Impact of Customer Knowledge Management on Enterprise Innovation Performance

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Abstract. This paper aims to examine the effect of customer knowledge management on continuous innovation and firm performance. Based on the perspective of marketing dynamic capability, this paper establishes a theoretical analysis framework of customer knowledge management--marketing dynamic capabilities -- enterprise’s innovative performance. Then selecting two innovative enterprise as the case, it makes a comparative study by the case study approach, and adjusts the above theoretical analysis framework through coding the qualitative data.

Introduction

In the era of knowledge economy, many companies have realized that it is far from enough to merely pay attention to and meet customers’ needs as well as build customer relationships. We must improve customers’ knowledge management level—because customers’ knowledge is a unique, inimitable and valuable strategic resource (He 2004). It is an important source for any business to gain competitive advantages. The growing trend of economic globalization has led to enterprises facing a more turbulent environment. Meanwhile, with unpredictable customer demands, the marketing environment tends to be more dynamic. Therefore, the ways of creating and delivering value for customers are constantly changing. Some foreign scholars have pointed out that customer knowledge process is a key factor in determining a enterprise’s product innovation. Sanchez and Elola pointed out the creativity to find market advantages comes from a series of activities in the customer knowledge management process. Many scholars have studied the importance of enterprise using external knowledge sources during the innovation process, which can improve their competitive advantages and innovation performance(Qin, Wang, Zhao 2014). For example, Mowery, Oxley pointed out it is particularly important to interact with external parties (such as customers, competitors, partners, etc.) during the innovation process to acquire new technical knowledge. Zhang and Lu (2012) did empirical research on the effects of customer knowledge management on service innovation capability and found customer knowledge management has a significant impact on service innovation capability with customers’ participation. Mou (2015) studied the impact of customer knowledge on technological innovation performance and drawn a conclusion that three variables—knowledge of customers’ needs, knowledge of customers’ technology and knowledge of customers’ service, have a strong positive correlation with an
enterprise’s technological innovation performance. Customer knowledge management focuses on reshaping corporate value, which will positively affect the level of product performance (Wang 2006). Product homogeneity has become more and more evident. Customer knowledge, as a persistent and important source of enterprise competitiveness, is an important resource for enterprises to cope with a dynamic marketing environment, promote the healthy development of enterprises, enhance the core competitive advantages and the pursuit of enterprises’ innovation performance. Therefore, doing well in customer knowledge management and improving customer response rate can significantly enhance the company's marketing strength. In addition, an enterprise which will achieve leapfrog development must have the ability to innovate. Thus, based on the intermediary role of marketing dynamic capabilities, the article explores the relationships between customer knowledge management and enterprises’ innovation performance.

**Literature Review**

**Customer Knowledge and Customer Knowledge Management**

Research for “customer knowledge” started in the early 1990s. Li and Calantone (1998) proposed, customer knowledge is a knowledge that accumulates customer data, information and experiences which are organized and structured in the process of communicating and transactions, through analysis, classification and systematic verification. According to the research of Zhang, Liu and Zhang (2007), customer knowledge is tacit knowledge referring to the customers at the individual level or collective level which is mainly a dynamic combination about the judge, experience and values of the specific aspects formed in customers’ purchase experience, such as enterprises, markets, products and services. In the process of enterprise innovation, customer knowledge is a very important asset, which plays the most important part in all of customer values (Rowley 2002).

Customer knowledge management, developed from an extended study of knowledge management, is becoming one of the research focuses. Gibbert, Leibold and Probst (2002) held the opinion that customer knowledge management is a strategic process to examine how companies acquire and share knowledge within the tacit customer-owned and increase customer value and create competitive advantage by these customer knowledge. Wang and Ke (2004) proposed that customer knowledge management is to effectively acquire, develop and maintain knowledge and experience which are in favor of the customer portfolio. Customer knowledge management is a strategic choice to acquire competitive advantage in the knowledge economy, that is, to acquire customer knowledge by combining traditional technology with network technology; to extend depth and breadth of enterprise grasp to customer knowledge through dissemination and sharing; to improve knowledge structure of enterprises and enhance their cognitive ability through application and innovation. Thereby enterprises can effectively manage the relationships between enterprises and customers and deliver superior customer value and maximize corporate profits (Yang, Dong, Zheng 2005).

In summary, the definition of customer knowledge management given by the article is the integration and optimization of the procedures of generation (focus, production), access (classification, integration), innovation (shared, create) of customer knowledge. In the process of interaction with customers, enterprises gain valuable knowledge resources on customers, markets and opponents, etc. and then meet enterprise innovation need of diverse knowledge and maximize the upgrading of innovation performance.
Innovation Performance and Its Evaluation System

Janssen and Van (2004) gave the first definition about innovation performance, that is, new ideas that the staff in a team or organization initiatively create, promote and realize, which are good for staff jobs, teams and organizations. Han (2007) represented innovation performance from the individual level and enterprise level respectively. Innovation performance at the individual level refers to the originality produced with innovation and feasibility. While innovation performance at the enterprise level refers to ideas and planning with high-value and rate of commercialization. In the competitive environment, employees not only need to complete job performance within the daily duties, but also need to pioneer innovative thinking and constantly interact with external customers to produce innovative ideas and improve innovation performance.

Among the literatures, different industry features and research subjects have different assessment contents of innovation performance evaluation system. Zhang (2004) used the number of patent applications, the number of new products (improved products), output rate, the speed of development and the success rates of innovative (improved) product to measure innovation performance.

Wei (2007) divided enterprise’s innovative performance into product innovation performance (sales profits, market share, the window of opportunity, the number of patent applications, etc.) and learning performance (use of new knowledge, new knowledge to maintain the corporate competitiveness, promotion in technological competitiveness of enterprises, enterprise response rate and promotion in demand capability, etc.). Based on mature innovative performance metrics that are built by predecessors and combined with the actual needs, the article will measure the level of innovation performance of enterprises from two dimensions: product innovation performance (R&D investment, the number of patents, the number of new products, product development speed, etc.) and market performance (market share, the window of opportunity, sales profit, etc.)

Marketing Dynamic Capabilities and the Dimensions

Combination of dynamic ability based on the RBV and marketing capabilities based on the knowledge-based view is one of the critical ways to realize focus and structuring of constructs. Therefore, researchers founded the meeting point of marketing capabilities and dynamic capabilities theory, which advanced the study of marketing dynamic capabilities based on dynamic capability theory. Fang and Zou (2009) firstly proposed “marketing dynamic capabilities” in the study of enterprise performance, which is defined as “responsiveness and efficiency that enterprise to create and deliver customer value in response to market changes. Based on the concept of the process, Xu, Li and Wang (2011) defined marketing dynamic capability as a highly reactive and efficient organizational process that enterprises do dynamic integration and configuration for marketing-related assets and knowledge to create and deliver customer value and ultimately obtain and maintain competitive advantages. The article uses the same definition about marketing dynamic capabilities of Xu (2011).

In the study of performance of China joint venture, Fang and Zou (2009) divided marketing dynamic capabilities into three dimensions-product development management (PDM), supply chain management (SCM) and customer relationship management (CRM) and used empirical data to validate the inter-departmental organizational processes. Based on views of Fang and Zou and previous findings on marketing management core business processes, Ji (2011)
divided marketing dynamic capabilities into four dimensions - product development management process, supply chain management process, customer relationship management process, market research and information use process. From the concept of organizational processes, the article learns from the above three types of inter-departmental organizational processes as index of marketing dynamic capabilities.

Through literature review we can find that few studies regard the customer knowledge management processes as input variables to study innovative performance evaluation index, especially making the marketing dynamic capabilities as a mediating variable. Thus, the article will focus on intermediary role of marketing dynamic capabilities and explore the relationships between customer knowledge management and enterprise innovation performance.

**Framework and Research Methods**

**Framework**

This article builds the theoretical framework based on the literature review (Figure 1) and expands business case analysis under this framework. It mainly covers the following contents: Constitution of customer knowledge management system; The auxiliary supporting role of mediating variable--marketing dynamic capabilities; The mechanism of customer knowledge management on innovative performance.

![Figure 1. Theoretical Framework.](image)

**The Methodology of Case Study**

The methodology of case study is suitable for exploring the hypothetical event that is not particularly limited. It is a widely used scientific method of research to analysis of current events such as the interpretation of “why”, “how” and other issues in the field of management science and sociology. In order to make a more persuasive case studies, based on research and after a comprehensive trade-offs, I select Chinese high-tech enterprise representatives-Huawei Technologies Co., Ltd. (hereinafter refer to as “Huawei”) and Lenovo Group (hereinafter...
refer to as “Lenovo”) from the list[19] that the first national “Innovative Enterprise” jointly issued by Science and Technology Ministry, the state-owned Assets Supervision and Administration Commission and the Federation of Trade Unions and use a variety of approaches and methods to collect relevant data. The data of article are mainly secondary data which are mainly from the business's official websites, corporate annual reports, internal publications, Baidu library, information centers and online media.

**Data Encoding**

Collate and analyze data by coding and categorization method in order to verify the theoretical analysis framework which is built based on large numbers of qualitative data. Considering the diversification of sources, the data will be encoded as SH (Second-hand) uniformly, and then classify the two companies by a progressive way to. A represents Huawei and B represents Lenovo Group.

**Case Studies**

**Case Overview**

Huawei was founded in Shenzhen in 1998, when its start-up capital was only 20,000 yuan. Huawei has been continuously making innovations based on customer needs, developing from an ordinary private enterprise to a Fortune 500 company and having annual sales of nearly 240 billion yuan in 2013. Huawei develops rapidly in the high-tech sectors (such as telecommunications network equipment, intelligent terminal, IT equipment and solutions, etc.). It serves a number of countries and regions in the world and provides customers with innovative services and solutions. It insists on creating value chronically for customers, which benefits a third of global population, and has successfully established itself as the world's top 20 list of telecommunications manufacturing.

In 1984, Liu Chuanzhi began Lenovo's entrepreneurial path with 10 computer scientists as well as 200,000 yuan as starting funds. During the past 30 years, Lenovo, which is known as a highly innovative international technology company, has been committed to innovation all the time and won the praise of international customers and partners by the development of a key Internet PC, launching the associated application technology and so on. In China, Lenovo's extensive product line meets the diverse needs of users and PC sales have ranked first for eight consecutive years.

**Case Analysis**

**Relationships between Customer Knowledge Management and Marketing Dynamic Capabilities.**

1) Customer Knowledge Management and Product Development Management Process

The capacity and speed of enterprise products development reflect the enterprise-to-market response rate to a certain extent. Continually creating new products or improving existing products are an inevitable choice for high-tech enterprises to follow the development trend of the times and deal with fierce market competition, which can meet the comprehensive and personalize needs of customers. The influence of customer knowledge management on product development management is mainly in identifying needs, designing and optimizing sub-process.

Huawei and Lenovo have been taking the lead in the speed of product development and market response. According to the encoded data, customer knowledge management has
played a beneficial role in the two sub-processes of identifying needs and design optimization: Identifying customer needs is not only the “patent” of R & D personnel and a lot of useful information can be obtained by actively listening to customers; the optimization of product design is inseparable from the enthusiastic support of customers. Therefore, customer knowledge management has a positive impact on product development management.

2) Customer Knowledge Management and Supply Chain Management Process

Briefly, supply chain management process is the integration of the supply of raw materials, processing and distribution, involving the coordination and control of logistics, capital flow and information flow. Influence that customer knowledge management on supply chain management is mainly shown in sub-processes of cost control and order delivery management.

Customer knowledge management mainly has an effect on the supply chain management in cost control. The specific performances include saving turnover time of raw material and resources organization, reducing inventory cycle, optimizing the details of the order delivery management and enhancing customer satisfaction as much as possible. Since these aspects are more involved in internal activities, customer knowledge does not show the necessity in these processes. Ultimately, the influence of customer knowledge management on supply chain management process is not significant.

3) Customer Knowledge Management and Customer Relationship Management Process

Customer knowledge management is a product of both knowledge management and customer relationship management. According to the literature, researchers generally considered that there is a close relationship between customer knowledge management and customer relationship management. Campbell (2003) believed that customer knowledge management can help enterprise to manage customer relationship better. Gebert put forward customer relationship management that customer knowledge assisted, that is, apply customer knowledge management to customer relationship management (serve customer, maintain customer and develop reciprocal relationship) in order to improve customer-oriented operational activities of the enterprise. Combining customer knowledge management and relationship management can play the synergistic effect better. Customer knowledge management affects such two sub-processes as serving customer and maintaining customer in customer relationship management process.

Scholars have obtained findings that in general there exist positive correlations between customer knowledge management and customer relationship management. For enterprises, to build customer information system is to improve customer relationship management capabilities, which gives a request that enterprise should transform the appropriate customer information into customer knowledge that plays a role in an appropriate way. This process requires customer knowledge management intermediary mechanism. Thus, in the study of customer relationship management processes, enough attention must be paid to the positive impact on customer knowledge management.

**Relationship between Marketing Dynamic Capabilities and Innovation Performance.**

1) Product Development Management Process and Innovation Performance

For high-tech enterprise, a product (new or improved) is directly supposed to reflect enterprise competitive advantages. Efficient product development management is a key procedure of the enterprise to ensure the innovation performance. Product development management process is a cross-functional one in order to meet existing preferences of customers and potential demands for new product’s design, development and launch (Fang, Zou 2009). According to the empirical research of relationships between marketing dynamic
capabilities and enterprise performance, product development and management process has the most significantly positive impact on enterprise performance (Chen 2013). The same conclusion can be obtained when qualitatively coding the collected data. For example, Huawei has independently developed chip technology. Its smart phone has high replacement rate, which is strict with the mobile phone chips. Huawei uses its own chip’s advantages to enhance the premium level so that it can snatch more windows of opportunities at the crucial moment. Lenovo's YOGA tablet’s innovations lie in: To avoid customer complaints for battery that is not durable, they have designed the reel innovatively. As a result, the integrate use of time is extended to 18 hours, at the same time, customers are available to the best playback whatever positions. Know then, that product development management has a positive impact on enterprise’s innovation performance.

2) Supply Chain Management Process and Innovation Performance

The main content of supply chain management is to manage, optimize and integrate organizational process between suppliers and end customers and manage and optimize procurements of raw materials, flexible production, logistics and other sectors to maintain patency of the supply chain. Conclusion of “empirical research of relationships between marketing dynamic capabilities and enterprise performance” shows that the influence of supply chain management on enterprise’s performance is not as significant as product development management. But still has a certain enthusiasm. Positively verify can be obtained from the number of qualitative coding data. By CSR (corporate social responsibility), for example, Huawei do well in enhancing purchase efficiency, optimizing business process, improving supply chain management capabilities, integrating supply chain KPI and continuously improving together with partners, all of which have a facilitating role in enhancing enterprise’s performance. Lenovo implements the dual-mode and the dual production line on supply chain design, which is, taking both the large customers and small customers demand characteristics into account. Its advantages over competitors in terms of cost control, failure rates and the average delivery cycle have become a big growth engine that promotes its performance. Therefore, supply chain management has a positive impact on enterprise’s innovative performance.

3) Customer Relationship Management Process and Innovation Performance

Customer relationship management mainly emphasizes the changing needs of customer and enhancing customer value. Serving customer is the primary responsibility for an enterprise and customer relationship is the result of daily interaction with customers. Customer relationship management enables enterprise to accurately identify key customers and for-profit customers and then take targeted marketing strategies to meet the diverse needs of customers. In this process, enterprise needs to invest a lot of manpower and financial resources. Research findings show that the effect of customer relationship management on innovation performance is weak. Also, seeing from the data encoded in this article, the number of entries collected from the customer relationship management processes and innovative performance related is small and relation of content is weak. For example, a client manager of Huawei said the work for customers like setting up a bridge of two-way exchange to create a good impression gradually and let customers willing to accept Huawei products in the end. However, the effect of the measure on innovation performance has great buoyancy ultimately. In addition, the author did not collect the relevant data. It follows that customer relationship management produces a weak influence on innovation performance.
Relationship between Customer Knowledge Management and Innovation Performance.

1) Customer Knowledge Management

Huawei’s “Pollen club” gathers a group of customers who love Huawei products. In face to face session with the product manager, “pollen” can ask questions or complaint against the product during using process. Zhang Shunmao, president of marketing and solutions department, said Huawei adhere to practice the “Focus” strategy, and in-depth cooperation with partners (Microsoft, Brocade and other vendors and customers) in the field of data center to build a “network of agile open ecosystem”. Customer knowledge is always dispersed and fragmented. At a symposium, Ren mentioned that “Experience should be written out to make youngsters to learn, to use, to sublimate. Otherwise there is no value and cannot heritage.” When expanding European 3G market, operators gave proposals that base station construction with small footprint, easy installation, more environmentally and good coverage. Huawei adopted and creatively put forward the concept of distributed base station. R&D team of 5600T product found quality defect indicator dropped sharply in year-end summary. And time to develop a test case is significantly shorten and efficiency has a substantial increase; In frontline pilot areas, some excellent experience of China region is also introduced to North Africa. Through summary reports and video sharing, overcome much more difficult areas based on existing knowledge and experience.

In the process of interaction with the customer in the long-term, Lenovo constantly enrich its knowledge base of solutions, wherein the service program can quickly solve problems that customer encounter; In 2003, Lenovo started knowledge management and many businesses departments already have their own knowledge management platform. Zhou Zhiqin led the team to promote the integration of knowledge management systems. Actively established a wide range of customer service knowledge management platform (eCare platform) and achieved a triple-play (support call center, service stations nationwide and web service website). Firstly apply the Wiki technology and share ideas to customer service knowledge management platform; For knowledge base of solutions, develop eRobot (Lenovo intelligent robots) tool by knowledge innovation; Set up knowledge-sharing process and set up button for easy release of knowledge in the application. Establish incentives mechanism based on the contribution of knowledge and knowledge innovation.

2) Enterprise’s Innovation Performance

Usually we measure product innovation performance with the number of new products, R&D input and number of patent and measure market performance with sales profits, market share and the window of opportunity.

At a Huawei network conference in 2015, carriers and partners launched a hundred T data center switch, WiFi and LTE converged access solutions, high throughput routers, agile networks 3.0 and other new technologies and new products for corporate users; Huawei distributes with 16 institutes and 31 joint innovation centers in the world. Taking 10% of annual sales revenue as R & D investment, there are 40 billion dollars in 2014, accounting for 14.2% of sales revenue that year. By the end of 2014, Huawei has patented a total of 38,825, of which more than 90% are patents for invention. Annual report of 2014 shows that Huawei's various businesses are growing steadily, achieving global sales of 288.2 billion yuan and an increase of 20.6%. At the same time, achieving net profit of 27.9 billion yuan and an increase of 32.7%; 4G network construction accounted for 46% of global market and communication power supply market ranked first in the world, accounting for 24.7% and the store share...
31.7%. In addition, Huawei also develops in areas such as glory phones, tablets, 4G networks, 5G network development, agile networks, converged communications and collaboration.

At CES show in 2014, Lenovo continuously introduces 23 new products on PC and the mobile services (mainly are smartphone). Publish multiple new products in the 2015 Mobile World Congress. Such as smartphone A7000, VIBE Shot; Lenovo has more than 30 R&D centers in the world, investing $450 million in research and development, with 7800 patents reserve and 2000 patent by acquiring Motorola's mobile. In 2014, there is an annual turnover of $46.3 billion with an increase of 20%, and pre-tax profits rose 12% to $1.14 billion; Share 19.4% of the global PC market, with strong growth in business of mobile devices and smartphone ranked fourth. Marketing integration of IBM X86 System and X system, which complement advantages with Lenovo's own R&D server. In addition, acquisition of Moto mobile services in favor of Lenovo's mobile business.

Knowledge generation, knowledge acquisition and knowledge innovation in customer knowledge management process have been fully verified in above cases. These related empirical results show that there is a certain positive correlation between enterprise customer knowledge management ability and new product performance (Wang 2006). Sharing and innovation of customer knowledge make different business units within the enterprise under the common goal sharing knowledge advantage together. Thus shorten the product development cycle and improve product quality, which significantly improve the innovation performance of enterprise. As lead soldiers of high-tech industry, Huawei and Lenovo have attached great importance to enhancing customer value and practicing of knowledge management, especially knowledge innovation. Thanks to the early innovation of application based on knowledge acquisition, quality defect indicator dropped sharply in 5600T research and product. Lenovo is committed to providing quality customer service, through the long-term interaction with customers, the enterprise precipitate down a large number of problems and solutions to knowledge innovation and then develop intelligent interactive systems, realizing response to user’s demand for technology in general at any time, which brought a lot of convenience for the customer. Therefore, customer knowledge management significantly affects innovation performance.

**Conclusion**

Based on existing research of relationships between the customer knowledge management and marketing dynamic capabilities and on the basis of the research results of the marketing dynamic capabilities and enterprise innovative performance, the article studies the mechanism of customer knowledge management on enterprise innovative performance. Hold Huawei and Lenovo as examples, from the perspectives of marketing dynamic capabilities to study the impact of knowledge generation, knowledge acquisition and knowledge innovation on innovation performance in customer knowledge management process. And then take the marketing dynamic capabilities as key mediating variable and straighten out the relationship between the customer knowledge management and enterprise innovation performance. In the end, establish a theoretical analysis framework of customer knowledge management—marketing dynamic capabilities—enterprise’s innovative performance. According to the results of cases, I amend the theoretical framework shown in Figure 1. Modified theoretical framework is shown in Figure 2.
There are different types of customers. Research on impact mechanism of customer difference on enterprise innovation performance is a research direction in the future. This article only takes two companies as cases for comparative analysis, with some limitations on the type of business and the number of selection. Future research could try to take multiple case studies or large samples data to examine and deepen related research findings.

Figure 2. Modified Theoretical Framework.

References


