ISSN (Print): 0974-6846 ISSN (Online): 0974-5645

The Influence of Resource Competence on Convergence Performance through Dynamic Convergence Capabilities

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Abstract

With the increasing tendency of convergence products and services, most firms are interested in facilitating organizational capability to combine existing technology into convergent technology with information and communication technology. Convergence capability in new product development of the firm has become essential component. In order to respond to rapid environmental change, most firms are continuing to improve organizational performance, by integrating the organization's resources with scanning for critical environmental change. This study suggests a research model to identify the relationship between resource competence and convergence performance through dynamic convergence capabilities. The empirical result shows that resource competence of the organization and dynamic convergence capabilities influence positively convergence performance. This study complements the prior studies with empirical evidence which dynamic convergence capability has a greater effect on convergence performance than resource competence.

Keywords: Resource Competence, Dynamic Convergence Capabilities, Sensing, Integrating, Coordinating, Convergence Performance

1. Introduction

Today, the development of ICT (Information and Communication Technology) convergence strategy in rapidly changing business environment is essential for maintaining competitive advantage in the market. Firms within an industry may be heterogeneous with respect to strategic resource they have. Since these resources may not be mobile to other firms, heterogeneity of strategic resource can be long sustained. For example, Apple and Toyota have used their superior product development skills to achieve competitive advantage in the smartphone industry and automobile industry respectively. New customer demands drive strategic alliance and acquisition of ICT skills into new product development that brings new resources into the firm from external sources^{5,10}. In addition, biotech firms with strong alliancing processes for accessing outside knowledge achieve superior performance¹⁹.

From the Resource-Based View (RBV), firms with abundant organizational resources can continue surviving and developing because of their strong competitive advantage, regardless of external environmental changes. However, RBV holds a limitation that retainment of firm's core resources represents a better strategy than continuously adjusting firm's business activities to match environmental changes^{7,9,23,24}. Firms can achieve sustained competitive advantages by accumulating organizational resources that produce economic value, are relatively scarce, and can sustain competitive attempts at imitation, acquisition, or substitution². However, RBV approach is often insufficient to explain competitive advantage, because all variants of RBV focus on the firm's specificity and immobility of resources¹¹.

Teece et al.^{23,24} suggest that the dynamic capability approach is promising both in terms of future research potential and as an aid to management endeavoring to gain competitive advantage in increasingly

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demanding environments. In order to respond to rapid environmental change, most firms are continuing to improve organizational performance, by integrating the organization's resources with scanning for critical environmental change¹⁵. Dynamic capabilities reflect an organization's ability to achieve new and innovative forms of competitive advantage with given market positions. This study reestablished dynamic convergence capability as a new concept of dynamic capability with a framework of sensing, seizing, managing threats, and transforming^{4,13,16,24}.

Based on the dynamic capability theory²³, we suggest a research model to explain how resource competence of an organization can influence on convergence performance, and what is the mediating effect of dynamic convergence capabilities. This study aims to identify the determinants of convergence performance in organization, by studying empirically the structural relationship between resource competence and dynamic convergence capabilities of the enterprise. Also, this study empirically investigates the mediating effect of dynamic convergence capabilities in the relationship between resource competence and convergence performance. This study contributes to enhance the knowledge on dynamic capability by providing theoretical insights and empirical findings.

Theoretical Framework and Hypothesis Development

2.1 RBV and Dynamic Capabilities

Prior studies on resource-based view argue that firms resources consist of a subset of which enables them to achieve competitive advantage, and a further subset which leads to superior long-term performance^{2,9,17,25,26}. There is

not clear in defining the standards of corporate resources and skills in RBV. In general, enterprise resources can be defined as the tangible and intangible assets owned by an enterprise. Grant⁹ suggests that there are direct links between resources and profitability which raise issues for the strategic management of resources. The critical task is to assess capabilities relative to those of competitors. The failure of Nokia to respond to increasing demand of smartphone market during 2010s was similarly founded upon misplaced confidence in their R & D leadership.

There is no doubt that RBV of competitive advantage has two assumptions. First, impact of idiosyncratic firm resource has appeared as competitive resource to explain the relationship between a firm's internal characteristics and performance. Second, this competitive resource may not be perfectly mobile across firms². RBV assumes that resources and capabilities are heterogeneously distributed across firms and that such heterogeneity may persist over time. RBV is considered to be essentially static in its nature and inadequate to explain firms' competitive advantage in changing environment²¹.

Teece et al.²⁴ defined dynamic capabilities as "The firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." Their approach was built around several main elements that highlight its major theoretical underpinnings such as its nature, role, context, creation and development, outcome, and heterogeneity. This was a natural consequence of their view of dynamic capabilities as an extension of the RBV toward regimes of rapid change⁴. Teece²³ redefined the concept of dynamic capabilities, which it can be disaggregated into the capacity

- To sense and shape opportunities and threats
- To seize opportunities and

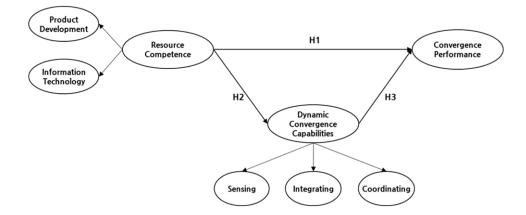


Figure 1. Research Model.

 To maintain competitiveness through enhancing, combining, protecting, and when necessary, reconfiguring the business enterprise's intangible and tangible assets.

From the theoretical foundations of RBV and dynamic capabilities in literature, this study suggests a research model to identify the relationship between resource competence and convergence performance, and the mediating effect of dynamic convergence capabilities. We adopt resource competence such as product development and Information Technology (IT) competence, as an antecedent of dynamic convergence capabilities for achieving convergence performance. Dynamic convergence capabilities in this study can be defined as the ability of organizational convergence activities such as sensing of convergence demands, integrating of convergence resources, coordinating of organizational competences and assets in convergence environment.

2.2 Resource Competence and Convergence Performance

In the RBV, the firm is seen as a bundle of tangible and intangible resources and capabilities required for product/market competition^{2,9}. Barney² considers firm resources to include all assets, capabilities, organizational processes, firm attributes, information and knowledge. We confirm that the resource-based view of the firm is not an alternative theory of strategy, the stress on resource should not replace but complement the stress on market position¹⁸. We believe that resources of the firm must be assessed against the competition, because a unique and superior resource competence can be a source of competitive advantage in convergence environment.

Zhang et al.²⁷ tried to study the relationship between innovation capacity and market performance for product development companies. As a result, they identified the positive influence on the relationship between product development with innovation capability and market performance. Chen⁶ carried out an empirical study of the relationship between the synergy of available IT resources and business performance with the perspective of RBV. In addition, Lu and Ramamurthy¹⁵ showed their results that IT capability influenced positively on organizational agility, which consists of market capitalizing agility and operational adjustment agility. Thus, we hypothesize the relationship between resource competence and convergence performance.

H1: Resource Competence of firm have a positive impact on convergence performance.

2.3 Resource Competence and Dynamic Convergence Capabilities

Today, organizations in rapidly changing business environment could not achieve their goal and performance only by retainment of their resources and capabilities. Firms can achieve their performance depending on how to leverage through capabilities development. Specifically, companies are trying to increase the performance while performing innovation and convergence of products and services. In order to meet with customer needs for innovative products and services, organizations are trying to develop the resources and capabilities, which improve convergent processes with heterogeneous skills and operations.

Dynamic capabilities are defined as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments, rather than retention of resources^{23,24}. Dynamic capabilities reflect an organization's ability to achieve new and innovative forms of competitive advantage with given market positions. Since that time, Teece²³ reestablished new concept of dynamic capability with a framework of sensing, seizing, managing threats, and transforming. Liao et al.14 classified resource stock of the firm into four resources (technology, alliance, human resources, planning) for firm innovation through integrative capability. These four resource stocks are suggested that the firm innovation can be achieved indirectly through dynamic capability perspective. Thus, we hypothesize the relationship between resource competence and convergence performance.

H2: Resource Competence of firm have a positive impact on dynamic convergence capabilities.

2.4 Dynamic Convergence Capabilities and Convergence Performance

For achievement of organizational performance, most firms are trying to perform the convergence capabilities in convergence environment. This is important factor to obtain competitive advantage through new product and service development. Teece²³ suggested the reconstruction of dynamic capability. He argued that most firms need to identify the ability of sensing, seizing, transforming to the environmental changes. Generally speaking, convergence performance refers to the extent which the firm tries to enhance the production process and apply innovative skills for the development of new product development. In order to develop convergence product and service,

firms must drive new customer demand into strategic alliance with competitive forces and acquisition of ICT skills^{5,10}.

Hung et al.¹² have conducted a study on the dynamic capabilities and organizational processes linked to the High-Tech industry. They argued that the alignment

of dynamic capabilities with organizational strategy influence positively organizational performance. Liao et al. 14 (2009) conducted empirically the research on organization's dynamic capability and innovation of Internet firms. Their study suggested that firm innovation does not only depend on the endowment and munificence

Table 1. Operational Definition and Measurements of Convergence Performance under Dynamic Convergence Capabilities

Construct	Variable	Operational Definition	Measurement Items	Reference
Resource	Product Develop-	Degree of process	Retainment of official manual for product and service	27
Competence	ment Competence	management for	development	
		Product and service	Process standardization for product and service	
		development	development	
		•	Process automation for production	
			Quality management for product and service	
			development	
	Information Tech-	Degree of IT support	Communication between staffs using IT	15
	nology Competence	and operation in	Speed of business process using IT	
		organization	Information sharing between departments through IT	
			Building of infrastructure for IT operation	
Dynamic	Sensing	Degree of	Quick recognizing and understanding the opportuni-	16,23
Convergence		understanding	ties of convergence	
Capabilities		the opportunities,	Quick recognizing and understanding the need of	
		innovation, knowledge	innovation for convergence	
		and technology change	Absorbing and understanding the knowledge from the	
		for convergence	outside	
		C	Quickly recognizing and understanding the technology	
			change for convergence	
	Integrating	Ability to integrate with	Applying resource allocation to the new opportunity	7,16
		the resources and capa-	for convergence	
		bilities of the organiza-	Development of convergence resource for product,	
		tion for convergence	service, and innovative convergence Integration of firm resource and knowledge for	
			convergence	
			Degree of integration to apply the technique of conver-	
			gence with the resources and capabilities of firm	
	Coordinating	Ability to coordinate	Reconstructing goal from the convergence resources of	16
		the resources and capa-	convergence opportunity and environment	
		bilities of the organiza-	Degree of change in business strategy to fit the com-	
		tion for convergence	bined corporate resources	
		8	Degree of transition to fit practical operation with	
			combined knowledge resources	
			Degree of reconfiguring for business process with inte-	
			grated technology resources	
	Convergence Per-	Perceived efficiency	Improvement of new product and service development	16,20
	formance	and effectiveness of	process	
		convergence product	Accelerating of new product and service development	
		and service develop-	Quality and Functional improvement for new product	
		ment through conver-	and service development	
		gence capabilities	Improvement of innovativeness for new product and	
		gence capabilities	service development	
			Creation of new market through new product and	
			service development	
			Increasing the number of patents and Intellectual	
			Property Rights	

of its resource base, but also, more importantly, depends on its dynamic capabilities to creatively deploy and utilize them. Pavlou and El Sawy16 studied on the relationship between company's dynamic capability and new product development performance. They suggested that NPD performance was positively influenced by dynamic capabilities, which consist of sensing, learning, integrating, coordinating corresponding to the changing business environment. Thus, we hypothesize the relationship between dynamic convergence capabilities and convergence performance.

H3: Dynamic convergence capabilities have a positive impact on convergence performance.

Research Method

3.1 Research Construct and Measurement

In the operational definition of research variables, we defined two resource competences, such as product development competence and information technology competence. Based on Teece²³, we modified the original model into three factors such as sensing, integrating, coordinating for dynamic convergence capability as mediating variables. Also, we adopted convergence performance as a dependent variable.

3.2 Data Collection

This study used survey method to collect primary data from Big 1000 firms in Korea stock market and 200 midsized firms. This study collected data from 181 firms, yielding a response rate of 15.1 percent. After reviewing process, 10 responses were found to be incomplete, thus this study used 171 responses for the analysis. Measurement items of each construct were extracted from prior studies. All measurement items were measured by seven-point Likert-type scales with ranging from strongly disagree to strongly agree. Data of the questionnaire was analyzed by using SPSS and Smart PLS 3.0.

4. Data Analysis

4.1 Demographic Characteristics

The demographic characteristics of those 171 answers are shown in Table 2. From the table, we can see that the majority of the respondent industry is ICT/Broadcasting 25% (43), Automobile 21% (36), and Machinery 13.5% (23). Companies below 300 employees are 71 respondents, which accounts for 43%, and 43 respondents from 1001 and above, which accounts for 26%. 48% of all respondents (75 firms) had annual sales less than 100 billion, and 25.6% had annual sales from 1 trillion and above.

Table 2. Demographic Characteristics

Construct	Items	Frequency	%
Industry	Automobile	36	21.1
	Shipbuilding	13	7.6
	Construction	17	9.9
	Machinery	23	13.5
	Electronic	23	13.5
	ICT/ Broadcasting	43	25.1
	others	16	9.4
	Total responses	171	100
Company Employ-	Below 300	71	43
ees	301 to below 600	32	19.4
	601 to below 1000	19	11.5
	1001 and above	43	26.1
	Missing value	6	3.5
	Total responses	171	100
Annual Sales	Less than 100	75	48.1
	billion		
	101 billion to be-	31	19.9
	low 500 billion		
	501 billion to	10	6.4
	below 1 trillion		
	1 trillion and above	40	25.6
	Missing value	15	8.8
	Total responses	171	100

4.2 Validity and Reliability

Confirmatory factor analysis in Table 3 presents the values of cross loading, composite reliability, standardized Cronbach alphas, and AVE explained by each construct. Table 3 shows that the cross loading of most items is larger than the level of 0.7. Table 3 also shows Cronbach's α and Average Variance Extracted (AVE). A widely accepted level of adequacy for Cronbach's alpha has been at least 0.7, and from the table we can see that all of the Cronbach's α values are higher than the cutoff value of 0.7. At the same time, all of the AVE values are higher than the threshold of 0.5. Thus, the reliability and convergent validity are acceptable to test the hypotheses.

We tested discriminant validity by showing the cross-loadings of all items. All indicators, as shown in Table 4, loaded more highly on their own construct than on other constructs. Fornell and Larcher⁸ proved that constructs are different if the square root of the AVE of a certain construct is larger than the absolute value of the standardized correlation of that construct with any other construct in the analysis. According to Table 4, the correlation indicators are all less than the square root of AVE, assuring the discriminant validity.

Table 3. Validity and Reliability

Construct	Variable	Items	First order	Second order	Composite	Cronbach's	AVE
			Cross Loading		Reliability	Alpha	
Resource Competence	Product Development	PDC1	0.842	0.924	0.955	0.937	0.841
	Competence	PDC2	0.847	0.932			
		PDC3	0.775	0.897			
		PDC4	0.802	0.914			
	Information Technology	ITC1	0.793	0.892	0.938	0.911	0.790
	Competence	ITC2	0.800	0.912			
		ITC3	0.789	0.908			
		ITC4	0.748	0.842			
Dynamic Conver-	Sensing	SEN1	0.807	0.896	0.938	0.911	0.790
gence Capabilities		SEN2	0.755	0.890			
		SEN3	0.740	0.875			
		SEN4	0.844	0.894			
	Integrating	INTEG1	0.841	0.888	0.950	0.930	0.827
		INTEG2	0.854	0.923			
		INTEG3	0.826	0.920			
		INTEG4	0.854	0.906			
	Coordinating	COOR1	0.789	0.849	0.933	0.904	0.777
		COOR2	0.842	0.912			
		COOR3	0.797	0.878			
		COOR4	0.809	0.885			
Convergence Performa	ance	CP1	0.	840	0.941	0.925	0.727
		CP2	0.	854			
		CP3	0.	878			
		CP4	0.	869			
		CP5	0.	846			
		CP6		827			

Table 4. Discriminant Validity

Variable	Mean	S.D	PDC	ITC	SEN	INTEG	COOR	CP
PDC	4.981	1.175	0.917					
ITC	4.965	1.081	0.569	0.889				
SEN	5.013	1.071	0.477	0.640	0.889			
INTEG	4.896	1.103	0.571	0.586	0.730	0.909		
COOR	4.871	1.096	0.606	0.619	0.712	0.796	0.881	
CP	4.764	1.003	0.598	0.596	0.650	0.753	0.798	0.852

^{*} Correlation is significant at the 0.01 level, Diagonal show the square root of the AVE for each construct

4.3 Hypothesis Testing

Table 5 and Figure 2 show the results of hypotheses test. All the hypotheses 1, 2, 3 are accepted. Resource competence have significant positive influence on convergence performance (H1: 191***) and dynamic convergence capabilities (H2: 0.722***). Moreover, dynamic convergence capabilities show a positive influence on convergence performance (H3: 0.669***).

Table 5. Hypotheses Testing Result

	Hypothesis	Path	t-value	p-value	\mathbb{R}^2	Result
H1	Resource	0.191	2.912	0.004***	-	Accept
	Competence →					
	Convergence					
	Performance					
H2	Resource	0.722	14.970	0.000^{***}	0.521	Accept
	Competence					
	→ Dynamic					
	Convergence					
	Capabilities					
H3	Dynamic	0.669	11.954	0.000^{***}	0.668	Accept
	Convergence					
	Capabilities →					
	Convergence					
	Performance					

^{*}p<0.1, ** p<0.05, *** p<0.01

4.4 Moderating and Sobel Test

Moderating test of dynamic convergence capabilities was verified moderation effect analysis using Baron and Kenny³. Table 6, 7 and 8 show the results of moderating effect and sobel test. Based on the result of Table 6, all models are accepted. Table 6 shows the result of each model path coefficient analysis. Resource competence (Model 1) shows positive influence on dynamic convergence capabilities (0.722***). Dynamic convergence capabilities (Model 2) show positive

influence on convergence performance (0.807***). Resource competence (Model 3) has a positive effect on convergence performance (0.676***). Table 7 show the result of full model path coefficient analysis. Moreover, all hypotheses are accepted. In this study, Sobel test to verify the significance of the indirect effect was verified by the mediating effect of dynamic convergence capabilities. As a result, the Table 8 showed to have full-mediated effects. Significant verification formula of indirect effects are as follows:

$$Z = \frac{a \times b}{\sqrt{(b_2 \times S_a^2) + (a_2 \times S_b^2)}}$$

Z: Indirect Effect Sobel Test Value

- a : Resource Competence → Dynamic Convergence Capabilities(Model 4) Path Coefficients
- b : Dynamic Convergence Capabilities → Convergence Performance(Model 4) Path Coefficients
- Sa: Resource Competence → Dynamic Convergence Capabilities(Model 4) S.E
- Sb : DynamicConvergenceCapabilities→Convergence Performance(Model 4) S.E

Table 6. Step 1 Path Analysis Result (Reduced Model)

Model	Model 1	Model 2	Model 3
	$RC \rightarrow DCC$	$DCC \rightarrow CP$	$RC \rightarrow CP$
Coefficients	0.722***	0.807***	0.676***
() t-value	(15.114)	(30.453)	(13.491)
\mathbb{R}^2	0.521	0.651	0.457

Table 7. Step 2 Path Analysis Result (Full Model)

Model		Model 4	
	$RC \rightarrow DCC$	$DCC \rightarrow CP$	$RC \rightarrow CP$
Coefficients	0.722***	0.669***	0.191***
() t-value	(14.970)	(11.954)	(2.912)
\mathbb{R}^2	0.521	0.66	68

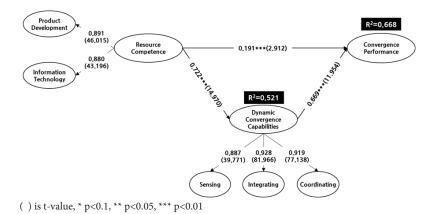


Figure 2. Hypothesis Testing.

Table 8. Indirect Effect through Step 3 Path Analysis Result (Sobel Test)

Inj	Test	Std.	p-value		
			statistic	Error	
Coefficients	$RC \rightarrow DCC$	0.722	9.355	0.052	0.000***
	$\mathrm{DCC} \to \mathrm{CP}$	0.669			
S.E	$RC \rightarrow DCC$	0.048			
	$\mathrm{DCC} \to \mathrm{CP}$	0.056			

^{*}p<0.1, ** p<0.05, *** p<0.01

5. Discussion and Conclusion

This study tried to identify the importance of dynamic convergence capabilities in changing environment. Empirical results showed that resource competence has higher effect on convergence performance through dynamic convergence capabilities, rather than direct effect of resource competence to convergence performance. Results of hypotheses testing indicate that resource competence, with product development competence and information technology competence, is significantly influencing on dynamic convergence capabilities and convergence performance. Also, dynamic convergence capabilities influence convergence performance. Therefore, all hypotheses were accepted.

This study offers theoretical implications for understanding the relationship of resource competence, and dynamic convergence capabilities on a firm's convergence performance. Although previous studies have identified the importance of organizational competence and dynamic capabilities, with explanation of empirical evidence, which makes it difficult for management of a business to identify appropriate actions based on the results. This study also provides theoretical insights of causal relationship by researches of resource-based view and dynamic capabilities. This empirical evidence shows that sensing, integrating, coordinating as components of dynamic convergence capabilities are very important factors for the organization to initiate and sustain major decisions for enhancement of convergence performance.

Though we already have got some results from the empirical study, there were still some limitations in this study. First, we need to study more explanation factors (such as other organizational resource factor) which can influence dynamic convergence capabilities and convergence performance for the further research. Second, this study has a limitation in data collection, in order to generalize the understanding of social phenomenon. For further research, we believe this research is a good starting to explain firm's convergence performance for more generalized studies. Also, further studies should be conducted to investigate the relationship between the convergence performance and organizational performance through dynamic convergence capabilities.

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