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MASS CUSTOMIZATION IN SERVICE OPERATIONS

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MSc in Operations Management

MASS CUSTOMIZATION IN SERVICE OPERATIONS

By

Wang AN

2010

**A Dissertation present in part consideration for the
degree of**

MSc IN OPERATIONS MANAGEMENT

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Abstract

The concept of Mass customization (MC) is the ability to provide individually designed products and services to each customer through high process flexibility and integration. In recent years, MC has been identified as a competitive strategy; however, the investigations of MC in the service context are limited. In this dissertation, the published classification of MC approaches have been discussed and tested through cases which are from four different service industries. The limitations of these methods and the main characteristics which they have not covered have been highlighted. The analysis of the findings leads to the development of a service operations process framework, which comprises five fundamental service MC modes based on the framework of MC modes for manufacturing developed by MacCarthy et al. (2003). The framework and models have been extended through integrating modularity approach in order to improve the ability of full utilization of operations resource in the service industries. Some feasible approaches related to the application of modularity approaches have been suggested for the enterprises, who adopt mass customization strategy, in the service industry.

Key words: Mass customization, Service industry, Modularity

Chapter 1: Introduction

1.1 Brief background on mass customization

The concept of Mass customization (MC) had first been discussed by Davis in 1987, and had spread the influence through the book of Pine (1993). MC relates to the ability to provide individually designed products and services to each customer through high process flexibility and integration. In recent years, MC has been identified as a competitive strategy by an increasing number of companies (Da Silveira et al., 2001). Many authors have contributed to establishing different frameworks and models about the implementation of mass customization. Although many models of mass customization have been built in different perspectives, most of investigations focus on manufacturing industry, the research related to MC in the services is still scant (Da Silveira et al.,2001; Sigala,2006a).

Moreover, with increasing of customer's requirements, the concept of MC has become a necessity in doing business. Several successful examples of mass customization in manufacturing have been mentioned by Corbett and Alptekinoglu (2004), such as Lands' End (pants and shirts), Lutro Electronics (lighting systems), Nike (sneakers and shoes), Procter & Gamble (beauty-care products through www.reflect.com), Ultra Pac (plastic containers), and Yankee Candle (candles). However, cases about the implementation of MC strategy in the service industry are limited, which means the application of MC in service industry is not mature enough to become a system. In addition, most of the time, service has been mixed with product, as well as treating service as a special product. In fact, however, services have many unique natures, and distinctive characteristics from products, such as customer participation in the service process, simultaneity, perishability,

intangibility and heterogeneity (Fitzsimmons, 2006). Most existing MC framework cannot be used in service context directly. Therefore, a MC framework for service industry is expected to be established.

Furthermore, most of the previous MC approaches are established from a general but not a practical perspective. Most of them do not focus on the operational processes or the relationship between different activities. That would be a little difficult for the enterprises to implement. Hence, in this dissertation, a mass customization framework which focuses on service industry and from value chain perspective, will be established. That framework will also contain the operations process in it. Then five MC modes will be developed for that framework based on a published formwork for MC in manufacturing industry by MacCarthy et al (2003). We expect the operations process framework and MC modes which are established for the service industry to be useful in several areas including organizational structure, service design and validation technologies, information management system and resource management.

Additionally, as the simultaneity, perishability, intangibility nature of service, full utilization of service capacity is a main challenge for service companies, especially for the mass customizers. We will attempt to help the managers who are in the service industry to solve that problem through the new MC framework. In order to achieve that aim, we will integrate the concept of modularity into the operations process framework. Modular production system have been seen as one of the good approaches for developing the products efficiently (Jiao et al., 2006), however, in terms of services, the investigation of modularity is scarcer (Meyer and Tore, 1999, 2000; Homann et al., 2004). Thus, the innovative points of this thesis are not only building the MC framework and modes for the service industry, but also integrating the modularity approach into the service context.

1.2 research objectives

There are two objectives in this thesis:

1. Advancing the understanding of configurations models for Mass Customization for the service industry.
2. Attempting to integrate the modularity approach into the MC model to improve the operations resource management in the service industry.

We will follow this order to reach the research objectives, the first objective is the fundamental for accomplishing the second one and the second one is an extension of the mass customization operations process framework.

1.3 Structure of the dissertation

There are seven chapters in this paper. Chapter One is the background description and the research objective of the whole dissertation. In Chapter Two, the approaches that relate to the concept of mass customization, modularity and service will be reviewed and discussed. The current situation of the concept of mass customization in practice is also described in Chapter Two. The methodology and research process which are adopted in this paper will be illustrated in Chapter Three. As the main research methodology is case study, all the cases will be introduced in Chapter Four. Chapter five focuses on establishing the mass customization operations process framework and MC modes in the service industry. The extension model for improving the usage of operations resource in service industry will be introduced in Chapter Six. The last chapter presents the conclusions. The contribution, limitation and further research suggestion of this paper are discussed in this chapter.

Chapter 2: Literature review

2.1 Mass customization

2.1.1 What is mass customization

The concept of mass customization has been evolving for over 30 years and has an extensive history. In the beginning, the main point of this concept was focused on physical product manufacturing (Toffler, 1970; Davis, 1987; Pine, 1993). In order to understand the concept of mass customization, we should know the both parts in this word: the nature of mass and the nature of customization (MacCarthy and Brabazon, 2003). The term 'Mass' could be explained in different ways. However, they are inter-related. Firstly, 'Mass' means attempting to achieve the mass production economics in all the manufacturing processes, such as design, manufacturing, logistics, avoiding additional cost which for product customized products (MacCarthy and Brabazon, 2003). Secondly, it also implies that mass customization could guarantee to reach the response times and quality levels as mass production does. Thirdly, 'Mass' is related to scale. That should benefit a large number of customers by offering customized product. Lastly, 'Mass' might be judged in relative terms; for example, the extent and level of customization usually offered in an industry or product sector (MacCarthy, 2009).

The term 'Customization' also could be interpreted. In the strategy that relate to mass customization, customers could be allowed to choose their specially configured product from hundreds of product options, in order to meet their special needs (Bourke and Kempfer, 1999). Therefore, customization always means options and variety. From MacCarthy et al's point of view in 2002, many product attributes have the chance to be customized. Broadly, these could be fitted into three categories:

(1) those that relate to dimensionality, shape, performance and

functionality,

- (2) those that relate to design, aesthetics, styling and personalization and
- (3) those relating to delivery, pricing, contractual, service and after-sales aspects.

Whereas MacCarthy et al have explained customization from the standpoint of options, the viewpoint of Anderson (1997) should be in the aspect of variety. He has pointed out four types of variety.

- (1) external variety, which is seen by customers,
- (2) internal variety, which is only experienced inside the manufacturing and distributions operations,
- (3) useful variety, which is appreciated by customers,
- (4) useless variety, which is transparent, unimportant, or even confusing.

Now that the natures of mass and customization have already been discussed, the definition of mass customization should be introduced. Da Silveira et al (2001) have indicated that the concept of mass customization could be defined either broadly or narrowly. Broadly, the term mass customization was coined by Davis (1987). He has promoted MC as the ability to provide individually designed products and services to every customer through high process agility, flexibility and integration. In addition, he also predicted that if a company could be able to supply customized goods on a mass basis that strategy could become one of competitive edge of the company in market (Pitt, Bertham and Watson, 1999; Duray and Milligan, 1999). The strategy of mass customization has been treated as a developed 'new' competitive strategy which challenges the old one -mass production (Pine, Victor and Boynton, 1993). Furthermore, an operational definition has been offered by Hart and Taylor in 1996:

"Mass customization is the use of flexible processes and organizational structures to produce varied and often individually customized products

and services at the price of standardised, mass produced alternatives.”
(Hart and Taylor, 1996 cited in Sigala 2006b:114)

This viewpoint has been classified to narrowly definition of mass customization by Da Silveira et al (2001), because that has been seen narrower and more practical. Most of the time, MC has been described as a systemic idea that contains all aspects of manufacturing, such as product design, manufacturing, and distribution; the whole circle from receiving the customers’ orders to delivering the finished products (Kay,1993; Jiao, et al,1998). This narrow definition of MC has already been integrated into the mass customization framework design for manufacturing industries. This idea has emerged in many researchers’ approaches. They defines the degree of mass customization depending on how many stages have been customized, for example, Lampel and Mintzberg (1996), Alford (2000). However, there is little evidence of this concept has been integrated to establish a framework for mass customization in the service industry. Which stages should be or could be mass customized during the whole service process is a critical issue to be considered when the service company adopts a mass customization strategy.

The important goal of mass customization is another issue that has been discussed a lot in literatures. Some authors argued that the goal of MC is to obtain economies of scope that enable customized goods could be manufacture as mass produced goods, which is agreement in literature(Pine, 1993; Hart, 1995; Alford et al., 2000; Tu et al.,2001). Although that definition has been assented to by many researchers, beyond this agreement, two viewpoints of MC are emerging (MacCarthy et al.,2003). One perspective is that MC is a label of manufacturing companies which exhibit particular structural features. For example, the firms who adopt mass customization strategy could offer the customers personal discretion over the attributes of products. The other view is that

MC is a performance ideal, which has been introduced by Hart (1995). He has pointed out that mass customization is 'the ability to provide customers with anything they want profitably, any time they want it, anywhere they want it, any way they want it.' Although this definition of MC is only an ideal concept, similar to 'zero defects' in respect of quality, it has turned MC into a standard that is independent of context and relevant to customizing companies in general (MacCarthy et al.,2003). However, mass customization is not the same with either pure customization or mass production (MacCarthy and Brabazon, 2003). This concept could be understood as the integrating of both concepts. Clear goal of mass customization is the fundamental of establishing a framework related to MC, whether in the manufacturing industry or the service industry. That has been seen as the guide for the researchers to establish the modes in mass customization field.

In order to explain how mass customization works and which type of product is more suitable to be customized, some authors have introduced some other concept or modes to explain MC system. Sliveira (2001) has indicated that MC system are followed the main diagonal of Hayes and Wheelwright's (1979) product-process matrix. The products in the medium to high-volume process types, such as manufacturing cells or assembly lines, are more suitable to be produced through mass customization strategy. There is a similar idea about MC system in service industry, which has been discussed by Schmenner in 1986. He has established a service process matrix with two dimensions: degree of labour intensity and degree of interaction and customization. According to the two factors, the service industries have been classified into four types: service factory, service shop, mass service and professional service. From this matrix, Schmenner (1986) has carried out the relationship between service type and customization, and the strategic operation changes within the service process matrix. Although through this service process

matrix, the relationship between MC system and service process has been discussed, the stage during the service process has not been analysed in detail and the way to implement MC in service has not been indicated.

2.1.2 The approach of mass customization

Many researchers have attempted to use different approaches to differentiate mass customization operations. They focused on distinct aspects and primary dimensions to define MC approach. From their approaches of MC, they always give different levels of customizations and classify the degree of customization, some based on empirical observation. Although the approaches toward mass customization are varied, they could be classified by some certain system, for example, most of the approaches could be separated as value chain customization and product architecture customization.

Value chain customization begins with the downstream activities, closest to market place, and may then spread upstream. One of the influential works in this field is written by Lampel and Mintzberg (1996). They have divided the value chain into four stages - design, fabrication, assembly, and distribution (Figure 2:1). From their point of view, the value chain customization begins with the downstream activities, and closest to the market. However, standardization begins upstream, from the fundamental design, and then fabrication, assembly, and distribution. According to that definition, they classify five different strategies along this chain: pure standardization, segmented standardization, customized standardization, tailored customization, and pure customization.

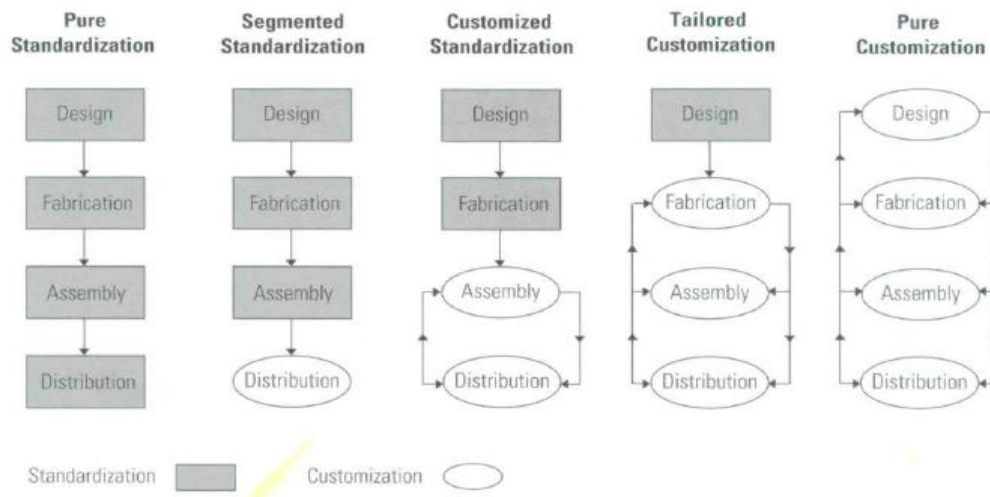


Figure 2:1 The mass customization approach taken from Lampel and Mintzberg, 1996.

Pure standardization

Normally designs in an attempt to target the broadest group of customers, produced as much as possible, and distributed commonly to all their customers. There is no distinction between the customers. In addition, customers did not have the opportunities to join the process of design, product, and distribution. Ford Motor Company is a good example to explain the definition of pure standardization, when they produce Model T. That strategy can also be considered as mass production.

Segmented standardization

For a segmented standardisation strategy, the firms, to some extent, begin to respond to the needs of different clusters of customers. However, they also remain aggregated. The customers will have some narrow choice to choose, but the individual choice is not to be taken into account. Therefore, although the customers will have some limited choice, they could not affect the process of design or production process. Most of time, the distinction occurs during distribution happen in the distribution part. So, the company who adopt this strategy offer limitless variety, but not at the buyer's request.

Customized standardization

The customised standardisation strategy is also called “modularization” or “configuration”. The reason why being called modularization is that the core point of this strategy is that the products are made to order from standardized components. Hamburger making is a good example to explain this strategy. Customers could specify their preferences for meat pie, mustard and so on. Although the customers might have more options for the products, the basic design is not customized, and all the components still be produced following the mass production strategy. The company who use this strategy could allow the customers to choose their own configuration but limited to the range of available components.

Tailored customization

As the name of that strategy, the type of the traditional tailor working for their customers is a good example of tailored customization strategy. The tailor will show the client standard fabrics and then adapt it to meet the wishes or needs of their customers. Later, the client will come back to fit. If necessary, the tailor will tailor his work. Birthday cake is another example that shows how the tailored customization strategy works in our lives. The buyer’s could choose one of cake design schemes from the given list, the name of the customers could also be allowed to write on the cake. Therefore, the main point of this strategy is customization expands to fabrication stage but not to the design stage.

Pure customization

If the customization reaches to the design stage, the strategy of pure customization should be introduced. The company adopting this strategy creates products exactly made to order, and wholly meet the wishes or needs of their customers that are a polarization of customization strategy. All the stages: design, fabrication, assembly, and distribution, are largely

customized. This strategy is used in art design industry, such as jewellery design or residential architecture design.

Ross (1996) has introduced another mass customization approach from value chain perspective. He explains the five different methods of providing customers with choice on a mass basis through graph and examples (Figure 2:2). At one end of the spectrum is core mass customization. The supplier is a mass customizer, and they will have both the direct understanding the needs of their customer and the ability to fulfil them (e.g. Panasonic Bicycle). Next of the spectrum, there is post-product customization. A standard product is converted to a customized one by a customizing service (e.g., business software package providers with integration companies). Then, this is mass retail customization. The customizing service is taken by retailer (e.g., eyeglass frame makers and high street quick response services). The next category is self-customizing products. The supplier is a mass customizer, the typical example is PC software. The last category, on the other end of the spectrum from core mass customisation, is high variety push (e.g., wristwatches). Ross also has introduced three levels of customization ability. The nature and degree of variation are the two main relevant parameters which can be offered to the customers. The easiest type could be cosmetic, offering a number of colours, a different surface finish or material (e.g., the automotive industry). A step up in level is functional options, which can be specified by the consumers. Finally, core customisation is the most difficult, allowing customers to modify core elements of the product, such as the operations pattern of Panasonic Bicycle.

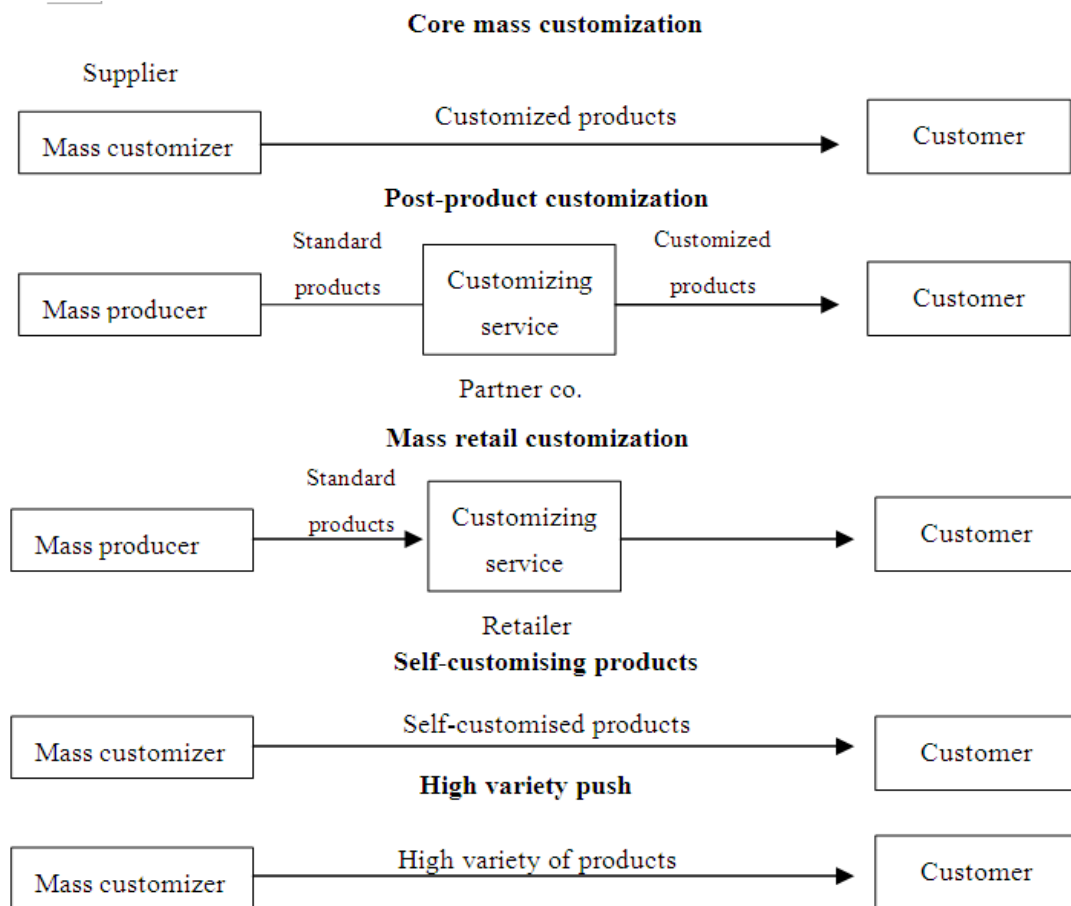


Figure 2:2 The mass customization approach taken from Ross, 1996.

As far as automotive industry has been concerned, the mass customization approach established by Alford (2000) could be one of the famous methods. There are three distinct strategies contained in this approach: form, optional, and core customization. These strategies have attempted to integrate progressively the customer factor of customer into the processes of design, manufacturing, and distribution progressively (Figure 2:3).

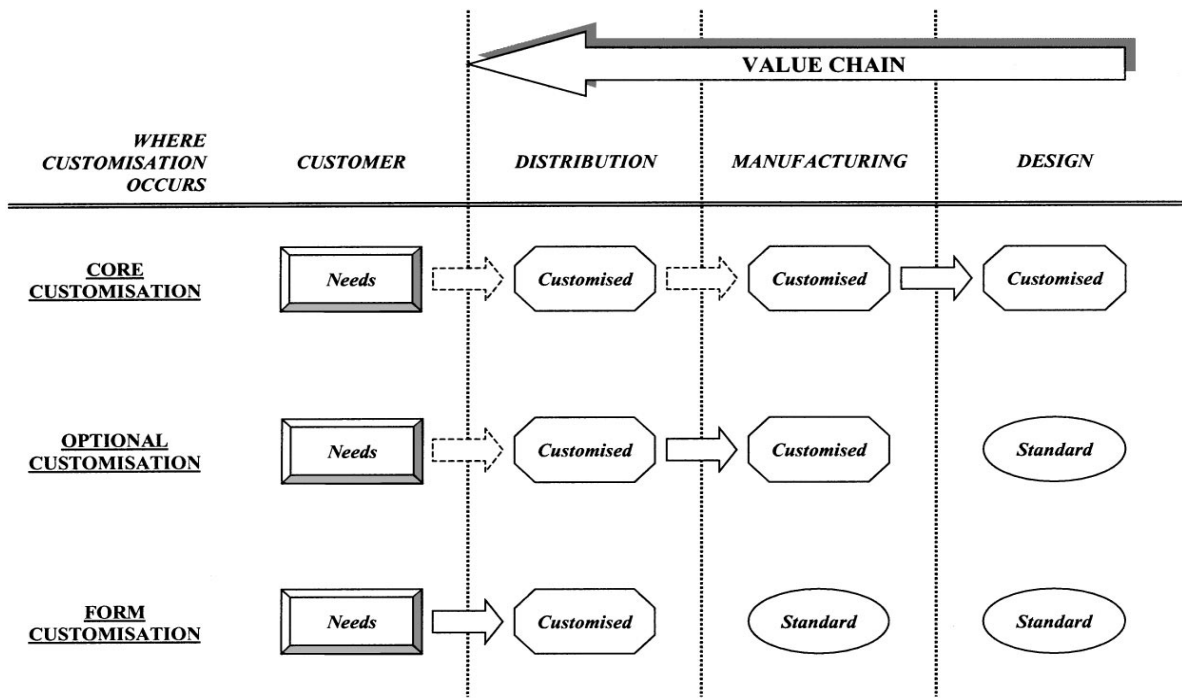


Figure 2:3 Automotive customization approach by taken from Alford et al 2000.

Core customization is suitable to the situation of low-volume and specialist vehicles. The customers can be involved in the process of vehicle's design. There may be a limited range for the customer to request changing the core design of the motor car. Land Rover is a typical example to show how this strategy works. They supply the classical vehicles; however, many optional features are supplied to customers, so that the company can meet the different needs of its consumers. If the customer is not satisfied with choices offered, he can contact the company and discuss their special requirements. The special order will be fulfilled by collaborating with customers based on a standard product in Land Rover. Generally, in the manufacturing process, collaboration with customers is a very common method used by low-volume luxury car companies to modify designs to match buyers' personal preferences.

Core customization is always for low-volume product, however, for high-volume vehicles, optional customization could be an ideal strategy. For

this strategy, although customers could choose their vehicle from a plethora of options, the core design is not allowed to be changed in any way. Based on the customers' requirements, they are allowed to join the assemble process during manufacturing of their cars. In this strategy, all of the features which could be selected are standard.

Distributor is another important factor when implementing a MC strategy. They play a critical role in form customization strategy. For example, some new parts or standard parts could be changed or added to the vehicle at the distributor, aiming to meet the requirements of their customers. Distributors also offer a special package of service which related to vertical to their customers to gain an advantageous edge in the automotive market. These services will include financing options, warranties, insurance, and so on.

Duray et al.(2000) have not only integrated the stages along the value chain which have been described in Lampel and Mintzberg's (1996) approach but also introduced the work of Ulrich and Tung (1991) which is six different modularity types. As we have discussed above, the four stages in Lampel and Mintzberg's (1996) approach are design, fabrication, assembly and distribution. The six modularity types are component sharing modularity, component swapping modularity, cut-to-fit modularity, mix modularity, bus modularity and sectional modularity. The detail of those modularity approaches will be discussed later. In the Duray's method, the four categories of mass customized are named: fabricators, involvers, modularizers and assemblers. In terms of the modularity categories, 'component sharing ' and ' cut-to-fit ' modularity method have been used in fabricators and involvers approach, while the other four modularity method have been used in the modularizers and assemblers.

Another mass customization approach that is underpinned by value chain

perspective is provided by Da Silveira et al. (2001). They have generated eight levels of mass customization ranging from pure customization to pure standardization. The eight levels are Design, Fabrication, Assembly, Additional custom work, Additional services, Package and distribution, Usage and Standardization. Compared with the previous approach, this one could be more detailed and related to more stages in the manufacturing industry. However, it has ignored the stage before design and after distribution. Those two stages play critical role in the whole process of implementation of mass customization, especially for the service industry. Collection the customers' preference and receiving their feedback are the foundation for improving the mass customization system in the service industries.

In 2001, Zipkin has proposed three main elements of mass customization. His approach is similar to the model of Lampel and Mintzberg's (1996) method. It also follows the value chain process. The three key elements of MC are elicitation (a mechanism for interacting which the customer and obtaining specific information); process flexibility (production technology that fabricates the product according to the information); logistics (subsequent processing stages and distribution that are able to maintain the identity of each item and to deliver the right one to the right customer). This approach has supplied more information about the value chain process, and the pre-information collection stage has been introduced to mass customization approach. This stage could be one of the most important in the implementation process of MC in both the manufacturing and service industries.

All the approaches which discussed above are from the perspective of value chain. We will turn to discuss some MC approaches from other viewpoint. Gilmore and Pine (1997) have introduced a method from the customer involvement attitude perspective, there are four types of

customization contained in this approach: collaborative, adaptive, cosmetic, and transparent.

Collaborative customization

There are three steps in the process to achieve this approach: conducting a dialogue with individual customers to help them articulate their needs; identifying the precise offering that fulfills those needs; making customized products for them. The collaborative customisation approach is suitable for businesses that have customers who cannot easily articulate what they want and grow frustrated when forced to select from a plethora of options.

Adaptive customization

For the adaptive customisation approach , the manufacturing firms offer the standard but customizable product. The customers could alter it by themselves. If the company services the customers who want the product to perform in a different way in various situation, that could be one of options of the MC approach.

Cosmetic customization

The companies which adopted this mass customization approach presented a standard product differently to different customers. The cosmetic approach is feasible when the consumers use a product the same way and differ only in how they want it presented. Although the product is standard, the packages have been customized for each customer.

Transparent customization

If the companies could predict or deduced the needs of customers, the transparent customisation approach would be taken by the managers. In this method, the firms offer the unique goods or services to their

customers without telling them that those products or services have been specially designed for them. The transparent customizers do not through direct interaction to observe customers' behaviour and customize their offers within a standard package inconspicuously.

In addition, Pine (1993), the father of mass customization has introduced five fundamental method for customization. They are not specifically for the service industry, but they are closely related to that industry.

1. Service customization, where the person-to-person service experience is customized, but the offered products and services are standardised.
2. Creation of customized products and services
3. Point-of-delivery customization
4. Quick response throughout the value chain in order to produce
5. The modular approach, which end users can modify products and service by selecting pre-defined components.

From Pine's (1993) point of view, modular approach could be one of the best approach to produce customized products and services among the five methods. The five different types of modularity which introduced by Pine (1993) will be discussed in detail in the following part.

In 2003, MacCarthy et al have figured out that it is useful to establish the MC model from the value chain perspective. However, they highlight the weaknesses of value chain classifications. They show how only two critical factors have been emphasised, but the third one has been omitted. The two factors which have not had prominence sufficiently are temporal relationships between activities, and whether the resources used for order fulfilment are fixed or modifiable. Therefore when they identified their own typology of fundamental modes of MC, they did not only discuss only the two factors, they also integrated the omitted factor: whether a

company customizes a product on a once-only basis or a call-off basis, into the framework. In addition, that model covers the six manufacturing operations processes. That could be the most comprehensive MC mode from the perspective of operations process. It not only contains the process of product development and design, product manufacture, and order fulfilment realization, which have been mentioned by the previous approach, but also considers the process of order taking and coordination, post-order process and even the order fulfilment management stage. Moreover, from this fundamental MC approach, they have also established five operational modes for MC. Through those five operational modes, we could understand whether the product design and validation/manufacturing engineering is by per order or by per product or by both, the order is by once-off or by call-off. The five modes identified are:

1. Catalogue MC
2. Fixed-resource design-per-order MC
3. Flexible resource design-per-order MC
4. Fixed resource call-off MC
5. Flexible resource call-off MC.

Although this approach is very useful and practical, this method has been designed mainly for the manufacturing industry. To some extent, this fundamental mode could be used in mass customization in service industry, nevertheless, all the stages in this framework should be redefined to follow the service operational process. Moreover, considering the unique characteristic of service, how to determine the range of order, per single service or per service package also should be taken into account, when establishing the mass customization operational modes for service industry.

2.1.3 Mass Customization in practice

With the concept of mass customization having been introduced to business factor, more and more firms have begun to adopt this strategy; however, different sectors have their unique features that affect the relevance and operational viability of adopting the strategy of mass customization (MacCarthy, 2009). The economic aspects should also need to be taken into account (Piller et al., 2004).

From my point of view, the developed process of the implementation of MC in the business field could be divided into three stages. The first phase emerged in the early of 1990s, after the concept of MC has been widely generalized by Pine. Most of the successful cases about implementation of the strategy of mass customization are in consumer goods, such as Levi Strauss jeans (Pine 1993), Motorola Bandit pagers (Eastwood, 1996) and National Panasonic bicycles (Kotha, 1995). The second phase of the development of integrating MC concept into the business field started from late of 1990s to the beginning of 2000s. During this period, the successful cases of MC implementation are concerned in three sectors: computer sector (or electronic product), auto-industry (Alford et al., 2000; Fredriksson and Gadde 2005), and clothing industry. The MC approaches adopted by Hewlett-Packard printers (Feitzinger and Lee, 1997) and Dell Computer (Anderson, 2004; Magretta 1998; Gilmore and Pine, 2000) have been seen as exemplars in the electronic product industry. Through the direct sales channel, Dell pioneered customer-driven configuration and achieved rapid response with their assemble-to-order strategy. After Dell, many companies in computer sector have begun to copy the MC operational strategy which used in Dell, such as Lenovo (<http://shop.lenovo.com>). However, the fast changes in product technology, functionality and performance has influenced the mass customization strategy in this industry. Many retail customers have

preferred to achieve the highest performance and functionality for their budget rather than presenting detailed customization of their product. To some extent, that situation would lead them to choose a pre-configured product with a competitive price points (MacCarthy, 2009). The auto industry is the most famous contributor to the mass customisation framework, as discussed by Alford et al. (2000).As we have discussed above, that has contributed to the development of the concept of mass customization. Furthermore, MC strategy is very popular in the clothing industry. Compared with other industry, according to the research articles, the number of the firms which have adopted MC strategy successfully in clothing industry is large. Not only many well-known companies, such as Adidas (Moser et al, 2006), Left foot company (Sievänen and Peltonen, 2006), but also some small companies have used MC strategy successfully. Additionally, even some special clothes, such as wedding gowns company (Choy and Loker, 2004) has also started to take MC strategy.

The third phase that relates to mass customisation in service was developed around in the middle of the 21st century's first decade. Although the concept of MC has not been widely implemented in service industries, and there is rarely a mature framework for implementation of MC in the service industry, some retailers in different service sectors have begun to attempt to integrate MC strategy into their business. Additionally, investigations have already been done in that field.

In terms of the catering industry, Chen et al. (2008) have investigated how IT systems can be decoupled from the actual services rendered in a Chinese restaurant which provides highly customized service. In addition, Chen et al. (2007) have also explored some key issues of improvement on information system in mass customization operation in the context of catering services. Moreover, Wang et al (2007) has intended to integrate

the new concept of modularity based on MC into the Chinese-style catering. Furthermore, to some extent, the Hangzhou dishes have already been successful in integrating the concept of MC into the catering services (Chen, 2005). For the case of flight catering, Chang and Jones (2007a) have pointed out that the flight catering industry has many traits of MC, but the industry has not yet fully implemented MC. From the perspective of integrating MC into flight catering, they also have pointed out that this industry could adopt the 'flexible resource call-off MC' mode which was established by MacCarthy in 2003 (Chang and Jones, 2007b).

As far as the education industry is concerned, in order to meet the demand of customers, MC has also been used in education field. Sietske (2007) has attempted to solve the problems of how Dutch secondary schools cope with diversity-efficiency dilemma and to what extent they apply 'mass customization' strategies, through analysis the data from seventeen schools from Dutch. Moreover, in higher education field, MC has been integrated with collaborative learning for graduate engineering course designing (Rippel et al.,2009).

Papathanassiou (2004) explores the financial services in UK and how Internet and mass customization principles are being employed to provide customers with better services. Zhang et al. (2008) investigated the application of mass customization principles in the tourism industry in an effort to provide better and customized service thus improving the overall experience of its customers.

2.1.4 Modularity issue

The aim of mass customization is to provide unique products in a cost-effective way by reaching economies of scale. Many researchers have suggested that modularity plays a critical role in achieving low cost

customization (Duray et al., 2000). The universal definition of modularity has not been given (Gershenson et al., 2003), however, in operation management field, modularity means that parts or components of a product could be subdivided into modules and easily interchanged and replaced (Heizer and Render, 2004).

In the mass customization field, the concept of modularity has been introduced by Pine in 1993, from his point of view, true mass customization should adopt modularity in manufacturing. However, he did not point out where and how to use modularity in mass customization modes. The advantage of modularity has been introduced by later researchers. Baldwin and Clark (1994) have indicated that adopting modularity in production could gain economies of scale and scope across the product lines through partition production. Modularity could not only benefit to reduce the cost, the variety and speed could also be achieved by using modular product design, thus, that could solve the problem of greater variety of customer's demand and reduce the delivery times at the same time (McCutcheon et al., 1994). The modularity approach has already been adopted in production industry successfully. Flexible manufacturing systems are a good example to explain the advantage of using modularity (Duray et al., 2000). Similarly, Ulrich (1992) has pointed out that modularity could not only increase product variety, but also shorten delivery lead times and provide economies of scope. Moreover, Pine et al. (1995) has indicated that integrating modularity into components and processes is the key to implement mass customization strategy successful. Therefore, modularity could be an effective approach to increase the product variety and reduce costs.

There are a number of forms of modularity, different mass customizer may prefer to take different types of modularity. In order to better understand different types of mass customizer, we should know the forms

of modularity first.

As far as the forms of modularity are concerned, although Pine (1993) has not identified the link between different modularity types and the patterns of mass customization, the various types of modularity which has appeared in production environment have been described. Ulrich and Tung (1991) have developed a very similar typology of modularity, which has been shown in Figure 2:4 . Levi Straus's custom-fit jeans are a good case to explain how the "cut-to-fit" modularity work in manufacturing process. In Levi Straus's factory, each unique pattern has been cut prior to stitching and sewing. The special pattern would be built upon one traditional style of jeans or "cut-to-fit" some unique dimensions as the customer required. Modularity has not only been used as an approach in manufacturing process, it has also been integrated into some framework. For example, Duray et al. (2000) has integrated the Ulrich and Tung's typology into the framework of production cycle and then used it as a basis to establish a matrix grouping of mass customization configurations. The types of modularity can be used separately or in combination to provide a customized end product.

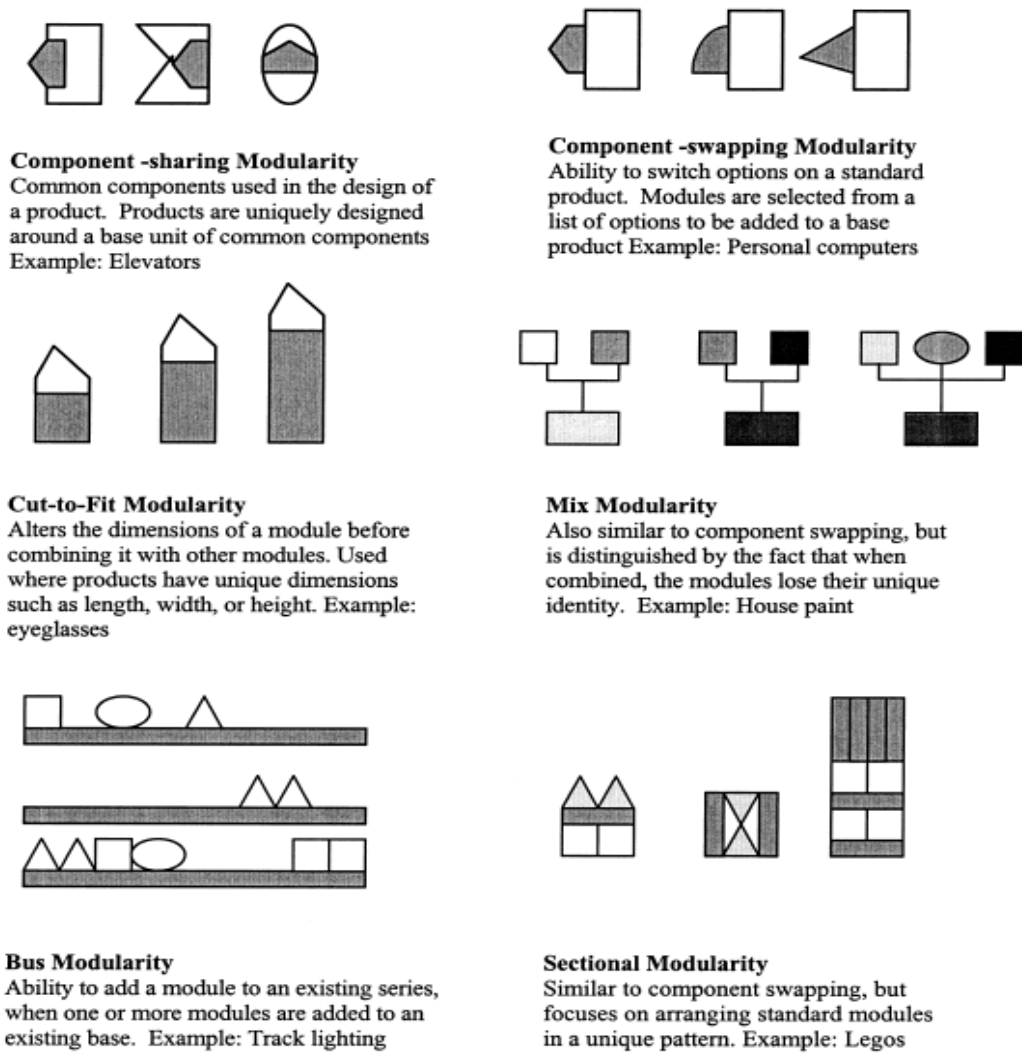


Figure 2:4 Modularity type (from: Ulrich and Tung, 1991)

All the above concerns the modularity practice in the manufacturing industry, showing that modularity has been successfully used for flexible product processes in production industry. However, the research of modularity in service industry is scarcer (Meyer and de Tore, 1999, 2000; Homann et al., 2004). Sundbo (1994) has introduced the modularity approach into service industry, and described the modularization model of service as between the manufacturing standard products model and service organization model; nevertheless, from his point of view, modularity is an effective approach to produce standard product or delivery standard service, and he has not mentioned customization.

Similarly, Pekkarinen and Ulkuniemi (2008) have explained the usage of modularity in service industry through developing modular service platform and introducing four dimensions: service, process, organizational and customer interface, however, they have not mention the relationship between the modularity and mass customization strategy.

2.2 Service

The concept and previous findings about mass customization have already been discussed, as the aim of this paper is to attempt to establish a framework of MC in service industry, good understanding of the definition and nature of service industry is the other critical part to be considered.

2.2.1 Definition of service

There are many different definition of service from different perspective. From Zeithaml and Bitner's (1996) point of view, '[s]ervices are deeds, processes and performances' that is the simplest one about the definition of service. There are some other definitions of service from other authors.

One of these definitions is: '[a] service is an activity or series of activities of more or less intangible nature that normally, but not necessarily, take place in interactions between 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.(Gronroos, 1990:27)

A precise definition of goods and services should distinguish them on the basis of their attributes. A good is a tangible physical object of product that can be created and transferred; it has an existence over time and thus can be created and used later. A service is intangible and perishable. It is an occurrence or process that is created and used simultaneously or nearly simultaneously. While the consumer cannot retain the actual

service after it is produced, the effect of the service can be retained. (Sasser, et al,1978:8)

A service is a time-perishable, intangible experience performed for a customer acting in the role of co-producer. (Fitzsimmons, 2006:4)

Some definitions are long and some are short, some are very simple and some are more in detail, but we could see that all of the definitions of service focus on describing the main nature of service. Thus, in the following part we could discuss the nature of service. A good understanding of them is helpful to know why mass customization strategy should be introduced to service industry, which will be discussed in the discussion part of MC mode of service industry.

2.2.2 Nature of service

As far as the nature of service is concerned, there are five distinctive characteristics of service operations should be figured out.

Customer participation in the service process

The presence of the consumers on-site requires attention to the physical surroundings of the service facilities, however, that is not necessary in the traditional manufacturing industry. In the traditional manufacturing industry, the customers may see the product in the dealers' or retailer's showroom, but not in the factory. To some extent, if the products could be customized, the customers could only be allowed to join some part of manufacturing process, but not the whole process as in service industry. For the customers, service is not only an experience happening in the front office of the service facility, more and more back office have been opened to public scrutiny in order to promote confidence in the service, showing the kitchens in some restaurants is a good example. Moreover, a significant consideration in providing a service is the realization that the

customer could be a part in the service process. The knowledge, experience, motivation or even honesty of the customers could contribute to or directly affect the performance of the service system. That nature could be one of the evidences to support the inevitability of adopting mass customization strategy in service industry (Fitzsimmons and Fitzsimmons, 2006:21)

Simultaneity

In fact, services are created and consumed at the same time, thus, one of the critical feature for services is that they cannot be stored. In the service industry, the companies do not have inventory as a buffer to absorb the fluctuations in demand as that in the manufacturing industry. In addition, a manufacturing facility could be operated at a constant level of output, but the facility for the service industry cannot. The decoupling for a manufacturing system is the inventory but for services it could be customers waiting or queuing. Therefore, the companies in service industry should consider solving the problem of customer waiting through balancing the selecting service capacity, facility utilization and use the idle time. Furthermore, because the service production and consumption are simultaneous, there is no opportunity for the companies to do quality control, the manager in the service industry should pay more attention to the quality of service delivered (Fitzsimmons and Fitzsimmons,2006:23).

Perishability

A service is a type of perishable commodity. Since services cannot be stored, it would be lost forever if not be used, (e.g., an empty airline seat, an unoccupied hotel room, etc.). Thus, full utilization of service capacity has become one of the challenges faced by the service managers. Moreover, customer demand for some service is typically cyclic behaviour during a short period. There is considerable variation between the peaks and valleys. For instance, the customer always have lunch between noon

and 1 pm, most travellers prefer travelling during the summer (Fitzsimmons and Fitzsimmons, 2006:24).

Intangibility

Services are ideas and concepts, products are things. In order to make sure the benefit of a new service concept avoiding losing the new service idea, a company has to expand extremely rapidly and pre-empt any competitors. Additionally, the intangible nature of service would also bring some trouble to the customers. The customer could not see it, feel it or test its performance before purchase it, as a product. Thus, for a service, consumers can only rely on the reputation of the service company. That means the image of a service firm would be more important, compared to a manufacturing company (Fitzsimmons and Fitzsimmons, 2006:24).

Heterogeneity

Because of the intangible nature of service and the customer's participation in the service delivery system, customers would have different feeling of the same service. The interaction between consumers and staff in a service system would create the possibility of a more complete experience of human work. In order to treat all the customers fairly, firms in service industry train their employees in proper procedures to ensure consistency in the service delivery process. However, each customer might have different experience and expectation, it would be a little hard to make every consumer has the same feeling (Fitzsimmons and Fitzsimmons, 2006:25).

2.2.3 Different types of service

Managing service operations will face general set of challenges, but for each part of service factor has its own specific set of problems, so we cannot treat all service as a whole. We need to understand different types of service. Each service sector has its own characteristic. According to

Johnston and Clark (2005)'s finding, they have separated the service into five broad sectors. Business to business services, business to customer services, internal services, public service (sometimes referred to as G2C-government to consumer service) and not-for-profit services.

Business to business (B2B) service are provided by a business for other business or organizations. The typical examples in this service sectors are maintenance, consultancy, training and catering. There are three main challenges for this type of service. Firstly, most of time, the company who provide B2B service should deal with multiple contacts in the organization. The consultants may need to work with a wide range of staff in the client firms. Secondly, the B2B service company should work with a complex set of relationships. Last but not least, the B2B relationships would last for a long time. The company should consider how to deal with the relationship with their customers during the long period (Johnston and Clark, 2005: 17)

Business to consumer (B2C) service means individuals purchasing for themselves or for another person. The typical cases in this service sectors are shops, hotels, banks, and food. Three main challenge faced by this service sector. Firstly, the service firms may need to deal with many different customers each day. They might have their own special needs or expectations of the service, so that would be a little difficult to meet all the needs of the customers. Secondly, it would be hard to keep the experience fresh for the next new customer, because the service would be operated many times a day. For the employees in the service delivery system, the customer could be just one out of hundreds, but for the customers, the service could be the first or only time experience. Thirdly, many B2C service operations may need for consistency across many points of contact with their consumers. That could be another complicated problem (Johnston and Clark, 2005: 19).

Internal services is a type of service which only in the organization but do not deal with the external customers, such as finance, purchasing, IT or Personnel. Public services (G2C) is the services provided by central or local government such as prisons, hospitals, schools, leisure. Not-for-profit services is the services provided by non-government organizations or charities. The typical examples are hospices, counselling, faith organizations, aid agencies. Those three service sectors also have their own challenges. However, in this paper we are focused on discussing the MC mode in B2B and B2C service sectors, we could not describe the challenge in internal services, public service and not-for-profit services sectors in detail.

Chapter 3: Methodology

In this chapter, we will discuss the research methodologies which have been used in this research, the research process discussion is followed.

3.1 Introduction

The goal of this paper is to move towards the configurations for mass customization models. As the objective of this dissertation, reviewing the previous MC classification schemes in the literature was the first step. To go forward, testing whether these MC approaches are feasible for service industry through case studies is the next step. The motivation in this paper is to develop a new approach of interpreting mass customization enterprises in the service industry, thus a theory building method has been taken here. In order to make the modes of MC more practical, a extension mode will be established and discussed. The theory building method is also used in that part.

From Remenyi et al. (1998)'s point of view, theory is 'a scientifically acceptable general principle or a set of principles offered to explain a phenomenon or group of phenomena'. There are four parts that should be covered in the theory building process, definitions, domain, set of relationships and variables, and specific predictions (Wacker 1998).

The methodology of case study is appropriate not only for understanding certain phenomena within a particular context (Yin, 2003), but also for theory building (Eisenhardt 1989; Flynn et al 1990; Voss et al 2002). Hence, the approach of case study is an optimal research method across the whole article. The cases will not only be used for testing the previous mass customization method in service context, but also for new service MC theories building. However, in using case studies research

methodology there exists risks for both testing and building method. If the cases are overly detailed, the theory could have a narrow focus (Eisenhardt 1989).

3.2 Research process

There are three main research processes contained in this dissertation: previous theories discussion, case selection, analysis and construction of models. The whole research process has been describe diagrammatically (Figure 3:1).

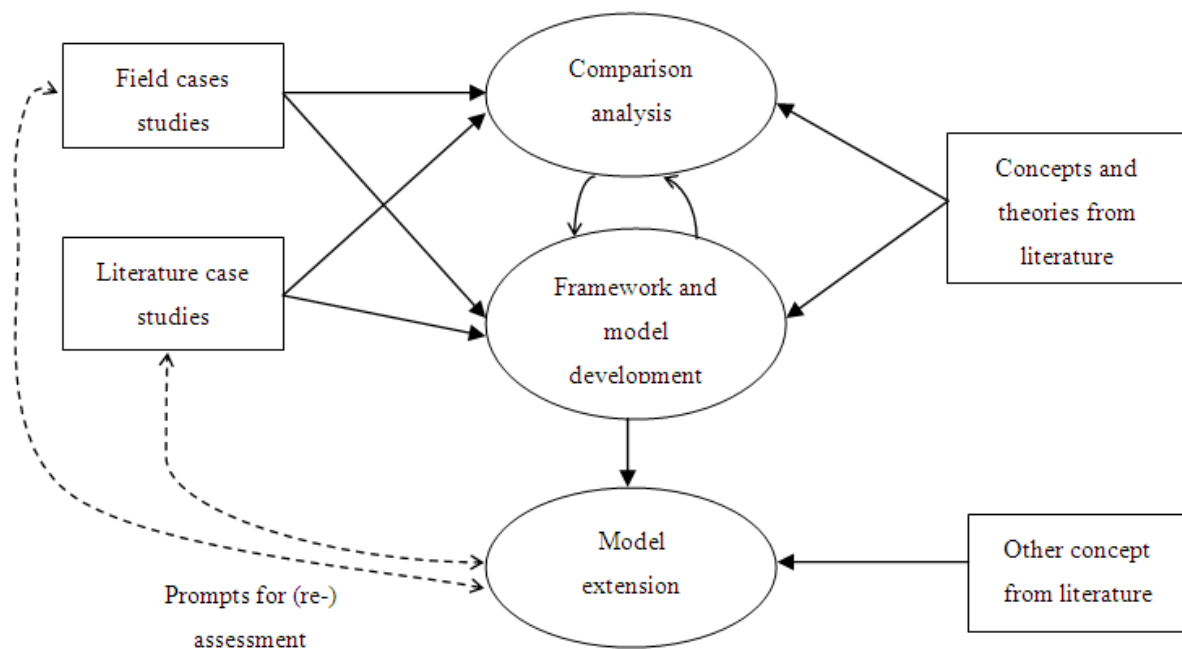


Figure 3:1 Research process

3.2.1 Previous theories discussion

The preparatory work for establishing a new model should be reviewing and discussing the previous theories introduced by other authors in the mass customization research field. From these previous works, we could understand the advantage and disadvantage of these approach and which aspects they focus on. These would be the basis for establishing a new

model. Moreover, most of the approaches related to mass customization focus on manufacturing industry, although some of them are from the value chain perspective, because the unique characteristics of service, the feasibility of those methods for service industry still needs to be tested. The main path for testing the feasibility of these MC approaches is case studies. Thus, in the section of case analysis, the MC approach which is suitable for service industry will be discussed through cases, however, for the infeasible ones, the reasons why those are not good enough for analysis the cases in service industry will be given.

3.2.2 Case selection

As we mentioned above, case studies are the main methodology in the whole research process, so the stage of case selection is very important for this thesis. There are two steps in the case selection process.

Firstly, as we focus on service industry, we need to decide which service industry is more worth to research. In order to cover the main service industry in the market, sample service industries have been selected from both B2B and B2C service sectors (Table 3:1). Five service industries have been chosen. All of them are close to our lives. As the flight catering industry is special, that could be treated from different perspective, if the business happens between catering company and flight company, that would belong to B2B business. However, if the business happens between the flight company and passengers, that could belong to B2C service, for this reason, the flight catering service industry has been discussed separately. In general, the market for B2C service companies will be larger than that for B2B companies, so two B2B service industries and four B2C service industries have been chosen in this paper.

Table 3:1 Case studies selection

	Field case study	Literature case study
Information service		Dow Jones News/Retrieval Mead Data Central
Flight catering (B2B)		Four name-unknown flight catering companies
Flight catering (B2C)	Dragon air	
Travelling service	Better Travel Company Thomas Cook	
Credit card service	NatWest Royal Bank of Scotland Lloyds TSB Garanti Bank Royal and Sun Alliance	
Hospitality	Royal Guest House 2 Hammersmith	Ritz-Carlton Marriott Corporation Regent

Secondly, since the organization structures and segment market of each service firm is different, though they are in the same service industry. In order to cover different sizes of companies, we use multi-cases in each selected service industry. Mostly, for one industry, especially for B2C service industry, the cases have been selected from the companies which provide different levels of services: mass level service and high level service. Moreover, the cases from both field cases studies and literature cases studies are used, however, the major case source is field cases. Considering the complicated situation in service industry, although we have attempted to cover more feasible firm types in each service industry, some types still have not been covered here.

3.2.3 Analyse and construct models

The last phase of research process is to analyse and construct models. The previous concepts of mass customization have been analyzed and tested on the selected cases. This analysis is fundamental for establishing the new service MC framework and MC models. These modes have also

been tested through cases. In order to help the mass customizers who are in the service industry to improve the ability of operations resource management, a developed modularity model for service MC implementation has been built. The modularity concept has been integrated into the framework during this process. Considering the feasible and practical of the extension model, some suggestions and examples have been given to the enterprise for implementation.

Chapter 4: Application of mass customization to case studies

In the service industry, the type of B2B and B2C service sector could be the major service pattern in market. Compared with G2C service and Not-for-profit service, B2B and B2C service are more profitable and general in the current economic environment. Attempting to integrate mass customization strategy in the B2B and B2C service sector first could be understood by the public more easily and attracted more interest of enterprises. Thus, the cases in this paper are focus on B2B and B2C service sectors. Since some service may be related both B2B service and B2C service in one service industry, such as flight catering, that is discussed separately.

4.1 B2B service: information service, flight catering (B2B service)

Information services

Dow Jones News/Retrieval

Dow Jones News/Retrieval is a information supply company. The main business in this company provides on-line access to news wires, business journal articles, The Wall Street Journal and other newspaper articles, financial reports, stock quotes, book and movie reviews, an encyclopaedia, sports and weather reports, and so on. This company is focused on searching all incoming news, using a profile of key categories and topics. Although Dow Jones collected all the news from different field, they provides their customers with only the information they want to see. That could help their customers to save the time for finding useful information (Pine, 1993:177).

Mead Data Central

Mead Data Central is also an information service company like Dow Jones News/Retrieval. However, this company focuses on providing comprehensive electronic databases specifically for the legal (the Lexis

service) and medical (Medis service) communities, as well as one for business and government information (Nexis). Additionally, Mead Data Central also provides electronic clipping service to any of its customers. The company has created and maintained private databases for legal companies, including the text and images of all internal documents (Pine, 1993:177).

Flight catering (B2B service)

The B2B service in flight catering industry is the service which a catering company supply to meals to a flight company. In this type of service, the flight company is the customer of the catering company. From the research of 4 flight catering companies, Chang and Jones (2007b) have mentioned that the flight-catering industry had already adopted some key aspects of modularity as they had modularised service equipment, trays, trolleys and galleys onboard aircraft. Modularity was also evident in the menus across the different classes (economy, first and business classes). From their research of four different flight catering companies, they found that, in all four cases, common food items — such as pasta and lamb — could not only be used for first and business class meals but also for economy class meals. Similarly, fresh fruits or vegetables could also be used as common ingredients for the different classes. Another indication of modularity was exhibited in the special meals provided by the four flight catering companies that included diabetic, low cholesterol and child meals. All these meals could be made up with existing food items based on modified recipes.

4.2 B2C service: flight catering (B2C service), travelling service, credit card, hospitality

Flight catering (B2C service)

In the part of B2C service of flight catering, the flight company has changed the role to supplier and the passenger is the real customer. Flight

companies supply food to their passengers. Most of flight companies supply very limited choices of meal to their customer in the economic class. For first class, the menu maybe a more little varied, but also very limited.

With the customer's requirement level rising, more and more flight companies attempt to varied their menu, however, most of menu improvement have been made for passengers in first class. For example, Dragon air (<http://www.dragonair.com>) has introduced a special crab roe seasonal menu to mark the annual hairy crab season. The new crab dishes are now being served to First Class passengers on outbound flights from Hong Kong to Shanghai and Beijing. The new crab roe menu features popular crab dishes including Crab Roe with Steamed Egg White and Bean Curd, E-fu Noodle in Soup with Crab Roe, Crab Meat and Shrimp, Crab Roe, Crab meat and Fish Maw in Broth, Steamed Crab Roe and Pork Dumpling, and Stuffed Scallop with Prawn Mousse topped with Crab Roe Sauce.

Travelling service

Better Travel Company

Better Travel (<http://tour.4better.co.uk>) is a travel agency in UK, their major customer groups are Chinese students. Recently, they have introduced a new European travel plan for their customers. Travellers would have opportunity to choose not only the city which they prefer to join or leave the travel groups but also how many days they will stay in that travel group; they just need to follow the arrow which showed in the guide map. The travelling expense just depend on the days which the customer in that travel group. That could be a successful approach to integrate mass customization into travel service.

Thomas Cook

Thomas Cook (<http://www.thomascook.com>) supplies different type of package holidays, from city breaks to cruises, from family holiday to ski holiday, bargain holidays to destinations worldwide. In addition, the customers could also find last minute holidays and all inclusive holidays, which you can relax in the knowledge that everything has been taken care of. Moreover, the customer also could choose flight and hotel deals as well as flight only and hotel only deals. Thomas Cook has not only supply the service related to flight and hotel but also car hire, theatre breaks and so on, if customers needed.

Credit card industry

In this service industry, most of banks only offer a limited list of service package of their credit card. Each card contain a certain service package, the customers are not allowed to change the service option in the package. From the name of each type of credit card we could see that the bank only design one or two types of credit card service packages for one certain group of people, such as for students, for the person who wants for saving, and so on. There are some examples in this industry.

NatWest (<http://www.natwest.com>) provide the following types of credit card: Platinum Credit Card, World Credit Card, Classic Credit Card, Student Credit Card, Savings Accelerator Credit Card, Advantage Gold Credit Card. The Royal Bank of Scotland (<http://www.rbs.co.uk>) credit card options: Platinum Credit Card, YourPoint World MasterCard, Classic Credit Card, Savings Accelerator Credit Card, Royalties Gold Credit Card, Student Credit Card. And Lloyds TSB (<http://www.lloydstsb.com>) credit card options: Lloyds TSB Airmiles Duo Credit Card, Platinum Credit Card, Advance Credit Card, Student Credit Card. The tables of comparison of different types of credit cards in each bank are shown in Appendix.

However, the strategy of mass customization has begun to be considered by some banks. Turkey-based Garanti Bank is one of the examples about supplying customized service in credit card industry. Garanti Bank has developed a kind of custom credit card called Flexi Card (<http://www.flexicard.com.tr/>) which does not only allow customers to personalize the image of their own card, but also to develop the entire own banking product.

"Flexi Cards are Visa cards that let the cardholder make a few key decisions, allowing them to set over ten parameters. When applying for a card, customers can manipulate variables like reward rates and types, interest rate and card fee. The rewards system is especially flexible, not only letting customers determine reward ratio and type (cash or points), but also enabling them to choose which payments will earn them extra rewards: whether it are broad categories like restaurants, or specific stores like Zara.

Interest rate, bonus rate and card fees are selected by sliding bars that render various combinations of rates and fees. Card fees, for example, can be pushed back to zero by committing to a monthly spending minimum. A lower interest rate leads to a lower bonus rate, etc. Lastly, after making serious decisions about financial terms, customers can design their own card, choosing from different colours and a gallery of images, or uploading their own image. There's even the option of picking a vertical card, which is a world's first for Visa."

(Taken from Piller, 2006)

A very similar idea has been adopted by an UK company Royal and Sun Alliance in 2002, but their card is based on a MasterCard. They also provided their customers to choose their own APR, cash back, servicing options and annual fee to suit their needs as they change over time (Piller, 2006).

Moreover, there is a Finland- based research about mass customization strategy for online banking. From that research, Santonen (2007) pointed out that investment and credit card related service and content was the most two suitable for customisation, however, the information and services affiliated to home mortgages and insurances gained the least

popularity.

Hospitality

Royal Guest House 2 Hammersmith (<http://www.booking.com>) is a family hotel. They are small but cheap, and they do not have their own website, only could be found through some hotel booking website like www.booking.com. There are many family hotels like this. The services in these hotels are very simple, and the choices for the customer are narrow, but the price is competitive, compared with luxury hotels.

Compared to those family hotel, luxury hotels might more easy to supply the customized service to their guests, because of the advance information system and abundant resource.

“Ritz-Carlton uses software to personalize guests' experience by linking to database filled with quirks and preferences of half a million guests. Any bellhop or desk clerk can find out whether a guest is allergic to feathers, their favourite newspaper, or whether they like extra towels. The company stores guest information in a database and uses it to tailor the service to each guest on his/her next visit. This is a way to transparently customize for those customers who do not want to be bothered with direct collaboration.”
(Connie, et al 2000)

Marriott Corporation is another example of luxury hotel which focuses on supplying a customized hotel experience. There are a number of options available in hotels: non-smoking versus smoking rooms, Corner versus side rooms, king-size versus double beds, different floors, and closeness to fire exits, and amenities such as pools and exercise equipment, concierge service availability, and so on. Marriott also have their information system to record the information of their customers. In each Marriott hotel, they use its Guest Recognition System to achieve mass customizing their standard rooms in the hotel. Because of the remembering system, Marriott can know the preferences of their guests and provide the service, room and amenities as their wanted. All the staff

who will need to interact with guests could familiar with the preference of the customers through that system. In addition, Marriott has created different hotel types for different customers, for instance, Marriott for upscale business and leisure customers, courtyard by Marriott for business travellers on a budget, and Residence Inn by Marriott for patrons on extended stays. Marriott also arrange the specific employees to different type of hotels in order to meet the service requirement of specific customers (Pine, 1993:175).

Not only the luxury hotels, some famous restaurant also integrate customization concept into their business. Regent is a fine dining restaurant in Hong Kong. They supply the personalizing service by printing their customer's name on the paper napkins and matchbox (Connie, et al 2000).

4.3 Case analysis using the previous MC approach

The cases have been described above, and the previous MC approaches also have been discussed in the literature review part. We will analyse each case study under each mass customization scheme.

Lampel and Mintzberg (1996):

From my point of view, the information service industry is practicing a mix of pure customization and customized standardization. That type of service always faces to companies, most of time that belong to B2B service. Since the needs of different companies are different, the firms which in information service industry should totally consider the request of each customer. They should communicate with their customers in advance, and make sure which types of information the customers really want, and then design their service system or the package of service in order to meet the needs of each customer. If the information which the

customer company needed has already been covered by the existing service package, that type of mass customization belong to customized standardization, the information service company only need to configure them, if not, that would be pure customization. Both Dow Jones News/Retrieval and Mead Data Central are the typical examples in this service area.

Flight catering could be viewed from different prospect, one is could be seen as B2B service, that means the catering companies service for the flight companies, the other way it can be defined as B2C service, which the flight company supply meal for their passengers. In the case of B2B service, flight catering is a customized standardization. The flight company could choose the meals from the list supplied by the catering company. The ingredients of the meal have be prepared in advance by the catering company, they just follow the need of different flight companies to assemble them. However, flight catering in B2C service aspect is mix of customized standardization and segmented standardization, that depends on the flight class. In general, the passengers in economy or even business classes could only be serviced using segmented standardization approach. They could only have very limited choice about their meal. However, for the customer in first class, they may have more choice about their meal. They are treated as customized standardization customers. Dragon air is a good example to explain this point. They have introduced a special crab roe seasonal menu to mark the annual hairy crab season, the menu is abundant, but only face to first class passengers.

Travelling service is a complicated service type, it is a mix of segment standardization, customized standardization, tailored customization and pure customization. One of the critical factors affecting the customization strategy is the price. The more the need of customers could be reached,

the higher the price is. For example, the basic service of travel agency could supply a whole plan travel to their customers; the traveller only could choose different travel plans from the list. That is segment standardization strategy. If the customers would like to pay more, they could enjoy customized standardization service.

One of the special service which Better Travel company supplied belongs to this strategy. They have give a map contains which cities or countries they will pass during a certain trip. The customers could decide which cities they would like to join and how many days they prefer to follow that travel group, likely they could assemble the components of the trip. Furthermore, like Thomas Cook, they supply many different travel packages to fit different customers demand pure customization strategy, travel agencies design the all travel issues just for one or a certain group of customer. All the service process and service items are totally customized, however, the price is high and flexible. In the current years, most travel agencies not only focus on their segment market but also expend their business to different level of services, so one company would choose different service strategy for different department. For instance, Thomas Cook supplies various types of service in order to meet the needs of distinct segment markets.

Credit card industry is usually a mix of segmented standardization and customized standardization. This service of credit card could be divided into two parts, one is the foundation of the card, the other could be the design of the card image. Since the card image design is basic on the card, that could belong to product design, so we would not consider this part. In the foundation service part, for most of banks, such as NatWest, Royal Bank of Scotland, they are using segmented standardization strategy. They have already designed the service packages for their customers. One type of credit card cover the certain service package, which the

clients could not allow to change them, so the applier could only have chance to choose their cards from limited choices. However, some banks have innovated their service through adopting customized standardization strategy. If the service choices are treated as components, then, as in customized standardization, a special card is made from standardized components and assembly is customized while fabrication is not and the service package of the credit card is constructed from a central core. Both Garanti bank and Royal and Sum Alliance have already give examples of how they service for their customers when the clients design their service package for their own cards (Table 4:1).

Table 4:1 The comparison between Segmented standardization and customized standardization strategy in credit card

	Segmented standardization	Customized standardization
Service of credit card	Service package (limited choices)	Service components
Examples	NatWest Royal Bank of Scotland Lloyds TSB	Garanti bank (Flexi Cards) Royal and Sum Alliance (MasterCard)

The operations strategy in MC aspect in hospitality industry could be a little similar with that in travel agency. However, they could not reach to pure customization, because their fixed property. Therefore, hospitality industry is a mix of segmented standardization and tailored customization. Which strategy will be taken depends on which customer market the company focuses on. To the mass market, the hospitality always adopts the segmented strategy. For instance, most of family hotels, like Royal Guest House 2 Hammersmith, prefer using segmented strategy. They only allow the customers to choose the type of room, such as single, double or twins room. All the facility and service for the certain room

could be the same. In contrast, some high level hotels prefer using tailored customization strategy to improve their service quality for attracting more customers and establishing their brand reputation. Ritz-Carlton, as well as Residence Inn by Marriott, attempts to tailor the service to each guest in their hotel through special remembering system. The guests who choose those hotels could live in their preference way. Additionally, Regent restaurant in Hong Kong is another typical example to show how tailored customization work in a restaurant. They customize paper napkins and matchbox by printing the customers' name on them. That operation strategy is very similar with printing buyers' name on birthday cake. Table 4:2 identifies the categories for each case study under the MC approach of Lampel and Mintzberg (1996).

Table 4:2 Classification comparison of Lampel and Mintzberg's MC approach

Information service	Flight catering (B2B)	Flight catering (B2C)	Travelling agency	Credit card	Hospitality
Pure customization	customized	segmented	segmented	segmented	segmented
+ customized standardization	standardization	standardization (economy class)	standardization	standardization	standardization
		+ customized standardization (first class)	+customized standardization	+customized standardization	+customized standardization
			+tailored customization		+tailored customization
			+pure customization		

Ross (1996)

From my point of view, in Ross (1996)' mass customization methods, the strategy that information services have taken could belong to core mass customization and high variety push. They attempt to supply a large range of service for the customers to choose. If the customer have addition requirements, they could contact to the company to request.

As we discuss above, flight catering industry is a complicated case to be classified. For B2B service, that could be self-customized and core mass

customization method (Figure 4:1). The catering company supply a list for the flight firms to choose. They could choose any menu they prefer from the limited range. If the flight company is not satisfied with the list, they also could ask for special design. In this case, core mass customization approach has been taken by the catering company. They would attempt to offer special food as the flight company request. For B2C service, from the perspective of the whole meal supply system, mass retail customization method has been taken here (Figure 4:2), the service in economy class and first class could be the same. The only difference is that the menu for first class passages could be much wider than that for economy ones. In the whole mass retail customization system, the flight company plays a role of mass retail customization. They have bought standard meal from catering firms, when they are delivering to passage, they customize the meal for different customers.

Core mass customization or self-customized method

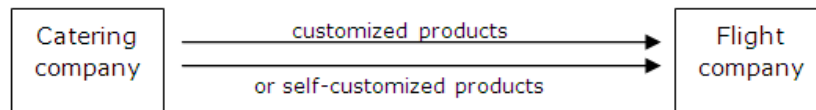


Figure 4:1 B2B flight catering service

Mass retail customization method

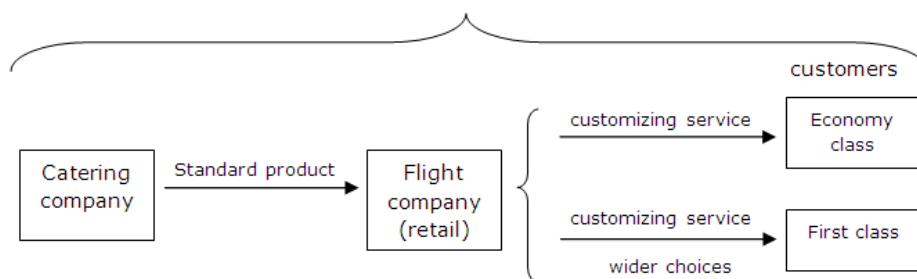


Figure 4:2 B2C flight catering service

As far as the travelling service industry is concerned, self-customized, and

high variety push, core mass customization are the optional approach which suit to different level of travelling service. The basic level could be self-customized service. The traveller could choose their preferred travelling plan from the website of the travelling agency, however, they are not allowed to change the plan, they have to exactly follow the plan. The higher level are high variety push and core mass customization. The firm could follow the customers' needs to design the unique travelling plan for the certain customers.

In general, the Ross' MC approaches which are taken by credit card and hospitality industries are similar. Most of time, they will prefer to adopt self-customized and/or core customization to different level of consumers. Some low level service just supply the customer limited choice, for example, in a hotel, the guest could only choice the types of rooms. Nevertheless, for some high level service, like Ritz-Carlton or Residence Inn by Marriott, they will attempt to meet all the needs of their guests, even using a system to remember the requirements of the customers in order to improve the satisfaction of their guests. The categories for each case study under the MC approach of Ross have been identified in Table 4:3.

Table 4:3 Classification comparison of Ross's MC approach

Information service	Flight catering (B2B)	Flight catering (B2C)	Travelling agency	Credit card	Hospitality
core mass customization	core mass customization	mass retail customization	core mass customization	core mass customization	core mass customization
+ high variety push	+ self-customized		+ high variety push + self-customized	+self-customized	+self-customized

Ross (1996) also has introduced three levels of customization ability. From this point of view, we could classify the above different service

industries into three categories: cosmetic, functional options and core customization. Information service is still core customization. The B2B flight catering service could be functional options, but B2C service is cosmetic in both economy class and first class. The travelling service industry could be the most flexible one. All the three customization ability levels have reflected in this industry, depending on the level of service the traveller would like to choose. The credit cards issued by most of banks are still cosmetic, but the core customized cards have been developed. For the hospitality industry, the low level service always is cosmetic, in which customers have very limited choice with low price. For high level service, although the price will be high, the customers could enjoy the core customization service.

Alford (2000)

It would be a little hard to analyse service industry using this MC approach, because this model was designed for the automotive industry specifically. However, although this approach could not be used to explain the service industry, the concept of the method would contribute to analyse the cases in service industry. According to the process of vertical manufacture, we could simulate the process of service following Alford's model. Both vertical and service need to design in advance, so the first stage is the same. The second phase in automotive industry is manufacturing, but in service could be service validation, that means, following the design plan of the service, the service company should arrange the labour and capacity to fulfil the service they will supply to their customers. The last step for vertical industry is distribution, for service, that is service deliver. The aim of this stage is similar in both automotive industry and service industry, it is delivering the product or service to the customers (Figure 4:3). If we simulate the service process in this way, that would be much easier to analyse service industry through Alford's model.

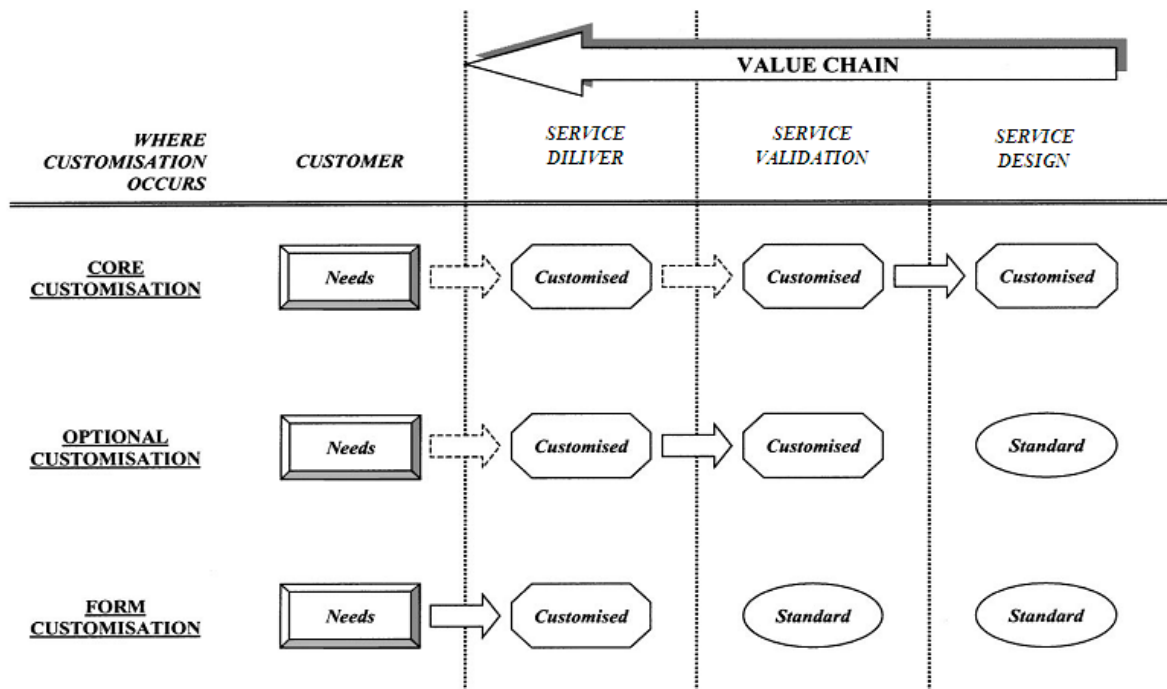


Figure 4:3 Developed automotive customization approach for service industry

According to the developed Alford model for MC in service, we could classify information service into core customization catalogue, as the whole process could be customized. The B2B flight catering could be optional customization, since the flight companies could request the catering firms to supply the meals follow their preference, based on the fixed raw material. However, for B2C flight catering service, the customer could only choose from the limited menu, and the customization only happens in the service deliver phase, so that pattern should be form customization. Since the travel agency service is a complicated operation pattern, it contains various mass customization strategies. In this model, depending on different service levels, all the three strategies have been covered. Credit card service and hospitality service are similar, both of them could be divided into top level service and mass level service. For the mass level service, they always supply the form customization service

to their service, the customized could only allowed in service deliver stage. As there is no evidence that a bank could allow the customer to join the financial service design process, the high level service in credit card industry could be optional customization. Nevertheless, in hospitality industry, such as luxury hotels, they could create new service only for the special guests, so their top level service could belong to core customization strategy. The summary for each case study under Alford's MC approach have been identified in Table 4:4.

Table 4:4 Classification comparison of Alford's MC approach

Information service	Flight catering (B2B)	Flight catering (B2C)	Travelling agency	Credit card	Hospitality
core customization	optional customization	form customization	core customization + optional customization + form customization	optional customization +form customization	core customization + optional customization +form customization

This approach is more detailed than the previous ones, the manufacturing processes have been introduced into the model. The developed MC approach for service industry would supply some basic idea to establish a unique model for service industry in the next chapter.

In the case of Duray et al.'s (2000) method, she has indicated some type of mass customization and integrates the concept of modularity into the MC approach, however, that mode is so general to use in practice, thus, from my point of view, that method is not so useful to analyse the cases in service industry.

For the approach of Da Silveira (2001) et al described, they have already treated the service as a part of mass customization process, so we could not use that approach into service industry. In the terms of the funding

of Zipkin (2001), he only introduced three main elements of mass customization, but no specific mode, so we could not use this to analyse the cases, however, that would contribute to establishing the MC mode for the service industry which we will discuss in the next chapter.

It is also a little hard to use Gilmore and Pine (1997) approach to analyze the service industry. The definition of different strategies in this approach is not so clear to classify the different service industry. The main point of this approach is finding whether the customer is active or passive in prompting the customization. In the service industry, compared with the manufacturing industry, the staff have more chance to communicate with their customers. Most of time, the service process is a process of communication, it is hard to say what extent the customer really know their needs, they could change their mind during the service process. Therefore, in service industry, the customers always active in prompting the customization. Moreover, most of service industry contains different levels of service, such as hotel and travel agency, we could not define the approach which the certain service industry should belong to exactly. In the case of five fundamental method of customization of Pine (1993), he just generally mentioned the approach, some related to service industry, but some not. There is no clear relationship between the five methods, so that could be not suitable to the cases in service industry.

In terms of the MC approach of MacCarthy et al, since the new modes we developed for service industry use that approach as the basis for the new service MC mode, we will discuss the cases later.

Chapter 5: Identification of modes for MC operations in service industry

According to the analysis of the cases and the existing MC approached, we could see that it is useful to establish the MC model from the value chain perspective. Moreover, the MC approach which established by MacCarthy et al (2003) could be one of the comprehensive approach, especially in the operations process perspective. Therefore, we use MacCarthy et al' s MC modes for manufacture as the basis to develop a fundamental modes for mass customization in service industry.

5.1 Fundamental modes for MC in service

As the MacCarthy et al. (2003) have indicated in their mode, the three factors which discussed in that model would also be take into account in the MC service framework.

Temporal relationships

There are three temporal relationships that need to be taken into account. First of all, the service design and validation for both service package or single service (called general) means all the design and validation process are completed before the customer make an order. Secondly, the 'per service package relationship' means the customers will join to the service package design and validation process. The service package would contain many different types of services. Thirdly, the 'per single service situation' means that the service process is designed and validated for the client, but all the process is about a specific type of service.

Fixed or modifiable order fulfilment resources

Both the manufacturing industry and the service industry are restricted by the limited resources. In that situation, the service companies could

choose either to fulfil the order within their present human resources, facilities or they modify them, such as align with other service company or outsourcing or hire some part-time employees, and so on.

Once-only basis or call-off basis

In this service mass customization framework, once-only means the service process is designed only for the specific client and that process might not be used later or to other customers. In the case of call-off basis, that is similar to "Repeat Business Customizer" identified by Amaro et al. (1999). There are two hypotheses contained in the concept of repeat business.

The first is that each order is for a one-off product or one-off buying decision, customization by individual order. The second is that there is customization of the product for a particular customer who makes regular repeated purchases of that product, customization by contract.

(Amaro et al 1999:365)

In addition, as they describe of the concept of "mass merchants" (McDermott and O'Connor, 1995) whose need for product differentiation affect their buying decisions and leads them to make requirement for customized orders, the so call-off approach in the service industry also need to be customized. For instance, the service process or structure could be fixed, but additional special service components should be added in the existing service process.

5.1.1 Identification of modes

The three critical distinguishing factors described by MacCarthy et al. (2003) have been identified with respect to services. We will now use them in the identification and development of fundamental operations modes for mass customization in service industry. The primary modes are identified by linking the three important factors which we discussed above

to a service operations process framework as shown in Figure 5:1. There are six fundamental processes in the mode of MC in service industry.

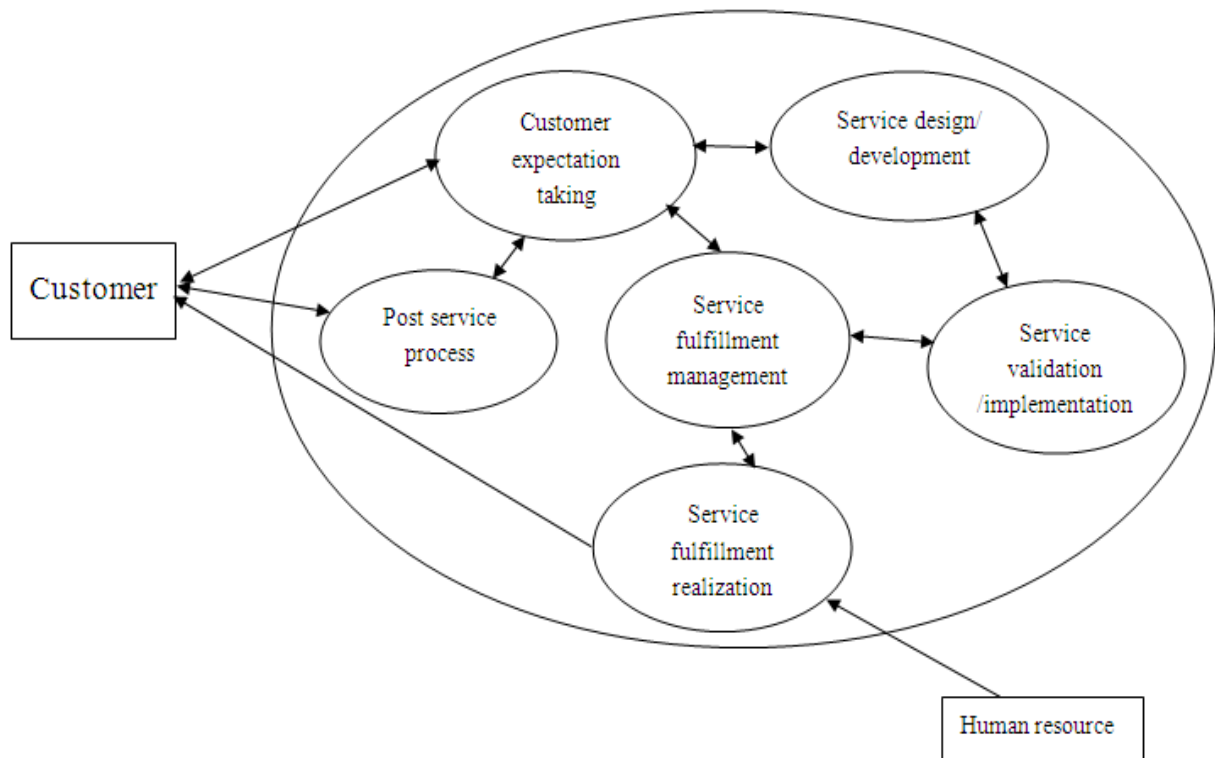


Figure 5:1 Service operations process in an MC system (adapted from MacCarthy et al. 2003)

Customer expectation taking process:

This process will contain having interview with customers, the questionnaires, receiving, collecting, interpreting the needs of customers', coding them for verification by customers, finding the service could satisfy customers and reach their expectation. This process will be similar to the approach of marketing research, the aim of this process is to understand the need and expectation of customers more clearly.

Service process design/ development:

Service process is the essence of the service. The main sales point in service industry is selling an experience. This process integrates the need

of customer into a service design process, considering the external and internal standard into its scope. Whether the service process should be designed for customized service will be decided in this process.

Service process validation /implementation:

This process is for confirming the service process design, and translating the design scheme into a set of working procedures and rules, in order to guarantee the service could be delivered to customer consistently. This process will prescribe how the employees use the procedures and how to interact with other resources such as materials or equipment. Whether the cost will increase or additional capacity will be necessary for customized service will be tested in this process.

Service fulfilment management:

This process manages the human resource, facilities and other input of service process and make sure the service could be delivered to customers. It interacts with service co-ordination process, and information control system, and adding value to the service process. This process also responsible for control the service fulfilment activities. Moreover, in the service industry, human resource is quite like the raw materials in the manufacturing industry, so the qualification and skill of the staff should also be taken into account in this process.

Service fulfilment realization:

This process encompasses the activities implemented in the whole service process, including front office processes, back office processes, the co-ordination between activities. The main issue should be considered is the operations capacity, not only human resource but also facilities.

Post service process:

Those activities are those that always follow the completion of services

process. That process will include collecting the feedback, analysis the feedback and assessment service quality, maintaining the long-term relationship with customers. That process plays a critical role in the whole service operations process. That is not only the end of the current service process, but also the preparation of a new service process. Moreover, maintain the long-term relationship with the existing customer could be one of the significant factor for the success of company.

This operations process model introduced the distinguishing factors which we have identified and described in the earlier analysis. The effect of the principal core process will be identified here. The temporal relationships dictate when the processes are executed relative to each other. The service design and service validation processes could be executed per service package or per single service or in general. The factor of fixed or modifiable resources is mapped onto the service fulfilment realization process. Whether an company customizes a product on a once-only basis or on a call-off basis depends on the temporal relationships and how the operations process are implemented, such as the management methods which used in the service fulfilment management process.

5.1.2 Five modes for MC in service

Although there are three temporal dimensions and two dimensions for the other two factors, making 12 theoretical configurations in total, however, not all of these are feasible. For example, when the temporal dimension is for general (for both per service package and per single service) is feasible, the mode for service group and independent service is the same. Moreover, for the case of prior designed, assuming the service fulfilment resources are fixed, there is no difference between once-off and call-off basis. Five modes A to E have been described below (Figure 5:2) that correspond to the five manufacturing modes identified by MacCarthy et al.(2003).

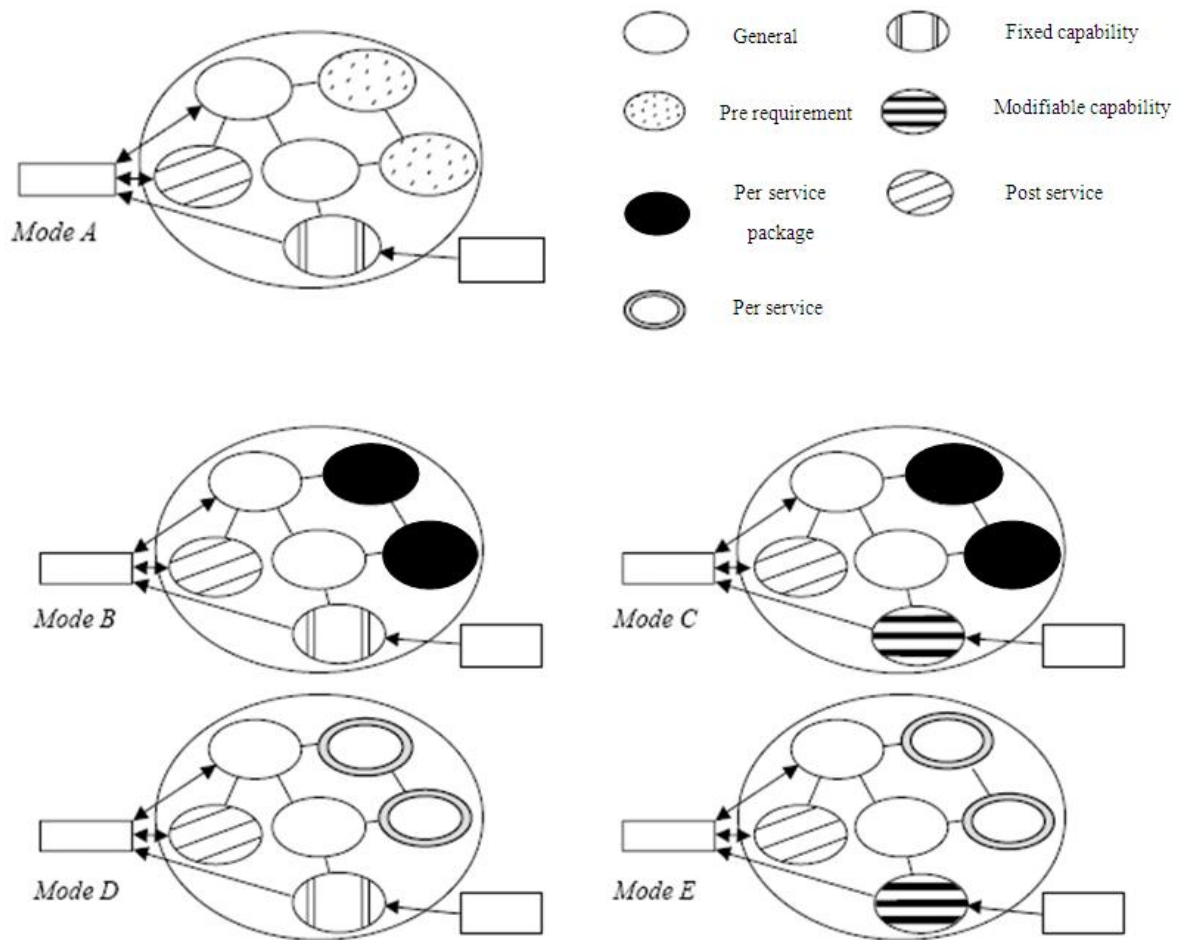


Figure 5:2 Five fundamental MC modes for service industry (adapted from MacCarthy et al. 2003)

Mode A: Catalogue MC:

A customer preferred service is fulfilled from a pre-prepared catalogue of services. The customers could select from a pre-specified range of service. The service process and the choices of the services have already been designed before the customer requested, but the number of choices would be more than the customer could choose. Most of time, that type of service will have some simple product as the evidence of the service, such as a card. That could be easier for the staff in a service company and customer to recognize which group of service being taken. Likewise, the facility and other capacity for the service implementation have been arranged and designed ahead of the service being taken.

Mode B: Fixed resource design for once-only MC

A customer order is fulfilled by designing a specific service scheme, the service is delivered through a standard service process. The customer places one basket of service and there is no expectation of repeat requirement, that means that group of service will not be requested in exactly the same way. Because the service deliver process is standard, and the facilities or operations capacities are fixed, all choice must be suitable for the service process. It is important the service choice design activities are aware of the process capacities.

Mode C: Flexible resource design for once-only MC

A customer order is fulfilled by designing a specific service scheme, the service is delivered through the standard service process. The customer places an order for one kind of service package and there is no expectation of repeat requirements, that means that group of service will not be requested again in exactly the same way. In this mode, service designed for specific customer and the service delivery process may be modified, for example, outsourcing or co-operating with other companies in the same service industry.

Mode D: Fixed resource call-off MC

The customized service process is designed for a customer, and is implemented via a standard delivery process in expectation of repeat requirements. The service could be designed through the standard service process and delivered within the certain facility or operations capacity that means the service delivery activities should be fixed. Moreover, the customer could request the service at any time.

Mode E: Flexible resource call-off MC

This mode is the same as Mode D except that the service deliver activities

could be modifiable. The customized service process is designed for a customer, and to be implemented via a modified deliver process in expectation of repeat requirements. The customer could also request the service at any time.

5.2 Classifying the case studies by mode

For Credit card, Travelling, Hospitality and Flight catering B2C service, these would belong to Catalogue MC service (Mode A). The service design validation process for either the service package or the single service have been designed in advance. For example, the banks supply the certain financial service or service package for the customers to choose, such as NatWest, Royal Bank of Scotland, Lloyds TSB. Although some banks, such as Garanti Bank, Royal and Sun Alliance, allowed the customers to design their service package for their credit card, the service components for chosen are still fixed. Most travel agencies, like Better Travel Company, give the list of travelling schedule and place for travellers. Mass hotel (Royal Guest House 2 Hammersmith) only supply the certain type of room or service for choose and the restaurant only provide a certain menu. In the case of flight catering B2C service, the meal menu for both economy class and first class is fixed. The passengers could only choose their meal from the provided menu. Moreover, their service fulfilment resources are matched to the service choice which they have already designed, hence they are fixed and there is no difference between on once-only basis and call-off basis.

In the terms of information service, such as Dow Jones News/Retrieval, Mead Data Central, most of clients will request a service package which contained a basket of information which they needed. As the service package which designed for each company will be unique, the same package will not be expected to repeat in future. Similarly, some service package provided by the travelling agency (Thomas Cook, Better Travel

Company) is designed for a certain group of people or some special client. Those travelling service packages have never been expected to be repeated. Additionally, the services agency in both the information services and travelling service industries could modify their resource through outsourcing or rearranging the service component to meet different requirements from their clients. Therefore, they belong to Flexible resource design for once-only MC (Mode C).

Some of firms (Ritz-Carlton, Marriott Corporation) in hospitality industry and most of flight catering (B2B) service companies both the design and validate the customized service process on a single service by single service basis, ahead of it being delivered. Both take on a customized service in anticipation of repeat the requirements. They differ in whether they modify their service fulfilment resources for a customized service. Because of the constrains of the property, the firms in hospitality industry have the fixed resources (Mode D), whereas the flight catering (B2B) companies are prepared to modify and extend their service fulfilment resources by taking on new food suppliers or adding new meal menu (Mode E). The names and descriptions of the five MC modes are shown diagrammatically in Table 5:1.

Table 5:1 Mode summary

	A	B	C	D	E
	Catalogue MC	Fixed resource design for once-only MC	Flexible resource design for once-only MC	Fixed resource call-off MC	Flexible resource call-off MC
Service design	General	Per service package	Per service package	Per service	Per service
Service validation/ implementation	General	Per service package	Per service package	Per service	Per service
Once-off/ call-off	-----	Once-off	Once-off	Call-off	Call-off
Fixed/modifiable deliver fulfilment resources	Fixed	Fixed	Modifiable	Fixed	Modifiable
Classification of case studies	Credit card, Travelling, Hospitality Flight catering (B2C)		Information service, Travelling	Hospitality	Flight catering (B2B)

5.3 Discussion

Although the customers have been treated fairly, because of the heterogeneity of service, they might have different feelings of satisfaction. Adopting customization strategy to the service industry, to some extent, could allow service providers the ability to follow the customers' expectation more closely. That could be one effective approach to improve the satisfaction of the customers. We have established a service operations process framework and five modes for mass customization for service industry, then, we will discuss the usage, advantages and

limitations of those modes.

5.3.1 Service operations process framework

In the framework we have added the customer expectation taking and post service process into it. In the previous MC methods, those two processes have rarely been mentioned; however, those would play significant roles in the mass customization approach in service industry. In the first place, as we have mentioned above, one of the nature of service is customer participation in the service process, from my point of view, that could be one of the main reasons why collecting the feedback from customers is important in the service process, and especially in the MC mode of the service industry. In the second place, Piller et al. (2004) have emphasized that learning from their customers is a way for mass customizers to gain a competitive advantage (Pine, Peppers and Rogers, 1995; Peppers and Rogers, 1997). Therefore, customer expectations are extremely important in the MC implementation process, especially for service industry.

Moreover, the service fulfilment management process is pretty new. Although that process will not be so related to the three important factors as the service design and validation process, taken once-only basis or call-off basis will link to this process.

In the case of human resource, Peters and Saidin (2000) have indicated that the human factor plays a vital role in the success of MC, especially in the services context, since the skills and knowledge of the employees will influence the implementation of MC significantly. The importance of human resource in service industry is quite similar with raw material for manufacturing industry, so in this MC model for service we have seen human resource as income of the service fulfilment realization process.

5.3.2 Five mode for MC in service

These modes have integrated the service operations process into the mass customization content and pave a path towards understanding the issues including why the firms evolve into one mode rather than another and how the fundamental factors or processes within the managers have to change when it is moved between modes.

In general, it is expected that the service mass customizer will implement at least one of the five modes. However, because of the various and complications in the service industry, a company can operate in more than one mode, even in regard to the same type of service industry. For example, a travelling agency, like Better Travel Company or Thomas Cook, only have business in one service industry but it operates in Mode A (Catalogue MC) for mass customers and in Mode E (Flexible resource design for once-only MC) for the special customers who have the unique requirement and prefer to pay extra fee. Furthermore, the fact is that it is very common that one service industry covers more than one mass customization mode, as the level of service or the level of requirement is different. In most of cases, the different companies in the same service industry will choose different MC mode, because their segment market is different. However, although the MC mode will be taken by different firms who in the same service industry, the range of choice are very limited, so we could still use the mode to classify the different service industry. For example, most hotels, like Royal Guest House 2 Hammersmith, which face to mass market, so they take Catalogue MC (Mode A) for reduce cost. In contrast, the luxury hotels, such as Ritz-Carlton, Marriott Corporation, would try their best to meet their guest's need, so they would use Fixed resource call-off MC (Mode D). This demonstrates the feasibility of multi-modal operations both in a company and in one type of service industry.

These five modes could be interpreted from the viewpoint of service levels. In Mode A, to be a mass customizer an enterprise should prepare a pre-designed service range, and service fulfilment system and the capability of delivering the service in advance. Compared with other MC modes, that type of service MC mode would be easier to achieve and the operations cost is low, however, the degree of customization would be limited. Most of cases, the companies which take this mass customization mode serve to mass market. For instance, all the Credit card, Travelling (normal level), Hospitality (mass hotel) Flight catering (B2C) industry are in this situation. Modes D and E can be interpreted as designed for medium level of service. Most of firms which take these MC modes are focus on the segment market. For example, most of the luxury hotels only focus on the upscale business and leisure customers. The flight catering companies only sever some certain flight companies. Modes B and C could be describe as an ideal approach of customization. To some extent, these two modes could achieve providing the service, anytime, anywhere, any they want it. However, in the service industry, these two modes only happen in special market and have not been adopted by most service industries. The summary of the market focus of the five MC service modes are show in Figure 5:3.

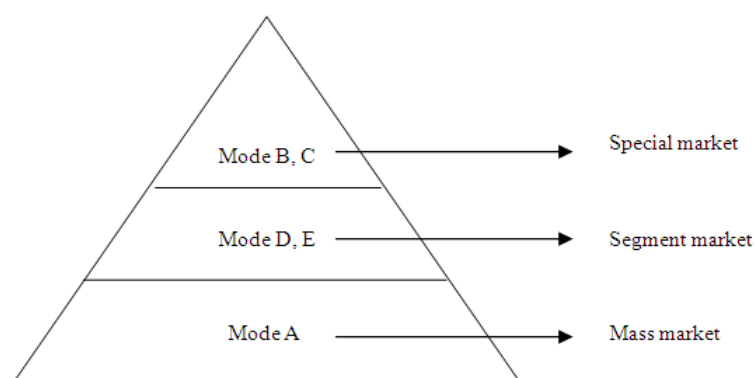


Figure 5:3 The focus market of five MC service modes

The main limitation of these modes is that the service industry could not be classified clearly. According to the goods-service continuum which introduced by Barnes (2008) shown in Figure 5:4, the number of pure services is very limited. Most of time, goods and service have been mixed. Although we have attempted to separate the parts which related to product, such as the credit card image design has not been considered as the service for credit card service industry, in some service industry we cannot separate the product part, such as flight catering industry.



Figure 5:4 The goods-service continuum

(Barnes, 2008:9)

Chapter 6: Integrate modularity into the new MC model in service industry

The operations processes in the service industry have been identified, and the five modes for mass customization in service have also been established based on the MC modes developed by MacCarthy et al.(2003). However, how to modify the resource and whether the fixed resource could be changed to modifiable resource could be one of the main issues existing in the MC modes practice process. In this chapter, we will integrate the modularity into the new MC modes in service industry and attempt to give the recommendations about how it works in practice.

6.1 Fundamental modularity mode of MC in service

Because of the simultaneity and perishability nature of service, full utilization of service capacity is a main challenge for service companies. How to solve this problem has become an important issue which considered by the managers in the service industries. From my point of view, modularity strategy could be one of the optional approach to relieve this problem. In the manufacturing industry, the ability of the companies for meeting customers' needs could be improved by modularity (Mukhopadhyay and Setoputro, 2005). Similarly, in the service context, modularity also be required to enable the use of core capabilities of a service producer (Pekkarinen and Ulkuniemi, 2008). Thus, integrating the modularity approach into the mass customization modes in service industry could not only benefit to the service companies to implement the MC modes better but also verify the channels to obtain operations resources and fully utilise the current service capacity.

According to Ulrich and Tung's typology, there are six feasible modularity

types could be selected. Although these option modularity types are designed for manufacturing industry, to some extent, most of them are still suitable for the service industry simultaneously. Thus, we attempt to integrate the six modularity into the service MC model and expect these ideas could bring some revelation to the mass customizer who is in service industries. The expanded service MC mode has been shown in Figure 6:1.

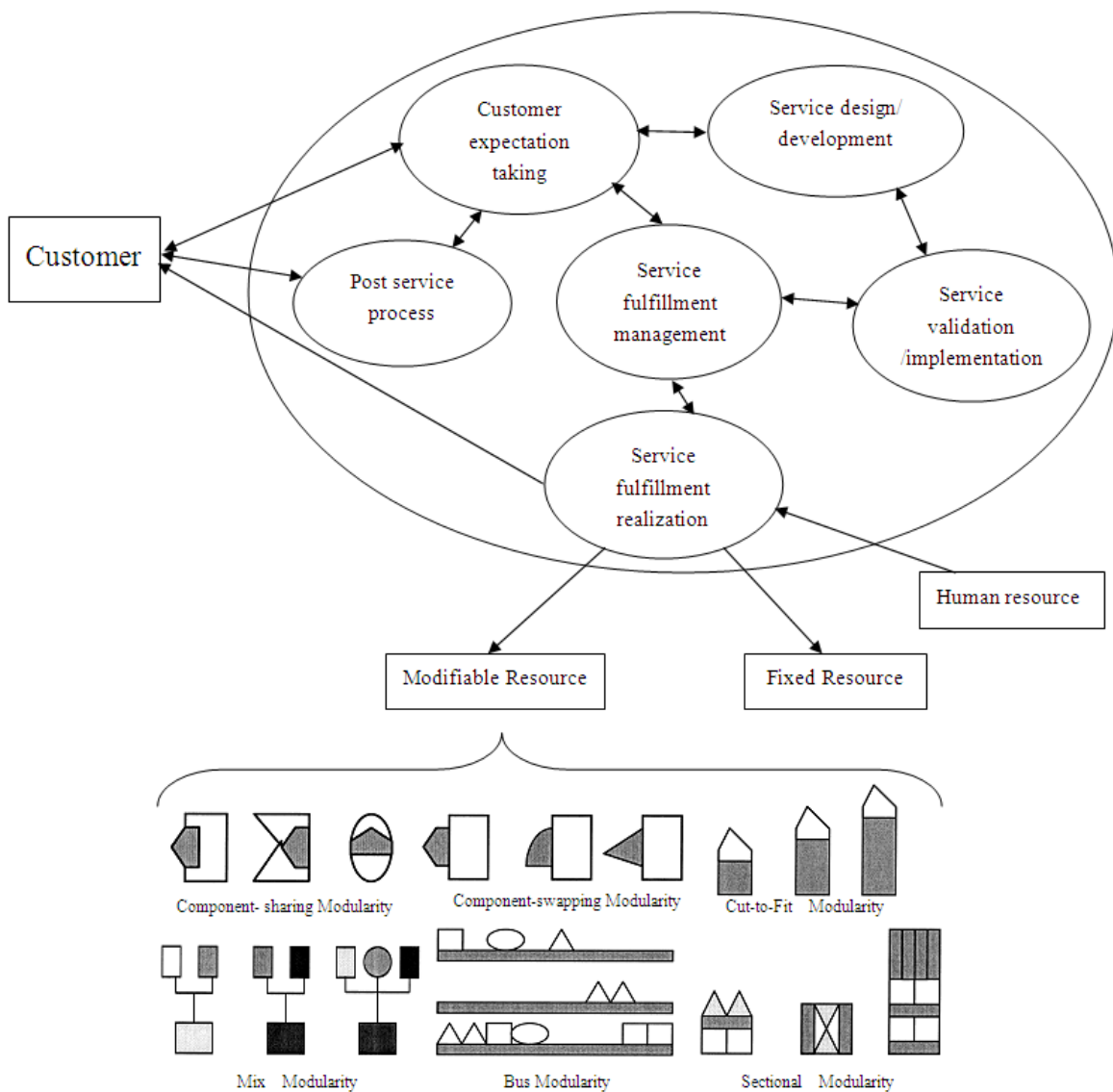


Figure 6:1 service extension MC model (adapted from MacCarthy et al (2003) and Ulrich and Tung (1991))

6.2 Modularity mode of MC in service in practice

In the manufacturing industry, modularity means that a final product is assembled from separate, independent modules or components (Sanchez and Mahoney, 1996). Similarly, the service could also be divided into separate, independent components. For example, in a travel agency, each service items could be treated as service components, such as hotel booking, renting car. Through the sectional modularity approach, each service items could be selected from a list of options and then arranged those in a unique pattern as the customer requested. Thomas Cook could one of the examples of how it works. In addition, bus modularity could also be used in the travelling industry. For example, in a tourist group, all the traveller will have a same tourist plan, however, on the travelling road, the guide of the group will attempt to meet some special requirements of their customers, such as adding the service item of watching local special perform.

All we have discussed above is regarding the use the internal modularity of a certain organization, whether modularity approach is feasible between different companies in one service industry will be discussed. From my point of view, the different companies could alliance with each other and put all the service components together and then adopt the modularity approaches, in order to meet their requirements of their customers (Figure 6:2). That could be an effective way to variety the list of selection and full use the internal and external resource, as the service will be produce and consume at the same time and cannot be stored. Alliance could not only benefit for the independence company to 'borrow' the facility from other company, but also in favour of variety the option of service components in order to achieve the strategy of mass customization. For example, in the peak time, if the hotel has already full, they could arrange the customers to their partner hotels. Through that

approach, the fixed internal resource in one hotel could change to modifiable resource in the whole hotel alliance. In the terms of information industry, when the request of the client has excess the service range of one company, they could ask their partner company to provide the extra information service. The component-swapping modularity has also been exemplified in that case. The service which provided by the partner company could be seen as the list of options, and the service supplied by the original company is the base service package.

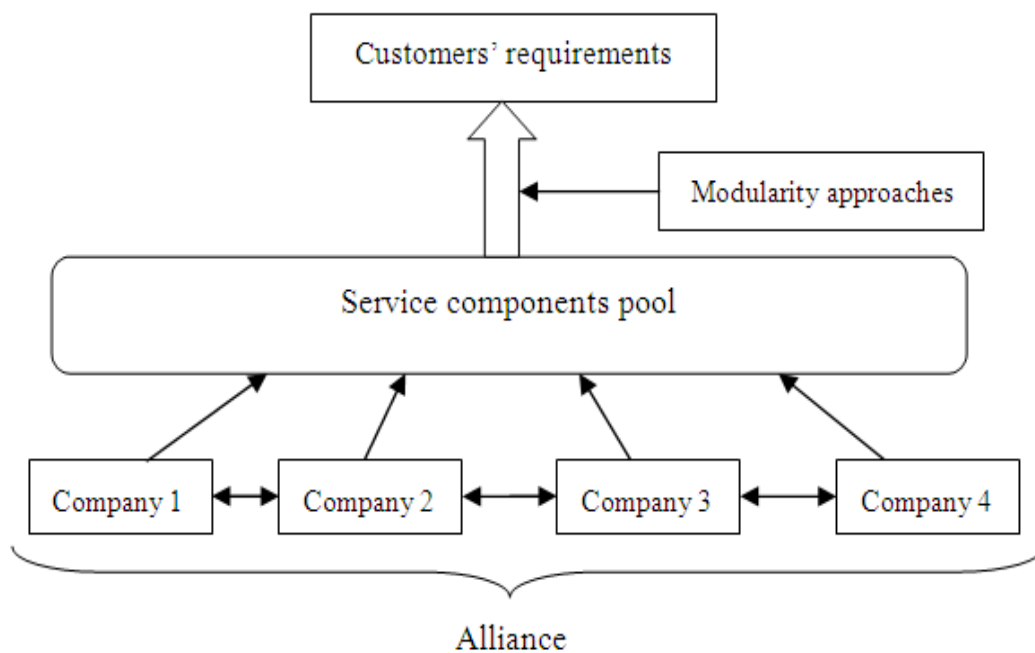


Figure 6:2 multi-companies modular service conceptual model

Furthermore, since the reputation of service company is very important, when the service company has decided to alliance, they should choose a company which face to the same level customer and have a good image. That could be and significant issue need to be concerned by the company before alliance.

Although the analysis above could not cover all the aspects of the usage

of modularity approaches in both internal and external organizational structure, to some extent, these cases and suggestions could bring some enlighten to the enterprises who adopting the mass customization modes in service industry.

Chapter 7: Conclusion

7.1 Summary and Contribution

We have reviewed the existing literature which related to the frameworks and models of mass customization, and found most of them are so general to be practical, and few of them designed for the service industry specially, so in this study, the mass customization service framework has been established. That framework was built from the value chain perspective, although many MC frameworks had been established from this aspect, limited of them covered the all operations process, especially in the service industry. In this dissertation, the processes of customer expectation taking, service fulfilment management, and post service process have been added in the whole service operations process and three critical factors have been taken into account based on the approach of MacCarthy et al. (2003). The first factor is temporal relationships between activities which have been highlighted by MacCarthy et al. (2003). There are three temporal relationships: design and validation per single service and/or service package (called general), per single service situation when the customer is involved in each service fulfil process, per service package relationships in design and validation process. The second factor is whether the operation resource used in service fulfilment are fixed or modified. The third one is whether the service is delivered on a once-only basis or a call-off basis.

Corresponding to the product case described by MacCarthy et al. (2003), a service operations process framework and five mass customization implementation models have been established. The three main factors have also been integrated into the five modes. The five modes corresponding to the product case are: Catalogue MC, Fixed resource design for once-only MC, Flexible resource design for once-only MC, Fix

resource call-off MC, Flexible resource call-off MC, which suitable for different types of companies. The enterprise could choose the optimal approach for their own firms. However, from the case studies, we have found that in one certain service industry, or even in one company, two different MC models could be adopted for different segment markets, so mixed the modes as the operations strategy could be an option for the mass customizers who focus on multi-segment market.

As how to fully use the operations resource in service industry is the main problem for the managers of service firms, likewise both the service operation process framework and MC models are designed for the service industry, and fix or modify operations resource is the main factor in both of approaches, so the other objective of this dissertation is attempting to solve the problem about operations resource management. In order to achieve that modularity approach has been introduced and integrated into our framework. According to the service extension MC model, the suggestions about how to implement modularity approaches inside one organization and within the company alliance will be given. The enterprise could receive some revelation from these recommendations. As the investigation of modularity in service industry is scarcer (Meyer and de Tore, 1999, 2000; Homann et al., 2004), introduces the concept of modularity into service field, especially to the service mass customization section could be another main contribution of this paper.

7.2 Limitations

There could be three limitations in this paper. Firstly, the main methodology is case studies, that may exists risks for testing and building the framework, the cases which been chosen may over detailed, to some extent, the theory may have the risk of narrow focus. Moreover, the cases cannot cover all situations in one service industry, some special issue may not be mentioned in this paper.

Secondly, according to the goods-service continuum which introduced by Barnes (2008), the number of pure services is very limited. Most of time, goods and service have been mixed. Although we have attempted to separate the parts which related to product, in some service industry we cannot separate the product part, such as flight catering industry. Therefore some of service industries which have been discussed in this paper are not pure service industries.

Thirdly, as integrating modularity into the service mass customization framework is only an image, so the number of examples to explain how it work in the real business environment could be limited, not all the six modularity approaches have been discussed through practical examples.

7.3 Further research

In this thesis, only four service industries have been discussed, other services are expected to be discussed through the MC framework and models, some new finding would be explored, as different service industries have their own characteristics. Moreover, how to utilize the modularity approaches in mass customization field is another issue could be researched. Furthermore, performance criteria and the fulfilling technologies of the five service MC modes are critical fields to be explored.

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Appendix

The compare of the credit cards in Natwest Bank

	Classic »	Platinum »	YourPoints World »
			
Features and benefits	Find out more Apply online »	Find out more Apply online »	Find out more Apply online »
Great if you...	...need a low rate on purchases for nine months	...want to transfer a balance from another card	...want to be rewarded for your everyday spend
Available to	customers who have a NatWest current account	customers who have a NatWest current account or who bank elsewhere	customers who have a NatWest current account
i Introductory balance transfer offer		✓ 0% on balance transfers for 16 months (2.9% fee, min £5)	
i Introductory reduced interest on purchases	✓ 4.9% for 9 months Typical 19.9% APR	✓ 0% for 3 months Typical 16.9% APR	✓ 0% for 6 months Typical 16.9% APR
i Earn rewards			✓
i No annual fee	✓	✓	✓
i Apply online	✓	✓	✓
i Manage account online	✓	✓	✓
i Best Price			✓
i Ticket cancellation insurance			✓
i Theft of Handbag or wallet insurance			✓
i Travel Pass			✓


<http://www.natwest.com/personal/credit-cards.ashx>

The compare of the credit cards in The Royal Bank of Scotland Bank

	► Classic	► Platinum	► YourPoints World
			
Features and benefits	Find out more Apply online ►	Find out more Apply online ►	Find out more Apply online ►
Available to	Customers who have a RBS current account	Customers who have a RBS current account or who bank elsewhere	Customers who have a RBS current account
Great if you...	...need a low rate on purchases for nine months	...want to transfer a balance from another card	...want to be rewarded for your everyday spend
i Introductory balance transfer offer		✓ 0% on balance transfers for 16 months (2.9% fee, min £5)	
i Introductory reduced interest on purchases	✓ 4.9% for 9 months Typical 19.9% APR	✓ 0% for 3 months Typical 16.9% APR	✓ 0% for 6 months Typical 16.9% APR
i Earn rewards			✓
i No annual fee	✓	✓	✓
i Apply online	✓	✓	✓
i Manage account online	✓	✓	✓
i Best Price			✓
i Ticket Cancellation Insurance			✓
i Theft of Handbag and Wallet Insurance			✓
i Travel Pass			✓

<http://www.rbs.co.uk/personal/credit-cards/g1/compare-credit-cards.ashx>

The compare of the credit cards in Lloyds TSB Bank

Card	Airmiles Duo	Platinum MasterCard	Advance MasterCard
			
APR	15.9% APR Typical variable	15.9% APR Typical variable	11.9% APR Typical variable
Why choose this card?	Collect Airmiles on your everyday spending ^A for free flights, hotels, days out and much more	Ideal for sorting your finances with a great balance transfer and purchase offer	Perfect for shopping with a great purchase offer and low APR
Introductory purchase offer	None	0% interest for 3 months	0% interest for 6 months
Interest-free days	Up to 56 days interest-free period on purchases	Up to 56 days interest-free period on purchases	N/A
Introductory balance transfer	0% interest for 6 months ^{**}	0% interest for 12 months [*]	4.9% p.a. interest for 12 months ^{**}
Balance transfer minimum spend	£100 spend in the first 3 months	£100 spend in the first 3 months	£100 spend in the first 3 months
Balance transfer fees	3%	3%	3%
Rewards	1 mile for every £10 spent on Amex or £50 spent on MasterCard ^A 150 miles for every £1000 balance transferred ^{**}	None	None

http://www.lloydstsb.com/credit_cards/compare_credit_cards.asp