

**THE ROLE OF STRATEGIC AND OPERATIONAL ABSORPTIVE CAPACITY IN
ORGANIZATIONAL AMBIDEXTERITY**

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ABSTRACT

Since it is becoming increasingly difficult for firms to maintain a competitive advantage in today's dynamic environment, ambidextrous firms focusing on both exploration and exploitation are more likely to survive and prosper in the long run. Scholars have identified and examined a number of antecedents of organizational ambidexterity, but extant studies have not fully explored the role of a firm's absorptive capacity in developing its organizational ambidexterity. The relevance of the absorptive capacity concept is paramount since new sources of competitive advantage would very likely come from outside the organizations. In this study, I explore the relationship between a firm's absorptive capacity and organizational ambidexterity by focusing on two levels of absorptive capacity and three dimensions of organizational ambidexterity. Using a survey of 5,600 companies performed by the Government of Chile in 2015, I find that both strategic and operational absorptive capacity contribute to the incremental exploitation dimension of organizational ambidexterity. My study contributes to our understanding of the absorptive capacity construct and illuminates how it affects organizational ambidexterity. The study also provides managerial implications as to what kind of external knowledge to procure and how to leverage it based on the firm's ambidexterity goals.

INTRODUCTION

Long-term successful organizations are becoming a rarity, while average company life is shortening at an increasing pace (Goodburn, 2015). There are many reasons for this trend, but the common denominator is that it is becoming harder to maintain competitive advantages in today's dynamic environment, with companies focusing on short-term goals. Firms focusing on the tactical use of competitive advantages (i.e., exploiting) and, at the same time, looking to acquire the next set of competitive advantages (i.e., exploring) are more likely to survive in the long run. In academia, the ability of a firm to exploit and explore has already been studied extensively. Researchers claim that the two activities should be undertaken sequentially (Duncan, 1976), cyclically (Boumgarden, Nickerson, & Zenger, 2012; Mudambi & Swift, 2011; 2014; Swift, 2016), and simultaneously, the latter known as organizational ambidexterity (O'Reilly & Tushman, 2013).

Studies have identified and explored many antecedents to the construct, but there is still a gap in the literature on the impact of external knowledge on organizational ambidexterity. The relevance of what Cohen & Levinthal defined as "absorptive capacity," or the ability of a firm to recognize, assimilate, and apply new knowledge, is paramount since new competitive advantages will very likely come from this source (Cohen & Levinthal, 1989; 1990). The direct relationship between absorptive capacity and ambidexterity, the primary focus of this study, remains mostly unexplored except for the studies by Datta (Datta, 2012), and Yan et al. (Yan, Yu, & Dong, 2016). Additionally, studies of absorptive capacity have been conducted by researchers in the innovation and operations fields independently without exploring the impact of their simultaneous effect. In the present study, borrowing from organizational learning and operational theories, a multileveled absorptive capacity construct is introduced. It includes a strategic element defined as the ability of top management to recognize and interpret the opportunity of disruptive innovations, based on Cohen & Levinthal and Yan et al. (1990; 2016), and an operational element defined as the ability of a firm's operational unit to acquire, assimilate, transform and exploit knowledge from the

operations environment (Patel, Terjesen, & Li, 2012). It is theorized that strategic and operational absorptive capacity exert independently a positive influence in the exploration and repetitive exploitation dimensions of ambidexterity respectively. Concurrently, strategic and operational absorptive capacity also influence positively the ability of the firm to perform incremental innovation, defined by Piao & Zajac as incremental exploitation (Piao & Zajac, 2016).

The rest of this paper is organized like this: I start with a literature review and develop hypotheses on the relationships between absorptive capacity and organizational ambidexterity. Next, I describe the data, methods, and results of the data analysis. I then discuss the study's contributions to theory and practice, its limitations, and future research areas.

LITERATURE REVIEW AND HYPOTHESES

Organizational Ambidexterity: Exploration and Exploitation

In the context of research on adaptive processes, March (March, 1991) recognized that exploration and exploitation are both essential for organizations, but compete for the limited resources available. In this context, exploitation seems to have an advantage in this competition because of its proximity to the action, clearer ties with its consequences, and therefore less uncertainty, but that exploration, in turn, had more uncertainty, longer terms, and less clarity in its implications. A lack of equilibrium between exploitation and exploration, with adaptive processes more inclined to exploitation, could become self-destructive, therefore, according to March, an organization should reach such equilibrium in the process of adaptation.

What exactly are exploration and exploitation? March conceived exploration as the pursuit of new knowledge, of things that might come to be known and exploitation as the use and development of things already known. From a learning perspective, the definition is focused on the type and amount of learning between the two, and on whether learning exploitation followed the same trajectory as old knowledge, while learning exploration followed a different path (Gupta, Smith, & Shalley, 2006). Regarding how organizations deal with the tension between exploratory and exploitative activities, many solutions have been suggested. Some authors proposed externalizing either exploitative or exploratory activity by establishing alliances or by outsourcing (Holmqvist, 2004; Rothaermel & Deeds, 2004). Other authors have suggested that firms should cycle between states of exploitation and exploration, defined as a punctuated equilibrium model (Mudambi & Swift, 2011; 2014; Swift, 2016). Another view is that successful organizations are efficient in their day-to-day activities and in satisfying their actual business demands while at the same time preparing for future challenges and adapting to changing environments, this view is called organizational ambidexterity (Raisch & Birkinshaw, 2008; Tushman & O'Reilly, 1996).

Organizations involved in exploitation and exploration, whether simultaneously or sequentially, are more likely to reach superior performance than organizations prioritizing one over the other. When firms concentrate only on the exploitation of existing competencies, they fall into organizational inertia. This inertia prevents them from adapting to changing conditions thus leading them to mediocre performance (i.e., the “success trap”) in the long run (Levinthal & March, 1993; Raisch & Birkinshaw, 2008; Smith & Tushman, 2005; Tushman & O'Reilly, 1996). Contrarily, if a firm leans too much on exploration, it runs the risk of falling into the “failure trap” of having too many underdeveloped innovative ideas that fail to contribute to value generation (Junni, Sarala, Taras, & Tarba, 2013).

The tension between exploitation and exploration is at the center of organizational ambidexterity. The prospect of potential success if the tension is balanced has caught the attention of a vast number of researchers from various perspectives. Contributions from organizational learning, strategic management, innovation, organizational design, and adaptation have enriched the discussion but, at the same time, have brought a lack of clarity into the meaning of the construct (Birkinshaw & Gupta, 2013). As Birkinshaw and Gupta proposed, "...the study of ambidexterity is the study of firms, or indeed organizations more generally" (2013: 290), but the generalization could lead to total loss of meaning of the construct. In a meta-analysis on organizational ambidexterity and performance, Junni and colleagues (Junni et al., 2013) concluded that "combined" exploration and exploitation, i.e., the independent, orthogonal, combination of high levels of exploration and exploitation pursued concurrently by the firm, explain the ambidexterity phenomenon better than "balanced" exploration and exploitation, or the equilibrium between both elements of ambidexterity. Following Junni and colleagues' argument, Piao and Zajac (2016) recognize that the relationship between exploration and exploitation is not a zero-sum game and that there is a component of exploitation that could impel exploration. Thus, in addition to the well-accepted definition of exploration "as the development of new products aimed at entering new product-market domains" (2016:1432), they introduced the concept of *incremental exploitation*, as "the creation of new designs for existing products," and *repetitive exploitation* (in italics in the original), as "the repetition of existing designs for existing products" that could potentially impede exploration (2016: 1432). For purposes of this study, the "combined" view of ambidexterity proposed by Junni et al. and its expansion introduced by Piao & Zajac are adopted. Additionally, services and processes are included in the definition.

Absorptive Capacity at the Strategic and Operational Level of the Organization

The fast pace of change of technology-enabled business models, products, and services requires resources and capabilities that are new to the organizations. Rather than developing them internally, companies look outside to acquire them. Therefore, the ability to seek and acquire critical resources and capabilities from outside the organization, known as "absorptive capacity," has become a key capability. The term "absorptive capacity" was originally introduced by Kedia and Bhagat (1988) in the context of technology transfer between nations, but Cohen and Levinthal's work (1989; 1990) is considered the originator of the absorptive capacity construct. Based on the stock of collected knowledge from R&D activities, Cohen and Levinthal defined absorptive capacity as, "...an ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990: 129). The construct became a focus of attention and researchers extended the concept from R&D to other areas. Zahra and George (Zahra & George, 2002) expanded and modified the concept by adding the ability to "acquire" new knowledge and dropping the ability to "recognize the value" of knowledge as suggested by Cohen and Levinthal (1990). The first two resulting capabilities, acquisition, and assimilation were grouped and labeled "potential absorptive capacity." Zahra and George added the ability to transform the assimilated knowledge to the already established exploitation ability, grouping both capabilities under the label "realized absorptive capacity." They also established that the higher the exposure to diversified and complementary external knowledge, the greater the ability to develop potential absorptive capacity.

Contradicting Zahra & George (2002), Todorova & Durisin's (2007) proposed construct dismissed the categorization by Zahra & George in potential and realized absorptive capacity as unnecessary. However, they retained the addition of acquisition and transformation as key

capabilities of the construct and incorporated the dynamic dimension in their model. They included the ability to “recognize value” originally proposed by Cohen and Levinthal (1990), and suggested that “assimilation” and “transformation” were events that occurred in parallel, not sequentially, and that there was an association between them.

Since the inception of the construct, absorptive capacity has been associated to new knowledge coming from R&D, either internal (Cohen & Levinthal, 1990) or external (Lin, Zeng, Liu, & Li, 2016) and with an almost exclusive emphasis on radical or incremental innovation. Also, from an organizational learning perspective, absorptive capacity is related to strategic learning when dealing with disruptive innovation and with business learning at the operational level (Yan et al., 2016).

As the construct became more mature, its application widened, and it was applied to other areas of the organization like marketing, finance (Huizingh, 2011), and operations (Fayard, Lee, Leitch, & Kettinger, 2012; Malhotra, Gosain, & Sawy, 2005; Patel et al., 2012; Tu, Vonderembse, Ragu-Nathan, & Sharkey, 2006). From the latter, Patel et al. defined operational absorptive capacity as, “the ability of a firm’s operational unit to acquire, assimilate, transform, and exploit knowledge from the operations environment.” (2012: 202). Thus, leveraging from organizational learning and operational perspective, the construct expanded beyond its innovation focus on efficiency and productivity. This development path is natural since the contribution of external knowledge is not restricted just to innovation from R&D but to all functional areas of an organization.

The expansion of the absorptive capacity construct to go beyond R&D and innovation to include other operational areas of the organization and its impact on the exploratory and exploitative abilities of the firm is the focus of this study by posing the following research question: *How does strategic and operational absorptive capacity affect organizational ambidexterity?*

Strategic Absorptive Capacity, Exploration, and Incremental Exploitation

The relationship between absorptive capacity and exploration has been identified in the study of R&D and innovation at the firm level by different authors including studies of external R&D sources by Lin et al. (2016), “knowledge spillover” as a criterion for locating R&D facilities introduced by Feinberg & Gupta (Feinberg & Gupta, 2004), and by Ritala & Hurmelinna-Laukkanen in the context of co-opetition (Ritala & Hurmelinna-Laukkanen, 2013). Also, studying the flow of knowledge between units of a firm and its impact on radical innovation, van Wijk et al. (van Wijk, Jansen, Van Den Bosch, & Volberda, 2012) found that excessive investment in in-depth knowledge beyond a moderate level limits absorptive capacity and subsequently impedes the firm’s exploratory capability.

Starting from recognizing the type of knowledge existing in an organization (i.e., breadth and depth), Zhou & Li (Zhou & LI, 2012) concluded that for companies with knowledge breadth, covering many disciplines and fields, it was convenient to concentrate on the dissemination of such knowledge internally to achieve radical innovation. In the case of companies with knowledge depth in a particular field, the conclusion was to reach out for new knowledge, to achieve radical innovation.

Inherent to open innovation is the notion of reaching outside the organization for new knowledge. Many studies have recognized absorptive capacity as an open innovation key

capability going as far as stating that absorptive capacity is a pre-condition to the implementation of open innovation (Spithoven, Clarysse, & Knockaert, 2011).

The building mechanisms of absorptive capacity have been explained successfully by the organizational learning perspective (Kim, 1998) at different hierarchical levels within the firm. Using Hyundai Motor Company as a case study, Kim shows the company's shift in learning orientation from imitation to innovation and the emphasis on absorptive capacity for the transition. Yan et al. (2016) expanded on this notion by introducing the strategic-business learning typology which acknowledges different learning outcomes due to efforts at different levels. At the firm's level, strategic learning "leads to a significant impact on the whole organization and causes long-term revolutionary changes such as new basic assumptions." (Yan et al., 2016: 653). The authors related strategic learning directly to the explorative capability of organizational ambidexterity and recognized the beneficial impact to exploration due to the ability of top management to recognize and interpret the opportunity of disruptive innovations (2016). Analyzing the history of Huawei in a longitudinal case study, the authors show how the company migrated its strategic learning focus towards external sources including external R&D, outside consultants, market reports, strategic alliances and inter-firm partnerships. The revolutionary nature of strategic learning and its external sources describes one of the levels, strategic in nature, of absorptive capacity that, for purposes of this research, is defined as "strategic absorptive capacity."

Despite the many research seams identifying a relationship between absorptive capacity and exploration at the firm level, the majority of the studies have explored such relationship indirectly or on restrictive case studies (Yan et al., 2016). Some studies assumed absorptive capacity as a moderator of ambidexterity (Narasimhan & Narayanan, 2013), or as an antecedent, simultaneously with ambidexterity, to innovative performance (Lucena & Roper, 2016); others assumed a partial impact of the absorptive capacity construct (i.e., realized vs. potential) on ambidexterity (Datta, 2012).

To advance the knowledge of the association between strategic absorptive capacity and the exploratory ability of firms, the following hypothesis is proposed:

H1. Strategic absorptive capacity increases the exploratory component of organizational ambidexterity.

In the context of innovation research, several authors have identified that external knowledge is used by organizations as input for their radical and incremental innovation but using different mechanisms (Ritala & Hurmelinna-Laukkanen, 2013; van Wijk et al., 2012). In the case of incremental innovation, external new knowledge is related to prior knowledge acquired by the company as postulated by Cohen & Levinthal (1990) and Lichtenthaler (Lichtenthaler, 2009). According to Lichtenthaler (2009), existing knowledge can be categorized as technological knowledge and market knowledge. Borrowing from Cohen & Levinthal (1990), the author defined technological knowledge as the knowledge the firm explores, transforms, and exploits in its absorptive capacity processes. Market knowledge refers to application and commercialization opportunities for technological knowledge, for example, identifying new applications of technology in new markets. Lichtenthaler links exploitative learning with the matching of knowledge and markets.

An excellent example of Lichtenthaler's postulate is 3M's external knowledge absorption mechanism within its ambidexterity. Through its R&D and radical innovation initiatives, 3M developed new imaging technology for its medical unit (i.e., exploration) (McNerney, 2002). But, in addition to the application of this radical innovation in the medical field, the company kept gathering external strategic knowledge, mainly from other industries with similar needs, to enhance the product or to find other uses for it, rather than just leaving the recently developed imaging technology to the exploitative area of the organization. In this case, the company applied the technology successfully to mining and constructions industries, to locate and identify subsurface formations or buried infrastructure. One could argue that this is a joint effort to gather strategic and operational knowledge from outside the organization to find a different use for the technology, or what could be defined as incremental innovation. Chance did not play any part in this finding since the company has an established process to work permanently on incremental innovation based on their new strategic and operational knowledge. 3M has defined roles to facilitate this task, called "scouts," people searching for new opportunities, knowledge, and needs outside the organization (i.e., strategic absorptive capacity); "entrepreneurs," individuals focused on converting the opportunities identified into new products, services or processes and "implementers," employees in charge of taking these new products to market

At 3M, scouts and entrepreneurs represent the interaction between strategic absorptive capacity and incremental exploitation, viewed as finding new uses for already developed products. This phenomenon is not exclusive to 3M; many other companies have implemented a version of this mechanism, but academia has lagged in studying this phenomenon in detail. I, therefore, represent this interaction by the following hypothesis:

H2. Strategic absorptive capacity increases the incremental exploitative component of organizational ambidexterity.

Operational Absorptive Capacity, Incremental Exploitation, and Repetitive Exploitation

From an operational viewpoint, Patel et al. defined "operational absorptive capacity" as "...the ability of a firm's operational units to acquire, assimilate, transform, and exploit knowledge from the operations environment" (2012: 202). The authors argued that operational absorptive capacity allows firms to rapidly analyze and act on changes to the operational environment like changes in demand and quickly increasing the range and mobility of machines, labor, and material. Operational absorptive capacity also allows firms to respond to changes in the competitive landscape by changing the product mix. Finally, the authors stated their expectation that operational absorptive capacity could influence the company's ability to achieve a competitive advantage through manufacturing flexibility.

Huizingh recognizes that external knowledge could come from suppliers, customers, competitors, research institutions and organization in different industries in a collaborative effort that may last for a significant period and are likely to be repeated (Huizingh, 2011). To explain his assertions, the author cites collaboration between supplier and customer in exploring applications to new technology or a customer inviting the supplier to participate in a project to reduce waste. Huizingh stresses that these efforts should go beyond R&D and include other areas of the organization like marketing, production, logistics and even finance.

By rapidly responding to environmental or market changes and technological innovation or collaborating with other stakeholders, operational absorptive capacity helps a firm innovate on

processes, product mix, adapt to technological changes and maintain its competitive advantage. For purposes of this research, Patel et al.'s definition will be complemented with Hiuzingh's more comprehensive view which includes other areas of the organization impacted by potential incremental innovation (Huizingh, 2011).

As presented by Patel et al. and in the 3M case, incremental innovations require the intervention of operational knowledge, to adapt existing products or services to other uses or clients, innovate on processes, modify the product mix and react to technological changes. We thus propose the following hypothesis:

H3. Operational absorptive capacity increases the incremental exploitative component of the ambidexterity capability of an organization.

Since the inception of the absorptive capacity construct by Cohen & Levinthal (1990), its application has been intended for the entire organization, even though they center their investigation on R&D and innovation, the authors recognized its applicability in other areas, as stated in their seminal paper: "...Production experience provides the firm with the background necessary both to recognize the value of and implement methods to reorganize or automate particular manufacturing processes. Firms also invest in absorptive capacity directly, as when they send personnel for advanced technical training." (1990: 129). Tu et al. (2006) studied the effect of absorptive capacity on time-based manufacturing practices and its impact on operational performance. Focusing on supply chain efficiency, Malhotra et al. (2005) identified five configurations of partnerships, with the collaborative type creating the highest level of absorptive capacity and operational efficiency. With an emphasis on supply chain costs, Fayard et al. (2012) concluded that absorptive capacity was vital in the ability to manage external costs originated by collaboration with suppliers.

From an operational risk perspective, Hora & Klassen recognize firms' needs to acquire external knowledge regarding problems that occur in others' processes to improve their operations and avoid similar losses (Hora & Klassen, 2013). Proper mitigation of operational and supply chain risks could have important implications for customer safety and operational competitiveness and even affect the industry as a whole (e.g., an oil spill, food contamination or recall of defective products). Operational absorptive capacity plays a relevant role in acquiring the necessary external knowledge in the form of "lessons learned" in order to improve the risk profile of a firm's operation. Setia & Patel (Setia & Patel, 2013) studied the interaction between information technology (IT) and operational absorptive capacity. The authors concluded that since "ITs are the backbone of operational activities" (2013: 410), IT-enabled operational absorptive capacities may help build operational knowledge management capabilities and improve operations.

These and other studies have validated the effect of operational absorptive capacity on organizational efficiency and productivity, but they have been done in isolation as if absorptive capacity only resided in the operational area of the firm. As discussed before, Yan et al. (2016) introduced the strategic-business learning typology to evaluate different learning outcomes. The authors identified performance reviews, training, best practices and working and reward systems as closely associated with business learning. These business learnings are required to achieve incremental improvements, but they do not come exclusively from within the organization, as prior knowledge does, but from outside sources as industry benchmarks and strategic alliances. This description of business learning is coincidental to Patel et al.'s definition of operational absorptive capacity. For purposes of this study, both constructs will be considered the same and

defined after Patel et al.'s operational absorptive capacity. To investigate the contribution of operational absorptive capacity to the operational efficiency of the firm (i.e., repetitive exploitation), the following hypothesis is presented:

H4. Operational absorptive capacity increases the repetitive exploitative component of organizational ambidexterity.

Figure 1 provides an overview of the proposed model with constructs and hypotheses.

Insert Figure 1 about here

EMPIRICAL ANALYSIS

Data Sample and Data Sources

The proposed theory assumes that organizations use their absorptive capacity at two distinct levels: the strategic, to draw knowledge and technology from outside the firm and apply it to exploratory actions and; the operational, to incorporate knowledge and technology to improve existing products and services (i.e., incremental exploitation) and to augment efficiency in existing operations (i.e., repetitive exploitation). These propositions are novel and have not been investigated before. Even though the constructs used are known, and have been subjected to previous research, their interaction and boundaries are still not well defined.

Given this situation, and the nature of the research questions, I conducted an exploratory quantitative study based on secondary data available from the Chilean National Innovation Survey 2015 of the National Institute of Statistics (Instituto Nacional de Estadística, 2015). This survey, performed at the firm level, follows the OECD guidelines included in the Oslo Manual (Organisation for Economic Co-operation and Development, 1997). Chile has been conducting this survey for nine consecutive years since its National Innovation Strategy was introduced in 2006.

The survey, including data from 2013 and 2014 was done in Chile's 15 Regions or States, at the firm level, classified by their economic activity using the International Standard Industrial Classification (United Nations, 2004).

The sampling is stratified on two levels: economic activity, and company size. Small companies are defined as those with sales at or less than \$1.0 mm; medium-sized companies are those with sales at more than \$1.0 mm, but less than \$4.0 mm, and large companies are defined as those selling more than \$4.0 mm. Companies with sales lower than \$0.1 mm are excluded from the study.

The total number of companies sampled was 163,418, with an effective sample size of 5,620 companies, made up of 2,240 small companies, 1,218 mid-size companies, and 2,162 large ones.

The database is open source, but the confidentiality of the companies is protected by assigning a unique code to each participant, and not disclosing any information that could identify them.

The average age of the responding firms is 20 years with a standard deviation of 11.22 years. The average size, measured in number of employees, is 184 with a standard deviation of 936 workers. The fact that the standard deviation is so significantly large is due to ten companies having a large number of employees (more than 10,000 employees) in the dataset.

Dependent Variables

Strategic absorptive capacity was derived from a factor analysis conducted on a set of questions from the survey addressing the external sources firms reach out to for purposes of their innovation activities. Since the questions do not include the type of innovation the external sources impact upon, it is assumed that all sources selected by the survey participants refer exclusively to innovation and not operations within the firm. Therefore, all external sources included in the survey are considered proxies of the strategic absorptive capacity. The external sources are classified as market (i.e., suppliers, customers, competitors, and consultants), institutional sources (i.e., universities and research facilities), and others (i.e., conferences, publications, professional associations, and the internet). Answers to these ten questions were dichotomous (YES/NO). Thus a polychoric procedure was conducted before the factor analysis. The results were rotated for a better fit, and the factors with an eigenvalue higher than 1.0 were retained. Table 1 summarizes the resulting loadings for the relevant factor. Strategic absorptive capacity is represented by one underlying factor encompassing 90% of total variance.

Operational absorptive capacity is defined as the ability of the firm to reach outside its boundaries for operational knowledge (i.e., engineering, operational, information systems). Since an innovation survey is the source of the data utilized, no direct question is related to this type of knowledge. A proxy is used following Setia & Patel (Setia & Patel, 2013), by assuming that the firm has established engineering and information systems departments and that these departments would reach out for the state-of-the-art practices in each area in order to improve operations. Again, three questions with dichotomous answers are used in the questionnaire to cover this area. The same procedure as the one used for strategic absorptive capacity is used to determine the relevant factors. One factor recorded an eigenvalue higher than 1.0, covering 121% of the total variance. All other remaining factors were negative.

Independent Variables

The exploratory function of ambidexterity is covered by identifying whether the firm launched new products and/or services during 2014. According to the Chilean National Innovation Survey 2015, product innovation is the introduction to the market of a new good or service, or a significantly improved good or service, regarding its characteristics or its use. Factor analysis is conducted on these two dichotomous variables. The same procedure as that for strategic absorptive capacity and operational absorptive capacity is used to determine the relevant underlying factors. One factor proved significant (i.e., eigenvalue larger than 1.0) describing 113% of the variability, defined as exploration.

Exploitation is divided into two functions following Piao & Zajac (Piao & Zajac, 2016); an incremental exploitation representing incremental innovation or a new design for existing products, that, I assume, is influenced positively by both, strategic and operational absorptive capacity; and repetitive exploitation which is the repetition of existing designs of existing products. Incremental exploitation is addressed in the survey by four questions regarding improved marketing practices ranging from new packaging to new pricing mechanisms. Factor analysis is conducted on these four dichotomous variables using the same methodology as before.

One factor is found to be representative (i.e., eigenvalue greater than 1.0) explaining 104% of the variability and is defined as incremental exploitation.

Finally, the repetitive exploitation is represented by six questions covering improvements in manufacturing, logistics and operational support methods as well as the inclusion of decision making, external relations and process design practices. Factor analysis is conducted on these six dichotomous variables using the same methodology as before. One factor is found to be representative (i.e., eigenvalue larger than 1.0) explaining 96% of the variability, defined as repetitive exploitation. Table 1 presents the factor analysis results of the dependent and independent variables.

Insert Table 1 about here

Control Variables

Potential confounding effects were controlled by including various relevant sets of variables. Because large companies may lack the flexibility to explore even though they might have more resources, company size was included as a variable. Company age was included as the logarithm of the number of years from its founding since previous studies have shown that aging companies are more likely to develop innovation that exploits existing competencies (Sørensen & Stuart, 2000). Diversity in organizational tenure could affect strategic organizational changes (Milliken & Martins, 1996). Therefore, the logarithms of the number of workers in three distinct areas (i.e., engineering, information systems, and R&D) are used as proxies of diversity.

Companies are likely to apply their existing in-depth knowledge to customer groups and geographic regions that are similar to those they already serve. The application of this in-depth knowledge could result in exploitative innovation (van Wijk et al., 2012). Therefore, there was control for geographic region; in the case of Chile, there are 15 geographic regions.

There are some industry sectors that are more exposed to technology changes than others. Companies in these sectors would, therefore, be more prone to engage in innovation activities. Also, companies acting in more than one sector could create economies of scope for internal resources (Wales et al., 2013). Industries with participation of more than 5% in the sample are included as control variables, i.e., manufacturing, wholesale and retail, construction, transportation, and healthcare.

Increasing levels of education may relate positively to the employee ambidexterity since the higher the education level, the greater the cognitive abilities for processing information and learning (Adler, Goldoftas, & Levine, 1999; Papadakis, Lioukas, & Chambers, 1998). Educational levels were controlled for by including a dummy variable reflecting employees with master's degrees. Employees with lower than the masters degrees were the reference group.

Companies with R&D capabilities in-house could be less aggressive in reaching outside the boundaries of their organizations for new knowledge. This variable, part of the questionnaire, is included as a control variable. In the same manner, the internal innovation efforts could have different impacts on the organization, which is measured in the questionnaire and included as a control variable with three distinct impact levels, where zero impact is the reference measure.

Statistical Methods

A multivariate regression model is used to analyze the relationship between strategic absorptive capacity and operational absorptive capacity (i.e., the independent variables) and exploration, incremental exploitation, and repetitive exploitation (i.e., the dependent variables). A multiple analysis of variance test is performed prior to the multivariate regression model to test whether or not the independent grouping variable simultaneously explains a statistically significant amount of variance in the dependent variables. The Wilk's Lambda U test, the Lawley-Hotelling test, the Pillai test and Roy's Largest Root test are performed.

Factor analyses have been conducted using the polychoric correlation matrix in all cases since the underlying variables were all dichotomous (Netter, Wasserman, & Kutner, 1990).

RESULTS

Main Results

Table 2 shows descriptive statistics and correlations for all variables. Most variables show low to very little correlation except for the variables depicting company size, with a moderate correlation factor of 0.515.

Table 3 presents the results of the multivariate regression analyses for the interaction between absorptive capacity and organizational ambidexterity. The baseline models (Model 1 for the three dependent variables) contain control variables. Model 2 includes the independent variables strategic absorptive capacity and operational absorptive capacity. Regarding the effects of absorptive capacity on organizational ambidexterity, Model 2 shows that strategic absorptive capacity has a positive and considerable influence on exploration at the firm ($\beta = 0.032$, $p < 0.05$), and therefore, H1 is supported. The analysis shows that strategic absorptive capacity also has a positive and significant influence on incremental exploitation at the firm ($\beta = 0.070$, $p < 0.01$), supporting H2. Model 2 also shows that operational absorptive capacity has, simultaneously with strategic absorptive capacity, a positive and considerable influence on incremental exploitation ($\beta = 0.088$, $p < 0.05$), validating H3. Finally, the model shows that operational absorptive capacity has a positive and considerable influence on repetitive exploitation ($\beta = 0.092$, $p < 0.05$), validating H4. Thus, our findings indicate that absorptive capacity has a direct and positive influence in organizational ambidexterity. Moreover, in a more detailed analysis, the model shows that strategic absorptive capacity influences exploration as well as incremental exploitation at the firm level. Another relevant finding is that operational absorptive capacity also influences incremental exploitation as well as repetitive exploitation.

Insert Table 2 about here

Insert Table 3 about here

Robustness Tests

Several robustness checks were conducted to validate the model. Eight sets of control variables as described above were introduced to avoid a confounding effect on the model. Adding the independent variables explained an additional 7% of the influence of all variables on organizational ambidexterity. To evaluate heteroscedasticity and multicollinearity on the model, a run was performed with robust standard errors, and variance inflation factors were calculated for each dependent variable. In all cases, the influence of the variables was significant at the 1%

level, and all factors were lower than 2.0, well below the rule-of-thumb cut-off of 10 (Netter et al., 1990).

Several data subsets were run to determine if they had more explanatory power than the original dataset. A run with only manufacturing firms resulted in strategic and operational absorptive capacity not being significant for exploration and repetitive exploitation. The same behavior is observed when the run is only on firms located in region 13 (i.e., Santiago, Chile's capital city), in which strategic absorptive capacity is not significant for exploration.

In a meta-analysis on organizational ambidexterity and performance, Junni et al. (Junni et al., 2013) discuss the different approaches taken by researchers on measuring OA. When exploration and exploitation are combined, ambidexterity has been represented as the addition or multiplication of exploration and exploitation. For purposes of this study's robustness check, a single dependent variable representing ambidexterity was used, replacing EXPLORE, IEXPLOITE, and REXPLOITE. Since the extant research has not addressed the separation between incremental and repetitive exploitation, a combination of EXPLORE is assumed as adding or multiplying a single variable, EXPLOITE, defined as the multiplication of IEXPLOITE and REXPLOITE. In both instances, representing the combination as an addition or multiplication, the explanatory power of analyzing the three separate variables is higher than the single variable, i.e., R^2 of 0.113 vs. 0.385 for the product, and R^2 of 0.183 vs. 0.385 for the sum. A similar result is obtained when replacing the strategic absorptive capacity variable with a proxy represented by whether or not companies have an external R&D function. Finally, additional control variables are included representing doctoral and technical education levels, resulting in no significant changes to the results.

DISCUSSION AND CONCLUSIONS

I began this study by introducing a gap in the literature regarding the direct relationship between absorptive capacity and organizational ambidexterity. The current business environment requires companies to reach out for new ideas, technologies, and best practices in order to maintain their competitive advantages. The original definition of ambidexterity posed a dichotomy between exploration and exploitation, assimilating the former with R&D and radical innovation, and the latter with operational efficiency (March, 1991). There is a significant spectrum between both positions that was not captured by the initial studies of the construct. In agreement with Piao & Zajac, and closer to actual organizational innovation practices, with which companies conducting radical innovation usually perform incremental innovation as a portfolio effort, I differentiate exploitation between incremental exploitation, associated with incremental innovation and repetitive exploitation, associated with operational efficiency.

Absorptive capacity has become increasingly relevant since the construct was introduced by Cohen & Levinthal (1990) but has been focused mostly on innovation and strategic change. However, organizations have always reached out for new knowledge or best practices, regardless of whether they were related to operations or new competitive advantages. Instead of treating absorptive capacity as a phenomenon exclusively in the realm of innovation or operations as the extant literature suggests, this study combines the observation of both research streams into a construct with two elements, a strategic absorptive capacity, related to innovation and operational absorptive capacity related to innovation as well as operational efficiency.

Focusing on organizational units, the objective of this study is to understand how the absorptive capacity at the strategic and operational levels affects organizational ambidexterity. Piao & Zajac have explored this relationship but only at the strategic level of absorptive capacity and based on one case study, lacking generalizability. This study's findings are consistent with those of Piao & Zajac, showing a positive relationship between strategic absorptive capacity and exploration. More relevantly, this study shows the positive effect of both strategic absorptive capacity and operational absorptive capacity on incremental exploitation. This finding indicates that the effort of improving existing products, services and processes is better served with contributions from innovative and operational external knowledge. Also, as expected from the extant operational literature, operational absorptive capacity has a positive impact on repetitive exploitation.

This study contributes to the understanding of the different dimensions of organizational ambidexterity, particularly with the validation of Piao & Zajac's model of incremental and repetitive exploitation. These authors proposed their hypothesis based on a single company case study; this analysis contributes to the generalizability of the proposed model through its validation over a data set of more than 1,000 companies of varied sizes across several industries.

The proposed model of absorptive capacity which includes an innovative and an operational dimension simultaneously is novel and contributes to the knowledge of this construct. Moreover, since absorptive capacity as an antecedent of ambidexterity has not been studied extensively before, this study contributes to theory by validating the hypothesis of the influence of innovative and operational absorptive capacity on incremental exploitation.

Managers tend to treat innovation knowledge separately from operational or efficiency best practices. This study shows that the simultaneous application of both types of knowledge contributes positively to the incremental innovation within the firm. This finding will allow management to become more successful in its overall innovative efforts.

Despite the positive results of this study, there are several limitations on the findings. Single-source bias is inherent to the study since the data was collected from one secondary source. Since the original survey is based on the OECD innovation questionnaire, further research, including data from other countries using the same standard, would be promising to overcome this bias. The analysis was conducted using multivariate regression methodology, resulting in common-method bias. It is suggested that other methodologies such as SEM or others, be used to overcome this limitation.

As mentioned above, since data were obtained from secondary sources, future research using ad-hoc surveys could improve the understanding of the relationship between these constructs and overcome this limitation.

Factor Analysis Table										
	Strategic Absorptive Capacity		Operational Absorptive Capacity		Exploration		Incremental Exploitation		Repetitive Exploitation	
	Loading		Loading		Loading		Loading		Loading	
Survey Item	Factor 1	Comm unality	Factor 1	Comm unality	Factor 1	Comm unality	Factor 1	Comm unality	Factor 1	Comm unality
External Market Sources of Information:										
Suppliers	0.451	0.203								
Customers	0.543	0.295								
Competitors	0.599	0.359								
Consultants	0.675	0.456								
External Institutional Sources of Information:										
Universities	0.753	0.567								
Research Institutes	0.744	0.554								
External Other Sources of Information:										
Conferences	0.784	0.615								
Publications	0.804	0.646								
Professional Associations	0.804	0.646								
Internet	0.620	0.384								
IS as a Dpt. of the Firm			0.729	0.531						
R&D as a Dpt. of the Firm			0.763	0.582						
Eng. as a Dpt. of the Firm			0.752	0.565						
The Firm launched a new product in 2014					0.844	0.712				
The Firm launched a new service in 2014					0.844	0.712				
Marketing Innovation in:										
Packaging							0.841	0.708		
Advertising							0.924	0.854		
Distribution							0.921	0.848		
Pricing							0.866	0.749		
Process and Org. Improvement in:										
Manufacturing									0.741	0.550
Logistics									0.820	0.673
Support									0.840	0.706
Process Design									0.918	0.843
Decision Making									0.913	0.834
External Relations									0.854	0.729
Eigenvalue	4.726		1.678		1.424		1.678		4.335	
% of Total Variance	90		121		113		121		96	

Table 1. Factor Analysis for Two Independent Variables and Three Dependent Variables

	Mean	St. Dev	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. SACAP	2.436	0.864	1.000																				
2. OACAP	0.122	0.231	0.251	1.000																			
3. EXPLORE	0.059	0.195	0.188	0.180	1.000																		
4. EXPLOITE	0.052	0.176	0.245	0.163	0.221	1.000																	
5. REPLOITE	0.092	0.224	0.222	0.207	0.234	0.340	1.000																
6. Num workers in Eng.	0.015	0.068	0.109	0.171	0.132	0.063	0.091	1.000															
7 Num workers in S	0.045	0.115	0.037	-0.005	0.042	0.019	-0.044	0.037	1.000														
8. Num workers in R&D	0.010	0.059	0.181	0.126	0.144	0.090	0.062	0.091	0.163	1.000													
9. Company Age	2.921	0.497	0.052	0.223	0.026	0.000	0.045	-0.123	-0.185	-0.111	1.000												
10. Medium Size Companies	0.217	0.412	-0.030	0.004	-0.140	-0.118	-0.081	0.016	0.002	-0.003	-0.100	1.000											
11. Large Companies	0.385	0.487	0.031	0.288	0.021	0.077	0.149	-0.123	-0.244	-0.191	0.322	-0.515	1.000										
12. Manufacturing	0.242	0.428	-0.002	0.191	0.059	0.011	-0.003	-0.081	-0.203	-0.122	0.262	0.062	0.126	1.000									
13. Transportation	0.087	0.281	0.008	0.004	0.057	0.045	0.058	-0.007	0.002	-0.026	-0.026	-0.058	0.083	-0.168	1.000								
14. Wholesale&Retail	0.131	0.338	-0.079	-0.106	-0.135	0.075	0.001	-0.080	-0.009	-0.059	-0.029	-0.045	0.080	-0.257	-0.075	1.000							
15. Healthcare	0.043	0.202	0.055	-0.082	0.057	-0.032	0.028	-0.063	0.068	0.000	0.011	-0.037	-0.021	-0.171	-0.050	-0.076	1.000						
16. Construction	0.072	0.258	-0.002	0.004	-0.026	-0.040	0.058	0.050	-0.061	-0.053	-0.001	0.037	-0.005	-0.186	-0.054	-0.083	-0.055	1.000					
17. Int. Innov. Low Impact	0.262	0.440	0.118	0.027	0.012	0.034	0.087	-0.030	0.003	-0.015	-0.017	0.028	0.015	-0.014	0.048	-0.026	0.021	0.057	1.000				
18. Int. Innov. Medium Impact	0.101	0.301	-0.038	-0.098	-0.046	-0.038	-0.101	0.029	-0.030	-0.030	-0.069	0.030	-0.077	-0.021	0.049	0.078	-0.016	-0.026	-0.203	1.000			
19. Int. Innov. High Impact	0.182	0.386	-0.329	-0.230	-0.143	-0.127	-0.174	-0.057	-0.011	-0.064	-0.051	0.025	-0.083	-0.005	-0.043	0.035	-0.022	-0.004	-0.282	-0.159	1.000		
20. R&D capability in-house	0.064	0.246	0.227	0.431	0.179	0.154	0.185	0.027	0.033	0.192	0.080	-0.095	0.188	0.030	-0.061	-0.046	0.011	0.040	-0.005	-0.094	-0.178	1.000	
21. Workers w/Masters	0.008	0.045	0.064	0.091	0.090	0.022	0.026	0.124	0.063	0.204	-0.048	-0.050	-0.054	-0.096	0.018	-0.067	0.064	-0.061	-0.013	0.014	-0.086	0.092	1.000
22. Region Dummies Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2 Descriptive Statistics and Correlation Matrix

Results of Regression Analysis						
	Exploration (EXPLORE)		Incremental Exploitation (IEXPLOITE)		Repetitive Exploitation (REXPLOITE)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Effects of Absorptive Capacity on Ambidexterity (IVs)						
Strategic Absorptive Capacity (SACAP) H1 and H2		0.032** (0.012)		0.070*** (0.012)		
Operational Absorptive Capacity (OACAP) H3 and H5				0.088** (0.035)		0.092** (0.037)
Control Variables						
Company Age	0.021 (0.022)	0.010 (0.022)	-0.020 (0.021)	-0.035* (0.021)	-0.013 (0.022)	-0.026 (0.022)
Company Size-M	-0.137*** (0.030)	-0.152*** (0.031)	-0.081*** (0.029)	-0.096*** (0.029)	-0.005 (0.030)	-0.021 (0.031)
Company Size-L	-0.055** (0.026)	-0.074*** (0.028)	-0.003 (0.025)	-0.024 (0.026)	-0.069*** (0.026)	-0.047* (0.027)
Industry Sectors:						
Manufacturing	0.067*** (0.025)	0.059** (0.025)	0.041* (0.023)	0.033 (0.023)	0.019 (0.024)	0.011 (0.024)
Transport and Communications	0.125*** (0.049)	0.121** (0.049)	0.099** (0.047)	0.093** (0.046)	0.113** (0.049)	0.108** (0.048)
Wholesale and Retail	-0.071** (0.035)	-0.064* (0.035)	0.106*** (0.034)	0.117*** (0.033)	0.045 (0.035)	0.054 (0.035)
Healthcare	0.106** (0.048)	0.106** (0.048)	-0.023 (0.045)	-0.032 (0.045)	0.068 (0.048)	0.064 (0.047)
Construction	-0.009 (0.045)	-0.009 (0.045)	-0.022 (0.043)	-0.021 (0.042)	0.081* (0.045)	0.081* (0.044)
Number of workers per Dpt.:						
Engineering	0.428*** (0.119)	0.334*** (0.122)	0.224** (0.113)	0.096 (0.114)	0.366*** (0.119)	0.249** (0.121)
Information Systems	0.034 (0.087)	0.010 (0.087)	0.022 (0.082)	-0.005 (0.081)	-0.099 (0.086)	-0.125 (0.086)
R&D and Innovation	0.334*** (0.126)	0.256** (0.127)	0.239** (0.120)	0.111 (0.119)	0.204* (0.125)	0.098 (0.126)
Internal sources of Innovation:						
Low Importance	-0.020 (0.024)	-0.021 (0.024)	-0.002 (0.023)	-0.004 (0.023)	0.014 (0.024)	0.012 (0.024)
Medium Importance	-0.059* (0.035)	-0.048 (0.035)	-0.056* (0.033)	-0.038 (0.032)	-0.111*** (0.034)	-0.096*** (0.034)
High Importance	-0.103*** (0.028)	-0.072** (0.029)	-0.085*** (0.027)	-0.031 (0.028)	-0.125*** (0.028)	-0.081*** (0.029)
R&D capability in-house	0.086*** (0.022)	0.060** (0.024)	0.077*** (0.021)	0.041* (0.022)	0.082*** (0.022)	0.049** (0.023)
Percentage of workers w/Masters degrees	0.127 (0.195)	0.107 (0.194)	-0.106 (0.185)	-0.112 (0.182)	-0.068 (0.194)	-0.085 (0.192)
R ²	0.126	0.138	0.077	0.117	0.110	0.130
F Statistics	***	***	***	***	***	***

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3. Regression Analysis

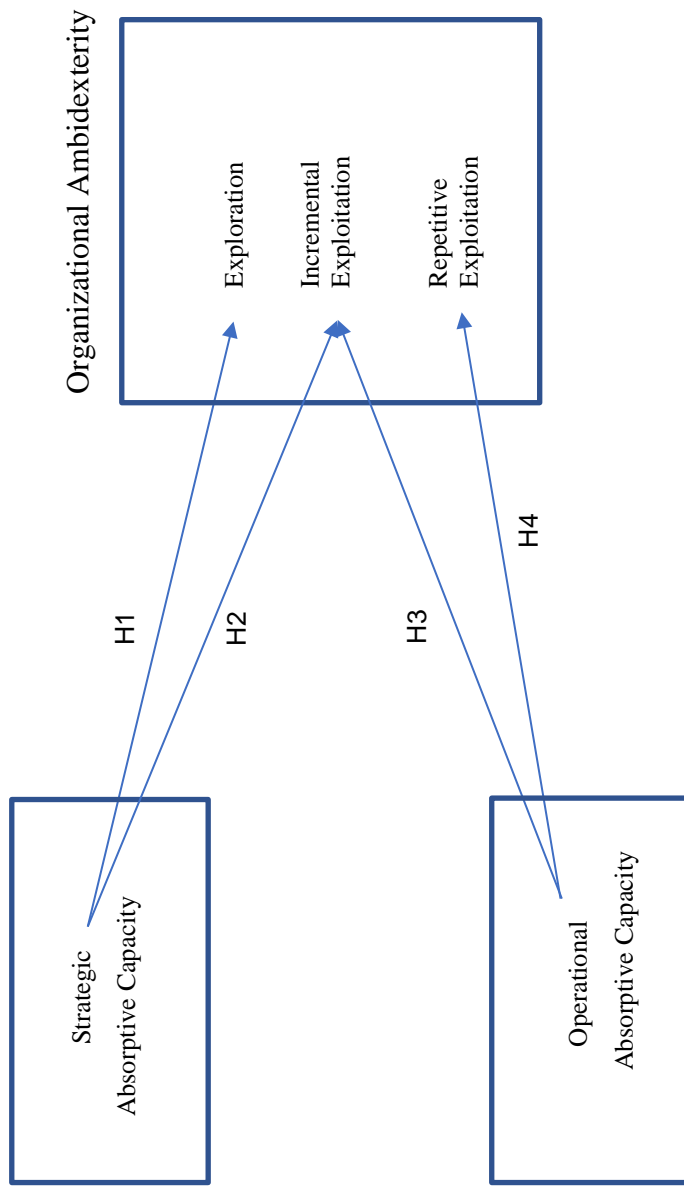


Figure 1. Antecedents of absorptive capacity and its role in organizational ambidexterity

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