Matching Mechanism between Technological Capabilities and Marketing Capabilities

S.B.HAO & P.B.GAO
Harbin Institute of Technology, Harbin, China

ABSTRACT: Both technological capabilities and marketing capabilities are positively related to firm performance. This paper aims to reveal the matching mechanism between technological capabilities and marketing capabilities. We analyze the matching relationship between technological capabilities and marketing capabilities and construct the evaluation index system. According to the plane geometry, we set up the matching degree computing model, which enables firms to have a better understanding of the function mechanism between two capabilities and take effective measures to achieve their synergetic development.

KEYWORD: Technological capabilities; Marketing capabilities; Matching

1 INSTRUCTIONS

Due to the increasing of technology complexity, the shortening of product life cycle, and the diversifying of customer's needs, the antecedents of innovation success have received renewed attention. The extant literature focuses on capabilities leading to innovation success, of which, technological capabilities and marketing capabilities attract much research interest. The resource-based view suggests that superior performance can come from resource uniqueness (Barney, 1991). Both technological capabilities and marketing capabilities are idiosyncratic and valuable resources, and they are critical sources of the competitive advantage (Clark & Fujimoto, 1991; Day, 1994; Peteraf, 1993). According to the RBV, technology capabilities and marketing capabilities should have positive impact on firm's innovation performance. Technology capabilities enable firms to develop and utilize various technologies and quickly respond to the changing technological environment (Afuah, 2002). Marketing capabilities enable firms to deliver market information and carry out appropriate responses to customer needs and preferences (Moorman & Slotegraaf, 1999). The assumed positive relationship between these two capabilities and business performance has been empirically confirmed in many studies (Cano, Carrillat, & Jaramillo, 2004; Krasnikov & Jayachandran, 2008; Song, Di Benedetto, & Nason, 2007; Su, Peng, Shen & Xiao, 2013). Despite this evidence, an increasing number of researchers are questioning whether merely having strong technological capabilities and marketing capabilities can provide firms with a sustainable competitive advantage and superior performance (e.g., Lichtenstein & Brush, 2001). Helfat (2000) raises the question: why some firms successfully use their technological and marketing capabilities while others do not. The resource-management model indicates that even when a firm has strong capabilities, it is unlikely for a firm to create great value unless it leverage those capabilities effectively (Sirmon, Hitt, & Ireland, 2007). 'Coordinating' is an important element of leveraging capabilities, and it refers to integrating capabilities into effective capability configurations. Hence, for the purpose of appropriately coordinating technological and marketing capabilities, it is important to analyze the function mechanism between these two capabilities. However, there is no systematic research on the function mechanism between technological capabilities and marketing capabilities. Therefore, this paper attempts to analyze the matching mechanism between technological capabilities and marketing capabilities, and this research will help firms to realize the performance implications of technological and marketing capabilities and coordinate the two capabilities to achieve innovation success and fast growth.

We organize this paper as follows: Firstly, we analyze the matching relationship between technological and marketing capabilities, and then construct a basic model describing the matching mechanism of the two capabilities. Subsequently, we present the matching degree evaluation index system, and set up the matching degree evaluation model based on plane geometry theory.

2 MATCHING RELATIONSHIP BETWEEN TECHNOLOGICAL CAPABILITIES AND MARKETING CAPABILITIES

There are two main operational definitions of matching: interaction and congruence. Technological capabilities and marketing capabilities are not independent, they are complementary capabilities and interact with each other. Song et al. (2005) and Su et al. (2013) investigate the relationships to performance of technological capabilities, marketing capabilities, and their interaction. The empirical results show that the interaction between technological capabilities and marketing capabilities relate positively to firm performance. Technological capabilities and marketing capabilities interact with each other and have the synergistic performance effects (Vorhies & Morgan, 2005). Marketing capabilities are important for the firm to profit from new products developed by its technological capabilities; likewise, despite marketing capabilities enabling the firm to grasp changes in customers' preferences, they can hardly adapt to such changes without using technological capabilities to develop new products (Song et al., 2005; Wernerfelt, 1984). Through the above analysis, the interaction between technological capabilities and marketing capabilities can be explained.

According to the smiling curve theory, we can explain the congruence of technological capabilities and marketing capabilities. A smiling curve illustrates the value-adding potentials of different components of the value chain. Both ends of the value chain command higher values added to the product than the middle part. Figure 1 presents this phenomenon in a graph with a Y-axis for value-added and an X-axis for value chain. In the value chain, the most lucrative value area focus on both ends − R&D and marketing. With the increasing competition in emerging economies, firms should excel in both R&D and marketing. The strong technological capabilities and marketing capabilities can ensure the successfully implementation of R&D and marketing activities. Therefore, firms should develop technological capabilities and marketing capabilities together, for the goals of their development are the same: creating high value for firms. From this point, we suggest that the relationship between technological capabilities and marketing capabilities is matching, and it's critical to achieve the proper match between these two capabilities.

The matching relationship between technological capabilities and marketing capabilities does not mean that firms have to promote them at the same time, it allows a certain gap between them, but the gap should be controlled within the certain range. Accordingly, the promotion of the two capabilities often has a certain order. When technological

capabilities are the constraint to innovation success, the firm will focus on enhancing technological capabilities, and then technological capabilities will be greatly enhanced while the marketing capabilities will be relatively weak, becoming the new constraints to innovation success, and the firm will allocate resources to promote marketing capabilities. In the subsequent third stage, technological capabilities will once again become the constraints, the firm will once again focus on the promotion of technological capabilities, a repeated cycle of development process is formed, reflecting both the stage and cyclical characteristics of the promotion of technological and marketing capabilities, the matching mechanism of the two capabilities takes the form of double helix mode. Based on the above analysis, we construct the double helix matching mechanism model of the two capabilities, which is shown in Figure. 2.
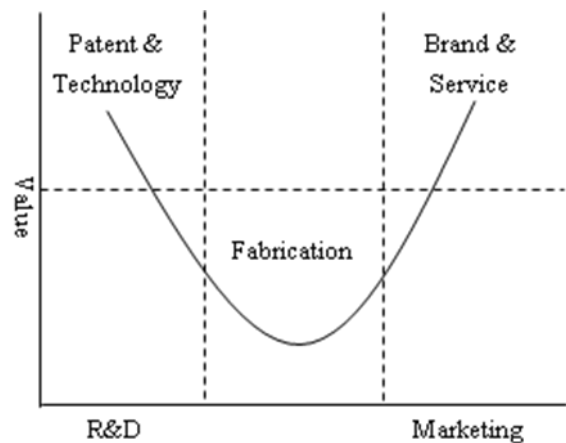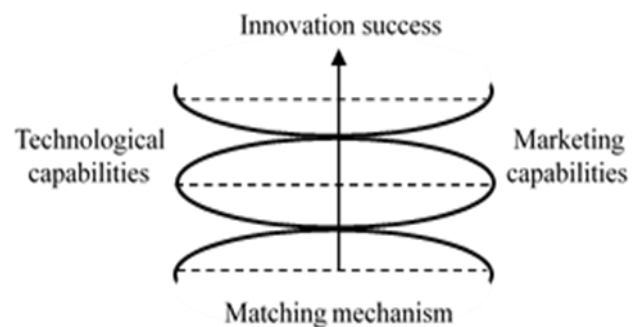

Figure 1. The smiling curve theory

Figure 2. The matching mechanism between technological capabilities and marketing capabilities

3 MATCHING DEGREE EVALUATION OF TECHNOLOGICAL CAPABILITIES AND MARKETING CAPABILITIES

3.1 *Matching degree evaluation index system*

Technological capabilities refer to a firm's abilities to deploy and utilize various technological resources. They focus on new product development, manufacturing processes, technology development, and forecasting technological change in the industry.

Marketing capabilities reflect the abilities of a firm to generate and disseminate information and carry out appropriate responses to current and future customer needs and competitive situations. They concern knowledge of customers and competitors, as well as skills in segmenting and targeting markets and integrating marketing activities. According to the definition and structure of the technological capabilities and marketing capabilities, we construct the matching degree evaluation index system of the two capabilities, as shown in Table 1. Respondents rate each item using a 5-point scale ranging from 1 (much worse than the top three major competitors in the industry) to 5 (much better than the top three major competitors in the industry). We calculate the means of the items to evaluate the level of capabilities.

Table 1. Matching degree evaluation index system.

First-class index	Second-class index
Technological capabilities (TC)	Technology development capabilities (TC1) Manufacturing processes (TC2) New product development capabilities (TC3) Capabilities in forecasting technological change in the industry (TC4)
Marketing capabilities(MC)	Knowledge of customers (MC1) Knowledge of competitors (MC2) Skills in integrating marketing activities (MC3) Skills in segmenting and targeting markets (MC4)

3.2 Matching degree evaluation model

Matching degree is used to reflect the interaction and congruence degree of the systems or elements. According to the plane geometry and statistics theory, the distance between points can reflect the congruence degree of the systems or elements. We treat the level of technological capabilities and marketing capabilities as two points $T(X_T, Y_T)$ and $M(X_M, Y_M)$ in the plane, and define the distance between these two points as the matching degree of technological and marketing capabilities. We calculate the means of the former two items of technological capabilities and marketing capabilities as X_T and X_M, and calculate the means of the latter two items of technological and marketing capabilities as Y_T and Y_M.

Then we establish the origin of coordinate system as the center of the circle, and the distance from origin to the level of technological capabilities T as the radius of the sector. According to the location of M which representing the level of marketing capabilities lies in or out the sector to judge marketing capabilities is insufficient or excessive compared to technological capabilities. Based on the above analysis, this paper presents the matching degree evaluation model between technological capabilities and marketing capabilities:

$$f_{TM} = \sqrt{(x_M - x_T)^2 + (Y_M - Y_T)^2}$$

In Figure 3, we define $d \in (0, r/n)$ as the threshold value, which is determined by the experts. The value of n is related to the number of subsystems m, is usually equal to m+1, in this paper, there are two subsystems: technological capabilities and marketing capabilities, so the value of n is 3, and r/3 is the upper limit. The smaller the value of d, the higher matching degree of technological capabilities and marketing capabilities. We draw the following criterions: ① $f_{TM} \leq d$, reflecting that marketing capabilities match with technological capabilities, the smaller the value of f_{TM}, the higher the matching degree. ② $f_{TM} > d$, reflecting that marketing capabilities mismatch with technological capabilities. If the point M is out of the sector, the level of marketing capabilities is excessive. If the point M is in the sector, the level of marketing capabilities is insufficient.
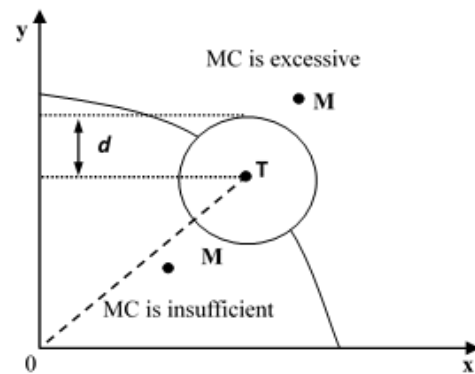

Figure 3. The matching diagram of technological capabilities and marketing capabilities

We provide Figure 4 to highlight the connection between technological and marketing capabilities which can be characterized in terms of four distinct situations. The vertical dimension in the Figure 4 captures the level of technological capabilities, the horizontal dimension captures the level of marketing capabilities. The I quadrant represents the fit situation where both the technological capabilities and marketing capabilities are high and match with each other, the matching degree is high. The III quadrant also represents the fit situation where the

matching degree is high, however, the levels of both capabilities are low. The II and IV quadrants represent the misfit situation between technological capabilities and marketing capabilities, where the matching degree is low. In II quadrant, marketing capabilities are insufficient compared to technological capabilities, while in IV quadrant, marketing capabilities are excessive compared to technological capabilities. In these two situations, there is "bottleneck" in the capabilities configuration, so firms should avoid these situations. According to the calculated matching degree, we can identify the quadrant where a firm locates in.
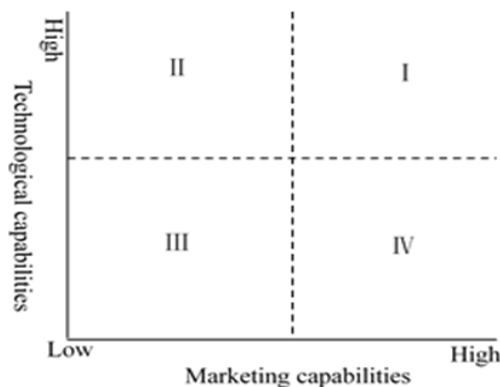

Figure 4. Four possible matching scenarios between technological capabilities and marketing capabilities

4 CONCLUSION

This paper analyzes the matching mechanism between technological capabilities and marketing capabilities, and finds that the two capabilities are reciprocal conditions and mutually reinforcing, the matching degree of them determines their contribution to innovation success. According to the plane geometric concepts, this paper constructs the matching degree evaluation index system and evaluation model. The evaluation results are helpful for firms to judge the matching state of their technological and marketing capabilities, more importantly, firms can find the bottleneck between them, then coordinate the development goal of the two capabilities, pay close attention to the technological capabilities and enhance marketing capabilities at the same time, and take concrete strategies to make them synergetic development to enable firms to achieve innovation success and fast growth.

REFERENCES

[1] Afuah, A. 2002. Mapping technological capabilities into product markets and competitive advantage: the case of cholesterol drugs. *Strategic Management Journal* 23(2): 171-179.

[2] Barney, J. B. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17(1): 99-120.

[3] Cano, C. R., Carrillat, F. A., & Jaramillo, F. 2004. A meta-analysis of the relationship between market orientation and business performance: Evidence from five continents. *International Journal of Research in Marketing* 21(2): 179-200.

[4] Clark, K. B., & Fujimoto, T. 1991. *Product development performance: Strategy, organization, and management in the world auto industry*. Boston, MA: Harvard Business School Press.

[5] Day, G.S. 1994. The capabilities of market-driven organizations. *Journal of Marketing* 58(3): 37-52.

[6] Helfat CE. 2000. Guest editor's introduction to the special issue: the evolution of firm capacities. *Strategic Management Journal, Special Issue* 21(10-11):955-959.

[7] Krasnikov, A., & Jayachandran, S. 2008. The relative impact of marketing, research-and-development, and operations capabilities on firm performance. *Journal of Marketing* 72(4): 1-11.

[8] Lichtenstein, B. M. B., & Brush, C. G. 2001. How do 'resource bundles' develop and change in new ventures? A dynamic model and longitudinal exploration. *Entrepreneurship Theory and Practice* 25(3): 37-58.

[9] Moorman, C., & Slotegraaf, R. J. 1999. The contingency value of complementary capabilities in product development. *Journal of Marketing Research* 36(2): 239-257.

[10] Peteraf, M.A. 1993. The cornerstones of competitive advantage: a resource-based view. *Strategic Management Journal* 14(3): 179-191.

[11] Sirmon, D. G., Hitt, M. A., & Ireland, R. D. 2007. Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of Management Review* 32(1): 273-292

[12] Song, M., Di Benedetto, C.A., & Nason, R.W. 2007. Capabilities and financial performance: the moderating effect of strategic type. *Journal of the Academy of Marketing Science* 35: 18-34

[13] Song, M., Dröge, C., Hanvanich, S., & Calantone, R. 2005. Marketing and technology resource complementarity: An analysis of their interaction effect in two environmental contexts. *Strategic Management Journal* 26(3): 259-276.

[14] Su, Z. F., Peng, J. S., Shen H., & Xiao, T. 2013. Technological capability, marketing capability, and firm performance in turbulent conditions. *Management and Organization Review* 9: 115-137

[15] Vorhies, D. W., & Morgan, N. A. 2005. Benchmarking marketing capabilities for sustainable competitive advantage. *Journal of Marketing* 69(1): 80–94.

[16] Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal* 5(2):171–180.