Research on the Impact of Customer Participation in the Innovation on Enterprise Innovation Performance Under the Background of MindCloud

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Abstract. The age of MindCloud gives more possibilities for companies to acquire the information of customer behaviour. This paper analyzes the analyse the influence mechanism of customer participation on innovation performance, which can give the theoretical and managerial implication for companies. The results show that intelligent collection of customer behaviour and intelligent analysis of consumer behavior have significant impact on promoting company innovation performance. Meanwhile, the information from ordinary customer and special customer are all valuable for promoting company innovation performance.

1. Introduction

Under the background of MindCloud, the development and application of high technology in big data, mobile internet, internet of things, cloud computing, artificial intelligence, 5G etc make the corporate internal management and external information collection effective and efficient. More and more company establish enterprise information platform by self to mast the market information in time and valid way and obtain the fast strategy support, which improves the enterprise innovation performance. If the customers cannot have the knowledge and ability to develop the product and service, the involvement of customers on the innovation have the negative impact on company innovation performance[1]. Meanwhile, many current companies cannot effectively use the innovation idea from ordinary customers to develop innovation performance because of the inadequate ability and threats from external environment. With the development of application of high technology like big data, cloud computing, artificial intelligence, high technology break the limitation of customers' professional knowledge on innovation participation and ordinary customers have more possibilities to participate in innovation. Therefore, the key of improving innovation of products and service is how to collect and interpret the data of customer personal demand and how to transfer the data to innovation idea. Therefore, this paper analyse the influence mechanism of customer participation on innovation performance of the different style and scale of company, which can provide the theoretical basis for effectively using the innovation idea of customers.

2. Literature Review

Customer participation on company innovation refers to value co-production between company and customer. Due to the theory that customers are the final groups to experience the products and services, they have adequate abilities to make valuable suggestion for company. As long as the customers are willing to cooperate with company, the research idea of new products can be expanded so as to improve R&D performance and create value [2]. However, many current scholars focus on special customers who have abilities and enough time to participate in the research, and think that special customers' participation can significantly improve company innovation performance. The process from information provided by ordinary customer to innovation idea is very long and how to
effectively transfer the information and improve innovation performance is worth pursuing further[3].

The reasons leading to less innovation performance of customer participation include: firstly, customers have less desire and ability to participate in the research and development[4-5]; secondly, the information provided by some customers cannot represent the general real demand. The ordinary customer participated in the innovation should have similar behaviour and thought with the customers who cannot participate in innovation so that the innovation results can be accepted by public[6]. In other words, if company cannot obtain innovation idea from each customers, the direction of innovation have deviation.

There are many people discussing the way of influence on company innovation performance. Wang xueyuan (2018) use resource based theories to analyse that the source of innovation originate from knowledge acquisition and company can create differentiation advantage and make profit by integrating the acquired knowledge[7]. Yang yanling (2020) externalize knowledge acquisition as the interaction between company and customers when discussing how to improve service innovation performance, and she thought that the processing big data can filter and integrate valuable information that interacts with consumers, so as to optimize the knowledge structure of enterprises and develop innovation performance[8]. Yu zhaoyuan (2020) demonstrated the impact of the way of cooperation between companies on company innovation performance based on the view of cooperation between companies[9].Wang baoli (2020) described the impact of service development for products on technology innovation was inverted U type[10], which means that company can strength the relationship with customers, develop the consumption experience, and improve the product innovation by providing high quality of service to some extent.

3. Research Design

3.1 Hypotheses Development

3.1.1. Intelligent Collection of Customer Behaviour and Degree of Customer Participation in Innovation

Since high technology in big data, mobile internet, cloud computing can be applied in company innovation, there are more possibilities for company intelligently collecting the information of customer behaviour. Compared with traditional way company can save more time, energy and cost to acquire information of customer behaviour[11]. Meanwhile, company can acquire information of customer behaviour automatically without customers' active participation on innovation. The development of high technology can also improve the intention of customers' participation in innovation, which can make customer actively share innovation idea and solution with company [12]. Currently, customers' behaviour information is collected without customers knowing so that this kind of information is always uncontrollable and useless. However, with the development of MindCloud, high technology make the system of collecting customer data more intelligent and useful. Therefore, this paper present the following hypotheses:

H1: Intelligent collection of customer behaviour is positively related to degree of ordinary customer participation in innovation

3.1.2. The Degree of Ordinary Consumers Participation in Innovation and Intelligent Analysis of Consumer Behavior

Customers’ participation in innovation is a process of knowledge transfer, and knowledge transfer can improve the cooperation and trust between customer and company[12]. During the traditional process of knowledge acquisition and transfer, company have to waste significant time, human resource and cost and the transfer efficiency is so low that company cannot correctly analyse and estimate the customer behaviour [7]. Currently, big data and mobile internet can effectively and automatically analyze customer behaviour to some extent. But information of customer behaviour passively collected through high technology cannot help company comprehensively analyse each
customer’s behaviour and create new innovation idea so that company also need customer actively participate in the innovation activities. Therefore, this paper present the following hypotheses:

H2: The degree of ordinary consumers participation in innovation is positively related to intelligent analysis of consumer behavior

3.1.3. Intelligent Analysis of Consumer Behavior and Company Innovation Performance

The process of analyzing customer behavior is knowledge integration. After company collect customer’s information, they will analyze and filtrate the information, which helps company promote the integration between company internal resource and external resource, improve the way of company production, enrich the R&D idea of product and service, and finally promote the company innovation performance[12]. However, high technology rather than traditional way can be used to reduce time and cost to select information of customer behaviour while solving the problem like uncertain result of information integration, which helps company quickly and exactly master customer needs and produce and provide service scientifically, and finally promote company innovation performance[7]. Therefore, this paper present the following hypotheses:

H3. intelligent analysis of consumer behavior is positively related to company innovation performance

3.1.4. Intelligent Collection of Customer Behaviour and the Degree of Special Customer Participation in Innovation

The traditional way of cooperating with special customer includes reciprocity mechanism, authorization mechanism and direct interview mechanism [13]. However, more and more people face with interference of different kinds of message and information, which causes customer’s boredom and lower intention of participation in innovation. Some company even collect the customer private information without agreement of special customer, which leads to low satisfaction and loyalty of products and service. If company can build a comprehensive platform which makes company interact with special customer, company can attract more special customer to directly reflect new idea for company and promote new idea transfer into practice, which means that it can finally increase the degree of special customer’s participation in innovation. Therefore, this paper provides the following hypothesis:

H4: Intelligent collection of customer behaviour is positively related to the degree of special customer participation in innovation

3.1.5. The Degree of Special Customer Participation in Innovation and Intelligent Analysis of Consumer Behavior

Strong desire of special customer’s participation in innovation means these kind of customer have the inner feeling of pursuing personal achievement and advocating independent self [13]. Nowadays, more and more customers cannot satisfy with mass product and service and pursue individuation. If more and more customers are willing to participate in innovation, the degree of participating in innovation will be higher, and company can comprehensively and automatically analyze customer information. Therefore, this paper presents the following hypothesis:

H5: the degree of special customer participation in innovation is positively related to intelligent analysis of consumer behavior

3.2. Research Methodology

3.2.1. Data Collection

In order to testify the model and hypothesis, and ensure the reliability and validity, this paper apply questionnaire to collect data. The detailed steps include: (a) this paper firstly determine senior management as the research object. For avoiding simplex of industry and area, this paper selects the senior management from different industry and different area as the research object. (b) according to numbers of references, this paper design the dimensions of variables. Through discussing with some senior managements, this paper makes a final questionnaire. (c) this research distribute the
questionnaire online. There are 210 respondents including 50 senior managements in manufacturing industry, 30 senior managements in clothing industry, 30 senior managements in catering service industry, 100 senior managements in IT industry. Meanwhile, these respondents are from different areas so that this survey sample have representative.

3.2.2. Variables and Measurement

In order to ensure reliability and validity, this paper referred to many scale systems used by some scholars, moderately modify and add some variables, interpret the language from English version to Chinese version. For intelligent collection of customer behaviour, this paper lean from the research made by Liu hailong (2019), and scale system developed by Kumar (2008). According to the research from Gurjeet Kaur Sahi, Sanjeeewani Sehgal and Rita Sharma (2017), this paper modify the scale system of the degree of ordinary consumers participation in innovation. This paper also learn from the scale system of Hush (2010) to choose 6 index to measure company innovation performance.

3.3. Results

3.3.1. Reliability and Validity

This research use SPSS to analyze the reliability and validity of the sample. Firstly, this paper testify the reliability through applying Cronbach alpha coefficients. The Cronbach alpha result for five dimensions was displayed in table. Results show that the Cronbach alpha of the five dimensions ranged from 0.6 to 0.8, which are over the minimum value of 0.5 and indicates its better reliability (see Table ). The validity analysis of the five dimensions can be tested through Kaiser-Meyer-Olkin’s measure (KMO) and Bartlett’s sphericity test. Displayed in table 5, KMO value (Kaiser-Meyer-Olkin’s) was high and scored 0.891, which exceeds the acceptable minimum value 0.60 (Hair et al., 2006), indicating the data was suitable to identify the dimensions. Bartlett's test sphericity was significant and reflected the significant relationship between these valuables since p-value which was 0 (<0.0001). Overall, there is a high validity for these valuables.

3.3.2. Correlation Analysis

Through correlation analysis, it is obvious to see the results (see Table 1): (a) there is an obvious strong relationship between intelligent collection of customer behaviour (ICB) and degree of ordinary customer participation in innovation (OCI) because the correlations rate is 0.803. (b) there is an obvious strong relationship between the degree of ordinary consumers participation in innovation (OCI) and intelligent analysis of consumer behavior (IAC) because the correlations rate is 0.763. (c) there is an obvious strong relationship between intelligent collection of customer behaviour (ICB) and company innovation performance (CIP) because the correlations rate is 0.778. (d) there is an obvious strong relationship between intelligent collection of customer behaviour (ICB) and the degree of special customer participation in innovation (SCI) because the correlations rate is 0.798. (e) there is an obvious strong relationship between the degree of special customer participation in innovation (SCI) and intelligent analysis of consumer behavior (IAC) because the correlations rate is 0.776.

Table 1. Results of Correlations Analysis.

<table>
<thead>
<tr>
<th></th>
<th>ICB</th>
<th>IAC</th>
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<tr>
<td>ICB</td>
<td>1</td>
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<td>.803*</td>
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<tr>
<td>IAC</td>
<td>.784*</td>
<td>1</td>
<td>.763*</td>
<td>.776*</td>
<td>.778*</td>
</tr>
<tr>
<td>OCI</td>
<td>.803*</td>
<td>.763*</td>
<td>1</td>
<td>.803*</td>
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<tr>
<td>SCI</td>
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<td>CIP</td>
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**. Correlation is significant at the .01 level (2-tailed)
3.3.3. Regression Analysis

In order to testify the established hypotheses and framework, this paper respectively establish 5 regression equations of 5 hypothesis. The regression equations are shown as follow:

\[ OCI = a_1 + \beta_1 \times ICB \]
\[ IAC = a_2 + \beta_2 \times OCI \]
\[ CIP = a_3 + \beta_3 \times IAC \]
\[ SCI = a_4 + \beta_4 \times ICB \]
\[ IAC = a_5 + \beta_5 \times SCI \]

For H1, R square and adjusted R Square is about 0.642 which means the model fitting is better and above 64% of OCI can be explained by ICB. Therefore, the H1 can be testified successfully. Meanwhile, the regression rate is 1.5, the relative regression equation can be shown as follows:

\[ OCI = 2.615 + 1.516 \times ICB \]

This regression equation means that higher the index of ICB is, higher the index of OCI is.

For H2, R square and adjusted R Square is about 0.583 which means the model fitting is better and above 58% of IAC can be explained by OCI. Therefore, the H2 can be testified successfully. Meanwhile, the regression rate is 0.552, the relative regression equation can be shown as follows:

\[ IAC = 1.972 + 0.552 \times OCI \]

This regression equation means that higher the index of OCI is, higher the index of IAC is.

For H3, R square and adjusted R Square is about 0.605 which means the model fitting is better and above 58% of CIP can be explained by IAC. Therefore, the H3 can be testified successfully. Meanwhile, the regression rate is 0.617, the relative regression equation can be shown as follows:

\[ CIP = 1.637 + 0.617 \times IAC \]

This regression equation means that higher the index of IAC is, higher the index of CPI is.

For H4, R square and adjusted R Square is about 0.637 which means the model fitting is better and above 63% of SCI can be explained by ICB. Therefore, the H4 can be testified successfully. Meanwhile, the regression rate is 0.957, the relative regression equation can be shown as follows:

\[ SCI = 0.064 + 0.957 \times ICB \]

This regression equation means that higher the index of ICB is, higher the index of SCI is.

For H5, R square and adjusted R Square is about 0.603 which means the model fitting is better and above 60% of IAC can be explained by SCI. Therefore, the H5 can be testified successfully. Meanwhile, the regression rate is 0.885, the relative regression equation can be shown as follows:

\[ IAC = 0.432 + 0.885 \times SCI \]

This regression equation means that higher the index of SCI is, higher the index of IAC is.

4. Discussion

Influence mechanism of customer participation on innovation performance is discussed on this paper, the findings are shown as follows:

A. The stronger ability of automatically collecting data for customer behaviour company have, more ordinary customers participate in company innovation, which is consistent with the results of Liu hailong & Liang lina (2019). This result shows that more and more companies are willing to invest on establishing a system or platform to collecting information of customer behaviour. These systems or platforms can make more customers actively take part in innovation and make companies can collect comprehensive information of customer behaviour without customer personal participation, which can promote companies’ reaction and sensitiveness for external environment.

B. Higher degree of ordinary customer participation in innovation is, more specific information of customer behaviour company will analyze, and more comprehensive information of customer behaviour company will acquire, which supports the research of Wang Xueyuan & Ma Weirui (2018). In order words, company should collect more enough and detailed information of customer behaviour to analyse the market need and make a new product or service to satisfy with the market so that it is necessary to make more ordinary customer participate in innovation.
C. More intelligent analysis of consumer behavior is, higher company innovation performance is, which illustrates the analytical ability of consumer behavior is company’s competitive capacity. By developing the analytical ability, company can easily transfer the external information to new idea for producing so that the innovative performance can be enhanced and the company can have differentiation advantage. This result is consistent with many relative researches.

D. Higher intelligent collection ability of customer behaviour company have, higher degree of special customer participation in innovation is, which illustrates special customer who have professional knowledge and ability in R&D pay attention to whether the system or platform of collecting customer information is convenient, or whether the company have active interaction with the special customers. Nowadays, some companies begin to use leading high technology to collect information automatically, which make special customers easily interact with company staff. Under this situation, the information from special customers can quickly transfer to new idea or even new design for companies. As long as the special customers buy and use the new product which satisfy with their need, they will have more desire to participate in innovation.

E. Higher degree of special customer participation in innovation is, intelligent analysis of consumer behavior is, which is similar with the results of many relative researches. Under normal situation, special customers have more professional knowledge and ability to take part in innovation compared with ordinary customers so that their information can be easily transferred to new idea and strategy for companies. After collecting the information, company can quickly analyse and make a relative accurate strategy to create or modify a new product or service.

5. Implication

This paper mainly analyses the influence mechanism of customer participation on innovation performance and find out this influence mechanism is acceptable on the theoretical view. Therefore, this paper presents following managerial implication for company:

Firstly, company can develop the ability of automatically collecting information of customer behaviour by establishing a relative system or platform. In this paper, finding shows that the ability of automatically collecting information of customer behaviour is fundamental cause of influencing company innovative performance. Therefore, company can choose appropriate system or platform to strengthen the interaction with customers while avoiding increasing the cost. Meanwhile, for some companies which have the system and platform, they should pay attention to maintain and update the system and platform so as to keep pace with the development of high technology.

Secondly, company can promote the ability of automatically analyse information of customer behaviour by establishing or improve the system or platform. In this paper, finding shows that the ability of automatically analyse information of customer behaviour play the role of intermediary in the whole influencing mechanism. Therefore, company can improve the system to fully transfer the information of customer behaviour to creative products or service, which finally promote the company innovation performance.

References


