

The Intermediary Role of Knowledge Management Capability in Product Variety Management and Knowledge Resources

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Abstract: In the era of digital intelligence, the importance of knowledge management capability is highlighted in enterprise management. Product variety requires the combination of knowledge management capability and knowledge resources. To further understand its action mechanism, this paper constructs a structural equation model for its empirical study. The results show that knowledge management capability plays an important intermediary role in the process of developing product variety.

Keywords: Product variety, Knowledge management capability.

1. Introduction

With the development of social economy, customer demand tends to be more diversified and customized. At the same time, the national policy also encourages manufacturing enterprises to implement product variety strategy [1]. The gradual transition from material economy to knowledge economy has gradually formed the concept of knowledge management, which has attracted more and more attention. With the improvement of enterprise product variety capability, the importance of knowledge management capability is highlighted in enterprise management. However, the role and influence path of knowledge management in the develop of product variety still need to be explored through empirical research.

2. Research on Product Variety

Fisher et al. [2] proposed that product variety can be defined by two attributes: the breadth of products provided by enterprises at any given time and the proportion of enterprises replacing existing products with new products. The report notes that the product categories include not only the number of unique product categories in the enterprise product portfolio, but also the number of unique products in each product category. In the existing empirical literature, most of them use the number of products owned by enterprises at a certain point of time to represent the product variety level of enterprise [3]. However, the quantity of products cannot comprehensively evaluate the level of product variety. Some literature indicates that the launch of new products is also an indicator that may have a positive impact on market share and returns in product variety strategies. The development speed of the new enterprise products and the enterprise product upgrading services are closely related to the launch of the new enterprise products [4]. Furthermore, some scholars have noted that the concept of customer engagement and customization must be considered when assessing the level of product variety [5]. In conclusion, this study puts forward three evaluation dimensions of enterprise product variety(PV): customized product design and manufacturing services(CMS) [6], product upgrading services(PUS) [8], and new product development speed(PDS)[6].

3. Knowledge Resources

This paper argues that the resources for enterprises to develop product variety are divided into two parts: internal flexibility and external information resources.

(1) Internal flexibility

In the existing literature, the research on the flexibility of product varieties mainly includes two aspects: strategic flexibility and manufacturing flexibility. Wang [9] proposed the conceptual framework of the strategic flexibility system in 2003, and divided it into four levels: strategic, functional, manufacturing, and basic level. At the strategic level, flexibility is mainly reflected in the adaptability of enterprises to the new environment, the ability to quickly resist risks and the ability to utilize opportunities, that is, strategic flexibility, which can be divided into resource flexibility and coordination flexibility. At the functional level, it mainly includes five aspects, such as flexibility in manufacturing. Enterprises can actively seek ways to enhance their internal flexibility according to the specific characteristics of the business environment, the nature of the industry and the stages of the industrial life cycle. Manufacturing level and basic level of flexibility ability to support the above two levels of flexibility ability, different levels of flexibility have mutual support and dependence relationship. This paper selects three kinds of flexibility(FL) related to product variety: manufacturing flexibility(MF) [12], coordination flexibility(CF) [11] and resource flexibility(RF) [10].

Among them, resource flexibility and manufacturing flexibility represent the ability of enterprises to quickly dispatch resources, and they are also the ability to use the tangible resources needed to achieve product categories. However, only improving both, does not always lead to higher performance. The ability to quickly convert resources is the basic ability to develop product varieties. Communication between different departments and the discovery of new resources. The ability to combine new resources is the core capability to develop product varieties and improve performance. Therefore, this study believes that the role of resource flexibility and manufacturing flexibility in improving strategic performance of product varieties needs to be regulated through coordinated flexibility. Make the following assumptions: H1 and H2:

H1: The flexibility of resources supports the flexibility of coordination.

H2: Flexibility of manufacturing work supports the flexibility of coordination work.

(2) External information resources.

The external information resources of manufacturing enterprises can be divided into supply chain coordination and supply chain elements. From the perspective of supply chain coordination, this paper can divide it into the coordination between the core enterprises of the supply chain and [13]. From the perspective of the components of supply chain coordination, this paper can be divided into logistics knowledge resources and information flow[14]. Therefore, the external information resources in this study refer to the knowledge resources obtained by manufacturing enterprises by using different methods or tools from suppliers and customers in logistics and information flow activities, choosing two evaluation dimensions of supplier relationship management(SRM) [15] and customer communication(CC) [16].

4. Research on Knowledge Management

Andersen [17] is one of the first experts to propose knowledge management, and defines knowledge management ability as a group of activities such as knowledge collection, identification, organization and creation. Tanriverdi [18] shows that knowledge management capability is the ability of enterprises to organize and regulate knowledge management behavior to integrate various kinds of knowledge existing in enterprises and attached to employees, so as to strengthen the competitiveness of enterprises. Sun Biao et al. [19] studied the relationship between social capital, knowledge management and innovation performance based on the highly knowledge intensive innovation situation of technological innovation alliance, and divided knowledge management capabilities into knowledge sharing and knowledge creation. This paper refers to previous research results and divides knowledge management capabilities(KMC) into three aspects: knowledge acquisition(KA) [20], knowledge integration(KI) [20] and knowledge creation(KC) [21].

Knowledge management emphasizes the adaptability of enterprise organizations to dynamic environments in complex

social interaction environments and obtains constant knowledge update and creates knowledge to maintain their own competitive [19]. According to the resource-based theory, the source of the sustainable competitive advantage of enterprise organizations is the heterogeneous intangible resource [22]. These resources are only belonging to enterprises and are difficult to be imitated and copied by competitors, so they can slowly be absorbed by organizations and transformed into unique capabilities. With support for resources and capabilities, businesses can take a range of actions to achieve the desired performance goals and ensure the durability of process [23]. This study summarizes the enterprise heterogeneous resources as knowledge management resources. The ability that it cultivates is the knowledge management ability. Knowledge management resources and knowledge management ability jointly encourage the innovative behavior of enterprises, and finally realize the improvement of product varieties. Logically speaking, this is a chain structure, that is, knowledge management resources are the prerequisite factor, product diversity is the result, and knowledge management ability plays an intermediary role in the role path. The theory of resource allocation further clarifies the relationship between resources and capabilities. According to this theory, resources are the basis of capacity formation, which is formed through unique bundling and resource integration. The level of dynamic management of resources and capabilities determines the level of product category [24]. Using the theory of resource arrangement as a reference, we can believe that the diversified knowledge and flexibility inside and outside the enterprise organization constitute the strategic resources needed for the development of the organization. With the help of knowledge management ability, we can combine and integrate the resources in the internal and external environment of the enterprise, effectively promote the implementation of the open innovation strategy, and then realize the improvement of the product variety [25]. Therefore, the following assumptions are made:

H3: Knowledge management capability mediates product variety and coordination flexibility.

H4: Knowledge management capability mediates product variety and customer communication.

H5: Knowledge management capability mediates product variety and supplier relationship management.

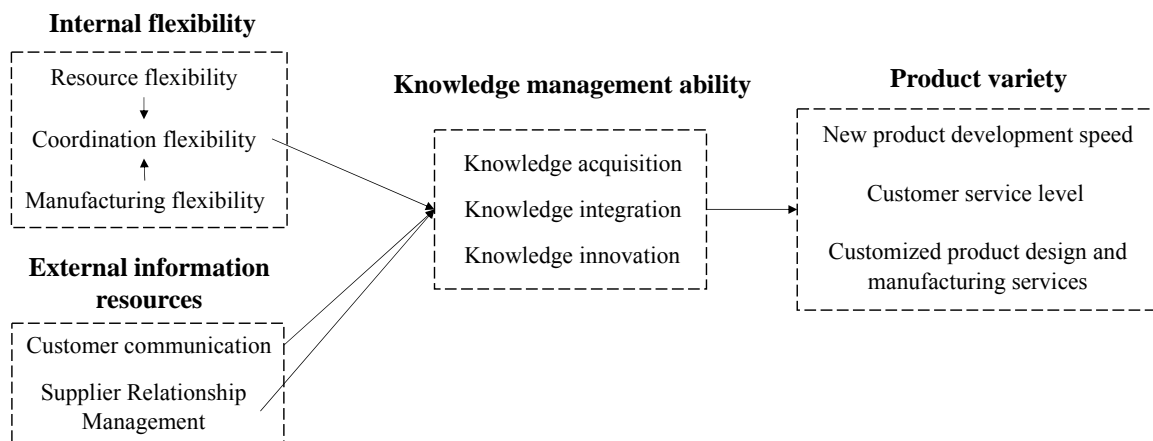


Figure 1. Research hypothesis model

5. Research Design

The study was designed and collected as a team. The questionnaire includes the evaluation of the enterprise product variety level, knowledge resources and knowledge management ability. To meet the requirements of indicator discrimination in follow-up studies, the questionnaire measured the observed variables using the Likert 5-level scale, and relevant information was obtained by scoring the attitudinal tendencies. Scores from 1 to 5 indicate inconsistent, relative, general, relative consistent, and consent, respectively. The higher the score, the higher the corporate level in the program.

From March to December 2018, the survey was conducted in inland manufacturing cluster provinces such as the Pearl River Delta Economic Zone, the Yangtze River Delta Economic Zone, and the Bohai Rim Economic Circle, which is representative and diversified in terms of geographical region and economic development level. The regional distribution is shown in Figure 2. The survey used corporate interviews, paper mail delivery, email distribution and other methods. A total of questionnaires were distributed, including 800 production enterprises, and 262 questionnaires were collected. Thirty-six of these were considered invalid because missing data exceeded 5% or 10 consecutive items with the same scores. There were 226 valid questionnaires, and the valid recovery rate was 86.3%. The four regions have more than 30 samples, including state-owned, private, and foreign-funded enterprises, covering large, small and medium-sized enterprises. Fifty-six and sixty-nine percent of the respondents were middle and senior managers, of which 11.3% were the chairman or general managers, and the rest were personnel serving related departments. They can reflect the product diversity, performance, and flexibility from different perspectives. Meanwhile, the results of the independent sample t-test indicated that there was no significant difference between responders and non-responses in terms of employee number, annual sales, and the mean value of the service business variables, and that no response bias did not affect the reliability of the data. The 226 samples covered 24 sub-industries of the manufacturing industry, and the final consumer had no difference from the industry ratio, and there were a certain number of samples, indicating that the samples are representative. Questionnaires were filled out by corporate employees, and the perception and comparison of flexibility and product categories were within the industry. Therefore, we believe that the impact of product cycle, resource scheduling speed and other aspects caused by different subcategories in the manufacturing industry can be

excluded.



Figure 2. The regional distribution

6. Empirical Results

The IBM SPSS statistics in this study 24 was used to test the reliability and validity of the samples. In terms of reliability, the clone Bach value of sample data α is 0.956, greater than 0.7, indicating that the variable is reliability; secondly, the CR value is between 0.7961 and 0.9429, meeting the reliability requirements; each CITC value is greater than the lowest acceptable value of 0.30, which further shows that the study data have good internal consistency and ensures reliability. In terms of validity, the sample data had a KMO value of 0.892, and Bartlett's spherical test of χ^2 is 211053.242 (degree of freedom of 1891), with a significance value of 0.000, reaching the significance level, indicating that the sample data of this questionnaire are basically suitable for factor analysis. Secondly, the standardized coefficients of the items are significant at 0.01 level. The CFA fitting indicators of the model obtained for the four groups of performance indicators have passed the test, and the AVE values are greater than 0.50, which can be considered as good convergence validity. Finally, the AVE value of each variable is greater than the square of the correlation coefficient, and the discrimination validity is guaranteed.

Amos Graphics software is used to establish the Structural Equation Model (SEM) in this study. The results are shown in Figure 3. In this study, comparative fit index (CFI) was used to evaluate the goodness of fit. CFI values of three SEM were greater than 0.90[26], which is an acceptable fit range, indicating that the model can reproduce more than 90% of the covariates in the data. At the same time, the chi square error and the approximate root mean square error (RMSEA) are both less than 0.08, within the acceptable range. Chi square/df are all within 3, and other indicators are also within an ideal range, indicating that the model is feasible[27], and the assumptions are valid. H1, H2, H3, H4 and H5 are true.

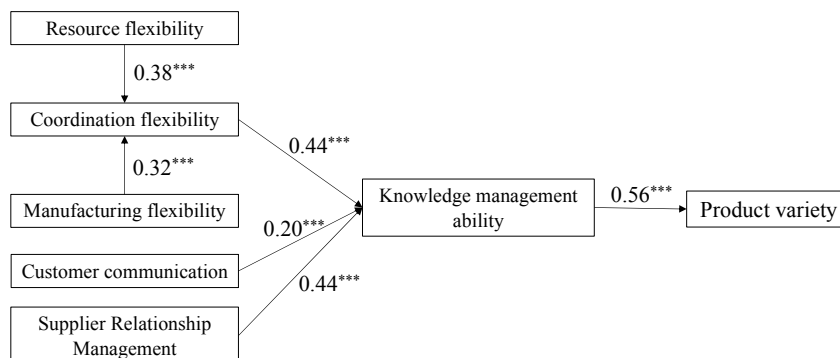


Figure 3. The regional distribution

Meanwhile, this paper further conducted the relevant mediation tests, and the results are shown in the table 1. Among them, model 1, model 2 and model 7 indicate that knowledge management fully mediates flexibility and product variety; model3, model 4 and model 8 indicate that

knowledge management mediates coordination and product variety; model 5, model 6 and model 9 indicate that knowledge management partially mediates supplier relationship management and product variety.

Table 1. The regional distribution

	PV						KMC		
	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8	Model9
SRM					0.387***	0.25**			0.529***
CC			0.383***	0.271**				0.394***	
FL	0.208***	0.05					0.425***		
KMC		0.37***		0.284***		0.259**			
R ²	0.043	0.155	0.147	0.215	0.15	0.198	0.181	0.155	0.28
adj.R ²	0.037	0.145	0.142	0.206	0.145	0.189	0.176	0.150	0.276
F	7.533	15.251	28.76	22.765	29.447	20.516	36.895	30.738	64.956
P	0	0	0	0	0	0	0	0	0

7. Discussion of results

The empirical results show that knowledge management ability plays an important intermediary role in the development process of product varieties, including the complete intermediary role between flexibility and product varieties, partly the intermediary role between supplier relationship management and product varieties, and the partial intermediary role between customer communication and product varieties. Knowledge management capabilities are proposed to help enterprises to better integrate internal flexibility capabilities and external knowledge resources. In practice, to develop product varieties, enterprises not only need to improve their internal flexibility and external knowledge resource acquisition ability, but also pay attention to improving their own knowledge management ability. To improve the knowledge management ability, we can start with the knowledge sharing, knowledge integration and knowledge innovation, including the establishment and improvement of the enterprise knowledge sharing system, and encourage the knowledge innovation mechanism.

In the era of big data, enterprises are faced with a more complex and constantly changing product variety knowledge environment. The root cause of competitiveness lies in the knowledge management ability. How to obtain knowledge output and best practice paths from massive data, and how to apply and practice correction to become enterprise wisdom[28]. The environment of the digital and intelligent era requires enterprise management to combine knowledge management ability to break through the existing paradigm, establish a new mechanism to build a bridge from resources to knowledge management ability to practice, and form a new knowledge ecology, knowledge-driven practice, and practice to create knowledge.

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