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# Knowledge inflows effects on middle managers' ambidexterity and performance

Middle managers' ambidexterity

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## Abstract

**Purpose** – The purpose of this paper is to report on lab experiments conducted to determine what impact managerial top-down knowledge transfer has on a middle manager's individual ambidexterity and decision performance.

**Design/methodology/approach** – The authors designed an experimental approach using a business simulator to test the hypotheses with middle managers. The methodological approach provides the authors with a framework to enhance the middle manager's understanding of how to attain superior short-term financial results by exploiting current resources, in addition to mastering new strategies to avoid a potential business bankruptcy.

**Findings** – The results suggest that top-down managerial knowledge inflow benefits middle manager strategic decision making, as well as his/her short- and long-term performance. Nonetheless, the best short-term results were achieved by those middle managers that mastered both exploitation and exploration activities simultaneously.

**Originality/value** – The contribution of this paper is to identify and test a control mechanism called top-down inflows that enhance middle manager's ability to exploit current resources to increase financial performance, and exploring new strategies to avoid a business bankruptcy.

**Keywords** Decision performance, Individual ambidexterity, Top-down knowledge inflows

**Paper type** Research paper

## Introduction

Strategy-process research is in full development regardless of the heterogenous "intellectual landscape," and research opportunities are plentiful (Hutzschenreuter and Kleindienst, 2006), as implied when "over the years, strategy-process research has produced an incredibly vast body of literature" (p. 703). In the context of more complex and global environments, organizations and their leaders face pressures to address multiple, competing strategic demands simultaneously (Smith, 2014), where most strategic decision performance depends on choosing between mutually exclusive alternatives. A seminal article developed by Duncan (1976, p. 184) introduced the idea of the ambidextrous organization in the sense of balancing "dual structures" to spur the development of innovation. This incompatible nature of the exploitative and exploratory activities (March, 1991) has been tackled for a long time, suggesting different ambidextrous organizational solutions: structural, sequential and contextual ambidexterity (Gibson and Birkinshaw, 2004; Tushman and O'Reilly, 1996). In fact, for March (1991), in the search for competitive advantage organizations face the constant dilemma, or trade-off, between exploiting "certainties" in organizational learning and exploring new possibilities. Given scant resources (e.g. tangible and intangible



resources) finding a balance between exploration and exploitation would prove problematic, since excessive emphasis on the exploitation of current competitive activities and/or excessive emphasis on the exploration of future opportunities hampers performance and survival. Despite the valuable insights that this body of literature has provided, a main limitation can be highlighted. These studies, adopting the firm level of analysis, implicitly assume homogeneity at the individual level, neglecting how manager's decision might influence the firm's ability to pursue a balance between exploration and exploitation (Bonesso *et al.*, 2014). In this paper, we relate the idea of business' key knowledge flow transfer toward middle managers and its effect in strategic decision performance through the mediated impact over individual ambidexterity. Our paper is related to the recent debate on the micro-level origins of a firm's capabilities – Microfoundation for Strategy (Foss and Lindenberg, 2013; Barney and Felin, 2013; Eisenhardt *et al.*, 2010), which focusses on exploring individuals' characteristics within the development of organizational capabilities. We follow the broad definition of ambidexterity as “an organization's capacity to address two organizationally incompatible objectives equally well” (Birkinshaw and Gupta, 2013, p. 291), understanding that is also applicable to the individual manager micro-level decisional challenges.

While several researchers have described the main constituents of individual ambidexterity and their relationship with strategy (Lavie *et al.*, 2010; Mom *et al.*, 2009; Raisch *et al.*, 2009), there is very little evidence of how to improve individual ambidexterity by sharing managerial knowledge. The aim of this work is seek insight into the impact of top-down knowledge flows on the delivery of business expertise to middle management. More specifically, we explore how the access to the causal model between variables of a business simulation game, as a resemblance of expert or senior manager knowledge about the industry, affects middle manager's ambidextrous capabilities and performance, i.e. the ability to balance short and long-term goals in competitive environments. By doing this, we explore links between individual ambidexterity, the availability of knowledge, the decision-making processes, and managerial decision performance.

Knowledge flows hinges on the key assumption in strategic management literature that the availability of knowledge regarding the external and internal environment is fundamental for strategic process and decision making (Porter, 2004; Barney and Clark, 2007), and that effective knowledge transfer significantly improves firm performance (Palacios-Marqués *et al.*, 2013). However, despite the significance of knowledge for the development of strategy and decision making, literature concedes that in most organizations generation and transmission of information for good strategy is not transparent (Whittington *et al.*, 2011, p. 535): “strategy is normally regarded as secret. The possibility of sustained competitive advantage relies substantially upon asymmetries and ambiguities of information.” The importance of information “secrecy” refers not just to competitors, suppliers and other external company aids, but also to any part of the internal structure that could release sensitive information; when executives change jobs, for instance. This, in part, would explain why strategy has traditionally been understood as “exclusive” or proprietary to the CEO and the organizational “elite” (Whittington *et al.*, 2011).

The structure of this paper is as follows. A review of the literature highlights the role of internal flow of knowledge within a given organization. Then, it is explained how a causal model describing how the industry works can be understood as a form of expert or senior knowledge inflow in a given strategic process. Then, the review concludes

with the analysis of individual ambidexterity, its characteristics, its measurement, and impact on short- and long-term decision performance. Work methodology follows describing how was information collected and analyzed. After the results and main discussions, the conclusions provide the main implications of our research for theory and practical purposes.

## Literature review

### *Strategy processes and internal knowledge flows*

According to Hutzschenreuter and Kleindienst (2006) the strategy processes, involving the strategy formulation and implementation, can be framed as located between the contextual antecedents and the strategic outcomes. The strategy process “can be described as being composed of three main elements: the strategists, the issue, and the sequence of actions” (p. 676), and subdivided in the strategists’ static characteristics, strategists’ personal and cognitive context, the issue characteristics, the process characteristics, and the process-outcome characteristics.

According to Hutzschenreuter and Kleindienst (2006) “in today’s knowledge economy, the long-term success of an organization is increasingly based on knowledge accumulation and sharing.” Consequently, many organizations have concluded that effective knowledge sharing is the crucial way to lever their core competencies and gain competitive advantage (Gold *et al.*, 2001; Lin and Lee, 2004). Haas and Hansen (2007) state that knowledge sharing can be viewed as the process of interaction, communication and coordination of knowledge or expertise. Knowledge sharing involves a set of shared understandings related to providing employees with access to relevant information and using existing knowledge within organizations (Lin, 2007). Knowledge transfer from senior managers is highly relevant in the strategy-process arena, because it creates organizational knowledge and exploring alternative architectures (e.g. formal procedures, process and actions) to connect the disparate elements of the business strategy in a cohesive way (Lin and Lee, 2004). Without some sense of how middle managers must relate strategic issues and the sequence of actions, knowledge will not accumulate into useful solutions to real problems (Chesbrough and Appleyard, 2007). Although most literature on knowledge sharing deals with inter-organizational knowledge transfer, and firm performance (Li *et al.*, 2006; Van Wijk *et al.*, 2008), intra-organizational knowledge transfer research has also shown a positive relation between knowledge transfer and firm performance (Wang *et al.*, 2014a; Palacios-Marqués *et al.*, 2013).

Despite the evidence of the importance of internal knowledge transfer to gain competitive advantage and enhance firm performance, not all managers, such as middle managers, do receive the internal knowledge and key information they may need. Most of the key knowledge that is required by middle managers for making strategic decisions it is not available in a clearly transferable form. According to Davenport *et al.* (1992) information politics seriously hinders the seamless flow and sharing of information within the organization: “As people’s jobs and roles become defined by the unique information they hold, they may be less likely to share that information-viewing it as a source of power and indispensability-rather than more so. When information is the primary unit of organizational currency, we should not expect its owners to give it away” (p. 102). In fact, the resource-based view theory suggests that employees who are intellectual powerhouses may keep their key knowledge jealously guarded to coordination initiatives (Chesbrough and Appleyard, 2007). This fact represents a problematic issue for organizations since it is assumed that

information is a kind of “personal strategic asset.” Any change in the existing bundle of strategic assets may benefit some employees and hurt others, leading not only to complex agency problems, but in obtaining the necessary information and judgments concerning information that lead to cooperation, trust, and competence in the strategy process (Amit and Schoemaker, 1993).

*Top-down knowledge inflows, manager’s ambidexterity, and decision performance*

In addition to the difficulty of different organizational confidentiality requirements and manifestations of conflict and individual zeal with information, the strategy literature recognizes that for an individual, wide differences exist in the amount and type of knowledge a managers possess on the firm’s internal and external operating environment (Gavetti *et al.*, 2005). An increasing body of strategy and management science literature explores similar phenomena such as the structures of individual knowledge, mental models (Morecroft, 1984), dominant logic (Prahalad and Bettis, 1986), causal models (Sterman, 1989), and cognitive maps (Eden *et al.*, 1992). This body of literature has focussed on understanding how cognitive bias affects managerial decision making. According to Gary and Wood (2011) every manager has knowledge structures that impact the perception, information processing, problem solving, judgment, learning, and decision making, influencing the organizational learning capability and firm performance. In this context, the transference of knowledge in the form of flows has been considered relevant in the literature for its importance to the organizational learning and absorptive capacity (Schulz, 2001; Gupta and Govindarajan, 2000). Mom *et al.* (2007, p. 913) defines knowledge flows as “the aggregate volume [...] of tacit and explicit knowledge pertaining to several domains such as technology, products, processes, strategies, and markets, which a manager receives or gathers per unit of time, from other persons and units within the organization.” Indeed, Mom *et al.* (2007) explore how three kinds of knowledge flows affect the explorative and exploitative activities of its managers across the organizational hierarchy: top-down, bottom-up, and horizontal knowledge inflows.

Here we focus on top-down knowledge inflows, specifically in the form of industrial causal model, since top-down inflows of knowledge tend to be fairly unambiguous; i.e. they possess a clear and recognized understanding of cause-effect relationships (Egelhoff, 1991), and their importance with respect to improving the recipient’s current activities is usually well-known (Schulz, 2003). Therefore, we assume that a hypothetical senior manager has enough expert knowledge about the main key strategic variables of the business-industry at hand, which can be structured in the form of communicable top-down knowledge. Mom *et al.* (2007) provide evidence of the relationship between specific knowledge flows and explorative and exploitative activities, opening the debate about the effect of knowledge inflows on manager’s ability to efficiently combine exploration and exploitation activities, known also as ambidexterity.

Research on ambidexterity and the balance between exploration and exploitation proliferates from 2004 although it is mainly focussed on firms leaving only a few studies centered on individual ambidexterity (Birkinshaw and Gupta, 2013). In the field of psychology, individual ambidexterity has been defined as “the cognitive abilities necessary to balance efforts of exploration and exploitation” (Good and Michel, 2013). In the management field, and mostly based on the work of Gibson and Birkinshaw (2004) and O’Reilly and Tushman (2004). Mom *et al.* (2009) define managers’ ambidexterity as “a manager’s behavioral orientation toward combining exploration and exploitation-related activities within a certain period of time.”

Although relevant to understand the roots behind ambidextrous organizations, research oriented to understand the concept of managerial ambidexterity is still scarce, and have attracted the attention of researchers recently (e.g. Simon and Tellier, 2011; Bonesso *et al.*, 2014; Li *et al.*, 2008). The main findings of those few recent studies are that prior work experience and competency profile play a relevant role as antecedents of personal ambidexterity (Bonesso *et al.*, 2014), that individual ambidexterity of managers in a research and development team network can be affected by the composition and network structure of the team (Wang *et al.*, 2014b), that managers' networks are important levers for their ability to behave ambidextrously (Rogan and Mors, 2014), and that learning goal orientation, political and innovative skills are positively related with managers' ambidexterity (Wang *et al.*, 2014c; Li *et al.*, 2008). Notwithstanding the importance of these findings, the relative scarcity of ambidexterity and exploration-exploitation studies among business executives represents a vacuum in literature, since the understanding of their micro-mechanisms such as, individual behavior and perceptions, has proven critical when explaining individual performance (Bonesso *et al.*, 2014), and how this impacts group and organizational performance (O'Reilly and Tushman, 2004, p. 81).

Evidence has been found in the specific domain of the relationships between superiors' behavior and subordinates' engagement in exploration and exploitation activities, supporting a positive interrelation between superiors' transformational leadership and ambidexterity either at organizational (Jansen *et al.*, 2009), team (Nemanich and Vera, 2009) and at individual level (Keller and Weibler, 2015). According to Bryant (2003), this interrelation is explained by the fact that transformational leadership may be more effective at creating and sharing knowledge at the individual and group levels, and evidence exists supporting a positive relation between transformational leadership and knowledge dissemination. Additionally, Moreno-Luzon and Valls-Pasola (2011) found that, in the context of total quality management, broad and regular training of managers renews their knowledge, skills, and expertise, generating ambidexterity in managers on an individual level. Therefore, it is possible to hypothesize that managerial knowledge dissemination by a senior manager with expert knowledge will increase middle managers' ambidexterity (with less expertise about the business). Then, our first hypothesis is as follows:

- H1.* When senior managers share managerial knowledge with middle managers, this expert knowledge increases middle managers' ambidexterity.

The relationship between ambidexterity and performance at the organizational level has been a prolific topic especially since the proposition of Tushman and O'Reilly (1996), whom observe that, in order to survive and change over decades, organizations need to explore and exploit simultaneously, i.e. to be ambidextrous. After that proposition, dozens of studies have provided consistent evidence of the positive relationship between organizational ambidexterity (OA) and different dimensions of performance, such as sales, subjective rankings of performance, innovation, market valuation, and firm survival (O'Reilly and Tushman, 2013), and a recent meta-analysis confirms the relationship between OA and performance, despite different moderators (Junni *et al.*, 2013). However, studies focussed on the relationship between managers' individual ambidexterity and their performances are still scarce. Among the few studies centered on this relationship, it is possible to mention the study of Jasmand *et al.* (2012), whom found that customer satisfaction representatives' ambidextrous behavior increases customer satisfaction and sales performance, and the

study of Laureiro-Martinez *et al.* (2015), whom found that sustained decision-making high performance depends on the ability to shift between exploitation and exploration, which in turn depends on stronger activation of the brain regions responsible for attentional and cognitive control. Based on the previous discussion, it is possible to hypothesize a positive relation between managers' ambidexterity and, for one side, their short-term performance and, for another, their long-term performance in competitive environments:

*H2a.* The higher the level of ambidexterity of the middle managers, the better their individual decisions' short-term performance.

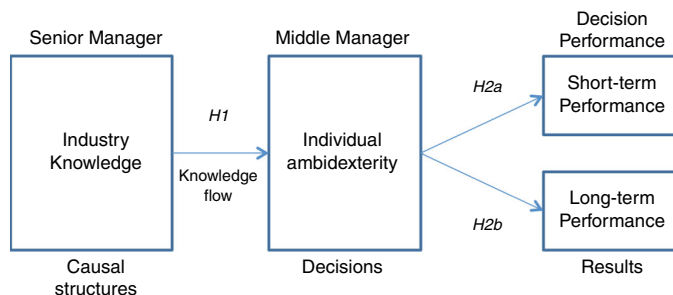
*H2b.* The higher the level of ambidexterity of the middle managers, the better their individual decisions' long-term performance.

Figure 1 presents our conceptual model and hypotheses.

## Research method

### Data collection

The objective of this study is to analyze how senior manager's transfer of strategic knowledge impacts upon a middle manager's individual ambidexterity and decision performance. We designed an experimental approach using a simulator called "People Express" to test our hypotheses. The simulator gets participants to make decisions involving the management of a low-cost airline operating for ten years. Decisions must be made quarterly and they involve managing two strategic resources: aircraft and personnel; and three operating variables: marketing expenditure, fare rates and target segment. Our experiment focusses on middle managers' individual decision-making processes. The virtual environment, therefore, provides the participant with a business "Micro-World" where the decision of increasing or decreasing resources determines decision performance. Two groups of middle managers, who are attending the MBA, MSc in Marketing and Executive Business courses at the University of Chile's Business School, were selected. Group 1 plays the simulator without the causal structure of the simulator. We called this group "uninformed participants" because they do not receive any industry information, or "expert knowledge" relating the key decisional variables. Group 2 plays the simulator with strategic knowledge about the industry (treatment group). Group 2 is called "confident participants" because they receive a top-down knowledge inflow in the form of a sheet of paper with the real causal map illustrating the dynamics of the industry used by the software simulation. We assume that the causal map functions as the supposed senior manager's top-down knowledge where she/he successfully identifies the main factors that are strategically significant for



**Figure 1.**  
Theoretical  
framework and  
hypotheses



superior business performance (Kunc and Morecroft, 2010). Hence, we tell participants of Group 2 that this knowledge inflow comes from their senior managers. Our choice of causal mapping as the treatment for analyzing top-down knowledge flows is consistent with the assumption that causal reasoning is the primary way in which strategic decisions are developed and understood, and it is thus the appropriate methodology to be employed to capture the belief structures associated with firm action (Kiss and Barr, 2014).

The simulator records every participant's decision and its impact on all of the business' variables, such as net income, demand growth rate, aircraft purchases, breakeven load factor, employees per plane, employee turnover, marketing costs and revenue. Every participant's business decisions during the experiment were collected quarterly during ten years (then, implying 40 decisions in total). All participants played the software for 45 minutes. If a participant runs their business to bankruptcy at any time during the game before reaching the ten-year game-limit (or 40 decisions), the participant must restart the simulation from year 0. Firm bankruptcy occurs when the participant is unable to meet its financial obligations during simulation.

The experiment is described as follows: a senior manager shares his knowledge about the industry with a middle manager (participant). This knowledge is structured as a causal diagram. It is assumed that business experience enables the senior manager to identify real causal structures behind the industry's competitive dynamism. Then the causal diagram of the People Express simulator is assumed to represent the top-down knowledge of senior managers (Eden and Ackermann, 2004). This causal diagram shows all of the interrelationships among the variables on the virtual simulator.

Questionnaires with an individual ambidexterity scale were made available to all students after their participation (Mom *et al.*, 2009); 72 participants accepted to play the simulator. All participants returned their questionnaire, yielding a response rate of 100 percent. Nevertheless, list-wise deletion of cases missing values reduced the final sample to 67. In total, 34 participants were from Group 1 and the remainder from Group 2. Groups 1 and 2 played the simulator in different rooms and they did not know each other. Data collection procedures were held at the University of Chile between July and November 2014.

We conducted a two-stage approach to test our hypotheses. Stage 1 concerns top-down knowledge through sharing knowledge to ambidextrous performance. Stage 2 relates individual ambidexterity to decisions' performance. We used an OLS model with robust standard error checking to validate *H1* and *H2a*; and a Probit model with robust standard error check to validate *H2b*. We analyzed multicollinearity problems for each model.

### *Measures*

*Dependent variables.* We measured long-term and short-term decisions' performance of middle managers with two variables: firm profit and firm bankruptcy. We define short-term performance as the profit reported by participants' simulations every quarter. Every simulation involves five decisions quarterly relating to the amounts of the following resources: number of aircrafts, marketing expenses as percentage of the revenues, and the number of employees hired by the participant. We measured long-term performance as a dummy variable where 0 = participants have one or more than one business bankruptcy in a simulation game, that we called "default" (once the firm "defaults," the participant must restart the game), 1 if the participant never defaults. The simulator displays participants a firm bankruptcy message when total

liabilities exceed total assets (negative net worth). Bankruptcy involves a lack of liquidity to pay debts as they fall due. We assume that participants who play the middle manager role explore different strategies to avoid potential bankruptcy as a long-term objective. Our two performance measures are aligned to those yardsticks suggested by Helfat *et al.* (2007) who define that a dynamic capability should be tested in terms of how effectively a capability performs its function and how well the capability enables a firm to make a living.

*Independent variables.* This study measure of participant ambidextrous behavior is based on an existing scale developed by Mom *et al.* (2009), which consists of 14 items developed to measure exploitation and exploration activities (seven items for each type of activity). The scale was adapted specifically for the simulation to measure participant ambidextrous behavior, and the total assessment of a participant's ambidextrous behavior was obtained by computing the multiplicative interaction between their exploration activities and their exploitation activities.

Participant demographic characteristics are measured as follows: gender as a dummy variable where 1 male and 0 female; age as participant age at the moment of the game; we intentionally selected participants who had no prior experience in the airline industry. In order to test the effect of senior manager transparency on individual middle manager ambidexterity, we define the availability of top-down knowledge flow as a dummy variable where 1 = the senior manager shares knowledge about the causal structure that affects the industry and 0 = the senior manager does not share such knowledge. As explained, we considered that the causal map reported by the software "People Express" is the senior manager's mental model in the experimental situation. This causal map shows cause-effect relationships between the environmental variables of the simulator, participants' decisions and their effects on their business performance.

## Results

Descriptive statistics and correlations for the variables used in the study are presented in Table I. *t*-Tests show that the means of middle-manager exploitation and exploration activities do not significantly differ from each other. However, the means of manager exploitation and exploration activities are significantly ( $p < 0.01$ ) lower when individuals do not receive top-down knowledge inflow. In fact, the means of middle-manager short and long-term performance are also significantly ( $p < 0.05$ ) lower when they do not receive top-down knowledge inflow. This is indicative, but not a measure, of knowledge inflow affecting a manager's ambidextrous performance. Furthermore, Table I identifies significant relationships among several of the independent and control variables. To examine the issue of multicollinearity, we calculated variance inflation factors (VIF) in each of the regression equations. VIF factors are between 1.20 and 1.03 in Models 1-9; 3.9 and 1.96 in Models 11 and 14; and 4.57 and 1.96 in Models 12 and 15. These VIFs are below the rule-of-thumb cut-off of ten (Mom *et al.*, 2007).

Table II shows OLS regression results for the nine models used to test *H1* on the relationships between top-down knowledge inflow and middle manager ambidextrous performance. Our results suggest that when senior managers share their causal structure that give coherence to their strategic actions with middle managers, the latter's cognitive ability for handling exploitation and exploration activities increased.

In Models 1-3, top-down knowledge inflow ( $p < 0.01$ ) correlates positively to middle manager exploitation activities. For exploitation activities our results suggest that male participants report a higher orientation than female participants ( $p < 0.01$ ). On the

	Mean	SD	1	2	3	4	5	6	7	8
1. Gender	–	–	1.0000							
2. Age	23.6	1.87	–0.3779***	1.0000						
3. Top-down knowledge	–	–	–0.0338	0.1663***	1.0000					
4. Ambidexterity	558.09	166.58	–0.0466	0.0588**	0.0829***	1.0000				
5. Exploitation activities	22.38	4.02	0.0517	–0.008	0.107***	0.862***	1.0000			
6. Exploration activities	24.11	4.21	–0.0768***	0.0925***	0.0626**	0.8838***	0.5495***	1.0000		
7. Netincome	8.35	30.64	–0.1295***	–0.0371	0.0262	0.1001***	0.0849***	0.0883***	1.0000	
8. No_default	–	–	–0.2134***	–0.1725***	–0.0357	0.2331***	0.1438***	0.2549***	0.2304***	1.0000

Notes: All correlations above are significant at \*\* $p < 0.05$ ; \*\*\* $p < 0.01$  (two-tailed)

**Table II.**  
OLS results of  
top-down knowledge  
inflow on manager's  
individual  
ambidexterity

Variables	Exploitation activities			Exploration activities			Individual ambidexterity		
	M1	M2	M3	M4	M5	M6	M7	M8	M9
Gender		0.458*** (0.152)	0.439*** (0.164)		-0.670*** (0.161)	-0.452*** (0.162)		-14.92*** (6.206)	-10.56* (6.393)
Age			-0.0130 (0.0297)			0.147*** (0.0465)			2.935*** (1.440)
Top-down knowledge	0.960*** (0.153)	0.977*** (0.158)	0.985*** (0.162)	0.608*** (0.156)	0.584*** (0.151)	0.487*** (0.153)	30.56*** (5.927)	30.01*** (5.856)	28.07*** (6.056)
Observations	3,173	3,173	3,173	3,173	3,173	3,173	3,173	3,173	3,173
R <sup>2</sup>	0.011	0.015	0.015	0.004	0.010	0.013	0.007	0.009	0.010
F	39.15	19.64	13.16	15.31	17.55	13.85	26.58	18.94	15.02
R <sup>2</sup> adj.	0.011	0.0139	0.0136	0.00361	0.00888	0.0121	0.00657	0.00818	0.00885

**Notes:** Robust standard errors in parentheses. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

other hand, Models 4-6 report that female participants are more oriented to exploration activities than male participants ( $p < 0.01$ ). Top-down knowledge inflow relates positively to exploration activities ( $p < 0.01$ ). Finally, higher participants' age relates positively to exploration activities ( $p < 0.01$ ). Supporting *H1*, Models 7-9 also show that top-down knowledge inflow relates positively to individual ambidexterity ( $p < 0.01$ ). Finally, Models 7-9 highlight that female participants are positively correlated to individual ambidexterity.

Table III presents the results of managers' individual ambidexterity on short and long-term performance as defined previously. Models 10-12 shows that individual ambidexterity relates positively to short-term performance ( $p < 0.01$ ), supporting *H2a*. As expected, however, a manager's exploration activities do not significantly impact short-term performance, although surprisingly our results suggest that a manager's exploitation activities also do not significantly impact short-term performance. This counterintuitive finding would seem to indicate that middle managers can only achieve superior short-term performance by simultaneously managing both exploitative and exploration activities.

Regarding ambidexterity capabilities, Models 13 and 14, consistent with *H2b*, show that individual manager ambidexterity ( $p < 0.01$ ) positively relates to long-term performance. When managers engage in exploration activities, their ability to avoid business bankruptcy also increases significantly ( $p < 0.01$ ). However, when managers focus solely on exploitation activities, they appear to find it difficult to anticipate the sequence of events/actions that lead to a firm's bankruptcy. When focussing in short-term financial results, middle managers overlook the bankruptcy risk.

### Discussion

Managers face difficulties when formulating and implementing long-term planning because they tend to drive exploitation and exploration activities as two different entities in nature (March, 1991). When managers lead strategy processes, they have to deal with the complexity of managing exploration and exploitation activities at the same time. In this context, there is a lack of conceptual and empirical evidence as to how middle managers, with little experience in the industry, improve ambidextrous performance. This paper aims to contribute to this understanding by showing that

Variables	Short-term performance (OLS model; $y = \text{netincome}$ )			Variables	Long-term performance (Probit model; $Y = 1: \text{No\_default}/0: \text{Default}$ )		
	M10	M11	M12		M13	M14	M15
Ambidexterity	0.0167*** (0.00380)	0.0159** (0.00674)	0.0183*** (0.00677)	Ambidexterity	0.00187*** (0.000148)	0.00321*** (0.000317)	0.000388 (0.000303)
Exploitation activities		0.0345 (0.237)		Exploitation activities		-0.0649*** (0.0130)	
Exploration activities			-0.0688 (0.212)	Exploration activities			0.0637*** (0.0119)
Observations	3,173	3,173	3,173	Observations	3,173	3,173	3,173
$R^2$	0.087	0.087	0.087	$r^2_p$	0.0653	0.0732	0.0730
$F$	14.05	14.35	14.79	$\chi^2$	248.6	265.3	260.2
$r^2_a$	0.0760	0.0757	0.0757	$p$	0	0	0

**Notes:** Robust standard errors in parentheses. We controlled by intertemporal decisions (Decisions 1-40). \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

**Table III.** Effects of individual ambidexterity on short- and long-term performance

top-down inflows from senior managers can play a significant role in improving short- and long-term decision performance. Our results suggest that a middle manager who receives a top-down knowledge of the causal structures behind the industry's competitive dynamism increases his/her individual ambidexterity level. This individual ambidexterity then enables middle managers to make better decisions and therefore positively impacting the firm's short- and long-term goals. Our findings are aligned partially to those results reported by Mom *et al.* (2007) who reported a positive relationship between top-down knowledge inflows and exploitation activities. We use a specific kind of top-down knowledge related to causal interrelationships and feedback structures that explain short- and long-term path dependencies rather than just tacit and explicit knowledge pertaining to technologies, process, systems, products, strategies and markets, which were used by Mom *et al.* (2007). When top-down knowledge flows do not represent the sequence of actions that lead to strategic decision making, knowledge coming from persons and units at higher hierarchical levels may affect only the manager's orientation to exploitation activities.

Additionally, our finding are in line with those reported by Gary and Wood (2011), who found evidence that accurate mental models of the key principles of the business environment lead to better decision rules and improved decision maker performance. Our results suggest that senior managers in possession of specific knowledge of the underlying structures behind the competitive dynamism of the industry – knowledge that is usually considered a strategic resource and therefore confined to top managers – should share this knowledge with middle managers, and especially with those that have the least industry experience. As a result, top-down knowledge inflow allows middle managers to efficiently combine exploration and exploitation-related activities, which, in turn, should lead them to achieve better short- and long-term performance.

#### *Theoretical implications*

Although individual ambidexterity research is recent, it concerns a fundamental aspect of strategic management: the balance between short- and long-term strategic management. According to O'Reilly and Tushman (2011, p. 20), managers are constantly dealing with decisions that require some degree of ambidexterity. In line with this idea, the results of the present research highlight the importance of strategic analysis of the competitive environment and, more specifically, the critical role of comprehending cause-effect relationships that underpin company performance. Our research reaffirms the results obtained by Gary and Wood (2011, p. 569), whom state “our results show more accurate mental models lead to better decision rules and higher performance.” Our results confirm the strategic value of knowledge in so far as how key variables affect manager's decision performance, as also affirmed by Gary and Wood (2011, p. 569) “we also find that decision makers do not need accurate knowledge of the entire business environment; accurate mental models of the key principles are sufficient to achieve superior performance.”

Future research avenues should focus on analyzing more complex market dynamics, which involve long-term relationships between decisions and performance, multiple actors, and their interactions. From this standpoint, ownership of complex causal information facilitates ambidextrous decision making. Complex causal information drives strategic choices that not only impacts short-term performance (quarterly results of a simulation game), but also contribute to superior performance in the long run (ten years of a simulation game) (Birkinshaw and Gupta, 2013, p. 296).

Additionally, the present study has methodological implications, as it emphasizes the growing importance of simulation software as a mechanism for improving individual decision-making skills. Moreover, it opens a path to study manager's learning processes; a field focusses on analyzing manager's real life decisions.

Finally, our results show interesting differences in terms of the orientation to exploration and exploitation activities reported by males and females, and a higher level of ambidexterity of female participants. While the possible explanation for these differences are out of the scope of the present research, these phenomena could be related to gender differences in risk taking and competitive behavior (Croson and Gneezy, 2009), and deserves further investigation.

### *Managerial implications*

Our results show a significant and positive relationship between the availability of knowledge related to the functional causal business structure and its managerial decision performance. Therefore, the importance of such knowledge for decision makers cannot be overstated. Ownership of succinct and applicable knowledge concerning the causal relationships that govern an industry and down to a specific company, leads to finer-tuned decisions, which in turn will deliver better performance and lower risk (a lower probability of default).

Emphasis on casual relationships may impact the way in which strategic planning and management is tackled. This, in turn, may demand development of explicit causal-performance models specifically for a single firm. Such a model should be, on the one hand, flexible enough to consider the dynamism of contemporary markets, and on the other, sufficiently robust to handle analytical decision making, and thereby improve the business' performance.

### **Conclusion**

A series of models were designed to determine how a senior manager's strategic information and mental model when shared with middle managers impacts on the latter's decision-making performance. They also aim to provide evidence regarding how such information inflows affect individual ambidexterity and decision performance. We explore the pressures on middle managers of exploiting current resources to achieve good financial results while mastering new strategies to avoid potential company bankruptcy. Our findings suggest that understanding the casual structures of an industry helps new middle managers to overcome difficulties of resource allocation and exploring potential futures that may prevent potential catastrophe. This paper reinforces the idea that independent of mechanisms for analyzing industry causal structures, without internal transparency policies to share such knowledge, new middle managers are more likely to make poor decisions that may eventually lead a firm to fail. We hope that ideas behind this research paper bring new insights for conducting managerial experiments at the level of strategic decision making by using business simulators with real managers, an area still unexplored in the strategic management and intra-organizational knowledge transfer literature.

### *Limitations and future research opportunities*

This study has some limitations that call for further research in management decision theory. First, this study employed a lab experiment design. Although our results are robust based on econometric techniques and theoretical reasoning, lab experiment designs have empirical flaws when researchers attempt to generalize effects by varying

multiple features simultaneously (Kachelmeier and Towry, 2005). One of the limitations of this study is to draw causal inferences about the primary treatment manipulation (that we have called knowledge inflows) across multiple cultures. Future research might address this issue by using longitudinal designs or experimental methods beyond Latin-American cultures.

Second, this study has selected participants who have managerial experience in Chile, Brazil, Argentina, Peru, Colombia, Panama, Mexico, El Salvador and Guatemala, and at the same time they are related to the University of Chile Graduate School's network. Therefore, the relationship among knowledge flows, ambidexterity and decision performance may be highly related with Latin-American strategy processes. Future research can investigate managers in different contexts such as European, Asian or African cultures to confirm or extend our findings.

Finally, this study makes a unique contribution to the current body of knowledge by examining the managerial process of making strategic decisions when managers face short- and long-term goals. Nonetheless, our study does not consider the roles played by health factors, such as stress conditions under uncertainty, increments of testosterone when participants make decisions, and brain activity when participants perform ambidextrous activities. Future studies might gain insights by exploring the effects of these health factors.

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