4th International Conference on Mass Customization and Personalization in Central Europe (MCP - CE 2010)
MC&OI and the Financial Crisis - Challenge and Opportunity
September 22-24, 2010, Novi Sad, Serbia

A COST SYSTEM DESIGN FOR CONFIGURABLE MASS CUSTOMIZED SERVICES

Matti Sievänen[1], Mikko Heiskala[2] & Kaija-Stiina Paloheimo[2]
[1]Tampere University of Technology, [2]Aalto University, Finland

Abstract: *Even though mass customization has been a popular topic since the early '90s, a deeper understanding of service mass customization is missing. What does mass customization mean in the service context? How can services be mass customized? Moreover, what kind of cost system design should be used for mass customized services? Cost system design is always a challenging task, and the new environment does not make it easy. The aim of this paper is to review the literature to find out how services can be mass customized and to give some suggestions as to what kind of cost system design should be used in the case of mass customized services. Causality and responsibility were taken as the most important factors of the relevancy of the cost system. Activity-based costing (ABC) is presented as one way to calculate the costs of mass customized services. Other methods might also be possible. If there are multilevel cost objects, such as activities, services, bundled services, customers, and market segments, ABC would be the most convenient choice. However, ABC is not a panacea, and it is important how processes, activities, and responsibility centers are defined.*

Key Words: ***Mass Customization, Services, Cost Management, Cost System***

1. INTRODUCTION

This paper brings out two interesting and popular subjects, mass customization and services. These subjects have similarities: they have been said to be a new way to compete and win in the market, and both are missing exact definitions. Mass customization has been defined as the ability to design and manufacture customized products at mass production efficiency and speed. Mass customization is often justified because different customers can give different values to the same product. Customers require different features and performance, and one size does not fit all anymore. Most mass-customization studies concentrate on consumer goods, and have typically either a marketing or an operations view. In service operations management literature, customization has been recognized. Services can be classified, for example, as professional services, service shops, and mass services based on the degree of customization. Moreover, although mass customized services have been discussed, the theory regarding such services is still quite fragmented.

When designing cost systems, many things have to be taken into account. Mass customized services are a new cost object, and they require new assumptions. In the manufacturing business, resources are used to produce one unit of goods, and in the services business, resources are consumed by the client in the realization of the performance connected with the service. Moreover, service operations management studies point out important factors such as contact time, customer's effect on productivity, source of value added, etc. that affect cost systems design.

The aim of this paper is to review the literature and shed some light on the mass customized service discussion from the cost system design point of view. The paper is structured as follows. First, an introduction to mass customization is given. This is followed by a short literature review of services. Next is a discussion of what mass customization could be, in a service context. Thirdly, the principles of cost systems design are presented, and their connection to mass customized services is discussed. Finally, some conclusions are made, and new directions for further research are suggested.

2. MASS CUSTOMIZATION

The term "mass customization" was first introduced in the book Future Perfect by Davis [14]. Mass customization was defined as a way to manufacture one-of-a-kind products, based on customer specifications, without sacrificing scale economics. Mass customization became more popular in 1993 when Pine [40] published his book Mass Customization: The New Frontier in Business Competition. Pine defined mass customization as the ability to design and manufacture customized products at mass production efficiency and speed. Furthermore, he defined mass customization as a process

by which companies provide variety and customization through flexibility and quick response. The goal was that almost anyone would find exactly what he or she wanted without paying a penalty in price. Similarly, Hart [23] gave a broad, and in his words, idealistic definition for mass customization: "the ability to provide your customers with anything they want profitably, any time they want it, anywhere they want it, any way they want it." In reality, the profitability requirement of the above definition compromises the other goals or at least restricts them to a "pre-determined envelope of variety". Piller [39] saw mass customization as follows: customer co-design and a fixed solution space (stable processes and product architectures), in which all operations are performed, are key aspects of mass customization. A fixed solution space ensures that a product or service can be produced at a cost and efficiency close to that of mass production and does not require a switch to an upper market segment.

Despite numerous attempts, the definition of mass customization has remained somewhat unclear. Moreover, the literature is missing good conceptual boundaries for mass customization [16]. Some scholars include variety management, locate-to-order strategy, customizable [30], and self-customizing [52] products as mass customization approaches. Moreover, the research on mass customization is mostly focused on goods, i.e., physical products [13, 25], and many of the approaches mentioned above are clearly geared toward goods manufacturing.

In this paper, we take a strict view of mass customization that resembles Piller's [39]. We require that the production process of an individual product be customer-specific, i.e., that the individual product be adapted to individual customer needs. This requirement excludes, e.g., locate-to-order and self-customizable products as mass customization strategies. Moreover, we require that the individual product be produced by combining standardized, pre-designed, and pre-defined components and modules. This combination must also happen within standardized and pre-determined processes. Products can be services or goods or a mix of both. We see that a mass customization implementation always includes a specification phase in which the customer needs are elicited and a specific description of the individual product the customer wants is defined. Next, an individual product is produced according to the defined customer-specific description. Lastly, the individual product is delivered to the customer. Our view of mass customization is similar to Customized Standardization as it is defined by Lampel and Mintzberg [29]: the utilization of product modularity and configurability to assemble customized products with standardized design and standardized components. Thus, "customization" is achieved because combining modules and components in different ways yields different individual products, and the "mass" is obtained from the standardized modules and corresponding production processes [16, 52].

The path of industrial development started with craft manufacturing, in which every product could be customized. With the Industrial Revolution, and especially with Ford Model-T production, the era of mass production began. Mass production was followed by continuous improvement, at least in some industries. Mass customization is presented as the current paradigm [40]. However, this path can be questioned in many ways. There are still companies in every phase, and the shift to mass customization can be from craft manufacturing as well as from mass manufacturing [15]. Similarly, it is not clear if continuous improvement has ever been the leading paradigm. Moreover, the benefits sought and the challenges companies may face are different when a mass production company moves to mass customization compared to a craft production company adopting a mass customization strategy [25].

The requirements for successful mass customization manufacturing systems involve product design as well as production and product configuration processes issues [5]. The often-mentioned prerequisites for product and process design are commonality and modularity [2, 16, 18, 41]. These design requirements may help in reducing internal process variety, which is said to improve flexibility, responsiveness, and quality as well as reduce costs [2]. These prerequisites are also present in the seven sequential strategies of complexity reduction and variety management for mass customization that Blecker and Abdelkafi [4] defined. They argued that achieving product and process modularity is a minimum requirement for efficient mass customization. Product modularity makes it possible to mix and match interchangeable modules that have standardized interfaces and, thereby, create product variants efficiently [4] by manufacturing the modules separately and simultaneously [18]. Process modularity, in turn, refers to turning processes into modules and ensuring the rapid and flexible integration between these modules with an adequate architecture [41]. In other words, regardless of the defined individual product, its production process can be derived in a standardized manner using the architecture. With component and process commonality and product and process modularity, the benefits of economies of scale and scope, as well as the goals of reusability and differentiation, can be reached simultaneously [5], all benefits that help to achieve efficient mass customization.

Beyond the minimum requirement of achieving product and process modularity for efficient mass customization, Blecker and Abdelkafi [4] identified product platform and delayed differentiation as mass customization complexity management approaches. With the product platform approach, a set of core modules is used across different product families. The efficiency benefits achieved stem from the possibility of optimizing production of the core modules, and from the reduced setup and lead times in manufacturing, due to module sharing across product families. Delayed differentiation can be seen as delaying the point where the individual products assume their unique forms in the production process [4] and as delaying some variation of the individual product until the final stages of manufacturing or until the product is sent to the dealer [44]. With delayed differentiation, manufacturers can lower their dependence on the customer order decoupling point, which separates mass customization production systems from push-and-pull subsystems, defines the depth of

customer integration, may limit the range of customization possibilities, and usually has a direct effect on delivery times [4]. Moreover, the customer-independent push subsystem lends itself better to standardization and production efficiency optimization than the customer-driven push subsystem.

3. MASS CUSTOMIZATION OF SERVICES

If mass customization is not well defined, neither are services. There has been a long and still ongoing debate in the literature about what services are. There is, to date, no unequivocal definition for services. In 1960, the American Marketing Association proposed that "[s]ervices are activities, benefits, or satisfactions which are offered for sale, or are provided in connection with the sale of goods" [11]. Other often-cited definitions include that by Grönroos: "A service is an activity or services of activities of more or less intangible nature that normally, but not necessarily, take place in interactions between the customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems" [21, p.27]. Rathmell [42] considered a good to be a noun whereas a service is a verb. As recently as three years ago, Sampson and Froehle [43], in their article proposing a unified service theory, cited 17 published definitions for services—and added their own.

Thus, services are somewhat elusive, and what is or is not considered a service seems to be context-dependent. What is common among all the candidates for services definitions is, however, that services always comprise activities or processes, the customer is involved in at least some phases of the value creation system, value is co-created with the customer, and the value is realized at the time of consumption. The customer perceived quality of a service not only depends on the technical quality but also on the functional, process quality and is mediated by the customer's quality expectations [20]. Further, scholars have found common ground in that some kind of a continuum or mix exists between products and services, or goods and services [9, 36, 37]. Products always have a service dimension, but services do not always have a goods dimension. Goods manufacturers commonly sell product services which somehow facilitate the use or enhance the performance of their manufactured goods. Service products refer to more independent billable items in the provider's offering.

Another topic of agreement is on the general characteristics of most services: intangibility, inseparability of production and consumption, heterogeneity, perishability, and lack of transfer of ownership [12, 51]. Intangibility means that services cannot be perceived by the senses. Inseparability refers to the observation that significant parts of services cannot be produced without customer involvement. Heterogeneity in services is due to service production resources often being unique, whether they are provider personnel or the customer herself. Many services are labor-intensive [13], and the individuals involved in the production process cause variation in it, at least when compared to manufacturing machinery. Perishability refers to the time-sensitive capacity of the provider to produce services that are perishable. Capacity is wasted if no customer inputs are available to be processed, such as a seat in a movie theater or consultant time. Services cannot be stored or produced to stock, nor resold or returned to seller.

Rather than engaging in another ongoing discussion on whether the characteristics attributed to services make any difference in how services should be managed [6, 10, 17, 46, 47, 50], we concede that the characteristics may adversely affect the quality, consistency, reliability, and documentability of services. Mass customization of services has been proposed to alleviate these unfavorable effects [24, 37, 48], in addition to achieving higher cost-efficiency in service co-production.

What, then, would mass customized services be like? Adopting a definition similar to the one we gave for mass customization in general, mass-customized services would contain pre-defined processes whose interfaces and interdependencies would be well defined and that could be combined into flexible processes according to pre-defined rules. These processes are mixed and matched to meet the customer-specific description of the service, which is also based on pre-defined customization possibilities.

Similar approaches to achieve simultaneous customization and efficiency goals that were presented by Blecker and Abdelkafi [4] for goods manufacturing can be found in the service literature. Modularity in services is discussed [38, 47] and using a product platform approach in services is suggested in [34, 35]. However, it is not clear what components and modules mean in services—and what the product and process components or modules are in the services. In this paper, we adopt a view that processes consist of activities that may themselves consist of (sub-)activities and/or tasks. The tasks an activity consists of describe the actual acts on a more detailed level than the activity itself. A task describes acts on the most detailed level that is practically required to successfully perform them. This is similar to what can be found in activity-based costing literature [45]. We argue that the descriptions and terms that define the outcomes the customer can expect to receive from service processes are the product components and modules in services. In service mass customization, these service product modules and components would be the subject of discussion with the customer during the elicitation phase. A collection of customer-chosen modules and components would then describe the customized individual service product the customer has a right to receive from the provider. We assume that the service provider should know what processes it needs to perform to realize the service product modules or components it has sold the customer the right to receive. The potential benefits stemming from learning effects when performing process modules and reuse of both process and product module descriptions in different service products are probably achievable in services mass customization as well. Learning effects when performing process modules, and reuse of both process and product module descriptions, and perhaps well trained personnel across different service products may yield efficiency benefits for the

provider. The perishability and simultaneity of production and consumption do limit module reuse in services compared to goods.

Fliess and Kleinaltenkamp [19] discussed a line of order penetration in service operations that divides the activities into customer-induced and customer-independent ones. This is similar to the order decoupling point in manufacturing. The authors also argued that customer-independent activities allow for easier standardization and efficiency improvements. However, due to the heterogeneity of services, it depends on the customers whether the perceived service quality is actually improved. Excessive standardization may sacrifice the feel of a customized solution offered to the customer and compromise customer-perceived service quality. Nevertheless, compared to (nearly) fully customized professional services, mass customized services could minimize customer sacrifice of time and other resources, enhance predictability, and enable efficient knowledge flows and interaction on the customer side. On the other hand, approaching mass customized services from the (nearly) standardized mass services end potentially yields the benefits of improved customer fit and the possibility of deepening the customer relationship without jeopardizing mutual cost-efficiency.

4. COST SYSTEM DESIGN

The first rationale of cost systems is to define the cost of objects, which are normally products or services. However, costs calculations do not have any value per se if they are not used in managing the company and especially in managing resources. Cost calculations by themselves might not be enough to manage resources, and other management tools such as performance measurement are needed. When the validity and relevancy of cost calculations are considered, the cost system has to fulfill certain conditions [see, e.g. 32, pp. 46-59]. Maybe the most important is causality, the ability to link causes and consequences. Causality has been one of the main reasons promoting activity-based costing [26]. Traceability and responsibility are also mentioned as requirements for internal relevancy. Traceability, the system's ability to track resources and cost from entry to exit, is not a problem for almost all cost systems design. Actually, this is more of a technical problem, and today many software solutions exist. Responsibility is more problematic because resources are typically divided through a budgetary system and used in processes. And processes are often transfunctional, consuming resources from different functions. If this is not considered while a cost system is being designed, it might lead to conflicts in allocating resources. There are other requirements such as the quality of calculations and clarity of communication that also have to be taken in account when designing a cost system.

When considering the reliability of cost calculation, it is good to keep in mind the principle "different costs for different purposes." Meaning that we have to know in which situation and to which purpose calculations are used. There is not one universal right cost; calculations are based on assumptions of value, usage, etc. The important thing is to know how and why the assumptions are made.

In general, it has been said that companies have difficulties in knowing the cost of services [3]. This might be a result of costs structures in services, with more fixed than variable costs [31]. However, Brignall [7] observed that the cost traceability decreases when moving from professional services to a service shop and further to mass services. This might be a result comparable to the low number of customers and service products in professional services thus making it possible to use project-costing methods. However, this might not be true when estimating costs beforehand. High customization and contact time may cause unexpected variance that is hard to estimate. Also, the customer has a crucial effect on productivity of services, thus affecting the use of resources [22]. On the other hand, service time in standardized mass services can be quite easily estimated. In that case, fixed costs can be high, and most costs are incurred when providing mass service, not by the use of that service. Internet banking is a good example of mass services where providing the system causes most of the costs. If we connect mass customizable services to service shops, we are somewhere in the middle. Project costing is not suitable because of the high number of customers. And contact time is not constant because the customer affects productivity.

If we define that mass customization requires a fixed solution space and service is a process, then mass customized service has to have predefined processes. Moreover, processes consist of activities that, in turn, consist of sub-activities or tasks. Value is created in processes, and costs are incurred in activities. For operational purposes of defining and modeling these processes, activities and tasks might be necessary to conduct services. Process modeling and defining done for operational purposes are useful for cost modeling as well. However, operational process models may include tasks that are so detailed that they should be kept out of cost modeling, because this can lead to a too detailed cost system that is hard and expensive to update. This might cause some inaccuracy; however, there are always variations, and if tasks and activities are well defined, the inaccuracy should be negligible. There are obvious similarities to ABC or even to process-based costing, which is one application of ABC [28, 45]. However, ABC is not the only cost system for mass customizable services, and costing can be done similarly with more traditional methods such as with responsibility centers and homogeneous cost pools. And even the direct cost method can work well if most of the costs are direct, which is quite often the case in customized services.

When deciding what kind of cost system is used, we have to keep in mind the principle of "different costs for different purposes." In services, inventory valuation is not important because, due to the perishable nature of services, there is no inventory. If we define that cost calculations are used mainly for pricing, setting the minimum price and resource management causality and responsibility are important for the relevancy of the cost system. Causality is the main weakness of the traditional costing system. If there are many allocations and re-

allocations, and money and direct labor are common allocation bases, this may lead to weak causality. This is a typical weakness of the hierarchical responsibility center costing system. For the homogeneous cost pool method, causality is not a problem, because cost pools should be defined based on causality. For the ABC system, causality is the main building block; thus, there should always be strong causality.

Responsibility is more problematic for all costing systems except responsibility centers in which it is obvious. For ABC, this problem can be solved by defining activities such that one activity uses resources only from one responsibility center. This does not mean that the responsibility center conducts only one activity. The other way is to have resource management based on the process, meaning that the budgetary system is based on processes. This is possible but, based on our experience, not a very common practice. However, this is an aim of activity-based management.

For the pricing purposes, we have to define a cost object. Often the only cost object is the product or service. However, in services this may violate causality because the customer significantly influences the productivity because of the inseparable nature of the service. Thus, the cost of the service may vary depending on the customer. It has been indicated that the customer, rather than the product or service, would be a suitable cost object [8]. This also supports the use of ABC because, in ABC, there can be multilevel cost drivers. For costing purposes, this means that the service has one cost (and price) and the customer has another cost. Furthermore, cost can be calculated in terms of market segment or geographic area. The total cost of providing the service is the sum of these costs.

Another interesting thing in mass customizable services is combining activities (modules). If a customer chooses many activities, the cost of the process can be less than the cost of separate activities. Meaning that there should be also process-level costs, not only activity-level costs. For example, if a company offers preventive maintenance that includes calibration, wear-part replacement, and remote monitoring, the cost of calibration and wear-part replacement is most likely higher without than with remote monitoring because things are done just in case. Moreover, both activities require technicians to travel, which cause expenses. Thus, it is obvious that the cost is lower if both can be done at the same service visit. If this is customer or process specific, the cost is not clear, and it can be defined as either one.

It is not agreed that investment to ABC is justified in mass customization manufacturing. If companies use advanced manufacturing technology, then the information requirements can be met with less sophisticated costing systems, such as one with multiple cost pools and a unit-level cost driver [1]. However, Brignall [7] observed that in some service shops and mass services it might be beneficial to invest in ABC. At least a part of these diverse views lies behind the definition of ABC. It is not clear what an ABC system is and what it is not. Rather than speaking of ABC, we should concentrate on features and then think if the costing system fulfills these features [27, 33].

5. CONCLUSION

In this paper, mass customized services were studied based on a literature review. As was shown, services can be mass customized as well as products. Mass customized services were defined to contain pre-defined processes whose interfaces and interdependencies would be well defined and could be combined into flexible processes according to pre-defined rules. Thus, service mass customization is possible and can use similar approaches to manage complexity as mass customization of goods. Modularity and service platforms are means to manage mass customization. Mass customized service is a process that consists of activities that can be called modules. Furthermore, in goods, modules consist of components, and similarly, in services, modules (activities) consist of tasks. The characteristics of services may lead complexity management and efficiency gains to be more difficult than in goods.

When designing cost systems for mass customized services, we have to know to what purpose the cost calculations are used. The company can use the calculations for pricing, deciding whether to offer a service to certain customers, or managing resources. In these cases, calculations have to be done beforehand, and it is more important to be approximately right than exactly wrong. Then causality becomes the most important feature of the cost system design and supports the use of ABC. Moreover, the analogy of modules and activities also strengthens the choice of ABC. What becomes important is how to define activities and processes in the costing model. Activities have to be defined so that they can be conducted in one responsibility center and processes are transfunctional. By doing so, the cost system supports automatic resource management. Moreover, it is crucial how activities and tasks are defined. If operational models are used for costing purposes, there is a big risk that the cost model will end up being too detailed and too laborious to be updated. So cost should be calculated only at the activity level, and tasks should be only for operational purposes.

A mass customization service may involve more customer-induced activities, and the heterogeneity in the customer inputs affects productivity. This requires the cost system to support multilevel cost objects that also support the use of ABC. Actually, it might be rewarding to get rid of product costing that has dominated the cost calculations. In service cost management, quite often a physical product is just replaced by a service product [see, e.g. 7]. Other cost objects, such as the customer or market segment, should be used.

If a costing system is used only for product costing purposes, these requirements can be met with less sophisticated costing systems than ABC, such as the direct cost method. However, if cost accounting systems need to be able to offer more than merely giving product cost information, the investment in ABC can be justified. The ABC system has been claimed to contain two dimensions: the cost view and the process view. It is further argued that the emergence of a process view could extend ABC beyond product costing to process improvement [49].

Being a short literature review, this paper raises more questions than it answers. However, it continues the

discussion of mass customized services and brings out a new view, cost system design, to that discussion. This paper gives some ideas about how mass customized services can be developed and managed. Furthermore, the paper emphasizes the importance of pre-defining processes, interfaces, and interdependencies. These are important both for operational and costing purposes.

There is an obvious need for further research at the conceptual level as well as at the practical level. It would be rewarding to find out what kinds of cost system designs are used for mass customized services. Actually, it would be interesting to find a company that systematically and deliberately aims to be a service mass customizer. Perhaps the most challenging task is to gain knowledge how to simultaneously manage cost and value in services.

5. REFERENCES

[1] Abernethy, M. A., A. M. Lillis, et al. (2001). Product diversity and costing system design choice: field study evidence. Management Accounting Research 12(3): 261-279.

[2] Anderson, D. M. and B. J. Pine (1998). Agile product development for mass customization: how to develop and deliver products for mass customization, niche markets, JIT, build-to-order and flexible manufacturing. New York, NY, McGraw-Hill.

[3] Anderson, J. and J. Narus (1995). Capturing the Value of Supplementary Services. Harvard Business Review.

[4] Blecker, T. and N. Abdelkafi (2006). Complexity and variety in mass customization systems: analysis and recommendations. Management Decision 44(7): 908-929.

[5] Blecker, T. and G. Friedrich (2007). Guest Editorial: Mass Customization Manufacturing Systems. IEEE Transactions on Engineering Management 54(1): 4-11.

[6] Bowen, J. and R.C. Ford (2002). Managing Service Organizations: Does Having a "Thing" Make a Difference? Journal of Management 28(3): 447–469.

[7] Brignall, S. (1997). A contingent rationale for cost system design in services. Management Accounting Research 8(3): 325-346.

[8] Carú, A. and A. Cugini (1999). Profitability and customer satisfaction in services - an integrated perspective between marketing and cost management analysis. International Journal of Service Industry Management 10(2): 132-156.

[9] Chase, R.B. (1981). The Customer Contact Approach to Services: Theoretical Bases and Practical Extensions. Operations Research 29(4): 698-706.

[10] Chowdhury, S. and G. Miles (2006). Customer-induced uncertainty in predicting organizational design: Empirical evidence challenging the service versus manufacturing dichotomy. Journal of Business Research 59(1): 121-129.

[11] Cook, D.P., C-H. Goh, et al. (1999). Service typologies: A state of the art survey. Production and Operations Management 8(3): 318-338.

[12] Cowell, D.W. (1988). New Service Development. Journal of Marketing Management 3(3): 296-312.

[13] Da Silveira, G., D. Borenstein, et al. (2001). Mass customization: Literature review and research directions. International Journal of Production Economics 72(1): 1-13

[14] Davis, S. (1987). Future Perfect, Addison-Wesley.

[15] Duray, R. (2002). Mass customization origins: mass or custom manufacturing? International Journal of Operations & Production Management 22(3): 314-328.

[16] Duray, R., P. T. Ward, et al. (2000). Approaches to mass customization: configurations and empirical validation. Journal of Operations Management 18(6): 605-625.

[17] Edvardsson, B., A. Gustafsson, et al. (2005). Service portraits in service research: a critical review. International Journal of Service Industry Management 16(1): 107-121.

[18] Feitzinger, E. and H. L. Lee (1997). Mass customization at Hewlett-Packard: The power of postponement. Harvard Business Review 75(1): 116-121.

[19] Fliess, S. and Kleinaltenkamp, M. 2004. Blueprinting the service company. Managing service processes efficiently. Journal of Business Research 57: 392-404.

[20] Grönroos, C. (1984). A Service Quality Model and its Marketing Implications European Journal of Marketing 18(4): 36-44.

[21] Grönroos, C. (1990). Service Management and Marketing. Massachusetts/Toronto: Lexington Books.

[22] Gummesson, E. (1998). Productivity, quality and relationship marketing in service operations. International Journal of Contemporary Hospitality Management 10(1): 4-15.

[23] Hart, C.W.L. (1995). Mass customization: Conceptual underpinnings, opportunities and limits. International Journal of Service Industry Management 6(2): 36-46.

[24] Heiskala, M., K-S. Paloheimo, et al. (2005). Mass customisation of services: benefits and challenges of configurable services. Frontiers of e-Business Research 2005 (FeBR), Tampere 26.-28.9.2005. 2006, Tampere University of Technology; University of Tampere. 206-221.

[25] Heiskala, M., J. Tiihonen, et al. (2007). Mass Customization with Configurable Products and Configurators: A Review of Benefits and Challenges. Blecker, T. & Friedrich, G. (Eds.), Mass Customization Information Systems in Business, Idea Group Publishing.

[26] Kaplan, R. S. and R. Cooper (1998). Cost & Effect - Using Integrated Cost Systems to Drive Profitability and Performance. Boston, Harvard Business School Press.

[27] Karjalainen, J. (1997). Advances in cost accounting of some Finnish companies in the early 1990's : is the slow pace acceptable? Espoo, TKK.

[28] Lawson, R. A., 1994. Beyond ABC: Process-based costing. Journal of Cost Management 8(3): 33-43.
[29] Lampel, J. and H. Mintzberg (1996). Customizing Customization. Sloan Management Review 38(1): 21-30.
[30] Logman, M. (1997). Marketing mix customization and customizability. Business Horizons 40(6): 39-44.
[31] Mathieu, V. (2001). Service strategies within the manufacturing sector: benefits, costs and partnerships. International Journal of Service Industry Management 12(5): 451-475.
[32] Mévellec, P. (2009). Cost Systems Design. Macmillan Publishers Limited, Hampshire.
[33] Mévellec, P. and M. Sievänen (2003). ABC, Process-Oriented Systems: a comparative study. 6th International Seminar on Manufacturing Accounting Research, Twente, The Netherlands.
[34] Meyer, M.H. and A. DeTore (1999). Product development for services. Academy of Management Executive 13(3): 64-76.
[35] Meyer, M.H. and A. DeTore (2001). PERSPECTIVE: Creating a platform-based approach for developing new services. Journal of Product Innovation Management 18(3):188-204.
[36] Oliva, R. and R. Kallenberg (2003). Managing the transition from products to services. International Journal of Service Industry Management 14(2): 160-172.
[37] Paloheimo, K.S., I. Miettinen, et al. (2004). Customer Oriented Industrial Services. Helsinki University of Technology. BIT Research Centre. URL: www.hcl.hut.fi/docs/Customer_Oriented_Industrial_Services.pdf
[38] Peters, L. and H. Saidin (2000). IT and the mass customization of services: the challenge of implementation. International Journal of Information Management 20(2): 103-
[39] Piller, F. T. (2004). Mass Customization: Reflections of the State of the Concept. International Journal of Flexible Manufacturing Systems 16(4): 313-334.
[40] Pine, B. J. I. (1993). Mass customization: the new frontier in business competition. Boston, Harvard Business School Press.
[41] Pine, B. J. I., B. Victor, et al. (1993). Making mass customization work. Harvard Business Review 71(5): 108-119.
[42] Rathmell, J. M. (1966). What is meant by Services? Journal of Marketing 30(October): 32-36.
[43] Sampson, S.E., and C.M. Froehle (2006). Foundations and Implications of a Proposed Unified Services Theory. Production and Operations Management 15(2): 329-343.
[44] Selladurai, R. S. (2004). Mass customization in operations management: oxymoron or reality? Omega 32(4): 295-300.
[45] Sievänen, M. and K. Tornberg (2002). Process-based costing: The best of activity-based costing. AACE International Transactions: CS151-CS156.
[46] Stauss, B. (2005). A Pyrrhic victory. The implications of an unlimited broadening of the concept of services. Managing Service Quality 15(3): 219-229.
[47] Sundbo, J. (1994) Modulization of service production. Scandinavian Journal of Management 10(3): 245-66.
[48] Sundbo, J. (2002). The Service Economy: Standardisation or Customisation? Service Industries Journal 22(4): 93-116.
[49] Turney, P. B. B. and A. J. Stratton (1992). Using ABC to Support Continuous Improvement. Management Accounting 74(3): 46-50.
[50] Vargo, S. L. and R. F. Lusch (2004). The Four Service Marketing Myths: Remnants of a Goods-Based, Manufacturing Model. Journal of Service Research 6(4): 324-335.
[51] Zeithaml, V.A., A. Parasuraman, et al. (1985). Problems and Strategies in Services Marketing. Journal of Marketing 4(82): 33-46.
[52] Åhlström, P. and R. Westbrook (1999). Implications of mass customization for operations management. International Journal of Operations & Production Management 19(3): 262-274

CORRESPODANCE

Ph.D. Matti Sievänen
CMC/Industrial Management
Tampere University of Technology
P.O. Box 541
FI-33101 Tampere, Finland
matti.sievanen@tut.fi

M.Sc. Mikko Heiskala
SoberIT
Aalto University
School of Science and Technology
P.O.Box 19210
FI-00076 Aalto, Finland
mikko.heiskala@tkk.fi

M.Sc. Kaija-Stiina Paloheimo
HCL
Aalto University
School of Science and Technology
P.O. Box 15500
FI-00076 Aalto, Finland
kaija-stiina.paloheimo@tkk.fi