Part 4
Duffell J., Jenkins B. and Street S.
Control vol. 25, no. 2, pp. 19-23, 1999.
This article, the last in the series on mass customization across the business, looks at analysing failures both during the manufacturing process and after shipment. It will first consider why there is a need for a new techniques and then explore the use of datamining software to assist the analysis.

Implementing mass customization
Eastwood M.A.
Computers in Industry vol. 30, no. 3, pp. 171-174, 1996.
Total Customer Satisfaction today can mean embarking on "Mass Customization": giving every customer a product tailored specifically to his or her needs. In the past, manufacturing was usually "high volume, low mix", characterized by keeping costs down with economies of scale, or "low volume, high mix", incurring costs and time for changeovers and special handling. Today's mass customization, however, can result in a challenging manufacturing environment with both high volume and high mix, where customers expect

individualized products at the same price they paid for mass-produced items. Meeting this challenge requires changes in the manufacturing processes. Equipment must be more flexible. Most important are the computer systems which support the manufacturing enterprise. Never has data been so essential to define, control, and monitor manufacturing as with mass customization. Motorola's product lines -- from the pagers with millions of possible options, to the cellular phones and semiconductors - are all experiencing the move to mass customization. This presentation will describe some Motorola examples and the methods used to achieve world-class manufacturing under these conditions.

From mass production to mass customization: the case of the national industrial bicycle company of Japan

Kotha S.
European Management Journal vol. 14, no. 5, pp. 442-450, 1996.
By means of a detailed study of the National Industrial Bicycle Company of Japan (NIBC), Suresh Kotha examines the dynamics of implementing mass customization in a firm that pursues both mass production and mass customization in two different factories. NIBC reaps superior returns by employing a 'system' which increases interaction between the mass production and mass custom factories and encourages knowledge creation. The author then considers the most important external (industry level) and internal (firm level) conditions which are necessary to successfully pursue mass customization, and points out that the interactions and interrelationships between them are important to a successful outcome too

Mass Customization: Implementing the emerging paradigm for competitive advantage

Kotha S.
Strategic Management Journal vol. 16, no. 5, pp. 21-42, 1995.
Discusses the dynamics of pursuing both mass production and mass customization strategies simultaneously based on an in-depth study of the National Bicycle Industrial Company (NBIC). NBIC organizational mechanism; Overall competitive positioning of NBIC; Illustration of dynamics; Maintaining a sustainable competitive advantage; Interacting mass customization and mass production approaches.

Examination of mass customization through field evidence

MacCarthy B.L., Brabazon P.G. and Bramham J.
In The Customer Centric Enterprise: Advances in Mass Customization and Personalization. Edited by Tseng, M.M. and Piller, F., Springer, 2003.
Mass Customization excites interest across both the research community and business and industry. However there are issues and question marks over what it means and how it may be realised. More evidence of practice is required to understand the implications of adopting a Mass Customization strategy. This chapter presents five case studies from a range of sectors - bicycles, computer assembly, communications components, mobile phones and commercial vehicles - and analyses their approaches to customization as well as their modes of operations. The type of the customization practised by these different businesses is identified in terms of dimensionality (fit/size), hardware functionality, software functionality, properties of the whole product, grade, quality level, aesthetics and style, personalization, literature and packaging. All five businesses offer more than one type of customization. The implications of customizing different product attributes are discussed. The operational modes observed in the case studies are analysed with respect to a typology of five modes of Mass Customization presented elsewhere. The reasons why different operational modes occur in different environments are speculated on. The chapter contributes to understanding both the potential for Mass Customization and the constraints under which real Mass Customizers may operate.

Mass customization at Hewlett-Packard: the power of postponement

Feitzinger E. and Lee H.L.
Harvard Business Review vol. 75, no. 1, pp. 116-121, 1997.
Focuses on the mass customization at Hewlett-Packard Company as customers are demanding that their orders be fulfilled more quickly. Why companies finds it difficult to fulfill orders swiftly; Pressures faced by Hewlett-Packard; Key to mass-customizing effectively; Details on three principle that form the basic building blocks of an effective mass-customization program.

Secondary

Mass-customization: A strategy for knowledge creation and organizational learning
Kotha S.
International Journal of Technology Management vol. 11, no. 7/8, pp. 846-859, 1996.
Proposes that the interaction between mass-production and mass-customization can be an effective source of knowledge creation and organizational learning. Effects of technological change on industrial competition; Technological change, diffusion and shortening product life cycles.

Welsh seat of power turns on responsive system
Tinham B.
Manufacturing Computer Solutions vol. 6, no. 7, pp. 22-23, 2000.
South Wales office chairs manufacturer Giroflex today offers its customers instantly validated choices from several million variants - of backrests, arms, upholstery and so on across all its ranges. It's customisation on a grand scale, and what it's done is simple but very impressive. The firm's Fourth Shift ERP (enterprise resource planning) system, and its associated partner IT systems were designed form the ground up to manage complexity - and provide customer service to beat off big rivals across Sweden, Germany, Italy and the USA

Direct from Dell: Strategies that revolutionized an industry
Dell M.
Profile Business, 288 pages, 2000.
'Dell's story is the stuff high-tech legends are made of' Forbes. At the age of twelve Michael Dell earned USD 2,000 selling stamps, and by the age of eighteen he was selling customized PCs from his room. He went on to found one of the most successful computer businesses in the world, redefining the industry. Direct from Dell teaches you how to get on to the front of the pack and stay there. The pioneer shares his ideas on:* Why, initially, it's better to have too little capital rather than too much* How studying customers, not competition, will give you a greater competitive edge* Why your people pose a greater threat to your business than the competition* How to exploit the competition's weakness by exposing it's greatest strength* How integrating vertically can make the difference between survival and collapse. Revealing nothing less than a new model for business in the information age, Direct from Dell is both a success story and a manifesto for revolutionizing any industry.

Collections of technical papers

Primary

The Customer Centric Enterprise: Advances in Mass Customization and Personalization
Edited by Tseng M.M. and Piller F.
Springer, 535 pages, 2003.
Companies are being forced to react to the growing individualization of demand. At the same time, cost management remains of paramount importance due to the competitive pressure in global markets. Thus, making enterprises more customer centric efficiently is a top management priority in most industries. Mass customization and personalization are key strategies to meet this challenge. Companies like Procter&Gamble, Lego, Nike, Adidas, Land`s End, BMW, or Levi Strauss, among others, have started large-scale mass customization programs. This book provides insight into the different aspects of building a customer centric enterprise. Following an interdisciplinary approach, leading scientists and practitioners share their findings, concepts, and strategies from the perspective of design, production engineering, logistics, technology and innovation management, customer behavior, as well as marketing.

Moving into Mass Customization: Information Systems and Management Principles
Edited by Rautenstrauch C., Seelmann-Eggbert R. and Turowski K.
Springer, 256 pages, 2002.
Mass customization is one of the principal strategies of successful companies in the 21st century. It indulges the customer with the product and service that exactly fits his desires and specifications. This book compiles a variety of views from mass customization specialists worldwide, both on an academic research basis and through practical case studies. This diversity should make it useful for any enterprise wishing to take its business into new and more ambitious dimensions.

Special issue of the journal Production Planning and Control
Edited by Ian P. McCarthy, Volume 15, Number 4 / June 2004, Taylor & Francis.
Special issue on *Mass Customization*

Special issue of the journal Concurrent Engineering: Research and Applications
Edited by Roger Jianxin Jiao, George G. Q. Huang, and Mitchell M. Tseng, Volume 12, Number 2, June 2004, Sage Publications.
Special issue on *Concurrent Enterprising for Mass Customization*

Secondary

Product variety management: research advances
Edited by Ho T.-H. and Tang C.S.
Kluwer Academic, 84 pages, 1998.

Criticism

Primary

The false promise of mass customization
Agrawal M., Kumaresh T. and Mercer G.
The McKinsey Quarterly vol. 3, pp. 62-71, 2001.
Build to order will be hugely expensive and challenging, and its benefits are uncertain. But there is a cheaper alternative. This article suggests the 'virtual build-to-order' (BTO) approach as a cheaper alternative to mass customization of automobiles. Doubts cast on the current BTO approach; Challenges in implementing it; Percentage of North American buyers willing to purchase a BTO vehicle.

The limits of mass customization
Zipkin P.
Sloan Management Review vol. 42, no. 3, pp. 81-87, 2001.
Discusses the limitations of mass customization in the delivery of commercial products to consumers. Elements of mass customization; Demand for mass customization; Tips for companies considering a mass customization strategy. INSETS: Mass Customization vs. Mass Production; Alternatives to Mass Customization.

Production customisation and manufacturing strategy
Spring M. and Darymple J.F.
International Journal of Operations and Production Management vol. 20, no. 4, pp. 441-467, 2000.
Reviews literature from manufacturing strategy, flexibility, agile manufacturing, and aspects of industrial marketing and highlights fragmented and inadequate treatment of fundamental issues relating to product customisation. Through synthesis of the literature and the analysis of four case studies - in the manufacture of fork-lift trucks, electro-mechanical devices, small telecommunications systems and stationery products respectively - presents a novel model of the customisation process. Identifies typologies of customisation problem-solving situations and custom-build option types. Demonstrates the importance of the relationship between the degree of design activity and volume of manufacture, and of the distinction between products that are custom-built from options, and those that involve some custom-designed elements. Proposes a range of potential roles for customised products to support management decision making in the selection of appropriate business activities

Defining Mass Customization

Primary

Mass customisation - an automotive perspective
Alford D., Sackett P. and Nelder G.
International Journal of Production Economics vol. 65, no. 1, pp. 99-110, 2000.
Increasingly automotive manufacturers are aiming for mass customisation, providing such a variety of products that nearly everyone can find what they want. More product variety is causing escalating costs and complexity in manufacturing. It is not clear how the manufacturing system engendered by lean production will respond to this challenge. Manufacturers are experimenting with models of the assembly and supply chain as a cost-e!ective solution for customisation increased is yet to emerge. These models represent a continuum of supplier involvement in the assembly process, as manufacturers seek to establish the optimum balance between cost reduction, retention of control and devolution of responsibility to the supply chain. The authors argue that an e!ective approach must be developed to support decisions on initiatives aimed at promoting customisation and preventing escalating costs and complexity in manufacturing.

Mass customization: literature review and research directions
Da Silveira G., Borenstein D. and Fogliatto F.S.
International Journal of Production Economics vol. 72, no. 1, pp. 1-13, 2001.
Mass customization relates to the ability to provide individually designed products and services to every customer through high process flexibility and integration. Mass customization has been identified as a competitive strategy by an increasing number of companies. This paper surveys the literature on mass customization. Enablers to mass customization and their impact on the development of production systems are discussed in length. Approaches to implementing mass customization are compiled and classified. Future research directions are outlined.

Mass customization: conceptual underpinnings, opportunities and limits
Hart C.W.L.
International Journal of Service Operations vol. 6, no. 2, pp. 36-45, 1995.
Traditionally, executives have assumed that trade-offs - high quality or low cost, efficiency or customization - are inevitable. In defining their businesses, the choice has always been seen in terms of mass production of inexpensive, commodity-like products or services (the assembly line) on the one hand, and on the other hand, premium-priced, individually-tailored, highly differentiated offerings (the "job shop"). But the notion that such trade-offs and choices are permanent, inevitable business realities is fading as a new management paradigm - mass customization - emerges. Mass customization consists of cutting-edge management methods and tools that give companies the ability to produce customized, affordable, high-quality goods and services, but with the shorter cycle times and lower costs historically associated with mass production and standardization. Proposes that much of the power of mass customization, like total quality management before it, lies in its visionary and strategic implications. Also delineates an exploratory diagnostic framework to help companies assess the potential for mass customization as an explicit strategy in their industries. The key dimensions of this framework are customer sensitivity, process amenability, competitive environment, and organizational readiness

Fundamental modes of operation for mass customization
MacCarthy B., Brabazon P.G. and Bramham J.
International Journal of Production Economics vol. 85, no. 3, pp. 289-304, 2003.
The concept of Mass Customization (MC)--producing customized goods for a mass market--has received considerable attention in the research literature in recent years. However, the literature is limited in providing an understanding of the content of MC strategies (the organizational structures, process technologies, etc., that are best in a particular environment) and the process of MC strategies (the sub-

strategy that an enterprise should select and how they should go about implementing an MC strategy). In this paper six published classification schemes of relevance to MC are reviewed. The classification schemes are applied to five case studies of enterprises operating in an MC environment. The limitations of the schemes are analysed and their failure to distinguish key characteristics is highlighted. Analysis of the findings leads to the development of a taxonomy of operational modes for MC. Five fundamental modes of operation for MC are identified. These modes are described and justified and their application is illustrated by contrasting the information requirements of two modes. The potential of these modes to provide the foundations for detailed configuration models is discussed.

Secondary

Approaches to mass customization: configurations and empirical validation
Duray R., Ward P.T., Milligan G.W. and Berry W.L.
Journal of Operations Management vol. 18, no. 6, pp. 605-625, 2000.
Mass customization is a paradox-breaking manufacturing reality that combines the unique products of craft manufacturing with the cost-efficient manufacturing methods of mass production. Although this phenomenon is known to exist in practice, academic research has not adequately investigated this new form of competition. In this research, we develop a configurational model for classifying mass customizers based on customer involvement in design and product modularity. We validate this typology through an empirical analysis and classification of 126 mass customizers. We also explore manufacturing systems and performance implications of the various mass customization configurations.

Topics

Strategy and business case

Primary

Implications of mass customization for operations management: an exploratory survey
Ahlstrom P. and Westbrook R.
International Journal of Operations and Production Management vol. 19, no. 3/4, pp. 262-274, 1999.
This paper reports the results of a survey conducted to explore issues surrounding mass customization and in particular its implications for operations management. The findings cover the market changes driving customization, the methods used to provide customized goods, the positive and negative effects of customization, and the difficulties of implementation. There are shown to be important implications for operations management in a strategy of mass customization, and thus substantial scope for further research by operations management academics.

The strategy-capabilities link in Mass Customization
Brown S. and Bessant J.
International Journal of Production Operations and Management vol. 23, no. 7, pp. 707-730, 2003.
This paper is based on longitudinal case studies of research into strategy formulation within six plants from large firms - three in the car industry and three from the computer industry - that have embarked on mass customisation. The core theme of this paper is that, in spite of the increasing attention given to manufacturing strategy from the seminal work of Skinner through to the plethora of articles in recent times, little is mentioned about its application to paradigms of agility or mass customisation. As a consequence firms attempt to become agile and to pursue mass customisation without appreciating the contribution of plant-specific manufacturing strategies that might enable them to achieve these aspirations. We examine the enablers and strategic blockages in pursuing mass customisation, via a mapping process, and reveal reasons why some firms remain unable to devise and implement manufacturing strategies.

Key Value Attributes in Mass Customization
MacCarthy B.L., Brabazon P.G. and Bramham J.
In Moving into Mass Customization: Information Systems and Management Principles. Edited by Rautenstrauch, C. et al. , Springer, 2002.
The chapter introduces the concept of product key value attributes (KVA) for understanding Mass Customization (MC). The customization potential and desirability of product attributes may be explained in this light. The concept provides a basis to understand the spectrum of MC strategies and the challenges that MC poses operationally. A number of conceptual models are introduced to explore both customization potential and desirability with respect to the customer and the producer. The challenges that MC poses for the design of effective operational systems and for strategy formulation are identified in the context of KVAs. A classification of different types of key value attributes is described and their operational implications discussed. The ideas are examined in the context of the market environment in which MC takes place. The impact of proliferation of product variety is highlighted. The nature of the customer is considered and the need to include business customers demanding product differentiation is noted.

Limits and opportunities in mass customization for "build to order" SMEs
Svensson C. and Barfod A.
Computers in Industry vol. 49, no. 1, pp. 77-89, 2002.
Customer satisfaction is at the focus for most manufacturers and mass customization can in some markets be one of the many tools used to increase the customer perceived value of a product by combining low price with extensive variation and adaptation. As a result, mass customization is on the agenda in many small and

medium sized enterprises (SMEs) but the question is, what it will take for a SME to be successful in achieving mass customization? This paper will discuss mass customization and its influence on "built to order" SMEs.

Secondary

The relative advantages of flexible versus designated manufacturing technologies
Norman G.
Regional Science and Urban Economics vol. 32, no. 4, pp. 419-445, 2002.
This paper analyzes the choice between flexible and designated manufacturing technologies when firms can choose the flexibility of their manufacturing systems. Firms can operate a mix of technologies, a flexible system to serve some consumers and a designated technology to serve others and can offer multiple products. For flexible systems to be preferred these must offer strong economies of scope and be capable of producing customized products that are largely indistinguishable from custom-built products. An increase in submarket size or in the willingness of consumers to pay for particular types of products encourages the use of designated technologies.

The diminishing utility of the product/process matrix: a study of the US power tool industry
McDermott C.M., Greis N.P. and Fischer W.A.
International Journal of Operations and Production Management vol. 17, no. 1, pp. 65-84, 1997.
It has been argued that manufacturing requires a trade-off between responsiveness and cost leadership. Manufacturers must make a choice between at one extreme low-volume, flexible, high-quality, customized production through job shop facilities and, at the other, high-volume, standardized, low-cost production through the flow shop at the other. The Hayes and Wheelwright[1] product-process matrix embodies the core principles of this model and has been central to the thinking about operations strategy since its publication in 1979. Much of the literature relating to operations strategy since 1979 is based on the trade-offs that are stated either explicitly or implicitly in this model. However, over the last 15 years a number of major changes have occurred in manufacturing practice which pose a direct challenge to the holdings of this model. It is the goal of this paper to examine empirically the impact these changes have had on manufacturing strategy and practice over time and to document how the new competitive environment faced by managers today maps on to the traditional trade-off paradigm.

Managing in the age of the mass merchant
McDermott C.M. and O'Connor G.C.
Business Horizons vol. 38, no. 6, pp. 64-70, 1995.
Highlights issues that relate to mass merchants, also known as retailing firms. Strategies for success; Manufacturing responses; Challenge to the volume-variety tradeoff; Manufacturing implications.

Organisational design

Primary

Fundamental modes of operation for mass customization
MacCarthy B., Brabazon P.G. and Bramham J.
International Journal of Production Economics vol. 85, no. 3, pp. 289-304, 2003.
The concept of Mass Customization (MC)--producing customized goods for a mass market--has received considerable attention in the research literature in recent years. However, the literature is limited in providing an understanding of the content of MC strategies (the organizational structures, process technologies, etc., that are best in a particular environment) and the process of MC strategies (the sub-strategy that an enterprise should select and how they should go about implementing an MC strategy). In this paper six published classification schemes of relevance to MC are reviewed. The classification schemes are applied to five case studies of enterprises operating in an MC environment. The limitations of the schemes are analysed and their failure to distinguish key characteristics is highlighted. Analysis of the findings leads to the development of a taxonomy of operational modes for MC. Five fundamental modes of operation for MC are identified. These modes are described and justified and their application is illustrated by contrasting

the information requirements of two modes. The potential of these modes to provide the foundations for detailed configuration models is discussed.

Refining and extending the business model with information technology: Dell Computer Corporation

Kraemer K.L., Dedrick J. and Yamashiro S.
Information Society vol. 16, no. 1, pp. 5-17, 2000.
The exceptional performance of Dell Computer in recent years illustrates an innovative response to a fundamental competitive factor in the personal computer industry--the value of time. This article shows how Dell's strategies of direct sales and build-to-order production have proven successful in minimizing inventory and bringing new products to market quickly, enabling it to increase market share and achieve high returns on investment. The Dell case illustrates how one business model may have inherent advantages under particular market conditions, but it also shows the importance of execution in exploiting those advantages. In particular, Dell's use of information technology (IT) has been vital to executing both elements of its business model--direct sales and build-to-order--and provides valuable insights into how IT can be applied to achieve speed and flexibility in an industry in which time is critical. Many of the insights gained from this case can be applied more generally to other time-dependent industries, suggesting that the findings from the Dell case will have implications for a growing number of companies and industries in the future.

Secondary

Mass customization - needs to go beyond technology

Kakati M.
Human Systems Management vol. 21, no. 2, pp. 85-93, 2002.
In recent time, mass customization strategy is considered in some industries as those trends, if not taken up, that might make firms lose their markets to the competitors. Thus, managers concerned with strategic issues might adopt new technology as the only means of implementing this strategy. Often they might make an error in doing so. Mass customization is a completely discontinuous leap from mass production and requires a major paradigm shift and breakthrough thinking. Understanding customers is the starting point, not the dizzying possibilities of technology to produce variety that nobody wants. Mass customization requires careful preparation in every stage of the supply chain and also enriching buying experience of customers. Innovation, quality improvement, time, flexibility, and cost management in every stage are essential pre-requisite of mass customization program. This paper critically analyses some of the issues of mass customization program and suggests measures for successful implementation of a mass customization strategy.

The impact of time-based manufacturing practices on mass customization and value to customer

Tu Q., Vonderembse M.A. and Ragu-Nathan T.S.
Journal of Operations Management vol. 19, no. 2, pp. 201-217, 2001.
Mass customization capabilities enable firms to design, produce, and deliver a high volume of differentiated products that meet specific customer needs in a timely manner and at close to mass-production prices. A critical part of mass customization is simultaneously achieving customer responsiveness, cost efficiency, and high volume production in the manufacturing system. This research describes mass customization and provides a framework to understand the relationships among time-based manufacturing practices, mass customization, and value to the customer. It involves the development of an instrument to measure mass customization. Data were collected from 303 manufacturing firms of various size, location, and industry to develop the instrument and test the relationships in the framework. The primary research method was structural equation modeling using LISREL. The study indicates that firms with high levels of time-based manufacturing practices have high levels of mass customization and value to the customer. Also, firms with high levels of mass customization have high levels of value to customer.

Competitive advantage, customisation and a new taxonomy for non make-to-stock companies

Amaro G., Hendry L.C. and Kingsman B.K.
International Journal of Operations and Production Management vol. 19, no. 4, pp. 349-371, 1999.

Presents a new taxonomy for the non make-to-stock sector to enable a like-with-like comparison, arguing that existing taxonomies within the literature are inadequate for strategic research purposes. Presents empirical evidence which has been collected from 22 companies in three European countries - the UK, Denmark and The Netherlands. The data support the structure of the proposed new taxonomy and provide insights into competitive advantage and customisation issues in the non make-to-stock sector. Finally, two new labels for this sector of industry are proposed. "Versatile manufacturing company" is used to describe those manufacturers which are involved in a competitive bidding situation for every order which they receive, customisation by individual order. In contrast, the "Repeat business customiser" may only be in this position for the first of a series of similar orders from a particular customer, customisation by contract.

Mass customization origins: mass or custom manufacturing?
Duray R.
International Journal of Operations & Production Management vol. 22, no. 3, pp. 314-328, 2002.
Mass customization presents a paradox to traditional man ufacturing practices. Historically companies chose to produce either customized, crafted product or mass-produced, standardized products. Thus, mass customization presents a paradox by combining customizationand mass production, offering unique products in a mass-produced, low cost, high volume production environment. If mass customization is truly a combination of mass production and craft manufacture, how does a manufacturer become a mass customizer? Are the key principles of mass customization rooted in customized product knowledge or mass production techniques? Does the path to mass customization impact financial performances? This paper begins to answer these questions by exploring the total product mix of mass customizing plants usnig data gathererd from 126 mass customizers. This study shows plants that choose mass customization approaches that match the non-mass customized line characteristics have higher financial performance than those firms without a matched product line.

Order fulfillment system design

Primary

The false promise of mass customization
Agrawal M., Kumaresh T. and Mercer G.
The McKinsey Quarterly vol. 3, pp. 62-71, 2001.
Build to order will be hugely expensive and challenging, and its benefits are uncertain. But there is a cheaper alternative. This article suggests the 'virtual build-to-order' (BTO) approach as a cheaper alternative to mass customization of automobiles. Doubts cast on the current BTO approach; Challenges in implementing it; Percentage of North American buyers willing to purchase a BTO vehicle.

Successful Build-to-Order Strategies Start With the Customer
Holweg M. and Pil F.K.
MIT Sloan Management Review vol. 43, no. 1, pp. 74-84, 2001.
Focuses on the importance of understanding the needs of customers in a successful build-to-order manufacturing strategies of companies. Challenges in producing products that the customers want; Three dimensions of a successful build-to-order strategy; Tips in making the business transition. INSET: Why Push Strategies Ultimately Fail.

Managing Broader Product Lines through Delayed Differentiation Using Vanilla Boxes
Swaminathan J.M. and Tayur S.R.
Management Science vol. 44, no. 12, pp. S161-S172, 1998.
In an attempt to reduce cost while maintaining good customer service, some of the leading manufacturers in the computer industry are delaying product differentiation (by exploiting component commonality) while managing broader product lines. In an environment where demands are stochastic, it seems a good strategy to store inventory in the form of semi-finished products (vanilla boxes) that can serve more than one final product. However, finding the optimal configurations and inventory levels of the vanilla boxes could be a challenging task. In this paper, we model the above problem as a two-stage integer program with recourse. By utilizing structural decomposition of the problem and (sub)gradient derivative methods, we provide an

effective solution procedure. A special case, a variant, and several extensions are also discussed. In our computational section, we utilize our model to study several new research issues. We provide insights on the effect of demand variance, correlation, and capacity limitations on the optimal configuration and inventory levels of vanilla boxes and the performance of a vanilla assembly process. In addition, we compare the performance of the vanilla assembly process to make-to-stock and assemble-to-order processes and provide managerial insights on the conditions under which one might be better than the others. Finally, we discuss the characteristics of an IBM product line (which motivated this work) and the effectiveness of a heuristic tailored for that application.

Managing design of assembly sequences for product lines that delay product differentiation

Swaminathan J.M. and Tayur S.R.
IIE Transactions vol. 31, no. 11, pp. 1015-1026, 1999.
The integration of product design and operations could potentially enhance the ability of manufacturers to provide large variety in the product line while keeping their operations competitive. At the plant level, an improved assembly sequence can lead to superior operational response to customer demands. While this has been intuitively accepted, there is a scarcity of models that can adequately reflect the operational benefits of a costlier yet better design. In this paper, we present integrated models applicable at a plant level that can provide quantification of certain operational benefits. Further, through a computational study, we also provide qualitative insights on several issues such as the effect of : (i) features in the product line; (ii) variance of demand for the different features on the optimal assembly design; (iii) set-up times; and (iv) life cycle of the product line.

Flexibility-driven index for measuring mass customization feasibility on industrialized products

Fogliatto F.S., Da Silveira G. and Royer R.
International Journal of Production Research vol. 41, no. 8, pp. 1811-1829, 2003.
Mass customization relates to the ability to provide individually designed products and services to customers through high-process flexibility and integration. It enables the delivery of individualized products at prices similar to mass-produced items. This paper proposes a customization index to estimate the viability of implementing mass customization systems. The index establishes a ranking of customizability for different characteristics of a product, which is based on three variables: customer requirements, supplier delivery flexibility and production flexibility. The index is implemented through an original application of the Quality Function Deployment matrix.

Secondary

A technique for uncertainty reduction based on order commonality

Bartezzaghi E. and Verganti R.
Production Planning & Control vol. 6, no. 2, pp. 157-170, 1995.
The use of commonality is widely diffused as a criterion to reduce uncertainty in demand forecasts for the master production schedule (MPS). Nevertheless, studies have mostly focused on exploiting component commonality in make to stock and assemble to order manufacturing. This paper refers to planning environments with two specific characteristics. First, the degree of certainty of the demand is extremely low, due to product complexity, with poor modularization and standardization, and to the presence of few customers of large dimensions. Second, the delivery lead time is less than the total lead time. In this situation, demand for MPS planning units is extremely uncertain and sporadic. It is therefore necessary to formulate in advance forecasts of customer orders with a redundant configuration. In this paper a technique for the reduction of demand uncertainty is introduced, based on the exploitation of order commonalities. In particular, relations between order commonality and uncertainty reduction in a planning environment with such complex features are illustrated. Then, guidelines for the implementation of the technique in order to reduce over-planning in the master production schedule are provided. Finally, the performances of the technique are empirically analysed by means of both a simulation model and experimental application in a telecommunication systems manufacturer.

Using Product-Mix Flexibility to Implement a Make-to-Order Assembly Line

Bradley J.R. and Blossom A.P.

Presented at *INFORMS International*, Hawaii, 2001.
The era of mass production was ushered in by the assembly line, which is traditionally managed with the goals of minimizing cost and attaining high labor efficiency. Seeking high levels of efficiency, however, renders the assembly line inflexible to producing a fluctuating product mix, and incapable of supporting popular strategies such as quickly manufacturing and delivering products on a made-to-order basis. We propose a process to increase product mix flexibility on the assembly line through which the current demands of the marketplace can be satisfied. We compute an upper bound on the amount of additional capacity that is required to implement made-to-order production, which allows us to describe the tradeoff among capacity, lead time, product complexity, and percentage of made-to-order production. We show that the cost of made-to-order production is small.

Mixed model assembly line design in a make-to-order environment

Bukchin J., Dar-El E.M. and Rubinovitz J.
Computers & Industrial Engineering vol. 41, no. 4, pp. 405-421, 2002.
Mixed model assembly lines can be found today in many industrial environments. With the growing trend for greater product variability and shorter life cycles, they are replacing the traditional mass production assembly lines. In many cases, these lines follow a 'make-to-order' production policy, which reduces the customer lead-time, and is expressed in a random arrival sequence of different model types to the line. Additional common characteristics of such mixed model lines in a make-to-order environment are: small numbers of work stations, a lack of mechanical conveyance, and highly skilled workers. The design problem of mixed model assembly lines in a make-to-order environment is addressed in this paper. A mathematical formulation is presented which considers the differences between our model and traditional models. A heuristic that minimizes the number of stations for a predetermined cycle time is developed consisting of three stages: the balancing of a combined precedence diagram, balancing each model type separately subject to the constraints resulting from the first stage, and a neighborhood search based improvement procedure.

Manufacturing flexibility: a literature review

De Toni A. and Tonchia S.
International Journal of Production Research vol. 36, no. 6, pp. 1587-1617, 1998.
In this article an attempt is made to classify the vast literature regarding manufacturing flexibility; the aim is to contribute to the conceptual systemization of the debate, whose richness plays witness of the abundance of themes and the difficulty of obtaining a unitary and univocal framework. The literature on manufacturing flexibility is analysed according to a scheme which considers six different aspects: (1) definition of flexibility, (2) request for flexibility, (3) classification in dimensions of flexibility (the authors group the various classifications proposed according to different logics: horizontal, vertical, temporal, by the object of the variation, mixed), (4) measurement of flexibility, (5) choices for flexibility, (6) interpretation of flexibility.

Production seat booking system for the combination of make-to-order and make-to-stock products

Kobayashi Y.
Production Planning & Control vol. 13, no. 4, pp. 3942002.
This study deals with the problem of the production seat booking system. Like an airline or train booking system, customers' orders are assigned a production seat. Using the production seat booking system, inquiries about the delivery for individual orders can be answered quickly. The key issues in the production seat booking system are: (1) In which manufacturing environments are the production seat booking system appropriate and efficient? (2) How should the production seat be set? (3) How should orders be assigned a production seat? A production planning model is formulated for a production seat booking system with a combination of make-to-order and make-to-stock as production environment. Two kinds of variables are set as policy in the model: one is a variable for setting production capacity and the other a variable for assigning orders a production seat. By focusing on the characteristics of market demand, this paper clarifies the following points: (1) How do these policy variables affect the manufacturing performance? (2) How does the buffer inventory for make-to-stock product affect the degree of the delivery date satisfaction for make-to-order products? (3) Within what range should the two policy variables be set in order to maintain the unfilled-rate of make-to-stock product under the specified level and the degree of delivery date satisfaction for make-to-order products over the specified level? This paper presents a basis for designing for a production seat booking system through a series of numerical experiments.

Effective inventory and service management through product and process redesign
Lee H.L.
Operations Research vol. 44, no. 1, pp. 151-159, 1996.
Describes the benefits of inventory models to the logistic dimensions of products or process design. Product proliferation (PP) in global markets; What causes PP; How PP affects production engineering; Listing of related studies; Examination of a build-to-order and build-to-stock models; Applications of the models.

Modelling the costs and benefits of delayed product differentiation
Lee H.L. and Tang C.S.
Management Science vol. 43, no. 1, pp. 40-53, 1997.
Proposes a simple model that captures the costs and benefits of delayed product differentiation. Product/process redesign approaches for delaying product differentiation; Characterization of the optimal point of product differentiation; Managerial insights from cases studied.

Variability reduction through operations reversal
Lee H.L. and Tang C.S.
Management Science vol. 44, no. 2, pp. 162-172, 1998.
Presents a study motivated by observations in the industry, where some companies have reengineered the manufacturing process by reversing two consecutive stages of the process. Development of formalized models that characterized the impact of such changes; Description of how the independence assumption of feature option choices can be relaxed; Findings of the study.

Coping with the build-to-forecast environment
Raturi A.S., Meredith J.R., McCutcheon D.M. and Camm J.D.
Journal of Operations Management vol. 9, no. 2, pp. 230-249, 1990.
High-value-added manufacturing companies today confront a competitive trend toward greater product customization in the face of reduced response times. This scenario is encountered most often in industries like machine tools, heavy construction equipment, heavy manufacturing in general and computer software and hardware. The product is highly customized, yet competition requires manufacturers to deliver it with lead times significantly shorter than the manufacturing lead time. Generally, the scheduling practice here is to release the manufacturing order before the customer order is released and subsequently match incoming customer orders to units in progress. This is referred to as the "build-to-forecast" (BTF) approach. This study investigated the coping mechanisms used by manufacturing firms to alleviate this dilemma. The tactics vary with the firm's business strategy, its operating environment, and its capabilities. We report on three case studies from firms building heavy machinery. The firms are similar in terms of the range of final product values, build times, customer delivery times and the very large number of components. Also, their operations require the use of a variety of flexible and dedicated resources. Flexibility in manufacturing processes, modular bills of materials, subcontracting and expediting are some of the approaches that these firms use to help resolve the double bind of short lead times and high levels of customization. We review some of the operational problems peculiar to the build-to-forecast environment and suggest alternative approaches for dealing with them. The coping mechanisms are grouped according to the manner by which they help relieve the BTF problem's severity. One set of mechanisms makes the problem less complex by simplifying products or the production process. Another set reduces the risks due to uncertainty in demand or supply. The third set provides engineering and manufacturing slack. While some or all of the mechanisms are used by the manufacturing firms studied, the predominance of particular mechanisms in each firm is explained by a contingency model developed in this paper. The case studies provide useful insights into the nature of the problem and how the firm's organizational environment often dictates the choice of mechanisms used to alleviate it. For example, these firms minimized their scheduling dilemmas with modular product designs, flexible processes, informal organization structures, or formal control mechanisms for limiting customization. We conclude by framing a number of research questions whose solutions would help such firms better manage their operations.

Designing customer oriented production planning system (COPPS)
Tamura T. and Fujita S.
International Journal of Production Economics vol. 41, no. 1-3, pp. 377-385, 1995.

The concept and practice of the production seat system
Tamura T., Fujita S. and Kuga T.

Managerial and Decision Economics vol. 18, pp. 101-112, 1997.
This paper presents features of the production seat system and its industrial applications in Japan. Like an airline reservation system, customers' orders are booked on the production seat table in the production seat system. Then orders are released from the production table to work processes at every production order cycle. To show the effectiveness of the production seat system, a simple simulation was conducted. It was observed that the production seat system would achieve better observance of customer delivery dates and would reduce the average production lead time when compared with the traditional production planning and scheduling system.

Supply Chain

Primary

Delivering the '3-day car'--the strategic implications for automotive logistics operations
Holweg M. and Miemczyk J.
Journal of Purchasing and Supply Management vol. 9, no. 2, pp. 63-71, 2003.
It is now becoming apparent that the current 'stock-push' vehicle supply in the automotive industry by fulfilling the large majority of orders from existing stock is no longer a viable proposition. Cost pressure from rising stock levels in the market and high discounts needed to sell these vehicles have forced vehicle manufacturers to rethink their order fulfilment strategy in favour of stock-less 'build-to-order' systems. More responsive order fulfilment at vehicle manufacturer level however will not only require flexible and responsive component supply and vehicle assembly, but will also have wide ramifications for all logistics operations in the auto supply chain. Based on findings of the 3DayCar research programme, this paper compares the implications on inbound, outbound and sea transportation logistics, leading to the development of a strategic framework for future automotive logistics operations.

Secondary

Supply chain postponement and speculation strategies: how to choose the right strategy
Pagh J.D. and Cooper M.C.
Journal of Business Logistics vol. 19, no. 2, pp. 13-33, 1998.
Effective management of a supply chain includes thinking creatively about how to integrate and perform logistics and manufacturing activities. Postponement and speculation strategies offer opportunities to achieve delivery of products in a timely and cost-effective manner by rearranging the conventional production and logistics structures, which are often designed and managed autonomously. Supply chain advancements have frequently been achieved by reducing risk and uncertainty through the employment of sophisticated forecasting techniques, with a low degree of cooperation and integration between the manufacturing and logistics processes. By employing the concept of postponement and combining it with a holistic view of the supply chain, a small number of best practice companies have managed to increase the performance of their firms and the supply chain as a whole.

Postponement, product customization, and market-oriented supply chain management
Waller M.A., Dabholkar P.A. and Gentry J.J.
Journal of Business Logistics vol. 21, no. 2, pp. 1332000.
An investigation is made of the concept of market-oriented supply chain strategies that result in a wider variety of product options/versions and internal capabilities to provide cost effective coordination of functional activities in order to meet external demand. Focus is on the relationship between postponement and product customization. Postponement can be viewed as a competency or capability in an inside-out process and product customization can result from a competency in an outside-in process. The coordination of these as one aspect of effective supply chain management is also investigated. It is demonstrated that postponement may be a meaningful and innovative approach for facilitating market-oriented supply chain management.

Order processing

Primary

Managing for variety in the order acquisition and fulfilment process: the contribution of product configuration systems

Forza C. and Salvador F.
International Journal of Production Economics vol. 76, pp. 87-98, 2002.
Flexible production is not enough to offer the customer variety without compromising company profitability. In conditions of product proliferation, in fact, the order acquisition and fulfillment process can turn out to be a serious bottleneck, as the multiplication of the product features induces an exponential growth in the volume of information exchanged between the firm sales organisation and its customer base. Furthermore, this information has to be fed back in appropriate formats to manufacturing, with the risk of errors and delays due to the variability and complexity of product information. This study, through the discussion of a case example, reports the first results from a research on a class of information systems that support the order acquisition and fulfillment process in high product variety environments, called product configuration systems. The research indicates that the implementation of a product configuration system significantly contributed to increase the effectiveness and efficiency with which the studied company translates the customer's needs into product documentation. Moreover, the benefits pertaining to product configuration system stretch beyond operational performance, as it offers the company a way to incorporate into organisational memory product knowledge otherwise retained by individual employees. However, the introduction of a product configuration system may require significant and potentially painful changes in the way the order acquisition and fulfillment activities are organised, and necessitate a high initial investment in terms of man-hours.

Product design and development

Primary

Fundamentals of product family architecture

Jiao J. and Tseng M.M.
Integrated Manufacturing Systems vol. 11, no. 7, pp. 469-483, 2000.
Recognizing the rationale of a product family architecture (PFA) with respect to design for mass customization (DFMC), this paper discusses the fundamental issues underlying a PFA, including product information modeling, structural implications of product families, functional variety versus technical variety, class-member relationships inherent in variety, modularity and commonality, PFA design spaces, and PFA composition. The background research is reviewed in terms of product architecture and modularity, product platform and product families, and product modeling and design process models. To organize product varieties in DFMC, a PFA should be described from three different perspective, namely the functional (as seen from the product technology or design engineer perspective) and structural (as seen from the fulfillment or manufacturing and logistic perspective). Meeting diverse customer requirements and achieving value economy simultaneously can be best achieved by synchronizing these there perspectives.

Understanding product family for mass customization by developing commonality indices

Jiao J. and Tseng M.M.
Journal of Engineering Design vol. 11, no. 3, pp. 225-244, 2000.
While the rationale of developing the product family as a means to achieve economy of scale and standardization of production has been well recognized in both industry and academia, the fundamental concern regarding developing the product family lies in the fact that a company must optimize the internal complexity and external variety. With this view, this paper recognizes the necessity to understand the product family through developing commonality measurements. The goal of the paper is to present design and process engineers with insight into product family design and its manufacturability. In this paper, two sources of commonality are identified: the component part commonality and the process commonality. The formulation of the component part commonality is based on the mindset of counting the average applications

per component part and takes into account product volume, quantity per operation, and the price/cost of the component part. The process commonality index incorporates such concerns as process flexibility, lot sizing, and scheduling sequencing into one analytical measurement. The effects of these two commonality indices on product family design are examined in response to changes in their parameters. Accordingly, the managerial implications are derived. In order to facilitate the understanding of the product family, the feasibility of evaluating the product family by relating commonality indices to the system's performance is discussed.

Concurrent design for mass customization
Tseng M.M. and Jiao J.
Business Process Management Journal vol. 4, no. 1, pp. 10-24, 1998.
Mass customization aims at satisfying individual customer needs while keeping mass production efficiency. This paper discusses the employment of concurrent engineering for realizing mass customization. Concurrent design for mass customization (CDFMC) is put forward by extending the traditional boundaries of product design to encompass a larger scope spanning from sales and marketing to distribution and services. In addition, CDFMC advocates designing product families instead of individual products. The paper develops a concept of product family architecture (PFA) to support CDFMC via assisting different functional departments within a manufacturing enterprise to work together cohesively. The rationality of CDFMC lies in synchronizing market positioning, soliciting customer requirements, increasing commonality in product designs, and enhancing manufacturing scale of economy.

Research on E-product development (ePD) for mass customization
Helander M.G. and Jiao J.
Technovation vol. 22, no. 11, pp. 717-724, 2002.
Electronic product development directly connects multiple customers and suppliers throughout the entire value chain. This alleviates much of the inefficiency in current product development and supply chain practices. It integrates different facets of product design, process design, order processing, and order fulfillment in a cohesive manner. This capability becomes a critical factor in global competition. This paper presents an on-going research program of e-product development (ePD) for mass customization. The program aims at investigating fundamental issues and enabling techniques for applying the Internet to re-engineering manufacturing companies towards mass customization. The ultimate goal is to assist industries to upgrade to become high value-added businesses.

Secondary

A variant approach to product definition by recognizing functional requirement patterns
Tseng M.M. and Jiao J.
Journal of Engineering Design vol. 8, no. 4, pp. 329-340, 1997.

Agile product development for mass customization
Anderson D.M.
Irwin, 293 pages, 1997.
How to develop and deliver products for mass customization, niche markets, JIT, build-to-order and flexible manufacturing

Quality

Primary

Quality management for manufacturers of short run semi-customized products
Burgess T.
The TQM Magazine vol. 11, no. 4, pp. 248-251, 1999.
This paper considers methods of modifying normal quality approaches and integrating them into a cost - effective management system to product high quality. Elements of this system include aspects such as

comprehensive design reviews/design qualifications, assembly process audits and a flexible final inspection program.

Secondary

Future production systems: Influences of self-organization on approaches to quality engineering

Massotte P. and Bataille R.
International Journal of Production Economics vol. 64, no. 1-3, pp. 359-377, 2000.
Self-organization and cooperation have been introduced into Smart production systems to improve the flexibility and reactivity of OKP systems (one of a kind production). In this paper, we analyze the influence of self-organization and collaborative processing concepts on process and product quality. These concepts have a direct impact on measurement and control processes of the critical components of end-products. We will focus on some new techniques - such as the James-Stein estimators and the Levy stable distribution. To end with, SPC techniques are reviewed in order to implement best of breed solutions with a view of monitoring and improving the performance of the process.

Issues in quality engineering research

Hassan A., Baksh M.S.N. and Shaharoun A.M.
International Journal of Quality and Reliability Management vol. 17, no. 8, pp. 858-875, 2000.
The field of quality has undergone significant changes as reflected by changes in its definition, paradigms, approaches, techniques, and scope of application. This paper reviews emerging trends and issues focusing on quality engineering. Changes in customer expectation have driven the changes in the technology of design and manufacturing, which is becoming more important in satisfying individual customer expectations. This also calls for special attention to the engineering aspects of quality. Brief reviews on recent advances in the prominent quality tools such as statistical process control, quality function deployment, and design of experiment are reported. General trends in quality engineering research show the tools are being enhanced, integrated, computerized and broaden their application bases, where possible opportunities for further investigation are indicated. Among others these include contributions in multiple-response optimization, intelligent quality systems, multivariate SPC, and practical and simple guidelines for actual implementation of various tools.

Customer issues

Primary

Value Creation by Toolkits for User Innovation and Design: The Case of the Watch Market

Franke N. and Piller F.
Journal of Product Innovation Management vol. 21, no. 6, pp. 401-415, 2004.
This study analyzes the value created by so-called“toolkits for user innovation and design,” a new method of integrating customers into new product development and design. Toolkits allow customers to create their own product, which in turn is produced by the manufacturer. In the present study, questions asked were (1) if customers actually make use of the solution space offered by toolkits, and, if so, (2) how much value the self-design actually creates. In this study, a relatively simple, design-focused toolkit was used for a set of four experiments with a total of 717 participants, 267 of whom actually created their own watches. The heterogeneity of the resulting design solutions was calculated using the entropy concept, and willingness to pay (WTP) was measured by the contingent valuation method and Vickrey auctions. Entropy coefficients showed that self-designed watches vary quite widely. On the other hand, significant patterns still are visible despite this high level of entropy, meaning that customer preferences are highly heterogeneous and diverse in style but not completely random. It also was found that consumers are willing to pay a considerable price premium. Their WTP for a self-designed watch exceeds the WTP for standard watches by far, even for the best-selling standard watches of the same technical quality. On average, a 100% value increment was found for watches designed by users with the help of the toolkit. Taken together, these findings suggest that the toolkit's ability to allow customers to customize products to suit their individual preferences creates value for

them in a business-to-consumer (B2C) setting even when only a simple toolkit is employed. Alternative explanations, implications, and necessary future research are discussed.

Variety for sale: mass customization or mass confusion?
Huffman C. and Kahn B.E.
Journal of Retailing vol. 74, no. 4, pp. 491-513, 1998.
Retailers who implement a high variety strategy need to ensure that customers are not confused with the complexity inherent in a wide assortment of options. Experimental evidence shows that when asking consumers to choose among items in a wide assortment, bth the way the information is presented and the type of customer input to the information gathering process influence customer satisfaction. First, asking consumers to indicate their within-attribute preferences through an attribute-based information format, as opposed to an alternative-based format, increases satisfaction and learning. Second, consumers are likely to be more satisfied and perceive less complexity in the choice set when they are asked to explicitly indicate their preferences within each attribute, as compared to more effortful tasks or less effortful tasks.

Secondary

Psychological Implications of Customer Participation in Co-Production
Bendapudi N. and Leone R.P.
Journal of Marketing vol. 67, no. 1, pp. 14-28, 2003.
Customer participation in the production of goods and services appears to be growing. The marketing literature has largely focused on the economic implications of this trend and has not addressed customers' potential psychological responses to participation. The authors draw on the social psychological literature on the self-serving bias and conduct two studies to examine the effects of participation on customer satisfaction. Study 1 shows that consistent with the self-serving bias, given an identical outcome, customer satisfaction with a firm differs depending on whether a customer participates in production. Study 2 shows that providing customers a choice in whether to participate mitigates the self-serving bias when the outcome is worse than expected. The authors present theoretical and practical implications and provide directions for further research.

Personalized ordering and consumer evaluations: the combined effect of search behaviour and presentation patterns
Diehl K. and Zauberman G.
Advances in Consumer Research vol. 29, pp. 155-157, 2002.

Customization Decisions: The Roles of Assortment and Consideration
Godek J., Yates F.J. and Auh S.
Advances in Consumer Research vol. 28, no. 1, pp. 396-396, 2001.

Customization and personalization: the influence of perceived control and perceived capability on product evaluations
Godek J., Yates F.J. and Yoon Y.
Advances in Consumer Research vol. 29, pp. 155-157, 2002.

Bundling options: increasing consumer satisfaction by constraining choice
Hamilton R.W. and Sivakumaran B.
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