

Performance Mechanism of Coordination Capability Based on Dynamic Capability Framework-the Mediating Role of Operational Capabilities

Gao Tiantian and Tian Yezhuang

*School of Management
Harbin Institute of Technology
gaotiantianme@163.com*

Abstract

A critical issue has been absent from the conversation on dynamic capabilities: how dynamic capabilities influence the enterprise performance. This paper proposes a new vision to research the performance mechanism of coordination capability as a dynamic capability. Operational capabilities are existed as mediating role. Data from International Manufacturing Strategy Survey in 2009 is used to verify the mediating model by hierarchical regression analysis. The results show that coordination capability impacts the enterprise performance positively and indirect impacts the enterprise performance through quality, cost and flexibility. This finding integrates insights from previous research in dynamic capability framework and operational management into a generalization and extension of the performance mechanism in manufacturing enterprises.

Keywords: *Coordination capability, Dynamic capability, Operational capability, Enterprise performance*

1. Introduction

Since the 1990s, great changes have taken place in external competition environment because of the rapid development of new technology and the highlight of knowledge economy. On the one hand, technological innovation is quickened enterprise external competitive environment presenting a sharp change of dynamic. Knowledge and technology, on the other hand, have the decisive influence to the business performance and competitive advantage which becoming more and more outstanding. In this case, the dynamic capability has become one of the most vibrant topics in the domain of strategic management, and has even been referred to as ‘the new touchstone firm-based performance-focused theory’ [1]. The primary premise of the dynamic capability framework is that a firm has operational capabilities and resources that are directly involved in firm performance by converting inputs into outputs and dynamic capabilities that influence firm performance indirectly by updating, integrating and reconfiguring a firm’s existing operational capabilities and resources [2].

Although the dynamic capability framework argues that dynamic capabilities influence firm performance by renewing operational capabilities, it is unclear from prior studies whether they actually influence firm performance through operational capabilities. It is also unclear whether a dynamic capability influences firm performance through the renewal of a single operational capability or several of them. There is not a clear clarification that one scholar will classify a particular capability as operational while another will classify that same capability as dynamic. Wu, Melnyk, and Flynn, for example, define product development

capabilities developed within a firm's operations function as operational [3], while Helfat and Winter categorize these same capabilities as dynamic [4]. We need this distinction to understand the mechanism(s) by which dynamic capabilities change operational capabilities and ultimately firm performance. This paper provide a way to understand the distinction between dynamic and operational capabilities, and investigate empirically whether a given dynamic capability influences firm performance by updating (renewing) a single operational capability or a number of them.

2. Literature Review and Hypothesis

2.1. Dynamic Capability

Based on resource-based view, Teece, Pisano and Shuen's first proposed the dynamic capability framework [2]. In this model, dynamic capabilities emphasize the transforming of environmental characteristics and how the firms manage to adapt, integrate, and reconfigure the internal and external organizational resources to compete with the dynamic environmental conditions [5]. Eisenhardt and Martin expand on Teece and Pisano's earlier view that dynamic capabilities are not vague but rather exhibit commonalities with "greater equifinality, homogeneity, and substitutability across firms"[6]. Rather than focusing on how dynamic capabilities reconfigure operational capabilities, the second stream of literature investigates how a firm uses its dynamic capabilities to reconfigure tangible and intangible resources [7]. Wang and Ahmed draw from the existing empirical findings and identify three main elements of dynamic capabilities: adaptive capability, absorptive capability, and innovative capability. Dynamic capabilities are organizational routines, which must be obtained by learning with highly stylized, repeatable or quasi- repeatable [8].

According to the dynamic capability framework, a firm's coordination capability is considered dynamic capabilities [5] because resource coordination can be used to renew a firm's operational capabilities [7]. Coordination capability is refers to the enterprise to maintain the relationship between customers and suppliers and force to adapt the demand of the competitive environment. In terms of enterprise's external environment, these relationships constitute the main inducement of the change in competition environment [9]. As a result, the enterprise must be dynamically adjusting these external relations.

2.2. Operational Capability

Since the modern management science applied to manufacturing enterprises, operational capability is not simply referring to the enterprise's production and the production varieties, *etc.* It has become a measure in the process of production with extensive significance. Taylor proposes that a firm should develop two tiers of interdependent operational capabilities: (1) the capacity to plan the most efficient work method for a given task, and (2) the capacity of line workers to execute a given activity as planned [10]. Skinner, *et al.*, consider that operational capability is the most important element to construct the enterprise competitive advantage. Manufacturing can provide organizations with certain competitive power [11]. These capabilities can be used as a competitive weapon, achieving manufacturing performance in cost, quality and time dimensions. Roth and Van Der Velde argue that operational capability has achieved the strategic capability in the process of manufacturing. It is the strategic transformation of enterprise [12].

Literature in the operations management field has currently classified operational capabilities into three types: quality, cost, flexibility. Cost reduction is an important means of creating value for customers. Cost is the core of the traditional manufacturing

strategy research of efficiency. Quality is the most basic capability. Flexible is a key manufacturing capability measuring respond to change [13].

2.3. Distinction between Dynamic Capability and Operational Capability

There are some attempts have been made to distinguish these two types of firm capabilities from one another. Teece *et al.*, theorize that firms generally have two sets of capabilities: operational or ordinary capabilities and dynamic capabilities. Operational capabilities are directed toward converting inputs into outputs, while dynamic capabilities are directed toward changing other firm capabilities [5]. Zollo and Winter consider that operational capabilities are “zero-order” abilities with static, dynamic capabilities are “higher-order” abilities equating with change [14].

However, since empirical studies show that operational capabilities can in fact change on their own and also change other firm capabilities. Helfat and Winter also acknowledge the limitation of using the zero-order concept to distinguish operational capabilities from dynamic noting that change is always occurring in all capabilities to at least some extent [4].

If we consider the dynamic and static systems concepts developed by Knight and Klein, we might be able to apply these concepts as we develop a new framework that distinguishes dynamic capabilities from operational ones [15, 16]. Systems that change in a predictable manner should be considered static or zero-order. Applying this systems concept to the field of dynamic capabilities, I distinguish between operational and dynamic capabilities by determining whether or not the outcome resulting from a change produced by a capability is predictable. If an operational capability induces change in a different firm capability, then the outcome of that change can be estimated a priori using initial conditions. If a dynamic capability induces change in a different firm capability, then the outcome of that change cannot be estimated a priori using initial conditions.

As a dynamic capability, a firm’s coordination capability is difficult to estimate outcomes resulting from the creation of new capabilities and resources because the creation of new capabilities entails high levels of uncertainty. While the changes inducing by quality, cost, flexibility capabilities are certain and can be estimated.

2.4. Dynamic Capability, Operational Capability and Enterprise Performance

Teece, *et al.*, propose dynamic capability to explain why some organizations are more successful than others in establishing competitive advantages in dynamic markets [5]. Dynamic capabilities are also found to be conducive to long-term firm performance [8]. D’Aveni, Dagnino, and Smith also highlight the importance of dynamic adjustment capability for short-term competitive advantages to deal with a hyper-competitive environment, in which resources are difficult to obtain [17].

Coordination capability as a dynamic capability, of which coordinate the resource of external environment can lead to the development of new capabilities and resources that help a firm gain a competitive advantage. Coordinating with customers and suppliers can achieve performance improvement through continuous absorption and transformation of external information and resources [9]. Tomas, Ketchen and Arrfelt found that the enterprise can get performance improvement through the supply chain relationship management and the accumulation of culture and knowledge competition [18]. Danniell and Wilson also pointed out that enterprises with coordination capability can well adapt to the dynamic changes of the external environment and market challenge [19]. The unique management model of suppliers, distributors and terminal customer in Dell is proved that coordination capability can create extraordinary performance and competitive advantage.

H1: Coordination capability will have a positive relationship on enterprise performance.

The quality capability influences a firm's overall performance and is defined as a firm's ability to meet customers' requirements and expectations [20]. It is easier for suppliers and customers to understand the requirement of enterprise by coordinating the resource. The information about the products, processes, plans, and ability to the interactive exchange process help manufacturing enterprises to develop their production plan and improve the quality. This procedure meets customers' requirements and expectations and eventually influences a firm's overall performance.

H2a: Coordination capability will have a positive relationship on quality capability.

H2b: Quality capability mediates the relationship between coordination capability and enterprise performance.

A firm's cost capability influences firm performance and is defined as a firm's ability to produce goods and provide services at the lowest possible cost [21]. Tacit customer and supplier resource that can be used to modify a firm's existing processes and create new one can be acquired efficiently by firms by involving customers in the product design and development process, encouraging them to share market information and developing business plans together [22]. Resource acquired by engaging in coordinating activities renews a firm's cost capability, which in turn influences overall firm performance.

H3a: Coordination capability will have a positive relationship on cost capability.

H3b: Cost capability mediates the relationship between coordination capability and enterprise performance.

A firm that can switch seamlessly from performing one interdependent task to another is said to have operational flexibility [23]. A firm that produces a wide variety of products must be able to switch from performing a set of interdependent activities required to produce a given product to a different set of activities essential to produce an entirely different product. The various activities required to produce a variety of products are performed by different departments and individuals, thereby requiring a firm to coordinate those interdependent activities effectively to gain a competitive advantage. To produce a variety of products, a firm must be able to effectively coordinate the completion of all the tasks and activities required to produce those products.

H4a: Coordination capability will have a positive relationship on flexibility capability.

H4b: Flexibility capability mediates the relationship between coordination capability and enterprise performance.

Through the analysis of the relationship between coordination capability, operational capability and enterprise performance, the schematic diagram of dynamic capabilities causal mechanism in this paper is shown in Figure 1:

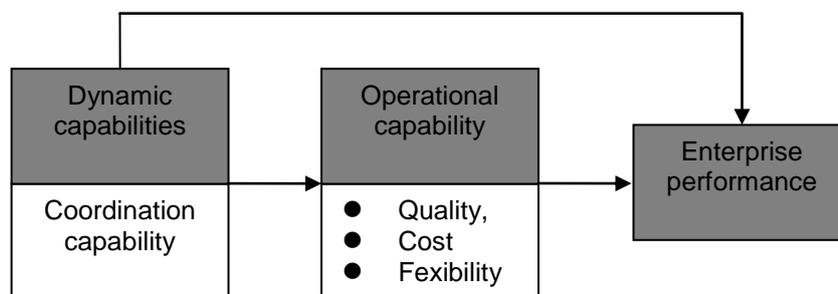


Figure 1. Schematic Diagram of Dynamic Capabilities Causal Mechanism

3. Data Analysis and Empirical Results

3.1. Data Source

The paper data comes from the fifth edition of the International Manufacturing Strategy Survey in 2009 (International Manufacturing Strategy Survey, IMSS - V). The project which is launched by professor Voss and professor Lindberg in London business school of Sweden's university of moss, It is designed for the research of manufacturing enterprise strategy practice and performance in the world. This investigation is mainly in the form of questionnaire mainly using Likert five-point scale, including 719 enterprises in 20 countries. All enterprises are classified according to the International Standard industrial (International Standard Industry Code, ISIC) 28-35, belonged to industrial and business operation entity. There are 508 samples of eight industries after removing the missing values. The samples of industries and geographical distribution are shown in Table 1 and Table 2.

Table 1. The Samples of Industries Distribution

No.	Industries	Percent (%)
28	Metal manufacturing, except the machinery and equipment	38.8
29	Machinery and equipment	20.9
30	Office, accounting and computer	2.29
31	Electrical equipment and instrument	13.6
32	Radio, television and communication equipment	5.58
33	Medical equipment, precision instruments	4.15
34	Motor vehicle, trailer, semi-trailer	9.59
35	Other transportation equipment	5.87

Table 2. The Samples of Geographical Distribution

Region	Country	Percent (%)	Region	Country	Percent (%)
Asia	Chinese Mainland	9.88	Europe	Germany	4.54
	Chinese Taiwan	5.73		Hungary	8.70
	Japan	3.16		Ireland	0.79
	Korea	7.70		Italy	4.83
North America	America	10.47		Netherlands	6.13
	Canada	3.16		Portugal	1.58
	Mexico	3.36		Spain	4.94
Europe	Belgium	5.93		Switzerland	4.74
	Denmark	2.17		England	3.36
	Estonia	3.16		South America	Brazil

3.2. Variables Measurement

Enterprise performance is measured by return on sales (ROS) and return on investment (ROI). Coordination capability measures the extent to which a firm coordinates with its key and strategic customers, suppliers for their plan and resources. Quality capability is measured by what extent a firm produces reliable and conformable products. Cost capability is constructed by the extent to which a firm can produce products at low costs. Flexibility capability is constructed by the extent to which a firm can switch from

producing one product line to another and the extent to which it can change the rate of production. There are special items in allusion to all the variables in IMSS-v questionnaire. Indicators of variables are shown in Table 3.

Table 3. Indicators of Variables

Variables	Indicators
Enterprise performance	1. Return on sales
	2. Return on investment
Coordination capability	3. Share the information of inventory levels
	4. Share the production plan and demand forecast information
	5. Collaborative planning, forecasting and supplement
	6. Share factories or other facilities with suppliers or customers
Quality capability	7. Consistency of product
	8. Quality and reliability
Cost capability	9. Unit production costs
	10. Productivity
	11. Inventory carry rate
	12. Capacity utilization rate
Flexibility capability	13. Product customization
	14. Production flexibility
	15. Variety flexibility

3.3. Reliability and Validity

This paper uses SPSS 17.0 to test reliability. Cronbach 's Alpha coefficients of all variables are greater than 0.6, showing good reliability. Confirmatory factor analysis show fitting index as followed: chi square/df = 1.93, RMSEA = 0.073, CFI = 0.91, GFI = 0.82, AGFI = 0.911. Model fitting results are good, and at the same time the factor loading coefficient of each variable show good convergent validity. The square root of average extraction variance (AVE) of each variable is greater than the correlation coefficient of this variable with other variables, which has better discriminant validity. Reliability, validity of test results and the correlation matrix are shown in Table 4.

Table 4. Reliability, Validity and Correlation Matrix

Variables	Cronbach's α	Mean	s.d.	1	2	3	4	6
Coordination capability	.732	3.20	.911	.782				
Quality capability	.842	3.96	.917	.215**	.776			
Cost capability	.877	3.35	.919	.198**	.225**	.836		
Flexibility capability	.820	3.81	.891	.188**	.113*	.282**	.817	
Enterprise performance	.890	3.26	.782	.211**	.209*	.226**	.289**	.852

N=508, ** p<0.001, * p<0.01, numbers on the diagonal show square roots of AVE.

3.4. Empirical Results

These papers take operational capabilities as mediating variables and examine the relationships between dynamic capabilities in manufacturing enterprise and performance. Results are shown in Table 5-7.

In model 2 of Table 5-7, coordination capability has a significantly positive relationship on enterprise performance ($P < 0.001$), providing strong evidence for the hypothesis 1. Enterprise performance will be promoted when coordination capability applying more. In model 1 of Table 5-7, coordination capability has a significantly positive relationship on ($P < 0.001$) quality capability cost capability and flexibility capability. In model 3 of Table 5-7, the relationship of coordination capability and enterprise performance is not significant when entering the operational capabilities. This conclusion shows the completely mediating role of operational capabilities. The hypotheses 5-7 are verified. Coordination capability influence enterprise performance by renewing quality, cost and flexibility.

Table 5. Mediating Test of Quality Capability between Coordination Capability and Enterprise Performance

	Model 1	Model 2	Model 3
Variables	Quality capability	Enterprise performance	Enterprise performance
Coordination capability	.211**	.192**	.093
Quality capability			.301**
F	2.87**	2.16**	2.84**
Adjusted R ²	.193	.079	.092
ΔR^2	.196**	.173**	.023*

N=508, ** $p < 0.001$, * $p < 0.01$, standardized coefficients are reported.

Table 6. Mediating Test of Cost Capability between Coordination Capability and Enterprise Performance

	Model 1	Model 2	Model 3
Variables	Cost capability	Enterprise performance	Enterprise performance
Coordination capability	.198**	.201**	.078
Cost capability			.261**
F	2.44**	2.28**	2.67**
Adjusted R ²	.186	.088	.072
ΔR^2	.191**	.165**	.013*

N=508, ** $p < 0.001$, * $p < 0.01$, standardized coefficients are reported.

Table 7. Mediation test of Flexibility Capability between Coordination Capability and Enterprise Performance

Variables	Model 1 Flexibility capability	Model 2 Enterprise performance	Model 3 Enterprise performance
Coordination capability	.179**	.176**	.081
Flexibility capability			.239**
F	1.76**	2.01**	2.09**
Adjusted R ²	.142	.076	.063
ΔR ²	.136**	.157**	.012*

N=508, ** p<0.001, * p<0.01, standardized coefficients are reported.

4. Discussion and Conclusions

In the past 20 years, the relationship between dynamic capabilities and enterprise performance is always an important research in the field of strategic management. Unfortunately, due to the dynamic capabilities rooted in resource-based view are difficult to measure, it has rarely been systematically studied dynamic capabilities whether and how to influence enterprise performance. Although dynamic capability literature posits that dynamic capabilities influence firm performance through operational capabilities, prior studies examine the direct relationship between dynamic capabilities and firm performance rather than a relationship mediated by operational capabilities. Therefore, it is unclear from these studies if operational capabilities actually mediate the relationship between dynamic capabilities and firm performance and whether in fact dynamic capabilities consistent with the definition were established. It is also unclear from these studies whether dynamic capabilities influence firm performance by renewing a single operational capability or several of them.

To understand the distinction between dynamic and operational capabilities, I relax the current dynamic capability assumption that capabilities are considered operational only when they are zero-order or lack mechanisms to change on their own and induce changes on other capabilities. It is necessary to relax this assumption because the existing definition of operational capabilities, that lack the mechanism to change on their own and change other capabilities, is inconsistent with empirical works in the fields of operations management [24], organizational routines and dynamic systems [25]. This paper finds that we can distinguish between operational and dynamic capabilities by examining the predictability of outcomes that are produced by changes in a firm's production systems. Those capabilities that produce outcomes that cannot be predicted using probability distribution should be considered dynamic capabilities, while firm capabilities that produce outcomes that can be predicted using probability distribution should be considered operational.

The indirect link between dynamic capabilities and performance may hold the most promise in dynamic capabilities framework. Dynamic capabilities may actually change the capability base. The new capability base may influence new product market positions, which in turn may affect performance [26]. This approach is fully consistent with early proposals that dynamic capabilities may be a key antecedent of firms' strategic choices, such as entry strategies, entry timing, or diversification, but, perhaps because of the strong emphasis initially put on the direct link to performance, those suggestions remained largely unexplored. These papers empirically investigate the process by which a

firm's dynamic capabilities influence firm performance. When a firm's given dynamic capability-coordination capability influences firm performance through the renewal of operational capability such as quality, cost and flexibility capability, the firms improve its performance. It is essential for a firm to understand how its dynamic capabilities are linked to its operational capabilities. A lack of such knowledge could prompt firm managers to invest in a dynamic capability that minimally influences firm performance. Danneels shows that Smith Corona's performance did not improve even after the firm invested substantially to develop a new dynamic capability [27].

As the forefront of strategic management, Dynamic capability theory is still in its infancy. This study enhances our understanding of dynamic capabilities by distinguishing them from operational capabilities and by showing how they contribute to firm performance through the renewal of operational capabilities. It is a beneficial supplement for the dynamic capability theory which opening the "black box" of dynamic capability performance mechanism.

Like any other study, this paper also has limitations. The data used in study belong to cross-section data, we failed to study dynamic capabilities' impact on enterprise performance in a temporal dynamic way. These limitations need discussion in future research.

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Authors



Gao Tiantian, she received her master degree in Tourism management (2010). Since 2010, she has studied in School of Management in Harbin Institute of Technology for doctorate. The research direction is manufacturing strategy.



Tian Yezhuang, he is the professor and doctoral supervisor of School of Management in Harbin Institute of Technology. His research directions are manufacturing strategy, organization theory and design.