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Knowledge management capability, customer relationship management, and service quality

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Abstract

Purpose – Firms survive by exploiting knowledge resources to maintain customer relationships more efficiently and effectively, as well as enhance their service quality. However, whether an enterprise can effectively utilize knowledge resources determines the effectiveness of knowledge management capability (KMC). Hence, the purpose of this paper is to investigate the relationship among KMC, customer relationship management (CRM), and service quality.

Design/methodology/approach – In order to explore on KMC, CRM, and service quality, the questionnaire and partial least square (PLS) techniques were used.

Findings – The results indicate that KMC has a positive influence on CRM and service quality; and further, that CRM has a positive influence on service quality. This result also reveals constructive suggestions that allow firms to strengthen their KMC and CRM, as well as enhance their service quality.

Research limitations/implications – This research applied a purposive sampling method and obtained a slightly inadequate number of respondents. Therefore, it is suggested that future research should apply a random sampling method to collect more responses and increase the generalizability of the findings.

Practical implications – This research aims to investigate KMC, CRM, and service quality, as well as establish and verify the patterns of the aforementioned relationships based on how enterprises implement their KMC and CRM to enhance service quality.

Originality/value – Although the critical factors for enhancing service quality have been identified in previous studies, few have specifically explored KMC despite the fact that it has a dramatic impact on service quality. To fill this knowledge gap, the present study employed a questionnaire and PLS techniques to explore the relationship among KMC, CRM, and service quality. Comprehending the essentials for enhancing service quality can provide useful management insights into developing effective strategies that allow enterprises to retain customers.

Keywords Service quality, Knowledge management capability, Customer relationship management
Paper type Research paper

1. Introduction

Consumers now have easy access to information on the internet and are well connected by means of technology, they can easily compare prices through the internet and hence non-price advantages, such as service quality, have become much more significant as a means of attracting and retaining customers (Ueltschy *et al.*, 2009). Moreover, when a customer has an enjoyable experience, this service experience will transform into a new service expectation, and so the next experience will be compared to the previous one. Thus, enterprises should incessantly surpass customer expectations in order to provide satisfying services and enhance service quality (Fang and Tsai, 2005).

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Since firms are increasingly dependent on the relationships they have with their customers, the development of a strong customer relationship has become key issues for business managers (Cheng *et al.*, 2008). Therefore, enterprises should deepen their knowledge regarding the customers and seize every opportunity of interacting with their customers to acquire customer knowledge and enrich customer knowledge database in order to utilize and reassemble customer knowledge that will create new values (Sheth *et al.*, 2000). Moreover, it is important for corporations to possess the capability of identifying and deciding which method to use for integrating diverse new knowledge from internal and external environments in order to develop new products and services for customers (Kodama, 2007).

Given the importance of service quality in retaining customers, it is critical for firms to understand what factors contribute to service quality. Moreover, firms have to perform better in their knowledge processing in order to acquire the knowledge needed to offer subsequent services that can best satisfy customers (Bull, 2010). While a vast amount of service quality literature exists, little empirical work has been done to explore knowledge management capability (KMC) and customer relationship management (CRM) in firms. To fill this gap, the objective of this study was to investigate the impact of KMC and CRM on service quality. Comprehending the essentials for enhancing service quality can provide useful management insights into developing effective strategies that allow enterprises to retain customers.

2. Theoretical background

2.1 KMC

Knowledge is a valuable, rare, inimitable, and non-substitutable resource (Barney, 1991; Peteraf and Barney, 2003). Knowledge management as an organizational capability that allows the integration of people, technologies, processes and strategy within the firm to create, use and share knowledge (Martelo *et al.*, 2013). Furthermore, the essence of knowledge management is to develop a KMC that aligns firms' knowledge resources with the needs of the changing market (Chen and Fong, 2015). Gold *et al.* (2001) reported that KMC as the processes that a firm requires in order to develop and use its knowledge. It includes the organizational capabilities of knowledge acquisition, conversion, application, and protection. Knowledge acquisition is an ability of firms to acquire, seek, generate, create, capture, and collaborate knowledge; knowledge conversion is an ability of firms to organize, integrate, combine, structure, coordinate, or distribute knowledge; knowledge application is an ability of firms to be able to actually use the existing knowledge to help companies improve their efficiency and effectiveness; knowledge protection is an ability of firms to protect their knowledge from illegal or inappropriate use or theft. Miranda *et al.* (2011) asserted that KMC refers to how an organization accumulates critical knowledge resources and how it manages their assimilation and exploitation. Understanding a firm's KMC is important to efficiently deploy its resources and grow its value. The KMC thus can be organized by a firm to sustain superior performance in a dynamic environment (Lewin *et al.*, 2011).

Tanriverdi (2005) investigated the influence of KMC on the corporate performance of multi-business-unit corporations and divided KMC into product, customer, and managerial KMC. Tanriverdi further described knowledge creation, transfer, integration, and leverage as the four main dimensions to measure the influence of three kinds of KMC on corporate performance. Aujirapongpan *et al.* (2010) explained corporate KMC based on the perspectives of resource-based and knowledge-based capabilities. Resource-based capability refers to different factors of resources for

investigating KMC and an assumption that possessing different resources will result in different KMC and influence the infrastructure of KMC, including technology, organizational structure and culture. Furthermore, the knowledge-based capability perspective particularly emphasizes intangible assets, knowledge management processes, and managing different kinds of knowledge. Aspects that influence KMC based on the knowledge-based perspective are expertise, learning, and information capabilities. On the other hand, Miranda *et al.* (2011) proposed a KMC concept from the perspectives of accumulating specific stocks (i.e. human resources, technology infrastructure, and strategic templates) and planning three key flows or processes (i.e. institutionalization, internal and external learning processes). Furthermore, they found that the stocks and flows dimensions of KMC had a strong direct effect on return on assets. Tseng (2011) further stated that KMC consisted of knowledge capture, documentation, and sharing within an organization or a project team. KMC has evolved into a business process that is supported by database technologies and activities to create and share knowledge. Liu and Deng (2015) investigated trends in the dimensions of low, medium, and high KMC of business process outsourcing firms and found that firms with high KMC significantly differ from those with low and medium KMC. They further stated that developing knowledge application capability should be the priority in managing business process outsourcing. As a result, superior KMC has become a core competence source to survive extreme market competition.

2.2 CRM

CRM is a way to manage customer knowledge so that a company can understand and serve customers better (Beijerse, 1999). Customer knowledge is an important asset for a company as it allows its business to provide quick response toward customer needs, as well as to adapt to the dynamic markets (Shi and Yip, 2007). du Plessis and Boon (2004) stated that CRM is about understanding, anticipating, and managing customer needs in order to build and manage customer relationships that will help the enterprise to retrieve useful knowledge from the customer that will enhance its organizational effectiveness and efficiency, all of which will enhance profitability. Kamakura *et al.* (2005) classified CRM into analytical and behavioral CRM. Analytical CRM refers to how an enterprise extracts and analyzes valuable knowledge through interactions with the customers. Meanwhile, this information is to be developed into customized strategies to enhance customer loyalty and raise switching costs in order to obtain sustainable corporate advantage. On the other hand, behavioral CRM refers to the integration among connection channels with its customers that include such things as stores, the internet, customer service, and so on, for which customer purchase and service records are documented to help enterprises understand customers' purchase behavior. Based on the marketing perspective, CRM is to identify and focus on the best customers in accordance to frequency and monetary scoring, which will help identify clear goals and quantifiable objectives for the marketing campaigns (Eid, 2007). As such, the CRM system is a means of innovative technology to facilitate the process of acquiring, developing, and maintaining customer relationships in more efficient and effective ways (Hung *et al.*, 2010).

Siriprasoetsin *et al.* (2011) defined that CRM as a concept based on the philosophy of combining customers and marketing for relationship building. It is a communication process between customers and an organization's services in order to attract and maintain those customers who will be the organization's true customers. Further, it aims to improve the relationship between companies and their customers by managing

all customer-related activities, such as marketing, sales, service and support in order to identify and retain the most profitable customers and improve the profitability of less profitable customers (Ryals *et al.*, 2000; Wang, 2012). Thus, if a company successfully maintains enthusiasm, participation and interaction with its customers, as well as continuously integrates sales, marketing, and customer care, then it is possible to enhance customer loyalty and expand customer lifetime value (Chalmeta, 2006; Ozgener and Iraz, 2006). This means that customers do not only deliver profits from the transactions they have made, but more importantly is the overall profit that they bring during the whole period when the firm is having a relationship with them (Ekinci *et al.*, 2014).

Due to the fact that customer demands are dynamic, continuous improvements to CRM systems should be a priority to provide customers with satisfying products and services so that companies can maintain customer retention (Birch *et al.*, 1999). Additionally, it has also been found that companies can understand customer behavior through customer lifecycles, which can then lead to customized products and services based on customer demands in order to attract, develop, maintain, and retain customers (Alexandra, 2003).

2.3 Service quality

Services are intangible and can only be experienced by customers; however, the production of a service occurs simultaneously and in the same location as its consumption (Fonseca, 2009). Service quality is the degree to which a service is fulfilled, and it refers to the results of the comparison between a customer's expectations and their perceptions of the service after it has been delivered (Crosby, 1979; Grönroos, 1984; Levitt, 1972). Etzel *et al.* (2001) stated that service quality is measured by customers based on a comparison between their real experiences and their expectations toward the service. Customer expectations toward the service standard will be influenced by their own requirements, previous experience and public reputation. In this context, it can be concluded that customer satisfaction depends on the customers' expectations and how they perceive the service quality that they actually receive. When the real experiences are better than the customer's expectations, the perception of the service quality will obviously be higher, and vice versa. Simultaneously, the higher the service quality, the more new and existing customers could be attracted and retained, and even lure customers away from competitors (Babakus *et al.*, 2004; Petruzzellis *et al.*, 2006). Therefore, service quality is crucial for attracting new customers and, more significantly, retaining existing ones (Li *et al.*, 2006). This issue has been one of the most discussed matters in marketing literature, and is seen as a vital element in management strategies to achieve success or survive in a competitive environment (Martínez and Martínez, 2007). Many firms have, therefore, decided to improve service quality in order to differentiate their services from those of other companies, and have utilized various tools to evaluate service quality in order to appropriately assess and improve their service performance, with such assessments serving as a basis for both employee and corporate rewards (Akmanligil and Palvia, 2004).

Grönroos (1982, 1984) suggested that the perception of service quality by customers during service delivery will be influenced mainly by two factors: technical quality (what the supplier delivers); and functional quality (how the supplier delivers). Technical quality reflects the outcome of the service act, or what customers experience during the service encounter, while functional quality is defined as the customers' perceptions of the interactions taking place during the delivery of the service.

Parasuraman *et al.* (1985, 1988, 1994) stated that service quality should be evaluated when providing the service, and that service quality is the level of enjoyment the customer experiences during the consumption process. They further argued that consumers evaluate service quality using similar criteria, which can be grouped into five dimensions: tangibility; reliability; responsiveness; assurance; and empathy. These five dimensions, along with 22 service items, yield the SERVQUAL scale for measuring service quality, and many previous studies on service quality have been developed around this scale (Kuo *et al.*, 2009; Wong and Chung, 2007; Yee *et al.*, 2010). Rust and Richard (1994) offered three dimensions – the service product (i.e. technical quality), the service delivery (i.e. functional quality), and the service environment components of service quality. Brady and Cronin (2001) suggested that service quality measurement consists of interaction quality, physical environment quality, and outcome quality. More specifically, interaction quality consists of attitude, behavior, and expertise; physical environment quality comprises ambient conditions, design, and social factors; and outcome quality is composed of waiting time, tangibles, and valence.

As a result, service quality is defined as the whole service quality perceived by customers after using the service (Liu *et al.*, 2011), and is the premise of customer satisfaction. Overall, service quality is given significant importance owing to its close relationship with cost, financial performance, and customer retention (Saravanan and Rao, 2007). Therefore, enterprises have started focussing on customer perceptions of service quality and subsequently on developing strategies by which to achieve customer satisfaction.

3. Research model and hypotheses

The purpose of this research is to understand how KMC enhances CRM, as well as how it can enhance service quality. The basic model examined the relationship between KMC and service quality. The effects of CRM on this relationship were explored. The research model is shown in Figure 1. The reminder of this section will develop the hypotheses presented in the model.

Service quality is a crucial input to determine customer satisfaction, as well as a driver to create customer lifetime value. Therefore, the key focus of any firms should be the understanding of customer perceptions of service quality in order to differentiate its offerings in the global market (Babakus *et al.*, 2004; Imrie, 2005). Hence, firms should observe, communicate and interact with their customers to acquire customer knowledge so that they can enhance the customized products and services. If firms can understand how customers perceive and use the products, then it is possible to develop a customized solution selling (Gibbert *et al.*, 2002). Criscuolo *et al.* (2007) further posited

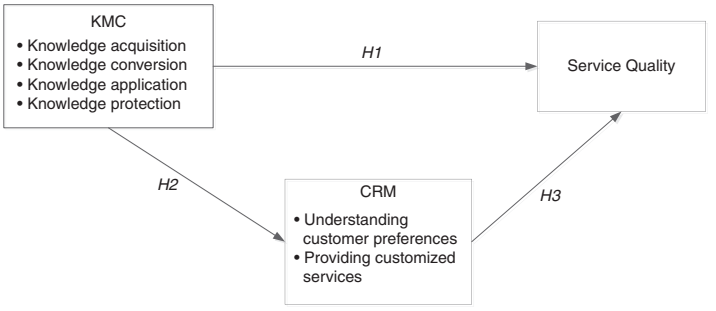

Figure 1.
Research model

that exploitation of skills and knowledge of employees to achieve successful new product and service development for clients is how professional service firms survive in the competitive market. The ability to develop new products and services is based on organizational knowledge, and so professional service firms typically invest heavily in knowledge management systems and enhance their staff's KMC to help their staff implement these concepts, perform better. In other words, enterprises should effectively utilize their KMC to increase service quality so that customers' repeat-purchase willingness and behavior will grow (Butler, 2000). As a result, it has been found that the pros and cons of KMC will have profound effects on service quality; therefore, this study proposed the following hypothesis:

H1. The degree of KMC will have a positive effect on service quality.

Selnes and Sallis (2003) stated that the information sharing between two parties in a customer-supplier relationship is an essential factor. Swift (2001) illustrated that the CRM process includes four parts: knowledge discovery; market planning; customer interaction; and analysis and refinement. Knowledge discovery involves the analysis of customer information in order to assure marketing opportunities and investment strategies. Therefore, it must provide detailed customer information that enables the sales department to make the best decision based on developed historical marketing records and analysis of customer attributes. Valmohammadi and Beladpas (2014) indicated that CRM comprises the acquisition and deployment of knowledge about customers to enhance a firm to sell more of their product and service more efficiently. Moreover, the meaning of KMC is the abilities of retrieving, managing, and transmitting real-time customer product and service information in order to enable organizations to make rapid decisions and improve customer response (Hung *et al.*, 2010).

Garrido-Moreno and Padilla-Meléndez (2011) assert that it is a complex knowledge task for a company to identify the high-value customers, as well as to define the profile ranges among its current customers. Yang and Lai (2012) stated that firms are required to create knowledge storage consisting of methods to maintain partner relationships in order to build relationship management capabilities. du Plessis and Boon (2004) also indicated that customer relationships cannot take place without knowledge management. Since CRM processes are based on large amounts of knowledge (Bueren *et al.*, 2005), therefore it can be implied that information sharing, knowledge discovery or knowledge storage creation are dependent on the costs and benefits of KMC. In other words, if firms possess excellent KMC, they are able to acquire, share, and create related knowledge. Moreover, if enterprises hold outstanding related knowledge, they can help their customers understand their demands and problems and, as a result, can provide appropriate services and solutions that will eventually enhance their customer relationships and service quality (Hedaa and Ritter, 2005). Hence, this study proposed the following hypothesis:

H2. The degree of KMC will have a positive effect on CRM.

Roh *et al.* (2005) indicated that the CRM system has been widely utilized to improve business intelligence, decision-making, customer relations, and high-quality services and product offerings. Thus, CRM through integrated selling, marketing, and service strategy will deliver consistent organizational activities (Kalakota and Robinson, 1999; Pai and Tu, 2011). Siriprasoetsin *et al.* (2011) investigated and analyzed factors affecting CRM practices in Thai academic libraries. Results show that a library's existence depends on service quality and customer satisfaction; therefore, CRM must

be a key strategy for the improvement of library service quality. This is due to the fact that CRM is a common strategy that every company applies to manage organizational interactions with the customers. This strategy covers myriad of processes, including: identifying, attracting and retaining new customers; nurturing and retaining the existing customers; convincing former customers back into the fold; and lowering the costs of marketing and customer service. Valmohammadi and Beladpas (2014) also illustrated that CRM allows firms to gather customer data swiftly, identify the most valuable customers over time, and increase service quality by providing customized products and services. Cepeda-Carrión *et al.* (2015) defined that relational knowledge is the knowledge arising from a manager's relationship with his or her customers. Good relational knowledge allows service firm members to deal with customers systematically, which in turn leads to a higher level of service quality. Therefore, many firms already use CRM to help them understand their customers better and enhance their service quality. Hence, this study proposed the following hypothesis:

H3. The degree of CRM will have a positive effect on service quality.

4. Methodology

4.1 Sampling and procedures

Samples were restricted to a list of the largest Taiwanese corporations compiled by China Credit Information Service (2011), from which 500 corporations were selected. Moreover, the integrity of research data can be affected if the respondents are reluctant to participate. Therefore, purposive sampling was used in order to ensure that respondents had high willingness to participate in the research. The questionnaire was anonymous, mainly distributed on-site and online through e-mails. Middle-top managers were asked to fill out the questionnaire since they tend to play key roles in organizational activities. A link to the online questionnaire was sent to the companies at the beginning of May 2012, with 114 questionnaires returned by June 2012. Although all returned questionnaires were valid, the effective response rate was 22.8 percent. Table I shows the demographic breakdown of the sample, including details of their es industries, annual sales, number of employees, job position, and years of experience.

4.2 Instruments

A structured questionnaire survey was adopted because this is the most appropriate way to collect relevant data from a high proportion of the marketing staff in the largest Taiwanese corporations compiled by China Credit Information Service. For the purposes of this study, an in-depth review of the literature on KMC, CRM, and service quality was conducted in order to clarify the research constructs. Based on the results of this, the various dimensions of each measure were identified to develop the draft questionnaire. As for KMC, this research is an attempt to understand how a firm applies its KMC to learn and project valuable knowledge in order to enhance CRM and service quality. Therefore, this study defined KMC as the capability to apply existing knowledge, as well as to continuously acquire, convert, apply, and protect knowledge in order to create new knowledge (Bose, 2003; Gold *et al.*, 2001). Therefore, this study is based on Gold *et al.* (2001) research in order to develop 16 questions that allow measurement through acquiring, converting, applying, and protecting knowledge. Furthermore, this research is an attempt to understand how a firm applies its CRM to attract and maintain their customer relationship in order to enhance service quality. Therefore, this study defined CRM is a kind of holistic strategic procedure that includes customer acquisition, selection,

Percentage of firms		Percentage of firms	
Industries		*Job position of the interviewee*	
Traditional manufacturing industry	18.4	CEO, general/vice manager	10.5
High-tech industry	26.3	(Vice) division manager, assistant manager	27.2
Service industry	42.1	Chairperson, chief, project supervisor	15.8
Others	13.2	Administrator, executive board, engineer	28.9
		Others	17.5
Annual sales (NTD)		*Years of work experience*	
Less than 30 million	21.1	⩽3 years	12.3
30 to 100 million	10.5	3-5 years	7.0
100 million to 5 billion	29.8	5-10 years	3.5
5 to 15 billion	6.1	10-15 years	36.8
15 to 30 billion	4.4	15-20 years	19.3
30 to 50 billion	7.9	Over 20 years	21.1
50 billion and above	20.2		
Number of employees			
Less than 300	37.7		
301 to 1,000	19.3		
1,001 to 2,000	5.3		
2,001 to 3,000	4.4		
3,001 to 4,000	0		
4,001 to 5,000	7.9		
Over 5,001	25.4		

Note: $n = 114$

Table I. Profile of the respondent firms

retention, and collaboration to manage the customer relationship in order to enhance service quality (Kandell, 2000; Parvatiyar and Sheth, 2001). The ten questionnaire items developed regarding CRM in this study refer to understand customer preferences and provide customized services by Kamakura *et al.* (2005) and Ngai *et al.* (2009). Moreover, service quality, which is the dependent variable in this research, refers to the level of enjoyment the customer experiences during the consumption process and it should be evaluated when providing the service. Thus, this research referred to the service quality proposed by Parasuraman *et al.* (1985, 1988, 1994) based on tangibility, reliability, responsiveness, assurance, and empathy to develop eight measurement items. All of the items were measured on a seven-point Likert-type scale, ranging from "strongly disagree" to "strongly agree." Some scholars and experts tested the draft questionnaire, which led to minor modifications in the wording, sequence, format and layout, question content and level of difficulty. After making sure that each item did not have any problems, the final questionnaire was sent to all respondents via an e-questionnaire. The final questionnaire items are shown in Table II.

5. Results

Partial least square (PLS) aims to estimate parameters by minimizing the residual variances of all the dependent variables involved. As compared to covariance-based SEM techniques, PLS is less stringent with distributional assumptions, measurement scale type, and sample size requirement (Chin, 1998; Fornell and Cha, 1994). The minimal demands on distributional assumptions and sample size made PLS an appropriate analysis technique for this study.

Constructs	Factors	Items	Measurements	References
KMC	Acquisition	KMC1	We are already equipped with the sufficient expertise	Gold *et al.* (2001), Tanriverdi (2005), Fan *et al.* (2009), Aujirapongpan *et al.* (2010), Miranda *et al.* (2011)
		KMC2	We are proactive in acquiring new knowledge	
	Conversion	KMC6	We are already equipped with the ability to methodically classify and generalize corporate knowledge	
		KMC7	We are already equipped with the ability to transfer corporate knowledge to individuals	
	Application	KMC10	We are already equipped with the ability to apply knowledge to adjust strategic direction	
		KMC11	We are already equipped with the ability to apply knowledge to solve problems	
		KMC12	We are already equipped with the ability to apply knowledge to face challenges from competitors	
	Protection	KMC13	We are already equipped with the ability to apply information technology to prevent any inappropriate knowledge accessing	
		KMC14	Our company has established effective protective policies and procedures to prevent knowledge theft	
		KMC15	Our company has established effective protective policies and procedures to prevent knowledge from any inappropriate access and usage	
CRM	Understanding customer preferences	CRM1	We understand what kinds of products customers like	Kalakota and Robinson (1999), Peppers *et al.* (1999), Ngai *et al.* (2009), Kamakura *et al.* (2005)
		CRM2	We understand what kinds of services customers like	
		CRM3	We understand our customers' preference on marketing methods	
	Providing customized services	CRM6	We can effectively identify and acquire the right customers	
		CRM7	We can effectively segment and classify customers in order to provide customized products and services for our target customers	

Table II.
The final questionnaire items

(*continued*)

Constructs Factors	Items	Measurements	References
	CRM9	We can learn valuable knowledge from our existing customers	
Service quality	SQ2	We can fulfill promises to our customers on time	Grönroos (1982, 1984), Parasuraman *et al.* (1985, 1988, 1991, 1994), Rust and Richard (1994), Brady and Cronin (2001)
	SQ3	We can immediately respond to customer demands	
	SQ4	We can immediately improve services when they fail or are not perfect	
	SQ5	Compared with other companies in the same industry, we are equipped with excellent communication skills	
	SQ6	Compared with other companies in the same industry, we are equipped with professional knowledge and skills	
	SQ7	Compared with other companies in the same industry, we can provide customized services based on customers' demands	
	SQ8	Compared with other companies in the same industry, we can place ourselves in our customers' shoes	

Table II.

5.1 The measurement model

Due to the fact that unidimensionality cannot be directly measured with PLS, but can be assessed using an exploratory factor analysis (EFA), this study applied EFA to establish whether the measurement items converge to the corresponding constructs (factors), whether each item loads with a high coefficient on only one factor, and whether this factor is the same for all items that are supposed to measure it. An item loading is usually considered high if the loading coefficient is above 0.6 and is considered low if the coefficient is below 0.4. KMC, KMC3-5, KMC8-9, and KMC16 were omitted due to factor loadings that were below 0.6 or were not be classified into their default dimensions. CRM, CRM4, CRM5, CRM8, and CRM10 due to factor loadings that were below 0.6 or were not be classified into their default dimensions and were therefore omitted. As for service quality, SQ1 was omitted due to factor loadings below 0.6. Finally, the measurement model of this study achieved good unidimensionality (Gefen and Straub, 2005).

This study initially specified a null model for the first-order latent variables, in which this study included no structural relationships. To assess the reliability of the measures, this study calculated the Cronbach's α, composite scale reliability (CR), and average variance extracted (AVE). Table III shows that the Cronbach's α exceed 0.70 (Nunnally, 1978); the CR exceed 0.80 (Nunnally and Bernstein, 1994); the AVE of all measures compellingly exceeds the cut-off value of 0.50 (Chin, 1998). Moreover, Table IV shows that the square root of the AVE exceeds the

Construct		Items	Loading	Cronbach's α	Composite reliability	AVE
KMC	Acquisition	KMC1	0.924	0.793	0.906	0.828
		KMC2	0.896			
	Conversion	KMC6	0.917	0.797	0.908	0.831
		KMC7	0.906			
	Application	KMC10	0.802	0.840	0.904	0.759
		KMC11	0.902			
		KMC12	0.906			
	Protection	KMC13	0.914	0.937	0.960	0.889
		KMC14	0.958			
		KMC15	0.956			
CRM	Understanding customer preferences	CRM1	0.874	0.821	0.893	0.736
		CRM2	0.890			
		CRM3	0.809			
	Providing customized services	CRM6	0.859	0.790	0.877	0.705
		CRM7	0.858			
		CRM9	0.800			
Service quality		SQ2	0.802	0.919	0.935	0.674
		SQ3	0.824			
		SQ4	0.794			
		SQ5	0.865			
		SQ6	0.851			
		SQ7	0.816			
		SQ8	0.794			

Note: AVE, average variance extracted

Table III.
Psychometric properties in null model for first-order constructs

intercorrelations of the construct with the other constructs in the model, in support of discriminant validity (Fornell and Larcker, 1981). Additional support for discriminant validity comes through inspection of the cross-loadings, which are not substantial in magnitude compared with the loadings (Chin, 1998; Fornell and Larcker, 1981). As shown in Tables III and IV, it can be found that internal consistency reliability, indicator reliability, convergent validity, and discriminant validity were assured for all of our measurement scales (Urbach and Ahlemann, 2010). In addition, the influence of common method variance was believed to be an important issue for this kind of data. The correlation matrix (Table IV) does not indicate any highly correlated factors (highest correlation is $r = 0.690$), whereas evidence of common method bias should have resulted in extremely high correlations ($r > 0.900$) (Pavlou *et al.*, 2007). Therefore, the common method bias is not a major concern in this study.

In Table V, this study includes the CR and AVE of the measures in the second-order model; these also show CR is greater than 0.80 and AVE is greater than 0.5, which provides evidence of reliable measures. As this study demonstrates in Table III, the loadings of the first-order latent variables on the second-order factors exceed 0.7, which is in support of the second-order model of KMC, CRM, and service quality.

5.2 The structural model

The structural model aims to examine the relationship among a set of dependent and independent constructs. A bootstrapping analysis with 5,000 samples and the original

Table IV.
Intercorrelations of the latent variables for first-order constructs

Constructs		Mean	SD	KMC				CRM		SQ
				Acquisition	Conversion	Application	Protection	UCP	PCS	
KMC										
	Acquisition	3.847	0.726	*0.910*						
	Conversion	3.667	0.671	0.615	*0.912*					
	Application	3.848	0.646	0.654	0.583	*0.871*				
	Protection	3.725	0.899	0.478	0.436	0.383	*0.943*			
CRM	UCP	3.880	0.626	0.404	0.391	0.498	0.225	*0.858*		
	PCS	3.860	0.618	0.476	0.505	0.562	0.405	0.506	*0.839*	
Service quality		3.865	0.603	0.531	0.505	0.630	0.406	0.604	0.690	*0.821*

Notes: UCP, understanding customer preferences; PCS, providing customized services. Square root of the AVE on the diagonal

Table V.
Assessing the second-order model of KMC, CRM, and service quality and testing the hypotheses for the structural model

Second-order model					
KMC		CRM		Service quality	
CR	0.901	CR	0.876	CR	0.935
AVE	0.535	AVE	0.541	AVE	0.674
Acquisition	0.804***	UCP	0.865***		
Conversion	0.820***	PCS	0.870***		
Application	0.867***				
Protection	0.679***				
Structural model					
	KMC		*H2*: 0.635***		*H1*: 0.290***
	CRM				*H3*: 0.562***
	R^2		0.404**		0.607**
Q^2 (CV redundancy)			0.210		0.388

Notes: UCP, understanding customer preferences; PCS, providing customized services. **$p < 0.01$; ***$p < 0.001$

114 cases was performed to examine the significance of the path coefficients. The structural model resulting from this analysis is presented in Figure 2.

R^2 measures the relationship of a latent variable's explained variance to its total variance. Values of approximately 0.670 are considered substantial; values around 0.333 are considered average, and values around 0.190 are considered weak (Chin, 1998). Table V shows a moderate level R^2 of 0.607 for service quality and a moderate level of 0.404 for CRM. Specifically, the exogenous variables explained 60.7 percent of the variation in the service quality construct. The research model accounted for 40.4 percent of the variation in the CRM construct.

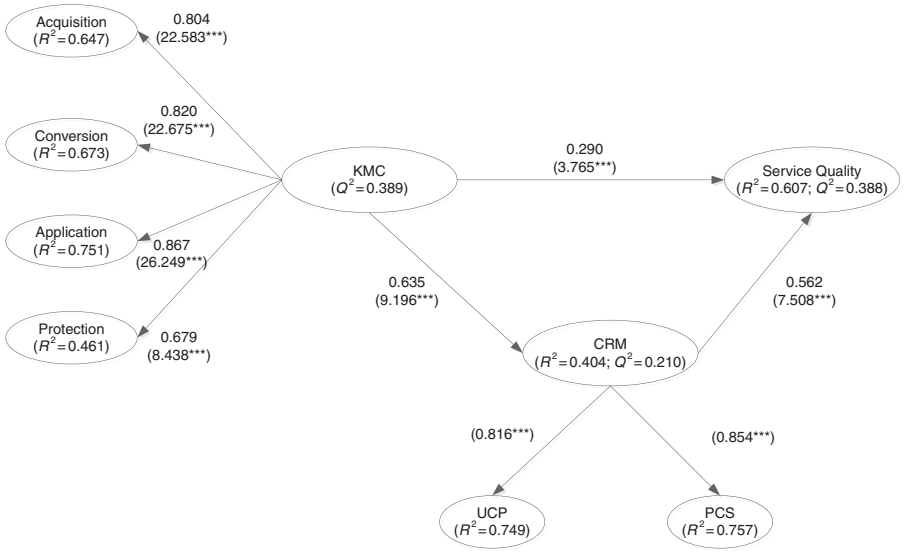

Figure 2.
Structural model

Notes: UCP, understanding customer preferences; PCS, providing customized services

Another criterion for predictive validity of the model is to apply the Q^2-test (also known as the cross-validated redundancy index) developed by Stone (1974) and Geisser (1975). To measure Q^2, a blindfolding procedure was performed. A Q^2 value larger than 0 means that the model has predictive relevance (Barroso *et al.*, 2010). As can be seen from Table V, it could be concluded that the proposed model had good predictability.

The significance of each path coefficient can also be seen from Figure 2. All path coefficients were found to be significant (t-values for all path coefficients are statistically significant at the $\alpha = 0.05$ level), providing support for propositions *H1*, *H2*, and *H3*. *H1* and *H2* state that the degree of KMC will have a positive effect on service quality and CRM, respectively. *H3* states that the degree of CRM will have a positive effect on service quality.

6. Implications for research and practice

Figure 2 showed that KMC has significant effect on CRM and service quality. This means that if the KMC of an enterprise is superior, the CRM and service quality of enterprise will significantly increase. Therefore, in order to enhance CRM and service quality, this study suggests that due to the KMC helps ascertain a firm to create a universal view of the customer that can be disseminated across geographical and divisional boundaries within the organization, hence the staff can be guaranteed that they are working with the most current set of customer knowledge regardless where their work posts are. This mechanism will allow the staff to gain better understanding of the customers and their demands, of which eventually will result in product, channel, and market segmentation strategies that are more effective and more accurate.

This study further found that the path coefficients of knowledge application, conversion, and acquisition are more than knowledge protection, as clearly shown in Table V. Thus, an enterprise should encourage their employees to participate in activities related to knowledge application, conversion, acquisition, and protection, as well as enhance their CRM and service quality, particularly knowledge application. Therefore, in order to enhance CRM and service quality, this study has the following suggestions. As for knowledge application, a firm should encourage their employees to equip themselves with the ability to apply their knowledge to develop new products/services, solve problems, and improve work efficiency, as well as to face challenges from competitors. As for knowledge conversion, a firm should encourage their employees to equip themselves with the ability to methodically classify and generalize corporate knowledge, as well as to transfer corporate knowledge to individuals. As for knowledge acquisition, a firm should encourage their employees to equip themselves with the ability to acquire new knowledge from external sources and internal organization, as well as to enhance their expertise. As for knowledge protection, an enterprise should establish an incentive scheme as an effective policy to protect knowledge and prevent any inappropriate access and usage.

Figure 2 showed that CRM has a significant effect on service quality. This means that if understanding customer preferences and providing customized services are superior, service quality is significantly enhanced. Therefore, in order to enhance service quality, enterprises must strive to enhance employees' capability of understanding customer preferences and providing customized services. As for understanding customer preferences, a firm should understand what kinds of products/services customers like and what kinds of marketing methods customers like. As for providing customized services, a firm should effectively identify and acquire the right customers and segment and classify customers in order to provide customized

products and services for their target customers. Moreover, a firm can maintain close interactions with their customers to establish long-term relationships.

Consequently, an enterprise should enable their employees to equip themselves with the ability to acquire, convert, apply, and protect valuable knowledge, as well as enhance their overall KMC. When a firm possesses better KMC, it can deal with different explicit and implicit matters in customer information, and then extract and transform this into strategies which can support its operations and marketing, as well as enhance CRM and service quality. Moreover, in order to enhance the KMC of employees, top leaders should accommodate members of the staff with a culture of continuous learning, a flexible knowledge management infrastructure, and should provide critical evaluation of the relevance of knowledge assets (Cepeda and Vera, 2007). That is, a firm should rely on its KMC to gather knowledge from customers to maintain and enhance their relationship between companies and their customers so that it can eventually enhance its service quality.

7. Limitations

There are two main limitations of this study, as follows. First, while this research applied a purposive sampling method and obtained an adequate number of respondents, the results may include some bias. Therefore, it is suggested that future research should apply a random sampling method to collect more responses and increase the generalizability of the findings. Second, this research investigated the impact of KMC and CRM on service quality in a Chinese cultural context, subject to a specific set of societal, cultural, and linguistic attitudes and behaviors. Therefore, future research could extend this study to other regions of the world.

8. Conclusions

The objective of this study was to assess the impact of KMC on service quality by considering CRM. Results show that KMC and CRM are the major factor for enhancing service quality. Enterprises can rely on the basis of high KMC and utilize CRM to better understand customer needs, to supply personalized information, and to increase the interaction between the enterprises and their customers. Moreover, the corporate growth is supposed to be concentrated on the customers, data warehousing, data mining, and the integration between computer technology and explicit knowledge that will help identify potential customer knowledge, maintain customer relationship, and enhance service quality (Hung *et al.*, 2010).

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