Research on the Critical Success Factors of Advanced Manufacturing Services in Hubei Province of China

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Abstract This paper used such variables like critical success factors, competitive advantages, corporate culture, innovative capability, core competence, KM (knowledge management) and customer orientated to probe into the determinants of success for Hubei advanced manufacturing services enterprises. In this study, 114 high-tech manufacturing and advanced manufacturing services enterprises accepted our survey. This research analyzed the statistical data and tested the hypotheses mode. This research found that corporate culture, innovative capability, core competence, knowledge management and customer oriented are strongly related. But due to the advanced manufacturing services focus on the result of R & D and service, only innovative capability, core competence and knowledge management are the critical success factors of corporate competitive advantages.
Key words Advanced manufacturing services; Critical success factor; Competitive advantage

1 Introduction

After reform and opening up, especially since the 90s of last century, the service industry of Hubei province has entered a period of rapid development. The size of service has been expanding, and the proportion of service in the national economy has continued to increase. The service industry made a significant contribution for the development of the national economy and the promotion of people's quality of life. The service industry has played an increasingly important role in the national economy. However, compared with developed provinces or cities in China and developed countries, the development of service industry in Hubei province still lags behind.

Into the 21st century, Chinese manufacturing industry is facing the opportunities and challenges that the global industrial structure adjustment brings to us. While the manufacturing industry been transferred to the developing countries, developed countries have experienced a wave of servitization in manufacturing. Manufacturing enterprises develop to the two ends of industry chain, and enhance the capacity of providing high value-added services. Hubei province is still at an early stage of manufacturing services. Its development speed can't meet the needs of the rapid development of manufacturing industry. So, develop the advanced manufacturing services becomes the emphasis of the development of Hubei service industry in the current stage.

2 Literature Review

2.1 Advanced manufacturing services

The servitization of the manufacturing industry was developed and widely grown up from the 1990s in the world economic system. It not only strengthened the relation between the manufacturing industry and the service industry, but also has facilitated the development of a new industry, that was "manufacturing service industry". The research of manufacturing service industry in the foreign academic circles was started from the late 1990s, and the concept of "manufacturing service industry" has evolved from "service-enhanced manufacturing", "service-embedded manufacturing", "service-oriented manufacturing" to "manufacturing services industry". [1][2] Through the research on the tendency of servitization of the manufacturing industry in developed countries, foreign scholars put forward a series of new concepts for the behaviors and activities of manufacturing servitization, and studied and explored the operation mechanism of manufacturing services enterprises from the enterprise organization level. [3] In the Chinese academic circles, Wang Yingluo (2008), Sun Linyan (2007) etc first stated the meaning of servitization of the manufacturing mode, and explored the macro and micro value and significance for Chinese manufacturing industry to develop manufacturing services mode. [4][5]

Vandermerwe and Rada (1988) first proposed the concept of "Servitization". They considered that the Manufacturing firms needed to transform from just providing goods to providing goods and services, and services must be taken the dominant position in the manufacturing firms' products. Because services

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could bring more profit for the enterprise. [6]

The research on manufacturing service industry was started from recent years in Chinese academic circles. Lu Yanyan (2007), Xu Jun (2009), Wang Zongguang (2009) etc all stated the definition of manufacturing service industry, and the definitions were almost the same. They considered that the manufacturing service industry was the professional services activities that developed around the various businesses of manufacturing industry product processes. And the modern manufacturing service industry was the manufacturing service which fused internet, communication and computer informatization methods and modern management concept and methods. [7] [8] [9]

2.2 Critical success factor

Daniel first proposed the definition and research methodology of "Critical Success Factor". He defined the "Critical Success Factor" as the work that enterprises or organizations must do very well to gain success. He suggested that there are generally three to six critical success factors in an industry. Enterprises must do very well in these key works to gain success. [10]

Many Chinese and foreign scholars studied and analyzed the critical success factors of different service industries and summarized the critical success factors of some specific industries. For example, Mao Qinghua (2006) suggested that strategic management and detail management were the two critical success factors of service enterprises.[11] Taiyuan University of Technology graduate (Shi Wenliang 2009) proposed in his thesis that the critical success factors to effectively manage a technical services enterprise included enterprise strategy, organization structure, human resources, corporate culture and knowledge management.[12] Taiwan scholar (Zhou Wenxian 1999) summarized the critical success factors to gain success as the following 12 items in his book "Marketing management: market analysis and strategy forecasting". It included "corporate image, brand image, entry timing, product attributes, product quality, core technology, advertising effect, promotion effect, purchase discount, price competitiveness, power of place control and other factors".[13]

3 Hypotheses

Through the study of advanced manufacturing services and the literature review of critical success factors for manufacturing service industry, this paper considered that advanced manufacturing service enterprises should start with the following five factors to establish their competitive advantage and promote the development of advanced manufacturing service industry in Hubei Province. The five factors were corporate culture, innovative capability, core competence, KM (knowledge management) and customer orientated. They were the cornerstone for advanced manufacturing service enterprises to establish competitive advantage and be successful. For a company to build to last, the most important is having the capability and advantage to defeat the competitors. For the enterprise operators, if the company owned some critical success factors for the industry, they would have the competitive advantage and be well positioned in the industry competition.

A company with a strong corporate culture can create its critical success factors. And the competitive advantage is from the value creation and the profitability of a company. Enterprise's value creation and profitability are directed by the enterprise's innovative capability, core competence and KM, and added the management strategy of customer orientated. Therefore, this paper established hypotheses as following:

H1: Corporate culture had significant positive correlation with each critical success factors.

H2: Innovative capability had significant positive correlation with competitive advantage.

H3: Core competence had significant positive correlation with competitive advantage.

H4: Knowledge management had significant positive correlation with competitive advantage.

H5: Customer orientated had significant positive correlation with competitive advantage.

4 Model Constructions

4.1 Research method

Narration statistical analysis and regression analysis are used to process dada in the paper.

Narration statistical analysis is used to process some variables, including the description of basic data in samples, to understand the structure of sample industries by doing numeral statistical analysis of different variables and percentage analysis. Regression analysis is used to analyze the relationship of corporate culture, innovative capability, core competence, knowledge management, customer orientated and competitive advantage, at the same time verify the hypotheses put forward.

4.2 Empirical testing

4.2.1 Hypothesis model

This paper took corporate culture as a starting point to explore the relationship between innovative capability, core competence, knowledge management, customer orientated and competitive advantage, and studied and analyzed the critical success factors of advanced manufacturing service enterprises. Finally, the important factors for advanced manufacturing service enterprises to be success were proved and the research purpose was achieved. The hypothesis model of this paper was shown in Figure 1.

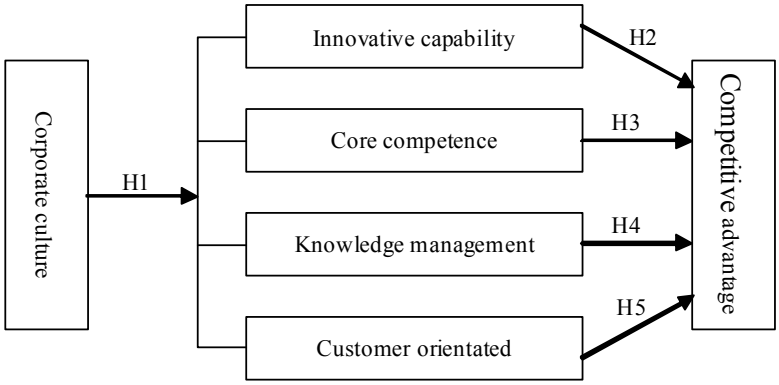

Figure 1 The Hypothesis Model

4.2.2 Data sources

To test the hypothesis model put forward before, the research made a questionnaire survey among the 150 high-tech manufacturing and manufacturing services enterprises in Wuhan East Lake High-tech Zone, Hubei Province. The survey covered the electronics industry, laser industry, communication equipment manufacturing and service etc of advanced manufacturing and advanced manufacturing service industry. It basically represented the development condition of the advanced manufacturing and advanced manufacturing service industry in Hubei Province. In this survey, 150 questionnaires were sent out, the actual response was 128, in which 114 was available questionnaires. The actual response rate and available response rate were 85.3% and 89.1%. The questionnaire survey was highly effective.

5 Discussions of Results

5.1 Corporate culture and critical success factors

5.1.1 Correlation analysis

According to the results of statistical analysis, the Pearson correlation coefficients ranged from 0.602 to 0.804, which meant the association degree between corporate culture and each critical success factors were highly correlated. The statistical result of correlation analysis between corporate culture and each critical success factors was shown in Table 1.

Table 1 The Correlation Analysis Between Corporate Culture and Each Critical Success Factors

		Innovative capability	Core competence	Knowledge management	Customer orientated
Corporate Culture	Pearson	.773(**)	.804(**)	.674(**)	.602(**)
	Sig.	.000	.000	.000	.000
	N	114	114	114	114

** p<0.01.

5.1.2 Regression analysis

Table 2 was the summary analysis table of the regression analysis model for the independent variable corporate culture and each dependent variable. Table 2 showed that the total variances explained were 59.8%, 64.6%, 45.4% and 36.2%; *F* value were: 166.432,204.483,93.020 and 63.662, and p = 0.000. This meant that the regression analysis model was statistically significant. Therefore, H1 was supported.

5.2 Critical success factors and competitive advantage

5.2.1 Correlation analysis

According to the results of statistical analysis, the Pearson correlation coefficients ranged from

0.587 to 0.760, which meant the association degree between each critical success factors and competitive advantage were highly correlated. The statistical result of correlation analysis between each critical success factors and competitive advantage was shown in Table 3.

Table 2 The Summary Analysis Table of the Regression Analysis Model for the Independent Variable Corporate Culture and Each Dependent Variable

Dependent Variable	R	R^2	Adjusted R^2	Std. Error of the Estimate	Variance R^2	F	F of molecular	F of denominator	Sig.	Durbin-Watson
Innovative capability	0.773a	0.598	0.594	2.762	0.598	166.432	1	112	0.000	1.583
Core competence	0.804a	0.646	0.643	3.162	0.646	204.483	1	112	0.000	2.111
Knowledge management	0.674a	0.454	0.449	3.426	0.454	93.020	1	112	0.000	1.902
Customer orientated	0.602a	0.362	0.357	3.924	0.362	63.662	1	112	0.000	1.682

Table 3 The Correlation Analysis Between Each Critical Success Factors and Competitive Advantage

		Innovative capability	Core competence	Knowledge management	Customer orientated	Competitive advantage
Innovative capability	Pearson					
	Sig.					
	N	114				
Core competence	Pearson	0.697**				
	Sig.	0.000				
	N	114	114			
Knowledge management	Pearson	0.650**	0.682**			
	Sig.	0.000	0.000			
	N	114	114	114		
Customer orientated	Pearson	0.629**	0.670	0.521**		
	Sig.	0.000	0.000	0.000		
	N	114	114	114	114	
Competitive advantage	Pearson	0.760**	0.747**	0.662**	0.587**	
	Sig.	0.000	0.000	0.000	0.000	
	N	114	114	114	114	114

** P <0.01.

5.2.2 Regression analysis

Table 4 was the summary analysis table of the regression analysis model for each critical success factors and competitive advantage. Table 5 was the analysis table of regression coefficients. Table 4 showed that the total variances explained of independent variables such as innovative capability, core competence, knowledge management and customer oriented to the dependent variable competitive advantage was 68.1%; f value was 58.184 and p = 0.000. This meant that the regression analysis model was statistically significant. However, Table 5 showed that the dependent variable competitive advantage had significant positive correlation just with the independent variables of innovative capability, core competence and knowledge management. Therefore, H2, H3 and H4 were supported, but H5 was not supported.

Table 4 The Summary Analysis Table of the Regression Analysis Model for Each Critical Success Factors and Competitive Advantage

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Variance R^2	F	F of molecular	F of denominator	Sig.	Durbin-Watson
1	0.825a	0.681	0.669	5.148	0.681	58.184	4	109	0.000	2.059

Table 5 The Regression Coefficients Analysis of the Competitive Advantage and Each Critical Success Factors

Mode		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.020	1.893		1.596	0.113		
	Innovative capability	0.845	0.172	0.409	4.906	0.000	0.421	2.377
	Core competence	0.789	0.152	0.348	3.885	0.000	0.364	2.748
	Knowledge management	0.588	0.152	0.148	2.889	0.000	0.475	2.104
	Customer orientated	0.035	0.140	0.019	0.253	0.800	0.500	2.000

Therefore, the results of the research hypotheses were shown in Table 6.

Table 6 Results of the Research Hypotheses

	Hypotheses	Results
H1	Corporate culture had significant positive correlation with each critical success factors	Supported
H2	Innovative capability had significant positive correlation with competitive advantage	Supported
H3	Core competence had significant positive correlation with competitive advantage	Supported
H4	Knowledge management had significant positive correlation with competitive advantage	Supported
H5	Customer orientated had significant positive correlation with competitive advantage	Not Supported

6 Conclusions

The paper mainly studied and explored the critical success factors of the development for the advanced manufacturing service industry in Hubei Province, and verified the five research hypotheses put forward before through the analysis of 114 sample data. Three research hypotheses were supported and two were not supported. The paper used correlation and regression analysis to explore the relationship between each variable. The results of this study summarized as follows.

The test results of H1 showed that advanced manufacturing service enterprises highly approved the relationship between corporate culture and the critical success factors of innovative capability, core competence, knowledge management and customer orientated. The test results of H2~5 showed that advanced manufacturing service enterprises highly approved the relationship between innovative capability, core competence, knowledge management and competitive advantage, but didn't approved the relationship between customer orientated and competitive advantage. This also explained the actual condition of the advanced manufacturing and advanced manufacturing service enterprises in Hubei Province. They took more attention on the development of innovative capability, core competence and knowledge management than customer orientated. They thought innovative capability, core competence and knowledge management could bring them competitive advantage, nevertheless the customer orientated couldn't.

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