

The Effect of Organizational Learning on Internationalization: An Empirical Study of Taiwan Semiconductor Industry

Chun-Yao Tseng[†], Da-Chang Pa, Yun-Ju Tseng

Department of Business Administration, Tunghai University, Taiwan

ARTICLE INFO	ABSTRACT
<i>Article History</i> Received 28 May 2026 Accepted 30 September 2026 <i>JEL Classifications</i> D83, M16, L29	Purpose: This study investigates the relationship between organizational learning and internationalization within Taiwan's semiconductor industry. Specifically, it addresses two main objectives: first, examining the relationship between an explorative learning orientation and the degree of internationalization; and second, analyzing the role of absorptive capacity in mediating the impact of organizational learning on internationalization in this sector. Design/methodology/approach: This study focuses on Taiwanese semiconductor companies, with a total of 129 public listed semiconductor firms included in the sample. This study uses financial and patent data to measure variables such as explorative learning orientation, absorptive capacity and internationalization. The study collected financial data from the Taiwan Economic Journal which has complete data of public listed firms in Taiwan and patent data from USPTO (United States Patent and Trademark Office). Findings: The empirical results of this article demonstrate that explorative learning orientation has a positive influence on a firm's degree of internationalization. In addition to that, absorptive capacity plays the role of mediator on the relationship between exploration orientation and internationalization. Research limitations/implications: The extent of a firm's internationalization is certainly not only determined by its level of exploration orientation alone. Other factors such as integration of knowledge (Casillas et al., 2009) or dynamic capabilities (Prange & Verdier, 2011) also may exert some kind of influences on a firm's internationalization. Future researchers can examine the impacts of these factors and compare their separate effects on internationalization. Originality/value: Theoretically, our mediation findings point to the possibility that it may not be so much the exploration orientation itself that matters for the degree of internationalization but rather the underlying absorptive capacity mediation. If the underlying mechanism is such that exploration orientation has a positive impact on absorptive capacity which, in turn, is a key driver of internationalization, this means that the insufficiency of exploration orientation could potentially be transcended by building firm's absorptive capacity. We believe that this is the important contribution to the growing body of literature on organizational learning and internationalization.

Keywords:
Explorative learning,
Absorptive capacity,
Internationalization,
organizational learning

©Democritus University of Thrace

1. Introduction

In an era of intensified global competition, firms—regardless of size—can no longer operate under the assumption that they remain insulated within their domestic markets. The inherently global nature of contemporary innovation is well exemplified by the rise of emerging-market enterprises, such as Indian firms integrating into global production networks (Krishna et al., 2012). To address these competitive pressures, firms are increasingly expanding their operational domains through foreign market entry and export activities; internationalization has thus shifted from a strategic choice to an imperative. Consequently, internationalization occupies a pivotal position in corporate strategy, with its strategic relevance poised to grow as global market integration deepens. Nevertheless, cross-border

[†]Corresponding Author: Chun-Yao Tseng
e-mail: cytseng@thu.edu.tw

expansion presents substantial challenges. Successful internationalization requires firms to bridge the 'knowledge gap' (Petersen, Pedersen, & Lyles, 2008) between their existing capabilities and the requirements of foreign markets. This endeavor demands substantial resource commitment to organizational learning and knowledge accumulation. Knowledge and learning capabilities therefore serve as core drivers of internationalization, particularly for high-technology firms navigating volatile and turbulent market environments.

As such, in the internationalization process, learning and knowledge are ascribed vital roles as maintained by the process theory of internationalization (Johanson & Vahlne, 1977, 1990). As Autio, Sapienza, & Almedia (2000, p. 910) also indicate: "Knowledge and learning can be expected to have an impact on international growth in that internationalizing firms must apprehend, share, and assimilate new knowledge in order to compete and grow in markets in which they have little or no previous experience". Thus, for firms to operate in foreign markets it is necessary to learn knowledge from external environment, market or technological. The problem is what kind of knowledge is useful for firms engaging in the internationalization process. It is related not only to how effective their knowledge is learned but also related to the environment they face. Simply put, when a firm decides to internationalize it firstly has to make sure what knowledge it lacks. While prior studies address direct learning-internationalization links, they often treat the underlying knowledge integration as a 'black box.' Absorptive capacity operates as the essential internal mechanism.

For a high-tech firm to operate in an environment as complex as foreign markets, explorative learning seems to be a more effective learning strategy to enhance its absorptive capacity to cope with the complexity of foreign markets. Thus, in this paper we argue that a firm's internationalization process has to do with its level of absorptive capacity which is determined partly by its exploration orientation. Taiwanese semiconductor sector—an environment characterized by high-velocity innovation, severe technological turbulence, and a strong international orientation. In such a dynamic context, path-dependent experiential accumulation (exploitative learning) is insufficient for firms to mitigate international market uncertainties. Instead, sustained overseas expansion hinges critically on explorative, boundary-spanning knowledge acquisition coupled with robust internal R&D absorptive capabilities.

There is a large stream of literature studying the effects of knowledge and learning on internationalization (Autio et al., 2000; Brennan & Garvey, 2009; Casillas, Moreno, Acedo, Gallego, & Ramos, 2009; Eriksson, Johanson, Majkgard, & Sharma, 1997; Eriksson, Majkgard, & Sharma, 2000; Fletcher & Harris, 2012; Forsgren, 2002; Hsu & Pereira, 2008; Johanson & Vahlne, 1977, 1990, 2003, 2006, 2009; Kogut, & Zander, 1993; Petersen, Pedersen, & Sharma, 2003; Petersen et al., 2008; Prange & Verdier, 2011). For example, the study of Casillas et al. (2009, p. 320) "considers the internationalization process to be a learning process per se". This paper aims to contribute to this new stream of literature by analyzing the role of explorative learning orientation and absorptive capacity in the internationalization of firms in Taiwan semiconductor industry. There are two purposes in this paper: first, we analyze the relationship between explorative learning orientation and the extent of internationalization; second, what role absorptive capacity plays in the effect of organizational learning on the internationalization process.

The paper is structured as follows: after theoretically analyzing how exploration orientation and absorptive capacity influence the development of internationalization, a number of hypotheses and an explanatory model are presented. We test these hypotheses using financial data and patent data and then discuss the empirical results. Finally, we conclude with a discussion of the results, limitations, managerial implications and suggestions for further research.

2. Theoretical Background and Hypotheses

This section delineates the core theoretical constructs and examines the relationships among them, as depicted in the conceptual framework (Figure 1). First, we introduce the concept of exploration orientation, originally proposed by Sidhu, Volberda, and Commandeur (2004) to capture an organization's propensity to engage in explorative learning. While their operationalization focuses on external *information* acquisition, this study adapts the construct to emphasize external *knowledge* acquisition. Second, we incorporate absorptive capacity, which serves as a foundational platform for future learning. Specifically, the proposed framework posits that exploration orientation exerts a direct positive effect on firm internationalization, while this relationship is concurrently mediated by the level of absorptive capacity.

Our explanatory framework necessarily provokes some doubt – why explorative learning and not exploitative learning? As we indicate in the following section, explorative and exploitative learning are both crucial to an organization. It is not possible to put an emphasis on one by ignoring another. The statement of Prange & Verdier (2011, p.127, emphasis added) helps us explain it: "The internationalization process depicts the path a firm decides to follow in order to seize worldwide opportunities. This typically takes place in a rather exploratory, testing and probing way by exploiting home advantages and transferring them abroad". This statement answers the above doubt and fits perfectly well with the reasoning behind our explanatory framework since our explanatory framework demonstrates that the degree of internationalization depends on the extent of explorative learning orientation and absorptive capacity. As we will explicate in the latter section stating absorptive capacity, the other reason why we do not include exploitative learning in our framework is that exploitation is one component of absorptive capacity (Zahra & George, 2002) which has been incorporated in our framework.

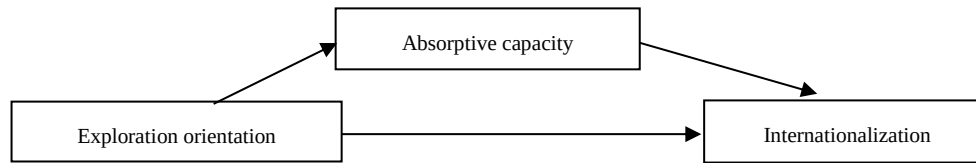


Figure 1: Research Framework

2.1. Exploration Orientation

Organizational learning involves two related dynamics of exploration and exploitation (March, 1991). The former refers to “learning gained through processes of concerted variation, planned experimentation, and play” whereas the latter refers to “learning gained via local search, experiential refinement, and selection and reuse of existing routines” (Baum, Li, & Usher, 2000, p. 768). March (1991, p. 85) also makes a distinction between the two different ways of learning and indicates that “the essence of exploitation is the refinement and extension of existing competencies, technologies, and paradigms ... The essence of exploration is experimentation with new alternatives”. From the viewpoint of organizations, both exploitation and exploration are deemed critical for their survival and prosperity because organizational “adaption requires both exploitation and exploration to achieve persistent success” (March, 1991, p. 205) and “exploitation and exploration are crucial both to the stable ongoing operations of organizations and to organizational change” (Holmqvist, 2004, p. 70).

The main difference between explorative and exploitative learning pertains to how new learning takes place. To the former, learning primarily occurs along an entirely different trajectory with old knowledge while learning in the latter goes along the same old trajectory. Based on this difference, we define exploration orientation as ‘the tendency of a firm to acquire external new knowledge from explorative learning’. Although we make this definition in reference to Sidhu et al. (2004) it is obviously inconsistent with their definition. Their definition is interpreted in terms of external information acquisition. However, they do not deny that “exploration ... is also an important way about pursuit of knowledge, experimentation and risk-taking” (Sidhu et al., 2004, p.917, emphasis added). Not only that, they also state that they “leave it to future work to ascertain whether an operational measure of exploration should be expanded to also explicitly include knowledge, experimentation and risk-taking items” (p.918). Hence, our definition seems to be not only appropriate but also expand their definition.

2.2. Absorptive Capacity

For organizational learning to be effective, it is necessary for a firm to have some level of absorptive capacity (Cohen & Levinthal, 1990). Absorptive capacity refers to “the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends” (Cohen & Levinthal, 1990, p. 128). Since absorptive capacity can “reinforce, complement, or refocus the firm’s knowledge base” (Lane, Koka, & Pathak, 2006, p.833), it is critical for a firm to develop and maintain its absorptive capacity to ensure its long-term survival.

The notion of absorptive capacity is first proposed by Cohen & Levinthal (1989, 1990) and latter extended and refined by Zahra & George (2002), Lane et al. (2006) and Todorova & Durisin (2007). The original concept of absorptive capacity proposed by Cohen & Levinthal (1990) has indicated its multidimensional nature involving “three basic capacities in relation to new knowledge: (a) recognition of its value; (b) its assimilation; and (c) its application for commercial ends” (Vega-Jurado, Gutierrez-Gracia, & Fernandez-de-Lucio, 2008, p. 393). The latter refinement of Zahra & George (2002) has expanded this concept into four dimensions grouped under two categories – potential absorptive capacity (including the two dimensions of knowledge acquisition and assimilation) and realized absorptive capacity (including the two dimensions of knowledge transformation and exploitation). Knowledge acquisition denotes “a firm’s capability to identify and acquire externally generated knowledge that is critical to its operations”. Assimilation refers to “the firm’s routines and processes that allow it to analyze, process, interpret, and understanding the information obtained from external sources”. Knowledge transformation refers to “a firm’s capability to develop and refine the routines that facilitate combining existing knowledge and the newly acquired and assimilated knowledge”. Finally, exploitation denotes an organizational capability that “is based on the routines that allow firms to refine, extend, and leverage existing competencies or to create new ones by incorporating acquired and transformed knowledge into its operations” (Zahra & George, 2002, p. 189-190).

Van den Bosch, Volberda, & de Boer (1999) suggest that the implicit feedback loop of Cohen & Levinthal, i.e. absorptive capacity facilitates learning and this in turn leads to new absorptive capacity, is mediated by the environment with which a firm needs to tackle to survive and prosper. In the context of this study, we consider the internationalization as an important environmental background that a firm faces when it tries to expand its domain of operations abroad. Environmental turbulence is often divided into technological turbulence and market turbulence (Droge, Calantone, & Harmancioglu, 2008). Technological turbulence refers to the rate of technological change (Lichtenthaler & Ernst, 2007) whereas market turbulence is related to the uncertainty of a firm’s markets (Helfat, Finkelstein, Mitchell, Peteraf, Singh, Teece, & Winter, 2007). The corresponding knowledge needed to tackle with market turbulence is market knowledge whereas the corresponding knowledge for technological turbulence is technological knowledge. In this study, we focus on the acquisition of external technological knowledge to face the

challenge of technological turbulence since what we investigate is the high-tech firms in Taiwan semiconductor industry. Therefore, it is justified to focus on technological knowledge in that the importance of technological knowledge is far greater than that of market knowledge.

2.3. Exploration Orientation and Internationalization

The study of Autio et al. (2000) also indicates that knowledge and learning are important determinants in internationalization process especially for firms in high-tech industries. Their study finds that the greater the firm's knowledge intensity, the more rapidly they grew internationalization. This means that the more a firm explores external knowledge the stronger its knowledge intensity which leads to rapid internationalization. When expanding internationally, firms inevitably confront the liability of foreignness and heightened environmental turbulence. In such settings, relying solely on path-dependent routines is insufficient; instead, explorative learning becomes decisive in enabling firms to overcome unfamiliar institutional and technological barriers and identify novel opportunities abroad.

On the other hand, Lichtenthaler (2009, p. 822) indicates that "the benefits from learning strongly depend on the degree of environmental turbulence" with exploitative learning having positive effects in stable environments and negative effects under dynamic environments whereas explorative learning having negative effects in stable environments and positive effects under dynamic environments. The study of Jansen, Van den Bosch, & Volberda (2006) also demonstrates the same conclusion.

Foreign markets are often environments characterized by more turbulence than domestic markets. When a firm internationalizes it must acquire totally new knowledge. Facing the challenge of environmental turbulence in foreign markets, firms have to commit most of their resources to explorative learning to take on completely new knowledge to engage in internationalization operations effectively. Thus, it is reasonable to argue that when operating in the turbulent environment such as foreign markets, explorative learning is more effective than exploitative learning. In other words, higher exploration learning orientation can lead to greater extent of internationalization. We therefore propose the following hypothesis:

H1: The stronger the exploration orientation a firm demonstrates the greater the degree of its internationalization

2.4. Absorptive Capacity as A Mediator on the Relationship between Exploration Orientation and internationalization

Exploration learning orientation can be a powerful source of absorptive capacity. In the literature of absorptive capacity, it is assumed that prior, related knowledge constitutes the basis for an organization's latter knowledge accumulation. The implicit feedback loop of Cohen & Levinthal's absorptive capacity is that existing absorptive capacity constitutes the basis for learning and learning, whether explorative or exploitative, leads to the formation of new absorptive capacity. Thus, explorative learning constitutes the important antecedent of absorptive capacity.

Absorptive capacity has, in turn, been identified as a key driver of internationalization in previous literature (Peterson et al., 2008). For example, the study of Petersen et al. (2008, 1097, emphasis original) indicates that a firm's internationalization process is contingent upon the gap identified by the firm 'between the knowledge possessed and the knowledge needed' in foreign markets. They term this gap "perceived knowledge gap". Their study thus focuses on addressing the factors that close the perceived knowledge gap. One of the primary factors they think will reduce this perceived knowledge gap is the absorptive capacity of the firm. However, their empirical results show that the effect of absorptive capacity on reducing the perceived knowledge gap in foreign markets is not very significant. There occurs a countervailing effect of absorptive capacity. That is, absorptive capacity can have a greater narrowing effect on 'real knowledge gap' (Petersen, Pedersen, & Lyles, 2008, 1109, emphasis original) than on 'perceived knowledge gap'. In other words, the higher the level of absorptive capacity a firm possesses the narrower its real knowledge gap for internationalizing operations. Thus, absorptive capacity constitutes an important antecedent for internationalization.

Lichtenthaler (2009, p. 824) also indicates that "the impact of absorptive capacity may substantially differ according to the level of environmental turbulence". In greater turbulent environment, the impact of absorptive capacity is also greater. Thus, in an environment as turbulent as the foreign market, we can expect that absorptive capacity will result in greater effect. Furthermore, Cohen & Levinthal (1990, p. 149) maintain that the greater the firms endeavor to absorb new knowledge, the more effective latter retrieval will be. When a firm fails to enhance its level of absorptive capacity in the internationalization process, it is difficult for it to retrieve the knowledge it has explored, leading to the narrower degree of internationalization. Drawing on the knowledge-based view (KBV), we argue that external explorative learning impacts internationalization exclusively through absorptive capacity. External knowledge acquired via exploration does not automatically confer a cross-border competitive advantage; rather, it must be systematically assimilated, transformed, and integrated into the firm's proprietary knowledge architecture through its absorptive capacity. Consequently, explorative learning alone is insufficient to drive international market success, as its strategic value is realized only when channeled through internal absorptive capacity. This conceptualization substantiates a full mediation mechanism. Therefore, we propose the following hypothesis:

H2: The relationship between exploration orientation and the degree of its internationalization is positively mediated by the level of a firm's absorptive capacity.

3. Methodology

3.1. Data Collection

To minimize potential confounding size effects and circumvent the severe lack of financial transparency among private enterprises, this research restricts its target sample to publicly listed semiconductor firms in Taiwan. Over the 2009–2011 observation window, 129 listed semiconductor firms met the sampling criteria, forming a three-year balanced panel dataset. Corporate financial indicators were sourced from the Taiwan Economic Journal (TEJ), a reliable database encompassing all public firms in Taiwan, while patent data were gathered from the United States Patent and Trademark Office (USPTO).

3.2 Measurers

3.2.1 Independent Variable- Exploration Orientation

A patent is built on the basis of prior patents, which might be from the same technology field or from other technology fields. Experimental learning strategy is measured by the percentage of backward citation for the focal firm's field patents that belong to its non-competitors (Fang, Wang, & Lilien 2009). This study modified Fang et al. (2009) measure method. While a patent cites patents from the same technology field, then it could be the exploitation learning. On the contract, if a patent cite patent from other different technology fields, then this kind of learning is called exploration learning. And to be represented exploration learning orientation, this study utilizes the patent information which this study collected the citing information hidden behind patents from USPTO. More precisely, exploration learning orientation is measured by the percentage of backward citation for the focal firm's field patents that belong to other non-semiconductor industries.

3.2.2 Mediator Variable- Absorptive Capacity

Absorptive capacity measures the capability to acquire, assimilate, and exploit new knowledge (Petersen, B., Pedersen, T., & Lyles, M. A., 2008). The development of absorptive capacity is highly dependent on previous R&D investment realized by firms (Cohen & Levinthal, 1990). R&D expenditure often influences the performance of internationalized companies (Kotabe, Srinivasan, & Aulakh, 2002). This study follows the measure by R&D intensity (Brouthers, Nakos, Hadjimarcou, & Brouthers, 2009). Absorptive capacity is estimated by expenditure of R&D divided by sale revenue.

3.2.3 Dependent Variable- Internationalization

An internationalized firm captures market opportunities not only within its domestic market but also abroad. Brouthers, Nakos, Hadjimarcou, and Brouthers (2009) suggest that a firm's level of internationalization is more accurately captured by export intensity than by export performance. This study follows the precious researches (Contractor, Kundu, & Hsu, 2003; Brouthers & Nakos, 2005) that use exportation revenue as the percentage of total sale revenue to represent the level of internationalization.

4. Results

Table 1 presents the descriptive statistics and bivariate correlations for all key variables. The mean values for exploration orientation, absorptive capacity, and internationalization level are 51.93%, 12.29%, and 60.83%, respectively. While the standard deviations for exploration orientation and internationalization remain smaller than their respective means, absorptive capacity exhibits a standard deviation that exceeds its mean, indicating substantial variance across the sampled firms. In terms of correlations, the association between absorptive capacity and exploration orientation is moderate ($r = 0.2319$), which is higher than the correlations between exploration orientation and internationalization ($r = 0.1013$) and between absorptive capacity and internationalization ($r = 0.1214$).

This study performed regression analysis in order to assess the effects of exploration orientation and absorptive capacity on the level of internationalization; these are shown in Table 2. The empirical result supports the hypothesis (H1) and was statistically significant at the 0.05 level. The stronger the exploration orientation a firm demonstrates the greater the degree of its internationalization ($\beta = 6.103$). Another research finding indicates that the effect of exploration orientation on absorptive capacity ($\beta = 6.602$) exceeds that of absorptive capacity on internationalization ($\beta = 0.257$).

To assess whether there is a mediation effects through absorptive capacity in this study, empirical results of three regression analyses are shown in Table 2. Exploration orientation positively affects a firm's absorptive capacity, which was significant at the 0.01 level. Absorptive capacity also positively affects a firm's level of internationalization (significant at the 0.05 level). And further, this study investigates the effect of exploration orientation and absorptive capacity on the level of internationalization. The coefficient of exploration orientation ($\beta = 4.658$) decreased and lost its statistical significance, thus giving initial support to hypotheses H2. The relationship between exploration orientation

and the degree of its internationalization is positively and completely mediated by the level of a firm's absorptive capacity.

To address potential concerns regarding the sensitivity of our baseline findings and ensure the stability of the reported results, we perform a robustness check by employing an alternative measurement for our mediator, absorptive capacity. In our baseline specification, absorptive capacity is operationalized using R&D intensity. To ensure the robustness of our findings and following established literature in strategic management and international business (e.g., Cohen & Levinthal, 1990; Kotabe et al., 2002), we re-estimated the mediation model using R&D expenditure as an alternative proxy for absorptive capacity. The empirical results of this alternative specification are reported in Table 3. Crucially, the robust estimates remain highly consistent with our primary findings. Absorptive capacity continues to exert a full mediating effect on the relationship between exploration orientation and internationalization. Notably, the statistical significance of both the individual path coefficients and the overall model specification improves even further, reaching the 0.01 level (***), thereby providing robust and consistent empirical support for our hypotheses (H2). Collectively, these sensitivity analyses reinforce the validity of our conceptual framework and demonstrate that our core conclusions are remarkably robust to alternative variable measurements.

Table 1: Descriptive Statistics and Correlations

Variables	Statistics		Correlations		
	Mean	Std.	(1)	(2)	(3)
(1)Exploration orientation	51.93%	46.55%	-		
(2)Absorptive capacity	12.29%	13.27%	0.2319***	-	
(3)Internationalization	60.83%	28.04%	0.1013**	0.1214**	-

Note: ^a **significant at 0.05 level ***significant at 0.01 level

Table 2: Results of regression analysis

	Variables	Parameter value			
H1	Exploration orientation -> Internationalization	6.103** (3.05)			
H2	Exploration orientation -> Absorptive capacity		6.602*** (1.41)		
	Absorptive capacity -> Internationalization			0.257** (0.11)	
	Exploration orientation -> Internationalization				4.658 (3.13)
	Absorptive capacity -> Internationalization				0.219** (0.11)
F-Value		3.993**	5.757**	21.879***	3.996**

Note: ^a estimated standard errors are in parentheses.

^b **significant at 0.05 level ***significant at 0.01 level

Table 3: Robustness Check: Alternative Measurement of Absorptive Capacity

	Variables	Parameter value		
H2	Exploration orientation -> Absorptive capacity	1.302*** (0.37)		
	Absorptive capacity -> Internationalization		1.303*** (0.41)	
	Exploration orientation -> Internationalization			4.549 (3.07)
	Absorptive capacity -> Internationalization			1.194*** (0.42)
F-Value		12.490**	9.982***	6.101**

Note: ^a estimated standard errors are in parentheses.

^b **significant at 0.05 level ***significant at 0.01 level

5. Conclusion and Suggestion

5.1. Conclusion

This study investigates the impact of organizational learning on internationalization. Specifically, we examine the interrelationships among exploration orientation, absorptive capacity, and firm internationalization, utilizing financial and patent data from Taiwanese semiconductor firms. The empirical findings reveal that an explorative learning orientation positively influences a firm's degree of internationalization. Furthermore, absorptive capacity plays a critical mediating role in this relationship. Based on these findings, important theoretical and managerial implications are discussed.

Theoretically, our mediation findings reveal that firm internationalization is driven less by exploration orientation itself than by the underlying mechanism of absorptive capacity. By demonstrating that exploration orientation fosters absorptive capacity, which subsequently fuels international expansion, our results suggest that internal absorptive capacity can potentially compensate for a firm's deficiencies in external exploration. This insight offers a meaningful contribution to the burgeoning literature at the intersection of organizational learning and international business strategy.

5.2. Managerial Relevance

Several managerial implications can be derived from the empirical findings of this article. First, our empirical results demonstrate that an explorative learning orientation exerts a positive influence on a firm's degree of internationalization. This suggests that to successfully expand operational domains abroad, high-tech firms in particular should allocate significant resources to explorative learning. In practical terms, this study recommends establishing cross-industry collaborative R&D, internal knowledge-sharing platforms, and targeted talent development programs—initiatives that help managers effectively operationalize an exploration orientation and build the requisite absorptive capacity for foreign market entry and growth. However, prioritizing exploration does not imply that exploitative learning should be neglected. As noted in the introduction, both explorative and exploitative learning are essential for an organization pursuing internationalization, requiring firms to maintain a balanced approach between them. Nevertheless, in the specific context of high-tech firm internationalization, explorative learning remains the more dominant and impactful driver of cross-border success.

5.3. Limitations and Future Research Directions

There are some limitations in this study and future researchers can overcome these limitations. Nevertheless, the extent of a firm's internationalization is certainly not only determined by its level of exploration orientation alone. Other factors such as integration of knowledge (Casillas et al., 2009) or dynamic capabilities (Prange & Verdier, 2011) also may exert some kind of influences on a firm's internationalization. Future researchers can examine the impacts of these factors and compare their separate effects on internationalization. In addition to that, although our research indicates that absorptive capacity influences internationalization it is hard to assert it as a causal relationship since other streams of research demonstrate an opposite causal direction, i.e. the extent of internationalization influences the level of absorptive capacity (Kafourous, Buckley, Sharp, & Wang, 2008). Future researchers can do their work based on longitudinal data to determine more precisely how their casual relationship operates.

Second, exploration orientation is a multidimensional organizational construct, yet the study measures it solely through technological patent citations. This approach may overlook other important dimensions of exploration such as experimentation, strategic alliances, market learning or organizational risk-taking. The measurement of exploration orientation focuses only on explicit technological knowledge without taking into account of tacit knowledge. This is the limitation prevalent in secondary database. Future works can consider tacit knowledge, or as Sidhu et al. (2004) suggest, experimentation or risk-taking etc. to form a more complete measure of exploration orientation.

Third, Fletcher & Harris (2012) has proposed an organizational learning framework for internationalization process. In their framework, there are four new knowledge acquisition sources: direct experience, indirect experience, internal information, external search. It is obvious that our research has only investigated one type of these knowledge sources – external search due to the limitations of our databank. It is urged that future works can discuss other types of knowledge sources to deepen our understanding about the role of knowledge in internationalization process.

Final, the findings of this study should be interpreted with caution due to several constraints: a relatively small sample size, a focus on a single industry within one country, a short three-year observation period, and the inability to infer definitive causal relationships from the data. We recommend that future research utilize cross-national, multi-industry, and longer longitudinal datasets to better establish causal relationships among variables and enhance external validity.

References

-
- Autio, E., Sapienza, H. J. & Almedia, J. G. (2000). Effects of age at entry, knowledge intensity, and imitability on international growth. *Academy of Management Journal*, 43(5): 909-924.
- Baum, J. A. C., Li, S. X. & Usher, J. M. (2000). Making the next move: How experiential and vicarious learning shape the locations of chains. *Administrative Science Quarterly*, 45, 766-811.
- Brennan, L. & Garvey, D. (2009). The role of knowledge in internationalization. *Research in International Business and Finance*, 23, 120-133.
- Brouthers, L. E. & Nakos, G. (2005). Role of Systematic International Market Selection on Small Firms' Export Performance. *Journal of Small Business Management*, 43 (4): 363-381.
- Brouthers, L. E., Nakos, G., Hadjimarcou J. & Brouthers K. D. (2009). Key factors for successful export performance for small firms. *Journal of International Marketing*, 17(3): 21-38.
- Casillas, J. C., Moreno, A. M., Acedo, F. J., Gallego, M. A. & Ramos, F. (2009). An integrative model of the role of knowledge in the internationalization process. *Journal of World Business*, 44, 311-322.
- Cohen, W. M. & Levinthal, D. A. (1989). Innovation and learning: The two faces of R & D. *Economic Journal*, 99, 569-596.
- Cohen, W. M. & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science*

Quarterly, 35(1): 128-152.

- Contractor, Farok J., Sumit K. Kundu & Chin-Chun Hsu (2003). A Three-Stage Theory of International Expansion: The Link Between Multinationality and Performance in the Service Sector. *Journal of International Business Studies*, 34 (1): 5-18.
- Droge, C., Calantone, R. & Harmancioglu, N. (2008). New product success: Is it really controllable by managers in highly turbulent environment? *Journal of Product Innovation Management*, 25, 272-286.
- Eriksson, K., Johanson, J., Majkgard, A. & Sharma, D. (1997). Experiential knowledge and cost in the internationalization process. *Journal of International Business Studies*, 28(2): 337-360.
- Eriksson, K., Majkgard, A. & Sharma, D. (2000). Path dependence and knowledge development in the internationalization process. *Management International Review*, 40, 307-328.
- Fang, E., Wang, Q. & Lilien, G. (2009). Developing knowledge-based innovation advantage through organizational learning strategy. ISBM Report 1-2009.
- Fletcher, M. & Harris, S. (2012). Knowledge acquisition for the internationalization of the smaller firm: Content and sources. *International Business Review*, 21, 631-647.
- Forsgren, M. (2002). The conceptual learning in the Uppsala internationalisation process model: A critical review. *International Business Review*, 11, 257-277.
- Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M. A., Singh, H., Teece, D. J. & Winter, S. G. (2007). *Dynamic capabilities: Understanding strategic chance in organizations*. Oxford, UK: Blackwell Publishing.
- Holmqvist, M. (2004). Experiential learning processes of exploitation and exploration within and between organizations: an empirical study of product development. *Organization Science*, 15 (1): 70-81.
- Hsu, C. C. & Pereira, A. (2008). Internationalization and performance: The moderating effects of organizational learning. *Omega: The International Journal of Management Science*, 36, 188-205.
- Jansen, J. J. P., Van den Bosch, F. A. J. & Volberda, H. W. (2006). Explorative innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science*, 52, 1661-1674.
- Johanson, J. & Vahlne, J. E. (1977). The internationalization process of the firm: a model of knowledge development and increasing foreign market commitments. *Journal of International Business Studies*, 8(1): 23-32.
- Johanson, J. & Vahlne, J. E. (1990). The mechanism of internationalization. *International Marketing Review*, 7(4): 11-24.
- Johanson, J. & Vahlne, J. E. (2003). Business relationship learning and commitment in the internationalization process. *Journal of International Entrepreneurship*, 1, 83-101.
- Johanson, J. & Vahlne, J. E. (2006). Commitment and opportunity development in the internationalization process: A note on the Uppsala internationalisation process model. *Management International Review*, 46, 165-178.
- Johanson, J. & Vahlne, J. E. (2009). The Uppsala internationalization process model revisited: From liability of foreignness to liability of outsidership. *Journal of International Business Studies*, 40(9): 1411-1431.
- Kafourous, M. I., Buckley, P. J., Sharp, J. A. & Wang, C. (2008). The role of internationalization in explaining innovation performance. *Technovation*, 28(1): 63-74.
- Kogut, B. & Zander, U. (1993). Knowledge of the firm and the evolutionary theory of the multinational corporation? *Journal of International Business Studies*, 24(4): 625-645.
- Kotabe, M., Srinivasan, S. S. & Aulakh, P. S. (2002). Multinationality and Firm Performance: The Moderating Role of R&D and Marketing Capabilities. *Journal of International Business Studies*, 33 (1): 79-97.
- Krishna, V.V., Patra, S.K. & Bhattacharya, S. (2012). Internationalisation of R&D and Global Nature of Innovation: Emerging Trends in India. *Science Technology & Society*, 17(2): 165-199.
- Lane, P. J., Koka, B. R. & Pathak, S. (2006). The rectification of absorptive capacity: A critical review and rejuvenation of the construct. *Academy of Management Review*, 31(4): 833-863.
- Lichtenthaler, U. (2009). Absorptive capacity, environmental turbulence, and the complementarity of organizational learning process. *Academy of Management Journal*, 52(4): 822-846.
- Lichtenthaler, U. & Ernst, H. (2007). Developing reputation to overcome the imperfections in the markets for knowledge. *Research Policy*, 36(1): 37-55.
- March, J. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1): 71-87.
- Petersen, B., Pedersen, T. & Lyles, M. A. (2008). Closing knowledge gaps in foreign markets. *Journal of International Business Studies*, 39(8): 1097-1113.
- Petersen, B., Pedersen, T. & Sharma, D. D. (2003). The Role of knowledge in firms' internationalisation process: Wherefrom and whereto? In A. Blomstermo & D. D. Sharma (Eds.), *Learning in the internationalisation process of firms* (pp. 36-55). Cheltenham: Edward Elgar.
- Prange, C. & Verdier, S. (2011). Dynamic capabilities, internationalization process and performance. *Journal of World Business*, 46(1): 126-133.
- Sidhu, J. S., Volberda, H. W. & Commandeur, H. R. (2004). Exploring exploration orientation and its determinants: Some empirical evidence. *Journal of Management Studies*, 41(6): 913-932.
- Todorova & Durisin (2007). Absorptive capacity: Valuing a reconceptualization. *Academy of Management Journal*, 32(3): 774-786.
- Van den Bosch, F., Volberda, H. & de Boer, M. (1999). Coevolution of firm absorptive capacity and knowledge environment: Organization forms and combinative capabilities. *Organization Science*, 10, 551-568.
- Vega-Jurado, J., Gutiérrez-Gracia, A. & Fernández-de-Lucio, I. (2008). Analyzing the determinants of firm's absorptive capacity: Beyond R & D. *R&D Management*, 38(4): 392-405.
- Zahra, S. A. & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review*, 27, 185-203.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Licence

