

Marketing Capabilities of China's Agricultural Science and Technology Enterprises

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Abstract

This paper analyzed the measurement and the classification of marketing capabilities of China's agricultural science and technology enterprises. According to the existing literatures, the scale of marketing capability is developed. With using of the first-hand data of 268 China's agricultural science and technology enterprises, the exploratory factor analysis (EFA) and the confirmatory factor analysis (CFA) were preformed. The conclusions show that marketing capabilities of China's agricultural science and technology enterprises are categorized into seven aspects, channel management, new product development, brand management, pricing and information management, marketing communication, selling, marketing planning and implementation. And the results of cluster analysis shows that these enterprises could be divided into three categories, namely, different enterprises attached importance to different marketing capabilities.

JEL classification numbers: M31

Keywords: marketing capabilities, cluster analysis, agricultural science and technology enterprises

1 Introduction

Marketing capabilities are defined as integrative processes designed to apply the collective knowledge, skills, and resources of the firm to the market-related needs of the business, enabling the business to add value to its goods and services and to meet

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competitive demands (Day, 1994; Vorhies et al, 1999, 2000; O’Cass et al, 2010). It is the source of competitive advantage and can create the superior customer value (Day, 1994). In these empirical studies, a critical problem that needs to be resolved is the measurement of marketing capability. Based on different purposes, marketing scholars may choose different indicators to measure marketing capabilities. These indicators or dimensions of marketing capabilities are related to the resource deployment and focus on the functional-level capabilities (Conant et al, 1990; Hooley et al, 1998). In addition, marketing capability plays an irreplaceable role in delivering commodity value and creating competitive advantage. But marketing capability of China’s agricultural science and technology enterprises has received less attention. Therefore, in the context of China’s agricultural science and technology enterprises, this study tries to analyze marketing capability from two aspects. Firstly, this study develops a scale of marketing capability with the brief dimensions that can reflect the most valuable and important aspects of China’s agricultural enterprises. Then, the sample enterprises are further divided into four types by the cluster analysis.

2 The Prior Researches of Marketing Capability

Marketing capabilities are defined as integrative processes designed to apply the collective knowledge, skills, and resources of the firm to the market-related needs of the business, enabling the business to add value to its goods and services and to meet competitive demands (Day, 1994; Vorhies et al, 1999, 2000; O’Cass et al, 2010). The roles of marketing capability are to meet customers’ need and response to the fierce competition by adding value to the goods and services.

There are two ways to study the marketing capability, the hierarchical model and the marketing capability-performance model (Han et al, 2010). The prior researches mainly focus on the hierarchy of capabilities. For example, Grant (1996) distinguished the capabilities by the integration of knowledge. Hooley (1998) defined marketing capabilities as strategic, functional and operational marketing capabilities. With the fierce competition, performance marketing gradually attracts the attention of marketing scholars (He et al, 2011). The mainly purposes of performance marketing are to study how marketing affects the performance. The measurement of marketing capability becomes a key problem. In the recently empirical studies, marketing scholars mainly focus on the functional level marketing capabilities (Morgan, Slotegraaf and Vorhies, 2009; O’Cass et al, 2010, 2011; Ripollés et al, 2012; Theodosiou et al, 2012). These capabilities are related to marketing functions or marketing processes within the firm (Hooley et al, 1998). This study also focuses on the functional level of marketing capabilities.

Based on the previous literatures, nine dimensions, channel management, marketing communication, selling, brand management, new product development, pricing, marketing information management, marketing planning and marketing implementation, were always used to analyze and measure marketing capability. (1) Channel management can help firms to build and sustain good channel relationships (Vorhies et al, 1999, 2000; Kemper et al, 2011; Mariadoss et al, 2011). The industrial market of agricultural science and technology enterprises is different from the consumer market. Channel becomes one of the most important factors. These enterprises and distributors is a kind of principal-agent relationship. The behavior of distributors can affect the brand image of enterprises and the consumers’ willingness to buy (Li, 2007). (2) Marketing

communication helps firms to affect the customer perceived value by the advertising, promotion and public relationship et al (Vorhies et al, 2005; Kaleka, 2011; Kemper et al, 2011; Shin, 2012). Advertising and public relations are to provide and spread the related information that can increase mutual understanding and trust, and sales promotion is to enhance the short-term sales (Li et al, 2006). (3) Brand management can help firms to build brand image and brand equity by providing superior products and service (Vorhies et al, 2011; Merrilees et al, 2011; Orr et al, 2011). The serious product homogeneity of China's agricultural science and technology enterprises needs the differentiated brand image to meet the market competition. (4) Selling is a process of persuading customer and obtaining orders (Vorhies et al, 2005; Mariadoss et al, 2011). And the personal selling is an important way (Vorhies et al, 2003; Leonidou et al, 2011). (5) Pricing can help firms to understand competitors' pricing strategies and timely modify the price (Kaleka, 2011; Kemper et al, 2011). (6) Market information management is mainly focused on perceiving the customers' needs, collecting the competitors' information (Vorhies et al, 1999, 2000; Murray et al, 2011). (7) New produce development can effectively develop new product offerings to meet customers' needs (Mariadoss et al, 2011; Kaleka et al, 2011; Murray et al, 2011; Kemper et al, 2011). (8) Marketing planning can help firms to integrate market information and customers' needs into the effective plans or tactics to optimize the match between the firm's resources and market (Vorhies et al, 2003, 2005; Morgan, Vorhies and Mason, 2009; Morgan et al, 2012). (9) Marketing implementation can helps firms to transform the intend marketing planning into resource deployments, and to adjust the plans according to marketing performance (Vorhies et al, 2005; Morgan, Vorhies and Mason, 2009). The previous literatures enrich the theoretical basis and provide the reference values. The analysis of marketing capability also needs to meet the industrial characteristics.

3 Methods

3.1 Questionnaire Design

The questionnaire includes two parts. The first part is the measurement of marketing capability. All measures used are 7-point Likert-type scales with the anchors 1=strongly disagree to 7=strongly agree. The second part is the basic information of enterprises and respondents, including enterprise size, firm age, the types of ownership, the proportion of research and development (R&D) investment in the annual sales revenue, and respondents' age, position and contact details.

We developed the questionnaire following the previous studies, and modified it according to the conditions that China's agricultural science and technology enterprises faced. Firstly, the relevant scale was fully examined and translated into Chinese, then was back-translated into English by marketing experts to ensure accuracy. The results indicated no substantial differences in the meaning of the scales. Secondly, we conducted in-depth field interviews with 13 marketing managers in China's agricultural science and technology enterprises. This scale of marketing capability includes eight dimensions, channel management, marketing communication, selling, brand management, new product development, pricing, marketing information management, and marketing planning and implementation.

3.2 Sample and Data Collection

Survey with a judgment sampling method was used in this study. The sample was restricted to China's agricultural science and technology enterprises which comply with the following standards: (1) the enterprises must have their own R&D department, (2) annual capitals for agricultural research and development should be more than one percent of the enterprise's annual total sales, (3) the enterprises must have own channel intermediaries.

We randomly selected 302 firms from a list provided by local governments and friends in the agricultural science and technology enterprises. Then we adopted the face-to-face interview method to obtain subjects' responses. It was divided into preliminary research and formal research and was a resource-intensive method that took us three months. The interviewers are postgraduate students. Most of them had the experience of taking part in surveys before, and we had given them some training. The trained interviewers were asked to present the key information of the questionnaire, answer and explain the general questions encountered by the respondents, and collect the completed questionnaires. They also inquired some questions about the industrial background, and finally collected all the gathered information to strengthen the understanding of agricultural science and technology enterprises.

The pilot test was performed with 110 firms. After deleting responses with missing data, we obtained usable responses from a total of 98 enterprises with a response rate of 89%. Our samples are mainly concentrated in eastern coastal areas, such as Shandong, Fujian, Jiangsu, Beijing, Guangdong, Zhejiang, et al., which account for 68% of the total samples. The average firm age is over 14 years ranging from 2 to 60 years. 65.70% of all the firms have at least 100 employees (i.e., 100-1000 staff, 41; 1000-10000 staff, 19; 10000-80000 staff, 7). In terms of the types of ownership, 82% of the firms are private enterprises or individually-run enterprises, and the remaining enterprises account for 18% (i.e., 6 state-owned enterprises, 4 collective enterprises, 8 foreign-funded enterprises). Some items were deleted after the EFA. Then the formal research was performed with 302 enterprises. And we obtained usable responses from a total of 268 enterprises with a response rate of 88.74%.

4 Analysis and Results

4.1 The Exploratory Factor Analysis and Confirmatory Factor Analysis

We ran exploratory factor analyses (EFA), followed by confirmatory factor analysis (CFA), to verify the dimensions. The pre-research was performed with 98 enterprises. The tests of Kaiser-Meyer-Olkin (KMO) and Bartlett are needed before implementing the EFA. The value of KMO is 0.88. And the test of Bartlett reaches the significance level, which shows that it's suitable to implement the factor analysis. According to factor loadings that are more than 0.50, 27 items were preserved. Seven factors were extracted by the varimax orthogonal rotation. The pricing and information management were merged into one factor. Table 1 shows the results of EFA. Then, on the basis of EFA, the CFA was performed with 268 enterprises. The results of CFA show that the model needs to be further modified. In order to improve the model fit values, CM1, BM3 and S5 were deleted according to the modification index (MI) that provided by AMOS 7.0. The results of CFA suggests the use of five items to measure channel management (CR (scale

composite reliability) = 0.89, AVE (average variance extracted) = 0.62), three items to measure marketing communication (CR = 0.81, AVE = 0.70), three items to measure brand management (CR = 0.86, AVE = 0.74), four items to measure selling (CR = 0.90, AVE = 0.64), three items to measure pricing and information management (CR = 0.88, AVE = 0.67), three items to measure marketing planning and implementation (CR = 0.92, AVE = 0.58), three items to measure new product development (CR = 0.85, AVE = 0.67). The results in table 2 indicates an adequate fit between the suggested model of marketing capability and the current data (χ^2 (229) = 351.41, χ^2/df = 1.53; GFI=0.90, NFI=0.92, IFI=0.97, TLI=0.97, CFI=0.97, RMSEA=0.045) (Wu, 2009).

4.2 Reliability and Validity

We assessed the reliability and validity of this scale by analyzing the factor loadings, Cronbach's alphas, composite reliabilities, and average variances extracted (AVE). In the EFA, the Cronbach's α of each construct ranges from 0.77 to 0.92. The overall fitness indices suggest good fit for the model (χ^2 (271) = 399.60, χ^2/df = 1.47; GFI=0.90, NFI=0.93, IFI=0.97, TLI=0.97, CFI=0.97, RMSEA=0.04). The factor loadings for each individual indicator on its respective constructs are statistically significant, and there is no evidence of cross-loading, supporting the dimensionality and convergent validity of the constructs. The composite reliabilities (CR) of each construct range from 0.81 to 0.92 (See table 2), exceeding the usual 0.70 benchmark (Bagozzi & Yi, 1988). We further assessed the discriminant validity of the latent constructs by the following way. The correlation of two constructs is less than the square root of the average variance extracted (AVE) estimates of the two constructs (Fornell & Larcker, 1981). Table 3 shows an adequate level of discriminant validity. Overall, the results suggest that the model fits the data well.

Table 1: Measurement items and standardized factor loading of EFA

Constructs	standardized factor loading
<i>Channel Management</i>	
CM1 Strength of relationships with distributors	0.76
CM2 Attracting and retaining the best distributors	0.75
CM3 Adding value to our distributors' businesses	0.83
CM4 Enhancing the reputation of the distributors	0.78
CM5 Providing the capital and technology for the distributors	0.70
CM6 Establishing an adequate distribution coverage	0.75
<i>Marketing Communication</i>	
MC1 Developing and executing advertising programs	0.85
MC2 using product launches and exhibitions to business promotion	0.65
MC3 Public relations skills	0.56
<i>Brand Management</i>	
BM1 Emphasis on brand image	0.69
BM2 Brand image management skills and processes	0.73
BM3 The differentiation of brand image	0.71
BM4 Managing corporate image and reputation	0.74
<i>Selling</i>	
S1 The ability of sales planning	0.63
S2 Giving salespeople the training they need to be effective	0.73

S3 Selling skills of salespeople	0.83
S4 Professional competence of salespeople	0.81
S5 Social competence of salespeople	0.67
<i>Pricing and Information Management</i>	
PIM1 Knowledge of competitors' pricing tactics	0.77
PIM2 Doing an effective job of pricing products/services	0.64
PIM3 Using multiple information sources to learn about customers and competitors	0.73
<i>New Product Development</i>	
NPD1 The clear goals of R&D	0.77
NPD2 The evaluation and adjustment of the R&D process	0.62
NPD3 The application of advanced technologies in the R&D process	0.66
<i>Marketing Planning and Implementation</i>	
MPI1 Developing creative marketing strategies	0.62
MPI2 Assessing the marketing performance effectively	0.74
MPI3 Adjusting the planning by monitoring marketing performance quickly	0.69

Table 2: Standardized factor loading, Cronbach's α and CR of CFA

Items	Standardized factor loading	Cronbach's α	Composite Reliability (CR)	average variance extracted (AVE)
<i>Channel Management</i>				
CM2	0.75			
CM3	0.87			
CM4	0.79	0.89	0.89	0.62
CM5	0.77			
CM6	0.76			
<i>Marketing Communication</i>				
MC1	0.72			
MC2	0.76	0.80	0.80	0.58
MC3	0.80			
<i>Brand Management</i>				
BM1	0.76			
BM2	0.89	0.85	0.86	0.67
BM3	0.80			
<i>Selling</i>				
S1	0.83			
S2	0.89			
S3	0.85	0.91	0.91	0.71
S4	0.79			
<i>Pricing and Information Management</i>				
PIM1	0.79			
PIM2	0.88	0.84	0.85	0.65
PIM3	0.75			
<i>New Product Development</i>				
NPD1	0.52			
NPD2	0.78	0.72	0.74	0.50
NPD3	0.79			
<i>Marketing Planning and Implementation</i>				

MPI1	0.83			
MPI2	0.87	0.89	0.89	0.73
MPI3	0.87			

Fit statistics for measurement model of 24 indicators for ten constructs: $\chi^2(229) = 351.41$, $\chi^2/df = 1.53$; GFI=0.90, NFI=0.92, IFI=0.97, TLI=0.97, CFI=0.97, RMSEA=0.045

Table 3: Construct correlation matrix

Constructs	1 Channel Management	2 Marketing Communication	3 Brand Management	4 Selling	5 Pricing	6 Marketing Planning and Implementation	7 New Product Development
1	0.79						
2	0.68	0.76					
3	0.65	0.74	0.82				
4	0.71	0.71	0.68	0.84			
5	0.65	0.74	0.73	0.73	0.81		
6	0.61	0.70	0.70	0.81	0.78	0.85	
7	0.61	0.57	0.56	0.70	0.70	0.72	0.71

Figures in brackets show the square root of the average variance extracted (AVE), numbers below the diagonal show the correlations.

4.3 Cluster Analysis

In order to better understand the characteristics of marketing capability of China's agricultural science and technology enterprises, the enterprises in our samples were classified by the cluster analysis. The cluster analysis was performed based on the factor scores of seven factors of CFA. The results of cluster analysis showed that three categories are appropriate (see table 4). Higher values of marketing capabilities indicate that the related capabilities of these enterprises are stronger.

Table 4 shows that the first kind of enterprises has high scores in new product development, selling, marketing planning and implementation and channel management. These enterprises have the explicit goals of the R&D and can timely evaluate and adjust the research progress. These enterprises focus on publicizing the strength of R&D and the technological content of products. These enterprises attach more importance to the relationship with the distributors and the training of sales skills and interpersonal skills for salesmen. These enterprises can develop creative marketing strategies, execute and evaluate marketing planning effectively. The outstanding characteristic of the enterprises is the attention of product R&D that can be reflected from the firm size and the model of innovation. There are 129 enterprises with the percent of 48 that the number of such enterprises is the most. The average value of the employees is 2649 after removing the maximum and minimum values. The enterprises that are more than 500 staffs account for 40%. Some enterprises are the group enterprises and national leading enterprises. These enterprises have the capability and strength of developing the new products. The annual capitals for agricultural research and development of 67% enterprises are more than 3% of the enterprise's annual total sales. In terms of the innovation model, there are three types of models. 94% of these enterprises chose the model of independent innovation and

cooperative innovation and the others chose the imitative innovation model.

The second kind of enterprises relatively attaches importance to pricing and information management, brand management and selling. There are 73 enterprises with the percent of 27. In the three kinds of enterprises, the firm sizes, the overall strength, or the capital investment of R&D investment, are in the second place. So this kind of enterprises needs to use the existing resources to shape differentiation brand image, and win the survival. The price advantage is an important factor. These enterprises need the salesmen to collect the competitors' information and then adjust timely the products' price. They always provide the training of sales skills and interpersonal skills for salesmen. The average value of the enterprises' employees is 648 after removing the maximum and minimum values. 68% of these enterprises chose the model of cooperative innovation and imitative innovation. The proportion of independent innovation model is highest in the four types of enterprises. The annual capitals for agricultural research and development of 67% enterprises are less than 3% of the enterprise's annual total sales.

From the table 4, we knew that every marketing capability of the third kind of enterprises is relatively weak. These enterprises don't have outstanding characteristics or advantages. They need to imitate or follow the development strategies of the other enterprises. The firm size of these enterprises is smallest and the strength is weakest. The enterprises that are less than 200 staffs account for 65%. 77% of these enterprises chose the model of cooperative innovation and imitative innovation. By the cluster analysis, we know that different enterprises need to cultivate different marketing capabilities according to the reality of enterprises.

Table 4: The results of cluster analysis

Factor	Categories of enterprises		
	1	2	3
channel management	0.22	-0.42	0.04
marketing communication	0.15	-0.05	-0.24
brand management	0.05	0.44	-0.59
selling	0.36	0.33	-1.07
pricing and information management	-0.13	0.47	-0.27
marketing planning and implementation	0.25	-0.51	0.08
new product development	0.65	-0.79	-0.39
<i>The number of enterprises</i>	48	27	25

Higher values of marketing capabilities indicate the related capabilities of these enterprises are more stronger.

5 Conclusions

The scale of marketing capability is built according to the characteristics of China's agricultural science and technology enterprises. Seven dimensions can be used to measure marketing capability, channel management, selling, brand management, marketing communication, pricing and market information, new product development, and marketing planning and implementation. By the cluster analysis, 268 China's agricultural science and technology enterprises are divided into three types that attach importance to different marketing capabilities. From these two parts, we can further understand the characteristics of marketing capabilities in the context of China's agricultural science and technology enterprises.

Some conclusions can be drawn from the previous researches. Firstly, the traditional 4P marketing mix already is the most important way to measure marketing capability. It's a prominent concept across countries, regardless of the countries' stages of development or cultural properties (Kemper et al, 2011). Secondly, brand management, customer-focused marketing capability, gradually attracts scholars' attentions in recently years (Vorhies et al, 2011; Merrilees et al, 2011). Finally, market information management is a process of gathering, processing, interpreting and distributing information (Morgan et al, 2012). It plays the fundamental role in the marketing activities.

The measurement of marketing capability in this study is different from the previous studies. Firstly, China's agricultural science and technology enterprises don't pay attention to the marketing planning and marketing implementation. The two dimensions are merged into one variable. Secondly, pricing and market information were extracted as one factor in the EFA. This also is in line with the industrial characteristics of China's agricultural science and technology enterprises that these enterprises adjust prices according to the competitors' price information.

And the cluster analysis shows that the strength of enterprises could affect the development of market capability. Different enterprises pay attention to different marketing capability.

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