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The Relationship Between Market Orientation and Sustainable Innovation Performance Based on Dynamic Managerial Capability View of Management Decision Makers

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ABSTRACT

With the continuous development of science and technology, the innovation ability of enterprises is becoming more and more important, and its role has become an important factor in the development and growth of enterprises. This paper analyzes the relationship between dynamic management capability and firm innovation performance and concludes that market orientation has a significant degree of influence on firm innovation performance, which in turn shows an increase and then a decrease under market orientation. For this phenomenon, the empirical analysis shows that there is a positive relationship between market orientation and firm innovation performance, and a significant correlation between market orientation and firm innovation performance. The results of this study show that dynamic management capability has a positive impact on it. Therefore, when constructing the theoretical model of dynamic management capability, attention should be paid to maintaining the sustainability of the existing resource system of enterprises; at the same time, it should be adjusted at different levels according to the market orientation to improve the ability of enterprises to adapt to the external environment; in addition, attention should be paid to the unstable factors between market orientation and firm innovation that may lead to the intensification of the phenomenon of technology spillover.

1. INTRODUCTION

Innovation, another important function of the firm, is defined by theory as a new idea or behavior adopted by an organization. The positive effect of innovation on firm performance has been supported by many studies as a new management approach [1]. The positive effect of innovation on firm performance has been supported by many studies, and it has become more important in an environment of increased competition. Most existing studies have focused on exploring the impact of market orientation on firm performance and the mediating role of innovation between market orientation and firm performance, and there is a lack of in-depth discussion on how market orientation affects the specific process of firm innovation decisions. With the rapid development of the economy and the adjustment of industrial structure and the transformation of competition mechanism, the various capabilities required by the enterprise in the innovation process are also changing. To better promote the research of the firm innovation capability index on firm innovation performance, this paper explores the difference of innovation performance and the influence mechanism on firm innovation performance by studying the influence mechanism of dynamic management capability and market orientation on the difference of firm innovation performance. In the current uncertain business environment, it is worthwhile to research how companies can sustain themselves through change and generate advantages in competition. Strictly speaking, the generation of firm innovation performance and strategic change requires the support of the cognitive capability of managers and firm social capital. Only intensive social capital and enhanced managerial cognitive capability can gradually generate change and innovation performance and thus competitive advantage [2]. Therefore, it is important to clarify how strategic change and innovation performance activities unfold and to investigate how the dynamic management capability of corporate managers can be improved by analyzing the interaction of the two dimensions of managerial cognitive capability, managerial human capital capability, and managerial social capital capability with the market orientation of top decision-making managers.

2. THEORETICAL BASIS AND RESEARCH HYPOTHESIS

2.1 Managerial cognitive dimension and innovation performance

Eggers [3] found through his research that a company with effective dynamic management capability in the product development process can facilitate new product development and product quality improvements, and contribute to the successful development of new market-friendly products. Further based on the theoretical foundation of dynamic management capability, specifically the three components of dynamic management capability, namely senior managers'

cognitive, human capital, and social capital, also profoundly influence their optimal allocation of organizational resources and the building and improvement of their capability, which in turn influence the innovative performance of the firm.

Helfat and Martin [4] found that cognitive heterogeneity leads to performance differences by examining the micro-foundations research of dynamic capability, emphasizing the potential impact of managerial cognitive capability on strategic organizational change, further suggesting that CEOs with high cognitive capability are able to quickly and accurately perceive changes in technology and customer needs, identify new market opportunities, and give the firm a better advantage over peer competition, which facilitates improved firm performance. Wasan et al. [5] found that identifying whether the environment is an opportunity or a threat is the main outcome of interpreting perceptions, and it directly influences the responses taken by the organization. If decision-makers judge the environment to be an opportunity rather than a threat, they will adopt an offensive strategy to expand the win. And conversely, they will adopt an avoidance strategy to reduce the loss. If the nature of the environment is not determined, decision-makers prefer to define the environment as a threat. Previous management experience enriches decision-maker's ability to cope with complex situations and makes them highly cognizant of complex issues. Under the role of discrete dynamics in nature and society, knowledge workers can promote innovation in their work through a dual-channel effect on their own knowledge perceptions, gaining a competitive advantage and thus improving innovation performance [6]. Research shows that the market orientation of enterprises is not only a product of the adaptation of enterprises to changes in the external environment but also a product of the burst of the wisdom of top managers. However, as top management's intuition in decision-making cannot be conventional and quantifiable, for firms in transition economies, corporate market orientation is inextricably linked to top cognition [7]. There has been little in-depth analysis and exploration of the ways in which the cognitive styles of senior managers influence the market orientation and innovation orientation of firms, although the conclusions are mostly positive [8].

Research hypothesis:

H1a The managerial cognitive dimension of dynamic management capability is positively associated with firm innovation performance.

H1b The managerial cognitive dimension of dynamic management capability is positively associated with responsive market orientation.

H1c The managerial cognitive dimension of dynamic management capability is positively associated with proactive market orientation.

2.2 Managerial human capital dimension and innovation performance

De Winter et al.'s [9] research show that the extent and speed of new technology diffusion are closely related to a firm's stock of human capital. Other things being equal, the larger the stock of human capital and the higher the quality of human capital, the wider and faster the spread of technology. Reihlen's study shows that most managers of existing private or state-owned enterprises in developing countries have worked in subsidiaries of MNCs and received good training there, thus accumulating human capital for the host developing country and providing human resources for technological innovation in that country. The mobility and reallocation of human capital may also have the effect of industrial agglomeration [10]. In his study, Zhou [11] confirms that human capital is conducive to internationalization in Chinese service firms, while customer relationship orientation and market orientation play a positive moderating role between human capital and internationalization in service firms, i.e., the higher the level of customer relationship orientation, the stronger the positive effect of human capital on internationalization.

Research hypothesis:

H2a The managerial human capital dimension of dynamic management capability is positively associated with responsive market orientation.

H2b The managerial human capital dimension of dynamic management capability is positively associated with firm innovation performance.

H2c The managerial human capital dimension of dynamic management capability is positively associated with proactive market orientation.

2.3 Managing social capital dimension and innovation performance

Shared trust and reciprocal norms between firms and partners brought about by external social capital, as well as close social interactions between firms based on trust and norms, will increase the depth, breadth, and efficiency of firms' access to external market knowledge, thus contributing to the reliability of customer and market information obtained by firms [12]. Yli-Renko et al. [13] believe that not only the network connections brought about by external social capital, but also the quality of social relationships between new technology companies and their key customer companies, facilitate the acquisition of valuable customer knowledge and the improvement of new technologies to better understand customer needs and create more unique technologies. With the increasing role of technological innovation in enhancing the competitiveness of firms, scholars have begun to explore the factors that influence the success of technological innovation in firms. The firm social capital has also received attention from management scholars as one of the factors influencing the technological innovation activities of firms. Scholars have found that the role of social capital varies across research sectors and innovation areas. And in general, social capital is important and facilitates applied innovation efforts for products and technologies [14].

Research hypothesis:

H3a The managerial social capital dimension of dynamic management capability is positively associated with responsive market orientation.

H3b The managerial social capital dimension of dynamic management capability is positively associated with proactive market orientation.

H3c The managerial social capital dimension of dynamic management capability is positively associated with firm innovation performance.

2.4 Market orientation and innovation performance

Responsive market orientation is a form of strategic orientation that can effectively meet real customer needs and create customer value, emphasizing innovative companies to

meet customer needs through market information acquisition and processing. The distinctive feature and value of responsive market orientation are that it facilitates faster market responsiveness and thus improves the performance of innovative firms [15]. Responsive market orientation emphasizes the acquisition and maintenance of competitive advantage through meeting consumer needs in addition to being satisfied with the survival of innovation when guiding the flow of organizational resources. Responsive market orientation encourages businesses to constantly gather data on customers and rivals, pay closer attention to recent events in the target market, and achieve innovative market performance by continuously updating or enhancing their goods to fulfill client wants [16]. Start-ups that adopt a proactive market orientation tend to emphasize the long-term growth of the company's core business. Compared to responsive market orientation, proactive market orientation does not have an "immediate" effect but requires a longer period. Although the proactive market orientation does not bring immediate short-term economic benefits, it does provide a solid foundation for the long-term development of overseas talent start-ups. Meanwhile, proactive market orientation can build a greater competitive advantage for foreign talent start-ups, which will gradually translate into sustained growth in the financial performance of the start-ups [17]. Proactive market orientation is more intense for new product success than responsive market orientation is for new product success. Without continuous innovation, a start-up's products will become similar to those of other companies over time. Therefore, start-ups must continuously increase their proactive market orientation and create new products that customers desire and potentially demand to maintain a competitive advantage [18].

Hypothesis:

H4 Responsive market orientation is positively associated with firm innovation performance.

H5 Proactive market orientation is positively associated with firm innovation performance.

2.5 Market orientation mediation effect

Market orientation is combined with entrepreneurial orientation to enhance product development performance, where market orientation plays a mediating effect [19]. In the relationship between the influence of entrepreneurial orientation and firm performance, market orientation is a critical factor for innovative firms to gain competitive advantage, and the loss of resources affects the innovative performance of the firm [20]. Some scholars have studied the impact of market orientation on organizational performance and organizational innovation performance, and have developed conclusions [21, 22]. According to higher-order management theory, differences in a manager's characteristics are important variables [23] that influence strategic decisions and performance differences. Corporate strategic decisions are assumed to be made by irrational economic people, which are to some extent influenced by the principle of limited rationality of decision-makers and are necessarily constrained by many factors of their own. Even in the same business environment, different decision-makers will make different choices and produce different performance outcomes. Thus, the dynamic management capability proposed by Arnould and Price [24] is fully consistent with this theoretical logic.

In summary, the research hypothesis can be derived.

H6 The market orientation mediates the relationship between dynamic management capability and firm innovation performance.

3. RESEARCH DESIGN

3.1 Sample and data collection

The latest statistics for 2021 indicate that there are 6,512 high-tech enterprises in Guangdong. The responder was chosen in 2021 from among the technology management decision-makers of high-tech businesses in Guangdong Province, China. In SEM model analysis, the sample number criteria are at least more than 100 and over 200 is the best [25]. When the sample size is assessed concerning the number of observed variables in the model, the sample size to observed variable ratio will be at least 10:1 or 15:1 [26]. Therefore, the sample number in the formal questionnaire for this study will be set based on the observed variables and will be selected in a 15:1 ratio of numbers. In this paper, there are 28 questions including control variables, so this study will select a total of 420 technical top management decision makers from 6512 high-tech companies as a sample for the questionnaire survey. Because the questionnaires were anonymous and the responses were kept private, respondents were incentivized to be as truthful as possible. Within a month, all surveys were gathered.

3.2 Variable measurement

All scales in this study correspond to earlier measures found in domestic and international literature, and Likert 5 scales were used to measure the items. One indicates "strongly disagree," while five indicates "strongly agree" in the descriptive statistics of the sample variables.

The managerial cognitive scale was based on the scale developed by Shi [27], with three items. The items are "MC1: I can accurately identify and timely capture opportunities and threats in the market", "MC2: I support and often encourage my team to recruit highly educated management personnel", and "MC3: I encourage a good creative atmosphere within the management team and communicate from time to time". In this paper, we used a scale developed by Barroso et al. [28] with three items to measure managers' managerial human capital capabilities. The items are "MHC1: The members of my team are highly educated as a whole", "MHC2: I have extensive experience in dealing flexibly with customers, suppliers, etc.", "MHC3:I have extensive developing experience with products and services within the strategic scope of the business". Regarding managers' ability to manager social capital, this paper used a scale developed by Li et al. [29], with three measurement items. The items are "MSC1: I attach great importance to developing and maintaining external social relationships", "MSC2: I am willing to establish partnerships with more companies", and "MSC3: I am good at obtaining valuable resources from my corporate social network".

Regarding responsive market orientation, we summarized a scale with six items that fit the Chinese context [30]. The items are "RMO1: Our business objective is primarily to satisfy our customers", "RMO2: We constantly review and adjust our commitment to our customers and the positioning

of our services", "RMO3: All departments can successfully communicate customer service successes or failures ", "RMO4: We develop competitive strategies based on customer needs", "RMO5: We conduct regular evaluations of our services", "RMO6: We regularly communicate information about customer satisfaction in all departments". Regarding proactive market orientation, we summarized a scale with six items that fit the Chinese context [30]. The items are "PMO1: We help our clients anticipate market trends", "PMO2: We continually discover customer needs that they are not aware of themselves", "PMO3: We brainstorm how our products and services are used by our clients", "PMO4: We innovate at the risk of phasing out existing products and services", "PMO5: We innovate in areas where our clients have difficulty expressing their needs", "PMO6: we anticipate prevailing trends to discover our clients' future needs".

The scale developed by Wang et al. [31] was used to measure the innovation performance of firms, with three items: "IP1: The company has more innovative products successfully commercialized than peer companies", "IP2: the company's innovative products cover more advanced technologies than peer companies ", "IP3: the company has made more efforts to improve the R&D of the original products than peer companies".

3.3 Reliability and validity tests

Reliability analysis is a measure of the level of consistency of the results collected by the scale. The reliability analysis in this paper mainly uses Cronbach's Alpha coefficient, according to the relevant literature Cronbach's Alpha value is greater than 0.7, which means that the reliability of the scale meets the requirements and its internal consistency is high and can be further analyzed, if it is less than 0.7, the questionnaire needs to be adjusted or the sample size needs to be increased. In this paper, we use SPSS.26 to determine whether the reliability coefficient of each dimension of each latent variable empirical data meet the requirement of internal consistency.

Table 1. Reliability analysis

Reliability Analysis	
Cronbach alpha	Item number
0.936	400

As can be seen from Table 1, Cronbach's Alpha was 0.936 and the Cronbach's Alpha coefficient met the basic criteria of greater than 0.7. It can be seen that the questionnaire used in this study has good reliability.

Exploratory factor analysis, which measures the structural validity of a scale and determines whether the measurement variables of each latent variable have a stable consistency and structure, is the most commonly used indicator when evaluating the validity of a scale. In this paper, spss.26 software was applied to test the composition of each dimension. When using exploratory factor analysis for validity analysis, the first step is to determine whether the conditions for factor analysis are met. Generally, two conditions need to be met: one is that the KMO value needs to be greater than 0.7; the other is that the significance of Bartlett's sphericity test is less than 0.05. If these two conditions are met, it means that there is a strong correlation between the observed variables and it is suitable for factor analysis.

The results are shown in Table 2: the KMO test value for the survey data is 0.920, which is greater than 0.70, indicating that the questionnaire is suitable for factor analysis. Bartlett's sphericity test shows that the approximate chi-square value is 6623.485, and the probability of significance is 0.000 ($p<0.01$), so the null hypothesis of Bartlett's sphericity test is rejected and the scale is considered suitable to do factor analysis, and therefore the validity structure is better.

Table 2. KMO values and Bartlett's spherical test

KMO and Bartlett's test		
KMO Sampling suitability quantity		0.920
Bartlett's sphericity test	Approximate chi-square	6623.485
	Degree of freedom	210
	Significance	0.000

4. STUDY ANALYSES

4.1 Common method bias test

In order to avoid common method bias caused by the measurement approach and methodology of this study, the following measures were taken： First, this study controlled the data collection process and question setting process. Specifically, the data collection included selecting managers of different genders, ages, education levels, and years of experience as the target population for the questionnaire collection, while the question items were set by expert evaluation and pre-research testing, and the questions were set as simple as possible to avoid ambiguity. Second, Harman's Single-factor test was used to analyze the degree of common method bias in this study, in which there were six factors with characteristic roots greater than 1 and the first principal factor explained 22.286% (less than 40%) of the variance, and the results are shown in Table 3. It shows that there is no effect of common method bias in our study.

Table 3. Exploratory factor analysis

NO.	Unrotated			Rotation		
	Total	Mutated %	Cumulative	Total	Mutated %	Cumulative
1	7.731	36.817	36.817	4.68	22.286	22.286
2	3.774	17.973	54.79	4.663	22.204	44.489
3	2.388	11.373	66.162	2.532	12.057	56.546
4	1.558	7.418	73.58	2.528	12.037	68.583
5	1.403	6.682	80.262	2.453	11.68	80.262

4.2 Confirmatory factor analysis

The confirmatory analysis was conducted by AMOS software to check the overall construct validity of the questionnaire (Figure 1), and the results are shown in Table 4 shows that the fit indicators met the general research criteria, specifically CMIN/DF=1.809 (less than 3), RMR=0.045, GFI=0.952, AGFI=0.931, NFI=0.945, TLI=0.970, IFI=0.975, CFI=0.975, all values were greater than 0.9, RMR=0.045 (less than 0.08), RMSEA=0.019 (less than 0.08). All of these indicate that the questionnaire model has good construct validity.

Table 4. Fit of the validation factor model

Model Fitting Indicators	Optimal standard values	Statistical values	Fitting situation
CMIN		354.531	
DF		196	
CMIN/DF	<3	1.809	good
RMR	<0.08	0.045	good
GFI	>0.08	0.952	good
AGFI	>0.09	0.931	good
NFI	>0.09	0.945	good
IFI	>0.09	0.975	good
TLI	>0.09	0.970	good
CFI	>0.09	0.975	good
RMSEA	<0.08	0.019	good

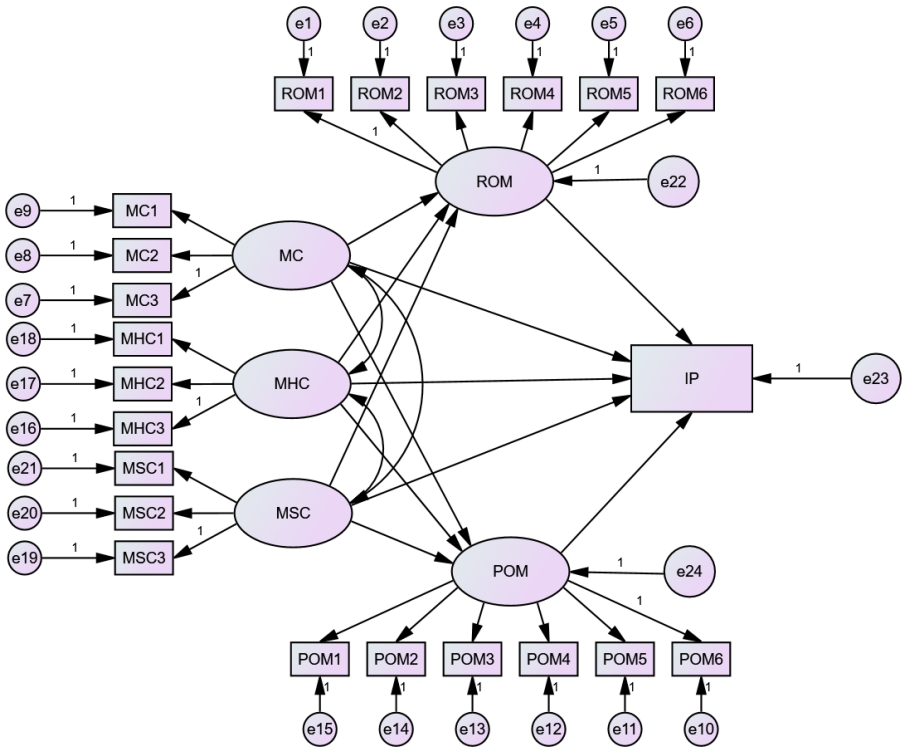

Figure 1. Confirmation factor analyses

Table 5. Table of correlation coefficients

	1	2	3	4	5	6	7	8	9
1MC	**0.864**								
2MHC	0.399	**0.851**							
3MSC	0.409	0.415	**0.875**						
4RMO	0.395	0.494	0.418	**0.817**					
5PMO	0.455	0.454	0.485	0.478	**0.840**				
6AGE	0.134	0.007	0.018	0.034	0.132	-			
7GRADER	0.025	0.011	0.015	0.093	0.144	0.005	-		
8EDUCATION	0.068	0.014	0.024	0.018	0.048	0.014	0.073	-	
9WORKYEARF	0.034	0.057	0.161	0.176	0.07	0.148	0.098	0.016	-
Means	3.41	3.54	3.61	3.54	3.68	3.48	2.68	2.65	3.24
Standard Deviation	1.108	1.128	0.938	1.009	0.987	0.989	0.911	0.899	1.079

4.3 Description and correlation analysis

In testing the discriminant validity of the scale, a table of correlation coefficients between the variables has been derived and the results are shown in Table 5. As can be seen from the correlation coefficient table, all correlation coefficients are above 0.7, indicating that there is a correlation between the three dimensions of managerial cognition, managerial human capital, and managerial social capital, which are included in dynamic management capability, and market orientation, which includes responsive market orientation, proactive market orientation, and innovation performance. Therefore, regression analysis can be conducted to test the research hypotheses.

4.4 Regression analysis

To test the direct role in the relationship between dynamic managerial competence of executives, double - dimensional market orientation, and innovation performance of firms, we used managerial cognitive, managerial human capital, managerial social capital, responsive market orientation, and proactive market orientation as independent variables and innovation performance as dependent variables, while substituting control variables of firm age, size, nature, and industry category in the regression model, and then implemented multiple linear regression analysis. Table 6 shows the analysis results. From M6, the explained variance R2 of innovation performance is 43%, while the managerial cognitive dimension (β=0.128, $p<0.05$, F=22.379), managerial human capital dimension (β=0.128, $p<0.05$, F=22.379), and managerial social capital dimension (β=0.186, $p<0.01$, F= 22.379) have a significant positive effect on innovation performance, and hypotheses H1a, H2b, and H3c hold. Responsive market orientation (β=0.205, $p<0.01$, F=22.379), and proactive market orientation (β=0.204, $p<0.001$, F=22.379) have a significant positive effect on innovation performance, therefore hypotheses H4 and H5 hold.

Table 6. Multiple linear regression analysis

	RMO		PMO		IP	
	M1	M2	M3	M4	M5	M6
AGE	0.024	-0.016	0.121	0.101*	0.159**	
GENDER	0.091	0.088	0.014	0.137**	0.002	0.112
EDUCATION	0.008	0.028	0.039	0.025	0.015	-.0.05
WORKYEAR	0.016**	0.103	0.06	0.003		0
MC		0.308**		0.156**		0.128*
MHC		0.166***		0.345***		0.128*
MSC		0.282***		0.202**		0.186***
MO						0.205***
IP						0.204***
R2	0.038	0.383	0.042	0.349	0.047	0.43
ADJUST R2	0.024	0.368	0.028	0.332	0.033	0.411
F	2.692	23.984***	3.004*	20.586***	3.357*	22.379***

The same method as above yields that responsive market orientation (β=0.308, $p<0.001$, F=23.984), managerial human capital (β=0.166, $p<0.01$, F=23.984), and managerial social capital (β=0.282, $p<0.001$, F=23.984) have a significant positive effect on responsive market orientation, hypothesis H1b, H2a and H3a hold; from model 4, we can get the explained variance R2 of 34.9% for proactive market orientation, while managerial cognition (β=0.156, $p<0.01$, F=20.586), managerial human capital (β=0.345, $p<0.001$, F=20.586), managerial social capital (β=0.202, $p<0.01$, F= 20.586) have a significant positive effect on proactive market orientation, therefore hypothesis H1c, H2c, and H3b are valid.

4.5 Mediation role test

In this study, we used the Bootstrap test in SPSS software to further verify the existence of mediating effects. The managerial cognitive dimension, managerial human capital dimension, and managerial social capital dimension included in dynamic management capability were used as the independent variables, market orientation as the mediating variable, and innovation performance as the dependent variable, and control variables including age, gender, education, and years of experience were substituted, and Bootstrap Samples=2000 times were selected in the Process program, and 95% confidence intervals were chosen for the mediation test. The results are presented in Table 7 below. The results indicate that market orientation has a mediating effect between dynamic management capability and firm innovation performance, and hypothesis H6 holds.

Table 7. Effectiveness test

	ESTIMATE	S.E.	C.R.	P	LABEL
MC<-->MHC	0.716	0.223	3.214	0.001	
MC<-->MSC	1.026	0.273	3.765	***	
MC<-->MO	0.989	0.284	3.823	***	
MC<-->IP	0.986	0.2587	3.674	***	
MHC<-->MSC	0.845	0.268	3.590	***	
MHC<-->MO	0.876	0.229	3.484	***	
MHC<-->IP	0.796	0.2121	3.520	***	
MSC<-->MO	0.799	0.230	3.480	***	
MSC<-->IP	0.998	0.219	3.403	***	
MO<-->IP	0.995	0.233	3.044	***	

5. CONCLUSIONS

5.1 Research findings and management insights

Based on the impact of dynamic management capability and market orientation on firms' innovation performance, and taking into account relevant domestic and international research and the current reality in China, this paper puts forward the following policy recommendations: First, the government should improve relevant laws and regulations, formulate specific measures and implement them gradually. On the one hand, it should establish a dynamic management capability model in line with China's national conditions for dynamic adjustment and optimization; on the other hand, it should strengthen innovation training for small and medium-sized enterprises, to improve their management capability and level. At the same time, in practice, the company management should be trained to improve its management level, adapt to the market, grasp the industry trends, and provide the appropriate service system for enterprises as the goal. Small and medium-sized enterprises should be reasonably structured so that they can reach a high level in the process of development. This is the only way to fundamentally ensure their sustainable development and provide a favorable guarantee for innovative products and services.

5.2 Research limitations and future perspectives

This study focuses on the impact of dynamic management capability on firms' innovation performance and the mediating role played by market orientation, without yet introducing other moderating variables to discuss the impact. Given that dynamic management competencies are derived from dynamic capability and are influenced by dynamic environmental factors, existing studies have not explored the construction and development of dynamic management competency mechanisms for managers under the influence of different environmental factors [32, 33]. This study suggests that the dynamic managerial competencies of executives and their effect on innovation performance may also be influenced by many factors such as organizational environment and organizational culture. Therefore, future research may consider introducing other elements such as organizational environment as moderating variables or introducing other mediating variables to expand the influence of executive dynamic management competency on corporate innovation development, to provide further guidance for companies and top management teams to use dynamic management competency to enhance innovation performance.

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