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## Review Paper: Mass Customization as a Strategy in Service Industry

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**ABSTRACT:**Modern service industry plays an increasingly significant role in world economy. In the meantime, the manufacturing companies are also expanding their service business as their next wave of growth. From the demand side, with the vast improvement of quality, there is an urgent need to improve services in healthcare, finance, housing and other personal services to meet the mass demands. Service processes are the inherent engine of service industry. They aim to provide value for customers and thus it is intimately related to customization in its nature. Although a variety of services are offered to customers, there still lack systematic ways to provide service customization efficiently. How to customize and personalize services to satisfy the requirements of different customers still remains a research challenge. However in the manufacturing industry, the mass customization paradigm has been applied quite well by the likes of Dell computer and a lot of research achievements have been made in product customization technology. This paper will review the methodologies in mass customization to the service customization in the service industry.

**KEYWORDS:**Mass Service Customization, Service Product Family, review paper

### I. INTRODUCTION

Modern service industry plays an increasingly significant role in world economy. The world economy is in transition to modern service industry and moving rapidly toward more service-oriented and low-carbon economy. Service is reported representing approximately 80 percent of U.S GDP and 70 percent of Europe GDP; 56 percent of India GDP and 44 percent of China GDP [1] in 2010 and keeps growing percentage of the GDPs of countries worldwide. At the same time, the rise up of tablet PC, cloud computing, iPad, Google, etc. makes some traditional product market shift to service leading market. "Consumers' increasingly higher expectations demand business models in which services are seen as added value to products from cars to personal electronics to clothing" [8]. In 2007, service worker was first time outnumber farmers [9]. In 2010, total service revenue has accounted for 63% GDP worldwide. With the trend of growing business in service industry, discovering a systematic method to manage service is getting emphasized.

There is more and more growing emphasis in business practice on creating meaningful, memorable customer experiences along with domination of service in the world's economies [3][4][5]. Service itself is challenging because of its nature of customers' co-participation from selecting service content, experiencing whole service process and co-producing the result. Therefore, customer's desire, view, and feeling would be part of service outcome. Values involving consciousness would be very personal and service itself is intangible and customized by nature. With these characteristics of service which are distinguishable from product industry, adopting effective methodology to systematize service management is necessary.

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In current service industry, customers are more empowered and demanding. They require personalized service with high service level while at the same time with relatively low cost. Therefore, with the emerging of new technologies and the transparency of information, a firm's competitiveness relies on service innovation, customization and quality provision to a large extent. Services aim to provide value for customers and thus it is intimately related to customization in its nature. Successful services are achieved by dynamic organizations that can adapt changes in a short time in the quantity and nature of demand which involves service content, structure and process sequence. How well a service can adapt depends greatly on the flexibility that has been designed into it. Otherwise, the gap of information and knowledge between customers and service companies may lead to customer's difficulties of selecting specifications of service. These difficulties may cause customer's un-satisfaction. Therefore, how to solve the conflicts that Hippel [11] suggested is also critical for a service's success.

Mass customization, a strategy gained enormous attention from both academia and industry in the last two decades, now has been widely recognized as useful strategy for companies to obtain competitive advantages. Mass customization aims at satisfying individual customer needs with mass production's efficiency [10] which offers possibility of flexibility with related low cost. In contrast to mass production, mass customization tends to achieve low cost via efficiency and standardization and customization attempts to satisfy individual's need with specified specifications. Mass customization aims to offer customized products with mass production's efficiency by fully utilize internal component commonality to achieve external variety. Although mass with customization essentially has conflicts, discovering a method which satisfies individual customer's need with relative low cost is an important competitiveness of a company because of globalization, the burst of internet which leads to information transparency, and the demands of customers expand diversely.

In this paper, we propose managing service from mass customization point of view. We first examine the nature of service, and introduce the concept of mass customization. We then explain how mass customization strategy can be adopted into service industry. At the end, we compare the existing service specification methods to which would be the first step of service management.

## II. NATURE OF SERVICE

Service industry has been noticed in the middle of 1980s that Richard Norman [11] stated the trend of service society is suggestive. He claimed that the rise of the service sector has become possible largely as a result of increasing effectiveness in the goods-producing sector. While he discussed about the difference of management of services and manufacturing, he depicted that the basic characteristics of service are (1) intangibility (2) service consists of acts, and interactions (3) production and consumption always occur simultaneously and (4) customers are also participants in the production of service. He also compared the difference of manufacturing and service and identified that service is immaterial, cannot be resold, effectively demonstrated, stored customization by Roger Schmenner [18] into service process matrix. Kolter also classified services into high tech/ high touch and discretely/ continuously render two groups. Singelmann (1975) devised a classification which has been widely used: distributive services, producer services, social services and personal services.

The dimension of service includes reliability, responsiveness, assurance, and tangible portion. Reliability means accuracy of service. Responsiveness is related to employees' will to serve customers with prompt requirement, caring of customers, and their enthusiasm. Assurance is employees' knowledge and courtesy. Tangible portion means physical facilities, equipments, personnel, and communication material. The scope of service includes content, process, structure, outcome and impact of service.

With understanding of definition, scope, importance of service, we conclude the characteristics of service base on past analysis. Table 1 depicts different analysis of service characteristics from past authors. From table 1, we summarize the characteristics of service as: (1) service is customer co-produced and as customer's experience (2) service is customized by nature and promptly changed (3) service is as process (4) service is highly resource demanded, and transported. Direct contact is necessary in most cases. It cannot normally be exported and is more labor intensive than manufacturing that implicates personnel management is critical to success in service business.

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Before we start to discuss about the nature of service, we first review the definition of service. There are many definitions of the term “service”. In 1960, the American Management Association depicted service as “activities, benefits, or satisfactions which are offered for sale, or are provided in connection with the sale of goods.” [12] Other authors define “service” differently as: “deed, an act, or performance” [13]; “personal performance” [14]; “a product which is a process” [15][16]; or “processes involving customer contact”[17]. To sum up, a service is a time-perishable, intangible experience performed for a customer who acts in the role of co-producer [6] [7].

Service industry ranges from five sub-groups [6],namely business services, trade services, infrastructure services, social/ personal services, and public administration. Service has been classified by the degree of interaction and

<i>Richard Norman [1984]</i>	<i>James A. Fitzsimmons</i>	<i>James A. Fitzsimmons [2001]</i>	<i>Christian Gronroos [2000]</i>	<i>CengizHake server [2000]</i>	<i>John R. Bryson [2007]</i>
Intangibility	Intangibility	Intangibility	x	intangibility	Lack of entity
Consist of act, interaction/ customer participate	Customer as participant	Customer participant in the service process	Customer participate	x	Producer and user present at the same time
x	Time-perishable	perishability	x	perishability	
production and consumption always occur simultaneously	Simultaneous production and consumption	simultaneously	Produce and consumed simultaneously	Inseparability	
x	Labor intensiveness	x	x	x	Labor intensive
x	Site selection dictated by location of consumers	x	x	x	
x	Difficult in measuring output	x	x	x	
x	x	heterogeneity	x	variability	Each service is unique because of co-production
x	x	x	Process consists of activities	x	Irreversible ( Gadrey, 1994 )

Table 1 Summarize of service characteristics

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Next, we examine the difference between service/ service oriented market with product market. James A. Fitzsimmons (1994) classifying the strategies of service by nature of the service act, relationship with customers, customization and judgment, nature of demand and supply and method of service delivery. According to the nature of service [tangible/ intangible actions] together with direct recipient of the service [people/ things], there are four classification possibilities [25]. Based on the properties of service delivery [continuous/ discrete delivery] together with types of relationship between service organization and its customers, there are also four classification possibilities. With the service permits customization and the service personnel have the discretion to modify the service provided, there are four possible classifications. With demand fluctuation over time together with peak demand can usually be met without a major delay and peak demand regularly exceeds capacity, it also has four groups can be classified. Based on these strategies classification, we are not hard to discover that service market distinguishes with product market by customer’s recipient [goods or service], deliver time period [discrete or continuous], customization from users or service providers [customized promptly or customized in choice], and demand fluctuation and supply capacity [resource capacity/ flexibility]. In the other respect, CengizHaksever (2000) discussed about goods typically are first produced, then sold and then consumed but service are first sold, then produced and consumed simultaneously. “The unique order of processes and the inseparability of the production of a service (an operations issue) from its consumption (marketing issue) significantly change the role of marketing in a service firm.” They viewed the difference from five different aspects which are: (1) output tangibility (2) organizational features (3) ownership, use and consumption (4) the scope of marketing activities (5) the consumer’s role.

From the past researches, we understand that the difference between service and product market are basically derived from characteristics of service such as intangibility, customer as participant and produce and consumption simultaneously and time perishable. One thing that Fitzsimmons pointed out apparently is service demand fluctuation over time that describes peak demand for some service cannot be delay and regularly exceeds that capacity. Based on these researches, we summarize the difference between two as below:

<i>Mapping features</i>	<i>Service Oriented Market</i>	<i>Product Market</i>
Service is customized by nature	Highly customized	Customized need
Service is as processes	Highly process-oriented	Standard product
Service is highly resource demanded	Highly resource-oriented	---
Service is promptly changed	Promptly change	With fixed choices
Service is customer co-produced	No inventory	Inventory need
Service is highly resource demanded	Flexible organization	---

Table 2 summarize the difference of service market and product market

The development and design of a service system always includes service delivery system design, facility design and layout, the service facility location choose and human resource management, etc. Within service delivery system design, the most important chapter is process design. In the other respect, while people discuss about managing/ operating service, it means managing demand and supply, quality management, service productivity, queuing model, performance measurement and improvement, and globalization management.

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The challenges of service management are first, how to control and reduce cost by fixed human and physical resources. While service demands are increasing, resources shortage may lead to customer un-satisfaction. However, if service demands are decreasing or under certain level, redundant resources will cause cost/ per service increase which customers possibly cannot accept. Therefore, how to manage service resources with economic of scale are important. Otherwise, while new technology adopt into service, economic of scale is also considerable. The second, the economies of scope can be seen as a strategy toward lower cost but diversification. The bigger scope may produce happy customers. Only those companies with the flexibility to design and deploy their services quickly can obtain a competitive edge. The third, service is complicated that thousands of diversities, demands from customers need effective management. The fourth, services are always implemented by a series of processes that executed by front-end employees and back-end employees. These cross boundary management with diverse services also makes management challenge. The fifth, nowadays, more and more service companies are international. Managing service worldwide such as DHL is another challenge. The sixth, with more and more diverse demands, how to manage thousands of varieties with time, nations, customer groups is challenge. The seventh, quality control with prompt customization and resource planning is worth considering. The eighth, how to let customers understand the flexibility and diversity that a company offers is another challenge. Without understanding, customers cannot select the needed content.

### III. MASS CUSTOMIZATION

The concept of mass customization was first expressed by Toffler in which he predicted that future manufacturing enabled by information technology would be able to provide customized products in a large scale with little or no extra cost (Toffler 1970). In 1993, Pine proposed the concept of mass customization and defined mass customization as the ability to provide individually designed products and services to every customer through high process agility, flexibility, and integration. Mass customization was further explained as technologies aiming at satisfying individual customer needs with near mass production efficiency [10]. Many authors propose more practical definitions by describing mass customization as a system that uses information technology, flexible processes, and organizational structures to deliver a wide range of products and services that meet specific needs of individual customers at a cost near that of mass-produced items [19][10][21]. It has been applied quite well to handle the seemingly contradictory object of achieving both customer satisfaction and efficiency.

Mass customization is fundamentally different from mass production and requires different values and roles, systems, learning methods, and ways of relating to customers [22][23][24]. The biggest different between mass production to mass customization is that customers participate in mass customization process to create value. Traditionally, manufacturers implement mass production by predicting what customer needs, manufacturing and assembling products before customer purchase it. Manufacturers take responsibility for inventories. However, in mass customization, customers are no longer passive. They involve in design, produce, and deliver phase base on their preferences. Table 3 compares the difference between mass production and mass customization [26].

	<i>Mass Production</i>	<i>Mass Customization</i>
Goal	Delivering goods and services at prices low enough that nearly everyone can afford them	Delivering affordable goods and services with enough variety and customization that nearly everyone finds exactly what they want
Economics	Economies of scale	Economies of scope and customer integration
Focus	Efficiency through stability and control	Variety and customization through flexibility and responsiveness

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Product	Standardized products built to inventory	Standardized modules assembled based on customer needs
Key Features	<ul style="list-style-type: none"> <li>▪ Stable demand</li> <li>▪ Large homogeneous markets</li> <li>▪ Low-cost, consistent quality, standardized goods and services</li> <li>▪ Long product development cycles</li> <li>▪ Long product life cycles</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fragmented demand</li> <li>▪ Heterogeneous niches</li> <li>▪ Low-cost, high-quality, customized goods and services</li> <li>▪ Short product development cycles</li> <li>▪ Short product life cycles</li> </ul>
Organization	Mechanistic and hierarchical	Organic and flexible
Customer Involvement	Customers are passively involved in the value chain.	Customers are actively integrated into the value chain.

Table 3 the difference between mass production and mass customization

There are many strategies used in mass customization development. Innovative tactics and technologies like differentiation postponement (Feitzinger and Lee 1997), product family design (Tseng and Jiao1996), and product configuration systems (Salvador and Forza 2004) have greatly mitigated the severity of these challenges. Among all of its enablers, product family has been well recognized as a rationale of achieving mass customization. Product family offers a systematic diagram which defines product platform, product architecture, product family, product family architecture and variety design and fulfillment. The knowledge circle of mass customization can be viewed as: 1) setting the solution space 2) configuration 3) fulfillment 4) customer relationship management [27].

## IV. MASS CUSTOMIZATION AS A STRATEGY TO SERVICE INDUSTRY

From the comparison of service market with product market and mass production with mass customization, we easily realize that growing demands of quick response to prompt customization either in traditional product market or service market although the varieties of previous one comes from the trend of globalization and information transparency because of internet, and the varieties of service comes from its nature, they own very similar characteristics. Customers in both of markets request high customized product/service with relative low cost within short period of time. Base on these similar demands, we can adopt mass customization strategy into service.

Mass customization aims to resolve various varieties into modules, and wills to gain response time and cost in both manufacture and customer side. The strategy can be brought with following scenarios:

1) Specification define with product family

Service specification is the first step of developing a service company -- what to offer. While we cannot define specification very clearly and demonstrate it to the customers, customers will not know what to choose and what exactly the service company can offer, even what he/ she can ask for. With traditional specification method, we cannot handle the varieties easily. However, because service is by nature customized, we need to manage and supply varieties. The rationale of developing product families with respect to satisfying diverse customer needs with reasonable costs has been well recognized in product industry. It helps to resolve the issue of gap between customers and service providers. Product family contains common bases, differentiation enables, and configuration mechanisms which forms the base strategy toward mass customization in service.

2) Configuration mechanism and system as fulfillment base

In service design, one of the most important parts is process design. In service product family methodology, it combines traditional product family with process modeling technique which can fulfill the needs of implementation

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**Vol. 4, Issue 8, August 2015**

service after configuration [28]. With this dynamic configuration between customer requirements and service process, related front-end / back-end departments can be carved and organized. Service is assembled by these department modules and delivered promptly. This can resolve the issue that service is promptly changed and customers still request high service quality. How to offer service with customization but promptly changed, mass customization is definitely a good approach.

### 3) Resource arrangement based on modules which related to service modules

Based on configuration mechanism and mapping to responsible physical departments, one of the most difficult issue of service operation and management --- queue management can be resolved. The waiting time is always one of most important factor impacts customer satisfaction. With modularizing service process with its related resources and real time configuration, we can easily arrange the resources queue which can greatly reduce the waiting time.

## V. SERVICE BLUEPRINTING AND SERVICE PRODUCT FAMILY

In this paragraph, we introduce service blueprinting which is a method of service process diagramming that can be used to evaluate existing or proposed service delivery designs. Otherwise, we also introduce service product family which is a method of service specification management with process diagramming specially can handle varieties in service. Table 4 we compare the two methods.

Service blueprinting was first proposed by G. Lynn Shostack that shows service delivery system in a visual diagram. [28] Service blueprinting was then involved by Mary Jo Bitner in 2007 [29]. Service blueprinting shares similarities with other process modeling approaches in 1) visual notation for depicting process 2) can be used to represent high level overviews or detail processes 3) can accommodate links to parallel and sub-process documents and diagrams. Service blueprinting consists of five components which are customer actions, onstage/ visible contact employee actions, backstage/ invisible contact employee actions, support processes, and physical evidence. Figure 1 is an example of service blueprinting.

Service product family has features that 1) hierarchical structure of managing service commonalities and varieties 2) visual notation of presenting process 3) can used to demonstrate high level overviews or detail process 4) modularize the service. Service product family consists of two parts which are service configuration engine and process model. In service configuration engine, it contains customer target actions and varieties. In process model, it includes not only customer target actions but required actions which has interface with customers such as payment. The two portions of service product family are both viewed from customer's point of view. In process model, because the service is supplied by employees, process modules can be traced to each department responsibility and further can be described into sub-processes which contain front-end processes and back-end processes. Figure 2 is an example of service product family.

Table 4 we illustrate the similarities and differences between service blueprinting and service product family. We compare them with their emphasizes, methodology, motivation, characteristics, evolution, result, and quality improvement.

Item	comparison	Service Blueprinting	Service Product Family
emphasize	similar	Emphasize process nature and experience nature in service	Emphasize process nature and experience nature in service
methodology	similar	Shown customer actions flow	Shown customer actions flow
motivation	difference	Overall view of company	- Solve complex service

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Vol. 4, Issue 8, August 2015

		employees, quality improvement	varieties ( product family itself is for identify commonality and variety ) - Solve varieties over time - Gain profit by new found business strategy
Methodology characteristics	difference	Statistic describe a service	Dynamic view of service changes
	difference	Categorize process by interaction or not	Categorize process by customer targets and company requirement
	difference	Process → PCs No design parameters	FRs → DPs → PCs
evolution	difference	-	Can discover customer innovation, new and real customer requirements outside service scope by techniques
result	More then	Offer overall view for employees on process	Except process/ we emphasize the customer targets
Quality improvement		Show SOP for employees from customers point of view	- Show dynamically change SOP for employees + target service ( not action but target ) - Could discover the pattern of repetition by process mining to improve quality

Table 4 Service blueprinting vs. Service product family

## VI. CONCLUSION

Service industry is no doubt getting more and more attention in 21 century. How to provide services with quality but fulfill diverse customer needs is absolutely the required strategy toward competitive environment. In this paper, we introduce mass customization as the methodology to achieve high level customization with relative low cost. We review the scope, characteristics and challenges of services which illustrate the suitability for adopt mass customization. We further introduce how mass customization approaches can be fit into service by three scenarios. At the end, we compare the traditional methodology for designing service with mass customization methodology. To sum up, mass customization can bring varieties management within this highly-diverse-demand service market which benefits customer's understandings. It also offers a methodology to configure relative service department/ resources with



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Vol. 4, Issue 8, August 2015

sequence and which offers the flexibility for future resource arrangement. Both of method can provide the standard procedure for employees to follow and it benefits the education of employees.

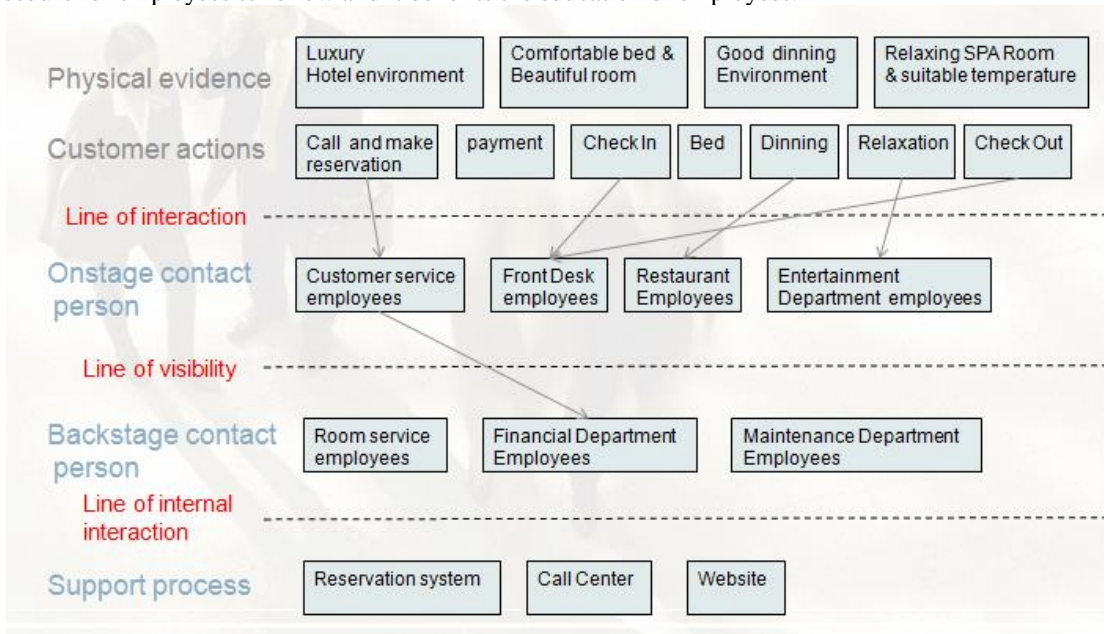


Figure 1 Example of service blueprinting

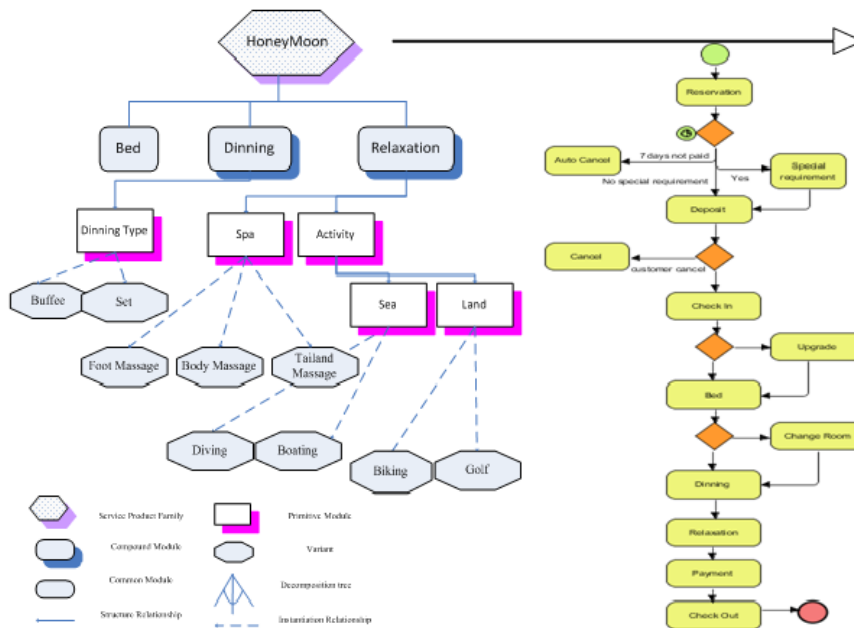


Figure 2 Example of service product family

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Vol. 4, Issue 8, August 2015

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