

Strategic Cognition of Operations Executives

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The nature of operations executives' strategic cognition, as the antecedent to their choices about operations strategy, remains underexplored in the literature. This mixed-methods study examines executives' thinking about supply chain strategy through the lens of managerial cognition. Our qualitative study at a pharmaceutical distributor, which examined 25 executives' outlook on the future of the turbulent U.S. healthcare sector and their suggestions for adapting the company's supply chain strategy to that future, suggests that an executive's strategic cognition can be defined by its *regulatory focus*—whether the executive envisions the future environment in terms of opportunities or threats—and the level of *optimism* in regards to the envisioned future. We propose a typology that predicts the strategic choices of operations executives based on four types of cognition: *pioneering*, *pushing*, *protective*, and *provocative*. It describes whether an executive's strategic choices target traditional or novel sources of revenue, and if they seek to influence either the firm's structure and practices or its environment. Our empirical test of the typology using quantitative data collected in a survey of senior operations executives supports the study's propositions associating three of the four types of cognition with their respective preferred strategic choices.

Key words: operations strategy; supply chain strategy; managerial cognition; strategic decision making

History: Received: April 2015; Accepted: August 2017 by Elena Katok after, 3 revisions.

1. Introduction

Supply chain management has worked its way into firms' boardrooms and onto their strategy agendas. Several companies—UPS, Li & Fung, and Amazon, to name a few—have built businesses around creating value in global and regional supply chains. Supply chain design, “a strategic precursor to supply chain management,” has been called “the ultimate core competency of an organization” (Fine 2000). Academic literature in the field of Operations Management (OM) highlights the role of operations executives in making strategic decisions related to operations and supply chain management (Menda and Dilts 1997). Involvement of operations executives in strategic decision-making is positively associated with superior firm performance (Demeester et al. 2014, Swamidass and Newell 1987). However, the nature of the *long-term* decisions made by these

executives, who are primarily responsible for managing *short-term* operations, remains underexplored.

The OM literature asserts that “structural and infrastructural decisions” about operations and supply chain strategy constrain a firm's future choices (Boyer et al. 2005) and require executives to consider how these decisions “might affect [the firm's] ability to make *future* changes in its competitive priorities” (Hayes and Pisano 1996, p. 39, emphasis in original). However, thinking about the long-term with a mind accustomed to making short-term decisions may risk confusing operational effectiveness—i.e., “performing similar activities *better* than rivals perform them”—with strategy—i.e., “performing *different* activities from rivals' or performing similar activities in *different* ways” (Porter 1996, p. 62, emphases in original). Without understanding how executives' choices about supply chain strategy relate to their perceptions of the firm's business environment, a fundamental

question posed by Hayes and Pisano (1996, p. 38) remains largely unanswered: “how should a company—given the difficulty of predicting the future in today’s turbulent world—select which capabilities to develop?”

Although the strategic thinking of executives is underexplored in the OM literature, the topic has been studied in the business strategy literature under the guise of managerial cognition. This literature shows how managers’ strategic choices are influenced by the issues they pay attention to (Ocasio 1997) and their interpretation of those issues (Dutton and Jackson 1987). These findings are based on the studies that typically use retrospective data collected from CEOs and other executives routinely involved in making strategic decisions. They may not completely explain the long-term thinking of operations executives whose attention is often focused on short-term issues. Furthermore, prospective cognition cannot be examined fully in retrospective studies due to the hindsight bias (Fischhoff 1975), as noted by the leading scholars of managerial cognition (e.g., Kaplan and Orlikowski 2013). Against this backdrop, this study seeks to advance the OM literature by answering the following question: how do the strategic choices of operations executives relate to their prospective cognition of the firm’s business environment?

The results presented here are based on a mixed-methods field study of *exploratory sequential design* (Creswell and Plano Clark 2011). Because of the relatively nascent nature of the topic, we began with a qualitative study to generate a suggestive theory about the role of cognition in operations executives’ strategic choices, as suggested by Edmondson and McManus (2007). This first phase involved an in-depth examination of the deliberations about the firm’s supply chain strategy of 25 middle and senior operations executives at a pharmaceuticals distributor in the U.S. Comparing the inductively developed concepts with “existing ideas or theories” (Gioia et al. 2013, p. 24) revealed that our findings were related to two theories of cognition. The *regulatory focus theory* (Higgins 1998) could describe whether an executive’s projections of the future consisted primarily of opportunities or threats, as interpreted by the executive, and if the advocated strategic choices sought to exploit those opportunities or avoid the threats. On the other hand, the level of *optimism* (Scheier and Carver 1993) could explain as executive’s confidence in the firm’s ability to adapt to those *opportunities* and *threats*. We formalized the findings of the inductive phase by borrowing constructs from these two theories to develop a typology of strategic cognition. In the second phase, we tested the propositions of the typology using the data collected in a survey of senior operations executives.

In summary, this study seeks to make three contributions. First, it suggests that the types of strategic choices advocated by executives relate to their prospective cognition, which is a combination of two first-order constructs: “regulatory focus” of projections of the future business environment and the level of “optimism” about the future. Second, it suggests that the types of revenue sources (either traditional or novel) targeted in an executive’s strategic choices are associated with the regulatory focus, whereas the focus of the action (i.e., whether to change the firm or influence the environment) relates to their level of optimism. Third, a typology of strategic cognition, built using the two-first order constructs, presents four “ideal types” (Doty and Glick 1994) of strategic cognition—*pioneering*, *pushing*, *protective*, and *provocative*—to describe the nature of strategic choices likely to be advocated by an operations executive. Our empirical test using a survey of senior operations executives supports the propositions relating three of the four proposed types of cognition to their corresponding preferred strategic choices.

2. Literature Review

Supply chain and operations strategies are the “decisions and plans involving the developing, positioning, and aligning of managerial policies and needed resources so they are consistent with the overall business strategy” (Boyer et al. 2005, p. 442). Executives’ choices about supply chain and operations strategies may “include not only the establishment of structural forms but also the manipulation of environmental features” (Child 1972, p. 2). The importance of involving executives in making such decisions in the realm of Operations Management was highlighted by Skinner (1969). In the following section, we first review the OM literature regarding the role of operations executives in formulating operations strategies. Subsequently, we present relevant findings from the general management literature, which has more extensive research into managerial cognition.

2.1. Operations Strategy and Operations Executives

Skinner (1969, p. 136) asserted the importance of executives’ involvement in making decisions relevant for operations strategy by noting the irony that “top management unknowingly delegates a surprisingly large portion of basic policy decisions to lower levels in the manufacturing area.” He suggested a “top-down” approach to formulating manufacturing strategy that prioritizes defining “basic manufacturing policies” over making technical decisions related to optimizing the use of chosen resources. Subsequent research shows that involvement of operations executives in

strategic decision making is associated with superior firm performance in complex and hostile business environments (Demeester et al. 2014). However, barring a few notable exceptions (e.g., Kim et al. 2014, Menda and Dilts 1997), the exploration of issues relevant to operations strategy in the OM literature tends to follow the rational perspective. Behaviorists challenge the assumption of rationality (Boudreau et al. 2003), noting that “real operating systems like factories, supply chains, and product development organizations are complex social systems where human behavior is a central driver” and “the usefulness of tools, methods, and frameworks that ignore the realities and limitations of human behavior is limited” (Gino and Pisano 2008, p. 681). A review of the research published in major OM journals between 1985 and 2005 identified 52 studies that examined operations from the behavioral perspective in experiments (Bendoly et al. 2006), three-fourths of which were conducted in controlled environments. A majority of these studies investigated the tactical areas of production and inventory management; “operations strategy” or “supply chain strategy” do not feature among the topics covered. Recent studies exploring behavioral and cognitive antecedents of OM decisions also examine tactical decisions, primarily related to inventory management (e.g., Bloomfield and Kulp 2013, Croson and Donohue 2006, Moritz et al. 2014, etc.). Thus, although the importance of the behavioral perspective is recognized in OM, its exploration has largely been confined to operational and tactical decisions rather than strategic ones (Boyer et al. 2005).

We are aware of only two studies published in major OM journals that have examined the behavioral issues relevant to operations strategy in natural settings. Menda and Dilts (1997) studied the perceived importance of operations-relevant order-winning criteria among 16 managers in one firm. They reported a high variation in the executives’ perceptions and recommended a process for making decisions relevant for operations strategy. Kim et al. (2014) examined action plans at six manufacturing plants and showed that (p. 471) “operations strategy formation is an iterative process of integrating competitive priorities, objectives, and action plans and encompasses top-down planning as well as bottom-up learning,” and that bottom-up learning does influence top management’s decisions.

2.2. Managerial Cognition

The strategic management literature has explored cognitive determinants of strategic decisions for at least three decades since Kiesler and Sproull (1982) promoted managerial cognition as a “necessary precondition for managerial activity directed toward organizational adaptation.” The subsequent research

has examined the topic of managerial cognition using various lenses, such as *problem sensing* (ibid), *sense-making* (Weick et al. 2005), *attention* (Ocasio 1997), and *cognition* (Kaplan 2011). These terms are used to indicate that strategic decision-making requires executives to make sense of an amorphous and ambiguous environment. Managers are not handed a list of environmental factors that affect their firm or told what they mean; instead, the “phenomena have to be forcibly carved out of the undifferentiated flux of raw experience and conceptually fixed and labeled” (Weick et al. 2005, p. 411).

The boundedly rational managers can pay attention to only a subset of the relevant factors of the environment. The factors they notice are influenced by their professional backgrounds and responsibilities, as well as the relative merits of other factors seeking their attention simultaneously (Ocasio 1997). Given that they are often bombarded with issues related to short-term operational matters, operations executives may overlook slow-changing long-term developments. Illuminating the types of issues they do attend to can help explain how operations executives make strategic choices to adapt their supply chains to long-term shifts (Lee 2004).

Decisions about supply chain strategy—such as, building production facilities, buying a fleet of vehicles, creating a distribution network, etc.—require making predictions about the future because of the lag between making and implementing the decision, and the difficulty of reversing the implemented decisions. However, field studies of forward-looking cognition are rare in the strategic management literature. Research in managerial cognition typically uses *retrospective* interviews with key informants to explain how managerial cognition led to some focal event. The limitation of this approach is that thinking backward in time from a focal event can make it easier to recall the strategic choices that led to the event than the competing choices faced by the executives when making the decision (Nisbett and Wilson 1977). This suboptimal methodological choice is enforced by the lack of relevant data, such as documentation of executives’ rationale for a particular strategic decision recorded at the decision time (Kaplan 2011). A recent field study of future-forward thinking (Kaplan and Orlikowski 2013) shows that executives’ “projections of the future are always entangled with views of the past and present,” and speculates that prospective cognition may vary widely among individual managers, as they envision “many paths to the future,” or hold “multiple and varied interpretations of the future.” Thus, prospective cognition may not be entirely predictable from the past and present experiences of operations executives, and merits individual study.

In this study, we use *prospective* semi-structured interviews to capture operations executives' visions of the firm's future business environment and their suggestions for the strategic choices the firm should make in order to operate in that environment. Thus, our data are not affected by the biases of retrospective recall; our characterization of managerial cognition is based only on the narrative of each individual executive, and not a public document.

3. Research Method

The study used an *exploratory sequential mixed-methods design*, in which a qualitative strand preceded a quantitative strand (Creswell and Plano Clark 2011). We began with an inductive study to develop theoretical understanding of operations executives' thinking about strategy. We tested the propositions of the inductive work in the qualitative strand. As in most *exploratory sequential mixed-methods* studies, the qualitative strand in this work holds primacy over its quantitative strand. We first present the research method used in the qualitative strand. The method used in the quantitative strand is presented along with its results in section 5 of the study.

3.1. Research Setting: Medford

The study's qualitative strand was conducted with a group of operations executives at a pharmaceuticals distributor, here nicknamed Medford, based in the United States. Distributors like Medford acquire pharmaceuticals from manufacturers and deliver them to thousands of pharmacies, clinics, and hospitals. When the study was conducted in 2010, the U.S. healthcare sector faced major uncertainties in various domains, such as regulations (e.g., questions about constitutionality of the Patient Protection and Affordable Care Act of 2010, which promised a large increase in the volume of drugs sold in the U.S.), technology (e.g., the growth of biologic drugs, which require cold-chain distribution), and competitive dynamics (e.g., large pharmacies bypassing distributors and sourcing drugs directly from manufacturers). The industry was also highly competitive: despite being the third largest by revenue, pharmaceutical distributors had the lowest profit margin (1.5%) among 32 industries in the U.S. healthcare sector (Figure S1 in Supplementary Material). The distributors anticipated higher costs, lower bargaining power, and the need for capital investments to comply with new laws about pedigree (to track drugs from production to patient) and drug-diversion (to prevent recreational use of medicines).

Medford had succeeded in this industry by the virtue of its excellent supply chain, its core competence (Fine 2000). To succeed in the future, Medford had to

maintain profitability in a highly cost-competitive industry, by simultaneously adding new revenue sources and investing judiciously in new supply chain capabilities. At the time of the study, a group of 25 senior executives was deliberating Medford's future supply chain strategy. Our engagement with the group began when its leader, Medford's top executive for the pharmaceutical distribution supply chain, invited us to facilitate these discussions. This was an ideal setting to study managerial cognition: it provided access to a large number of executives striving to identify strategic initiatives to improve the company's profitability, and the high uncertainty in the business environment meant that the executives could vary in their projections of the future and their proposed strategic choices. The 25 executives participating in the study held titles such as Senior Vice President (2), Vice President (12), Director (7), and Manager (4), and oversaw a wide spectrum of supply chain functions, such as distribution center operations, regulations, human resources, information technology, strategy, environment health & safety, and corporate ethics.

3.2. Data Collection and Analysis

We collected data related to the executives' prospective cognition in two stages. In the first stage, we used semi-structured qualitative interviews to capture the executives' projections of Medford's future business environment and the strategic choices they advocated. In the second stage, we obtained the executives' interpretation of their projected future using structured questionnaires. We had tested and refined the interview protocol in four phone interviews with supply chain managers in four different firms before interviewing the Medford executives.

3.2.1. Qualitative Interviews. All interviews were conducted over phone by the first author and recorded with each respondent's consent. At the start of each interview, the respondent was told that the questions had no right or wrong answers, and the interviewer was interested hearing the respondent's perspective. The executives were also informed that their answers would be shared with the rest of the group only anonymously and were encouraged to be open. The interviews used two generic questions: how Medford's business environment will look five years from now, and what actions Medford should take to succeed in that environment. Besides these two questions, the interviewer did not use any predefined probes. Instead, the interviewer relied on "markers"—i.e., "reference made by a respondent to an important event" (Weiss 1994, p. 77)—in the respondents' answers to ask follow up questions to elaborate the markers. For example, one respondent

recommended that Medford should target specific offerings to hostpitals. When the marker “specific offerings to hostpitals” was explored during the follow up conversation, the respondent elaborated it by giving examples, such as barcoding single doses of medicine for each patient to improve patient safety, improving efficiency by reducing hospital inventory, and offering consulting to improve operational efficiency. Instead of relying on memory to “remember and return to them when possible” (ibid), the interviewer wrote down all markers in the respondent’s narration, and explored each further using the breadth-first approach described below (Exhibit S1 in the Supplementary Material shows a marker sheet from one interview).

When answering the open-ended question about the business environment or strategy, the executives typically described a few key aspects. The interviewer listened carefully and jotted each down. When the executive stopped talking, the interviewer summarized what was mentioned and asked if the executive would like to add to that description. These questions often produced moments of silence, suggesting that the respondent was thinking. During these pauses, the interviewer remained silent and waited for the executive to speak again. Almost invariably, this tactic led to the executive describing more aspects of the environment (or strategy). Again, the interviewer listened carefully, noted all aspects mentioned, and asked if the respondent had more to add. This procedure of alternating between attentive listening and elaborative questioning was continued until the respondent mentioned that they had nothing more to add. At this point, a number of markers describing the environment or strategy had been gathered, covering the *breadth* of the respondent’s attention. From this point on, the interviewer asked questions to explore each marker in greater *depth*. After exploring all the markers, the respondent was asked one last time if they had anything else to add. The interview concluded if the respondent answered in the negative. The interviews lasted between 33 and 98 minutes. Average interview time was just over one hour. At the conclusion of each interview, the interviewer detailed his overall impressions of the interview in a memo.

3.2.2. Qualitative Data Analysis. All interviews were digitally recorded and coded from the recording by the first author according to the Gioia methodology (Gioia et al. 2013). The coder performed first-order analysis by assigning initial codes to each respondent statement. The *first-order concepts* “adhere faithfully to informant terms” (ibid, p. 20) to express the ideas in the terms used by the respective executive; they neither are influenced by the existing

literature nor attempt to describe theoretical categories. The subsequent second-order analysis identified emerging themes and refined them through constant comparison to generate *second-order themes*. These themes were then distilled into *aggregate dimensions*. (Figure S2 in Supplementary Material shows the coding data structure). The exercise produced 1235 first-order concepts from the 25 interviews (average of 49.4 per respondent; range of 33–64), 55 2nd-order themes describing factors of Medford’s business environment and 42 2nd-order themes describing strategic choices.

3.2.3. Validation. We validated the first-order concepts for each respondent to ensure that they represent the executive’s vision of the future environment and strategic choices accurately and completely. Our three-step validation exercise is detailed in the Supplementary Material (Exhibit S2). For a key step, we created a mental map for each respondent showing all first-order concepts expressed by the respondent in the interview. We asked each respondent to identify their map from a collection of three, containing their own map and two chosen randomly from the rest, by allocating 100 points among the options to indicate the likelihood that each map belonged to them. Seventeen out of 25 executives placed all 100 points on their own map; six others placed between 70 and 90 points on their own map.

3.2.4. Within-method Triangulation. The executives often described their visions of the future environment without specifying the effect of some environmental factor on Medford. For instance, consider two executives’ quotes predicting the future of mail-order order pharmacies:

RESPONDENT 01. *Mail order, I think will continue to grow. Even the big retail guys over the last several years have all bought a mail order arm ... that’s the wave of everything – [you] don’t have to leave your home - everything is delivered to your doorstep [...] it becomes easier [...] as technology improves and population ages...*

RESPONDENT 05. *“The large chains and the mail order... those will probably grow at or above market. [...] Mail service... exists here solely because it is economically advantageous as a different class of trade. Pharma [producers] give mail order rebate that no other class of trade can get access to.”*

In the descriptions such as above, it was not clear to us whether the respondent considered the mentioned factor—i.e., an increase in the “Volume of drugs sold

through mail-order pharmacies” (as coded) above—to be an opportunity or a threat to Medford. We performed within-method triangulation to obtain each executive’s interpretation of different environmental factors using a structured questionnaire. We also obtained the executives’ predictions about the likelihood that the factor would take the specified value over the study’s planning horizon.

Several of the 55 factors described similar features of Medford’s business environment. We included 32 factors describing some unique aspect of the environment in the questionnaires used for assessing the executives’ interpretations and outlook. This was done in consultation with one of the study’s coauthors with extensive knowledge of the U.S. pharmaceuticals industry. Table S1 in Supplementary Material lists all 55 factors and the reasons for excluding each of the 23 from the questionnaires. This also helped us minimize our demand on the executives’ time.

Each factor in the questionnaire came from one or more executive’s projections of the future (average: 4.7 executives per factor; range: 1–19). The questionnaires were completed by all 25 executives at the beginning of a workshop held at Medford’s headquarters. 19 respondents attended the session and completed the questionnaires in person; the remaining six joined via teleconference and completed the questionnaires online. Due to a disruption in the teleconference connection, some remote attendees noted of having difficulty hearing the instructions for completing the questionnaires. Therefore, we decided to omit all six remote questionnaires from the analysis. Questionnaires completed by 19 group members are used in the analysis.

4. Results of Qualitative Strand: Cognition and Strategic Choices

4.1. Prospective Cognition: Projections of the Business Environment

All participants gave multifaceted descriptions of Medford’s future business environment. These were not quantitative projections of demand or prices, but qualitative descriptions of factors that constitute, in the eyes of the study’s participants, Medford’s business environment. These factors encompassed issues from various domains, such as competition, customers, suppliers, industry attributes, the economy, regulations, society and demographics, technology, and the natural environment. Almost all (23 out of 25) participants’ projections of the future included factors from at least five of these nine domains (average = 6.9, median = 7; see Table S2 in Supplementary Material). A few of the 55 factors were present in a majority of projections. For instance, 19 of 25 executives referred to the intensity and pervasiveness of regulations related to pharmaceutical distribution; 15 speculated about the enforcement of pedigree regulations slated to go in effect from year 2015; 15 pondered the viability of small, independent pharmacies; and so on. On the other hand a few factors were present in only a handful of executives’ projections, including four that were mentioned by only one executive each. Table 1 presents the frequency with which various environmental factors appeared in the executives’ projections, and gives a few examples. The within-method triangulation using two structured questionnaires revealed if an executive considered a particular factor to be an opportunity or a threat to Medford,

Table 1 Distribution of Environmental Factors Mentioned in Future Projections

Nbr of projections containing a given factor (out of 25)	Number of factors	Illustrative examples environmental factors
At least three-quarters (19 or more)	1	(Regulations) Pervasiveness and intensity of regulations
Between half and three-quarters (13–18)	3	(Regulations) Use of pedigree laws to track drugs in supply chain (Customers) Presence of small and independent pharmacies (Economy) Focus on reducing cost in all domains of healthcare
Between one-quarter and half (7–12)	18	(Economy) Overall demand for healthcare products and services (Customers) Consolidation among Medford’s customers (hospitals, pharmacies, etc.) within and across industries (Society) Frequency of drug thefts
More than one, no more than one-quarter (2–6)	29	(Regulations) Presence of a single set of “pedigree laws” that all U.S. states will follow (Customers) Demand at hospitals, compared to today (Society) Availability of talented employees
Only one	4	(Technology) Adoption of information technology solutions such as e-prescription, electronic medical and health records (Environment) Environmental sustainability of the pharmaceutical production and distribution processes (Supplier) Presence of local and regional trucking companies (Economy) Reimbursements by payers (insurers, Medicare/Medicaid) based on health outcome, instead of treatment
Total	55	

and whether the executive was optimistic or pessimistic about the future (based on the reported likelihood of the factors considered opportunities and threats to materialize).

4.2. Strategic Choices

The strategic choices advocated by the interviewees consisted of two elements: potential revenue sources to target and strategic actions to take. Collectively, the executives suggested 20 types of revenue sources, which could be classified as either *traditional* or *novel* (illustrative quotes in Table S3 in Supplementary Material). Traditional revenue sources are the ones Medford relies on at present or are of similar nature; they relate to the physical distribution of pharmaceuticals, management of distribution centers, and consulting services to improve distribution center operations. Novel sources are those which have little in common with current revenue sources; the proposed ones included selling data analytics, consulting for small customers to help grow their business, solutions to improve patient safety, etc. The executives also suggested 14 types of actions (illustrative quotes in Table S4 in Supplementary Material). Some actions advocated *changing the organization*—such as, “Consolidate network of DCs to reduce cost” or “Build capability to deliver small quantities to multiple locations”—to make it fit the envisioned future business environment better. Others advocated *influencing the business environment*—such as, “Educate customers about fee-for-service model” or “Influence industry to change practice of drug dating”—to improve its fit with the firm. Table 2 summarizes the actions coded in the qualitative data collected at Medford.

Table 2 Types of Actions Advocated

Type of action	Focus of action
Align different parts of the organization	Firm
Develop a new capability	Firm
Educate own employees	Firm
Improve efficiency of operations	Firm
Redefine contract terms with customers more favorably for the firm	Firm
Reduce reliance on a single supplier for specific product(s)	Firm
Reduce scope of operations	Firm
Segment customers by need and develop specific products	Firm
Understand customer needs better	Firm
Understand how environmental changes affect the firm	Firm
Build deeper relationships with customers and suppliers	Environment
Educate customer about firm’s capabilities	Environment
Influence customer or supplier behavior for firm’s benefit	Environment
Influence regulation(s) and/or industry standards	Environment

Our examination of the qualitative data suggested two patterns of relationships between the executives’ strategic choices and their projections of the future. To ensure that these patterns were not artifacts of any bias in our analysis of the qualitative data, we complemented our observations with quantitative analysis (see Table 3). This analysis, although rudimentary due to the limited number of observations, supported our interpretation of the qualitative data.

First, we observed that novel revenue sources were more likely to be advocated by the executives whose projections of the future consisted predominantly of opportunities, as interpreted by the respective executive. The Pearson correlation between the number of novel revenue sources suggested and the balance between opportunities and threats (“O/T balance”)—calculated as $(x_O - x_T)/(x_O + x_T)$, where x_O and x_T indicate the number of opportunities and threats, respectively, in an executive’s projection—is $+0.449$ ($p = 0.054$); the correlation between the number of traditional revenue sources and O/T balance is almost zero. The correlation of balance between optimism and pessimism (“O/P balance”)—calculated as $(y_O - y_P)/(y_O + y_P)$, where y_O and y_P represent the number of factors an executive was optimistic and pessimistic about, respectively—with the number of traditional ($r = 0.290$, $p = 0.23$) and novel ($r = 0.326$, $p = 0.17$) revenue sources was almost identical and not significant at $p < 0.1$, suggesting future outlook to be not a useful predictor of an executive’s preference for novel vs. traditional revenue sources.

Second, we also observed that action intended to change the business environment were more likely to be suggested by executives with high optimism about the firm’s future. The correlation between O/P balance and the number of actions suggested to influence the business environment is $+0.489$ ($p = 0.047$); that between the O/P balance and the number of actions to change the firm’s own operations is -0.058 ($p = 0.82$). The correlations of O/T balance with the number of actions advocated to change the firm’s operations ($r = -0.227$; $p = 0.38$) and to influence the business environment ($r = -0.147$; $p = 0.57$) are similar. This suggests that the types of actions advocated by executives are associated with their level of optimism and not with the types of environmental factors in their projection of the future.

4.3. Typology of Operations Executives’ Cognition

Focus on opportunities or threats, observed in our grounded exploration of Medford executives’ strategic cognition, describes a person’s *regulatory focus*, and parallels the distinction between *promotion-focus* and *prevention-focus* (Higgins 1998). According to Regulatory Focus Theory, “people in a promotion focus are eager for ‘hits’ [whereas ...] people in a

Table 3 Descriptive Statistics and Correlations of Medford Executives' Cognition

Variable	Mean	SD	1	2	3	4	5
1. Attention to positive factors	-0.10	0.35					
2. Optimism	0.15	0.24	0.286				
3. Revenue sources: Traditional	6.21	2.32	-0.002	0.290			
4. Revenue sources: Novel	1.68	1.34	0.449 [†]	0.326	0.005		
5. Focus of action: Firm	1.41	1.18	-0.227	-0.058	-0.040	-0.309	
6. Focus of action: Environment	0.59	0.87	-0.147	0.489 [*]	-0.017	-0.067	0.420 [†]

Notes: [†] $p < 0.1$, ^{*} $p < 0.05$.

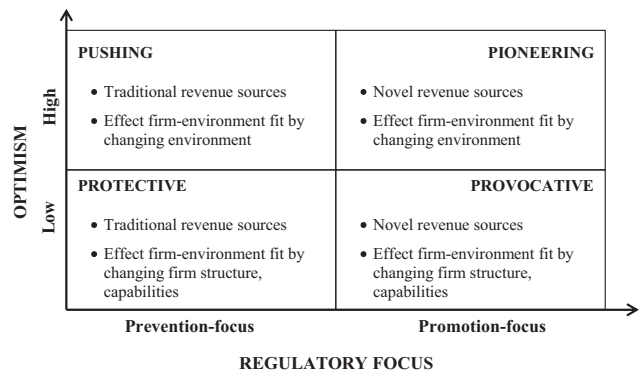
prevention focus are vigilant against making mistakes” (Brockner et al. 2004, p. 210). Thus, promotion-focused executives are likely to envision the future environment primarily in terms of opportunities, whereas prevention-focused executives are likely to see it primarily in terms of threats.

Secondly, the association between optimistic outlook and the preference for actions to influence the environment seen among Medford executives has been observed in the research on optimism. While most Medford executives suggested changing the firm’s practices, those with high level of optimism—i.e., those who believed opportunities were likely or threats were unlikely to materialize—tended to suggest actions to influence the firm’s environment as well. This observation parallels the finding that optimists actively seek to “reduce, eliminate, or manage the internal or external demands of a stressor,” while pessimists tend to “ignore, avoid, or withdraw from the stressor” (Solberg Nes and Segerstrom 2006, p. 236).

Optimism and *regulatory focus* are not correlated; people with an optimistic outlook “expect to have positive outcomes, even when things are difficult” (Scheier et al. 2001). Furthermore, a person’s regulatory focus “is a motivational condition that is independent of individuals’ self guides” (Higgins 1998); it can be influenced via extrinsic means and has even been induced in subjects in experimental studies of regulatory focus (Higgins et al. 2001). On the other hand, optimism is considered a stable individual attribute (Scheier and Carver 1993), and may even be influenced by an individual’s genetic makeup (Schulman et al. 1993). Our analysis (Table 3) also shows that the correlation between the two ($\rho = 0.286$) is not statistically significant ($p = 0.24$). Thus, “Regulatory focus” and “Optimism” can serve as two-first-order constructs to form a typology of operations executives’ strategic cognition, presented in Figure 1. The typology shows how “multiple ideal types, each of which represents a unique combination of the [cognitive] attributes that are believed to determine the relevant outcome,” i.e. the strategic choices advocated by an operations executive (Doty and Glick 1994, p. 232).

Pioneering executives have both a promotion-focus and a high level of optimism. Because of their

Figure 1 Typology of Operations Executives' Strategic Cognition



promotion-focus, they have a heightened “salience of potential gains to be attained” (Brockner et al. 2004, p. 203) and are more likely to discover “hidden possibilities and novel uses” (ibid, p. 209). As a result, their strategic choices focus on novel opportunities. Because of their optimistic outlook, they “expect things to go their way” (Scheier and Carver 1993) and adopt *approach coping* strategies, which seek to act on the external demands of a stressor (Solberg Nes and Segerstrom 2006, p. 244). As a result, their strategic choices are targeted to exploit the opportunities promising novel sources of revenue by influencing the environment.

PROPOSITION 1. *“Pioneering” operations executives tend to advocate strategic choices to exploit novel revenue sources and shape the environment to maximize the benefits obtained by selling the novel products.*

Pushing executives are also optimistic individuals, but are prevention-focused. As such, their actions target “threats to safety, responsibility, and obligations” of the firm with “a predilection to attain desired end states by avoiding mismatches to them” (Higgins 1998), and are likely to prefer “what one already possesses over something new” (Brockner et al. 2004, p. 209). Thus, they focus on mitigating threats to the existing revenue sources. Due to the optimistic outlook, their coping strategies involve acting on the external demands of a stressor (Solberg Nes and

Segerstrom 2006). As a result, their strategic choices are targeted to overcome threats to the firm's traditional revenue sources by influencing the environment.

PROPOSITION 2. *“Pushing” operations executives tend to advocate strategic choices to exploit the firm's traditional revenue sources and shape the environment to maximize the benefits obtained by selling the traditional products.*

Protective executives are low in optimism and are prevention-focused. As such, they have a heightened “salience of potential losses to be avoided” (Brockner et al. 2004, p. 203) and “are strategically inclined to insure correct rejections and insure against errors of commission” (Higgins 1998, p. 37). Thus, their strategic choices are focused on protecting the existing revenue sources and retracting from risky ventures. Their pessimistic outlook leads them to believe that things may not go their way and the envisioned threats would materialize. Therefore, they use *avoidance coping* strategies, which seek to “avoid or withdraw from the stressor” (Solberg Nes and Segerstrom 2006, p. 236). As a result, their strategic choices are targeted to protect the firm's traditional revenue sources by changing its structure and practices to make the firm less vulnerable to the potential threats.

PROPOSITION 3. *“Protective” operations executives tend to advocate strategic choices to protect the firm's traditional revenue sources and change the firm's own structure or practices to minimize loss of revenue generated from selling the traditional products.*

Provocative executives are similarly low in optimism, but combine it with a promotion-focus. Owing to the promotion-focus, they foresee “hidden possibilities and novel uses” (Brockner et al. 2004) and are inclined to “insure against errors of omission” (Higgins 1998, p. 37). Their pessimistic outlook leads them to believe that things may not go their way and the firm may fail to take advantage of the envisioned opportunities. They choose *avoidance coping* strategies to prevent failures to exploit the novel opportunities by the firm. As a result, their strategic choices are targeted to protect the firm's novel revenue sources by ensuring that the firm's structure and practices are configured so they do not fail to take advantage of the new opportunities.

PROPOSITION 4. *“Provocative” operations executives tend to advocate strategic choices to protect the novel revenue sources and change the firm's own structure or practices to minimize loss of revenue generated from selling the novel products.*

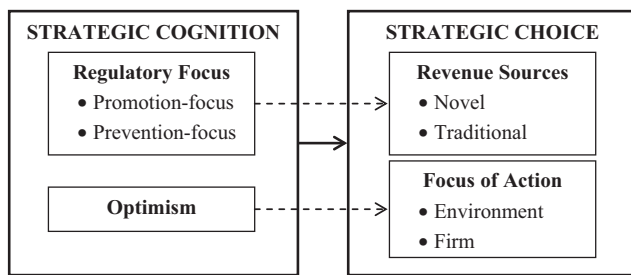
5. Quantitative Strand: Empirical Test of Typology

We tested the propositions developed in the qualitative strand using a survey of supply chain executives in the database of MIT Center for Transportation & Logistics. The survey was administered online using Qualtrics. The respondents were asked to answer the questions for their current position at the firm. A link to the survey was sent in an email message. Emails sent to 1553 unique addresses were opened by their recipients, 247 of which completed the survey (15.9%). The largest group of respondents reported their role in the firm as “Manager or Director” (112; 45.3%); 23 reported having the responsibility of “President or C-level (CEO, COO, etc.)”, 20 as “Vice Presidents or Senior Vice Presidents”, 31 as supervisors and 6 as entry-level. 55 respondents left the question answered. Because of the study's focus on strategic decision making, we chose to use the responses of only those who had identified themselves as either “Manager or Director” or above, as they are likely to have engaged in making strategic decisions. We eliminated 15 additional responses that did not evaluate all the items used for measuring the study's constructs. Therefore, our analysis is based on a sample of 140 responses.

The 140 responses used to test the propositions come from 103 “Managers or Directors,” 19 “Vice Presidents or Senior Vice Presidents,” and 18 “Presidents or C-level” executives. The majority ($n = 82$) had at least ten years of experience in their current industry; 23 each reported having five-to-ten, and one-to-five years of industry experience. 10 of the respondents worked at firms with annual revenue greater than US \$100 billion, 59 at firms with revenue between US \$1 billion and 100 billion, 40 at firms with revenue between US\$10 million and 1 billion, and the rest in firms making less than US\$10 million a year. The respondents reported working at firms in sectors such as manufacturing ($n = 47$), transportation and warehousing ($n = 20$), wholesale and retail trade ($n = 20$), professional and technical services ($n = 14$), etc. The companies were headquartered primarily in North America ($n = 69$), followed by Europe and Central Asia ($n = 27$), and Latin America and the Caribbean ($n = 25$). Thus, the data used for testing the propositions comes from a diverse sample of senior operations and supply chain executives.

5.1. Variable Measurement

Figure 2 presents the study's first-order constructs, and the independent and dependent variables. The solid line shows association between strategic cognition and strategic choice, representing the propositions tested in the quantitative strand. The dotted

Figure 2 Relationship between Operations Executives' Strategic Cognition and Choices

lines show associated first-order constructs; these associations are not tested because “typological theories do not highlight the hypothesized relationships between the unidimensional first-order constructs and the dependent variable(s)” (Doty and Glick 1994, p. 234) and “the relationships between constructs within an ideal type and the dependent variable may vary across the set of types” (p. 235).

5.1.1. Optimism. We measured optimism using the Life Orientation Test-Revised (LOT-R) questionnaire (Scheier et al. 1994). Wording of the items in LOT-R pertains to respondents’ personal lives. Our pretest of the survey suggested that executive responding to our survey may not feel comfortable answering the personally-worded questions. Therefore, we reworded each item slightly to relate it to the work environment. For instance, the item “If something can go wrong with me, it will” was reworded as “If something can go wrong in my job, it will.” Table S5 in the Supplementary Material shows the original and the modified items. Since optimism is considered a stable trait, we expected that the minor changes made to the items would not affect the measure of optimism. We compared the responses on the original and the modified scale in a pilot survey. The differences in responses to nine of the ten items on the two scales were statistically not significant ($p < 0.2$). For one item, subjects in the pilot survey reported higher optimism in the personal context (“I’m always optimistic about the future”) than the organizational context (“I’m always optimistic about the future of my firm”) (means = 4.78 vs. 4.11; $p = 0.045$). We used the modified scale in the study’s main survey.

5.1.2. Regulatory Focus. We measured regulatory focus using the 11-item questionnaire by Higgins et al. (2001). The items in the standard questionnaire also pertain to personal life. Since regulatory focus can vary by situation (Higgins 1998), we reworded the items to describe work environment. For instance, the item “Growing up, would you ever ‘cross the line’ by doing things that your parents would not

tolerate?” was reworded as “Do you ever ‘cross the line’ by doing things that your supervisor(s) would not tolerate?” Table S6 in the Supplementary Material presents the items in the standard questionnaire and their modified versions used in the survey.

We validated the modified scale using all responses ($n = 206$) in the survey where the respondents had rated all 11 regulatory focus items. The confirmatory factor analysis using maximum likelihood estimation revealed that the proposed two-factor model, corresponding to promotion- and prevention-focus, did not provide an acceptable fit to data on several metrics: Chi-square = 90.85 ($df = 43, p < 0.001$) (desired small, statistically non-significant), comparative fit index (CFI) = 0.830 (desired ≥ 0.95), Tucker-Lewis Index (TLI) = 0.783 (desired ≥ 0.95), standardized root mean square residual (SRMR) = 0.084 (desired ≤ 0.08), etc. (Hatcher 2013). We performed exploratory factor analysis by specifying two-factor model and oblimin rotation to check item loadings. Nine items loaded correctly on the factors corresponding to the regulatory focus at the threshold of ± 0.2 . Items 3 (measuring promotion-focus) and 8 (measuring prevention-focus) loaded on both factors. After dropping these two items, the confirmatory factor analysis of the revised scale suggested a good fit between the model and data: Chi-square = 32.75 ($df = 26, p = 0.169$), CFI = 0.969, TLI = 0.957, SRMR = 0.054. Therefore, we measured promotion- and prevention-focus using five and four items, respectively, in the modified scale.

5.1.3. Strategic Choices. Strategic choice is defined by the focus of action (environment vs. firm), the revenue source targeted by the action (novel vs. traditional), and the purpose of action (exploiting vs. protecting the revenue source). Combinations of these attributes yield eight types of strategic choices (listed in Table S7 in Supplementary Material). The respondents expressed their preferences for investing in these strategic choices for their firm over the next three-to-five years by assigning a weight to each item using a sliding scale. The weights were standardized so that the sum of each respondent’s weights for all alternatives is 100. The dependent variable measuring the preference for a strategic choice corresponding to each proposition was computed by adding the weights assigned to the two items associated with the choice.

5.2. Analysis

We follow the three-step approach recommended by Doty et al. (1993) for testing typological theories. As explained below, the third step in our analysis differs from that in Doty, et al.; the first two steps are identical.

The first step involves *modeling the ideal types* by “quantitatively specify[ing] ideal profiles that correspond to the qualitative descriptions of the ideal types” (Doty et al. 1993, p. 1212). Two parameters need to be specified: the *level* of each first-order construct in the ideal type and the *weight* given to each first-order construct. The inductive definition of each ideal type of strategic cognition in our study relies on two-first-order constructs: optimism, and either promotion- or prevention-focus. We assign weight of 0.5 to each of the two-first-order constructs used to define each type, and leave the third construct as having zero weight. We also assume that the effect of each first-order construct on the dependent variable is monotonic. Therefore, levels of the first-order constructs in each ideal type are extreme values, either 0 or 1, on the standardized 0-to-1 scale. Let, y_{Opt}^K , y_{Prom}^K , and y_{Prev}^K indicate the respective levels of optimism, promotion-focus, and prevention-focus in ideal type K. We specify the ideal types as follows: *pioneering* cognition is optimistic ($y_{Opt}^{Pion} = 1$) and promotion-focused ($y_{Prom}^{Pion} = 1$); *pushing* cognition is optimistic ($y_{Opt}^{Push} = 1$) and prevention-focused ($y_{Prev}^{Push} = 1$); *protective* cognition is pessimistic ($y_{Opt}^{Prot} = 0$) and prevention-focused ($y_{Prev}^{Prot} = 1$); and *provocative* cognition is pessimistic ($y_{Opt}^{Prov} = 0$) and promotion-focused ($y_{Prom}^{Prov} = 1$).

The second step involves *modeling the fit of an observed entity* (i.e., strategic cognition of an executive) with each ideal type by calculating deviations of the observed entity from the ideal type along the different dimensions of the typology. We calculated scores for three attributes for each respondent: optimism, promotion-focus, and prevention-focus, and standardized them to 0-to-1 scale. The average standardized values of optimism, promotion-focus, and prevention-focus in the sample used to test the hypotheses are 0.705 (SD = 0.123), 0.793 (SD = 0.130), and 0.754 (SD = 0.145), respectively. Let x_{Opt}^j , x_{Prom}^j , and x_{Prev}^j be the standardized scores for respondent j of optimism, promotion-focus, and prevention-focus, respectively. Thus, deviation of

respondent j 's cognition from the ideal type *pioneering* is

$$D_j^{Pion} = \sqrt{\left(0.5 * \left(y_{Opt}^{Pion} - x_{Opt}^j\right)^2\right) + \left(0.5 * \left(y_{Prom}^{Pion} - x_{Prom}^j\right)^2\right)}$$

where $y_{Opt}^{Pion} = 1$, $y_{Prom}^{Pion} = 1$. Deviations from the other ideal types are computed in a similar manner.

The third step involves *testing the strength of association between the fit with the ideal type and the dependent variable*. The present study differs from Doty et al.'s (1993) in this step. In the latter study, the dependent variable (“organizational effectiveness”) is identical for all ideal types; the greater the fit of an organization with *any* of the ideal types, the more effective is the organization. On the other hand, the propositions in our study associate four ideal type of cognition with four *different* types of strategic choices (the study's dependent variable). This is because our study claims that each type of cognition is likely to prefer a particular type of strategic choice, with different preferred choices for different types of cognition. Therefore, we test four hypotheses, one for each ideal type, of the following form: the greater an executive cognition's fit to a particular ideal type, the more likely the executive is to prefer the strategic choice associated with that type of strategic cognition.

5.3. Results

Following the recommendations of Doty et al. (1993, pp. 1220–1221), Table 4 presents the zero-order correlations between the deviations of respondents' cognition from each ideal type and their standardized weights given to the strategic choices. Correlations relevant to the propositions are shown in bold font and enclosed in a box. A negative correlation in a cell corresponding to an ideal type (column) and a strategic choice (row) indicates that the smaller the deviation of an executive's cognition from the ideal type (i.e., greater resemblance to the ideal type), the greater their preference for the corresponding strategic choice.

Table 4 Means, Standard Deviations, and Correlations among Measures of Strategic Choice and Distances from the Ideal Types

Strategic Choices	Mean	SD	Ideal types of strategic cognition			
			Pioneering	Pushing	Protective	Provocative
Shape environment to exploit revenue potential of traditional products (S1 + S3)	24.8	7.73	-0.12	-0.14†	0.06	0.09
Shape environment to exploit revenue from novel opportunities (S2 + S4)	28.0	7.87	-0.15†	-0.18*	0.13	0.16†
Change the firm structure to prevent loss of revenue from the traditional products (S5 + S7)	23.8	6.96	0.15†	0.18*	-0.08	-0.09
Change the firm structure to prevent loss of revenue from any novel revenue sources (S6 + S8)	23.5	6.72	0.16†	0.20*	-0.13	-0.19*

Notes: † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$. A box around a correlation value suggests the hypothesis that an executive of cognitive similar to the ideal type listed in the column would prefer the strategic choice listed in the row.

A negative correlation supports the proposed association between a cognitive type and a strategic choice.

Correlation between the deviation from the ideal type *pioneering* and the weight given to the strategic choices that “shape environment to exploit revenue from novel opportunities” is negative ($r = -0.15$, $p = 0.074$), and statistically significant at $p < 0.1$. Thus, the closer an executive’s strategic cognition is to type *pioneering*, the more likely the executive is to advocate strategic choices that manipulate the firm’s business environment to generate revenue from novel products (Proposition 1). Correlation between the deviation from ideal type *pushing* and the preference for strategic choices to “shape environment to exploit revenue potential of traditional products” is also negative ($r = -0.14$, $p = 0.088$) and supports Proposition 2. The correlation between the deviation from ideal type *protective* and the preference for strategic choices to “change the firm structure to prevent loss of revenue from the traditional products” is also negative, but not statistically significant ($r = -0.08$, $p = 0.318$). Thus, we do not find support for Proposition 3. Finally, the deviation from the ideal type *provocative* and the preference for strategic choices “change the firm structure to prevent loss of revenue from any novel revenue sources” are negatively correlated ($r = -0.19$, $p = 0.021$), supporting Proposition 4.¹

A few other significant (at $p < 0.1$) correlations exist. Positive correlations—which indicate a *lower* preference for a strategic choice by executives of a particular type—were found between the deviations from the ideal types *pioneering* and *pushing*, and the preference for strategic choices intended to modify the firm’s structure and policies (S5 + S7 and S6 + S8), as well as deviation from the type *provocative* and preference for shaping environment to exploit novel opportunities (S2 + S4). These provide secondary support to the proposition about the types. The negative correlation found between the distance from type *pushing* and preference for strategies choices to exploit novel opportunities is not predicted by our propositions.

The correlations associated with the *pioneering* and *pushing* types, as well as those for *protective* and *provocative* types have similar values. This could be interpreted to suggest that *regulatory focus*, the dimension distinguishing the two types in each pair, is not a predictor of strategic choice. However, this contradicts the evidence from the qualitative strand of this study as well as the extant literature. There are two plausible reasons for this²: first, regulatory focus, which is non-innate, temporary condition (Higgins 1998), may not have fully influenced the executives’ ratings of the strategic choices in our questionnaire; instead, their rating may have been based on the strategic choices they have put together over a longer period of time. Second, the two ideal types with the

same level of optimism are defined using two separate dimensions of regulatory focus (i.e., promotion or prevention focus). If an executive scores high on both promotion- and prevention-focus, their cognition will be close to two types (i.e., *pioneering* and *pushing* in case of optimistic outlook, or *protective* and *provocative* otherwise). In such a case, the effect of regulatory focus on strategic choice may not be evident. This discrepancy needs to be explored in a future study.

6. Discussion

This study examined prospective strategic cognition of operations executives, who devote a significant portion of their attention to *short-term* operational issues (Demeester et al. 2014), but may also be involved in making choices with *long-term* consequences regarding operations and supply chain strategies (Boyer et al. 2005, Hayes and Pisano 1996). The qualitative strand of our mixed-methods study showed that the future projections of the operations executives consist of a diverse set of environmental factors, and the types of strategic choices advocated by executives are associated with the *regulatory focus* of their visions of the future and their level of *optimism*. Our inductively derived typology combines these two psychology constructs to define the nature of operations executives’ prospective strategic cognition and predict their strategic choices. The study’s quantitative strand supports the propositions relating the *pioneering*, *pushing*, and *provocative* types of cognition to the corresponding preferred strategic choices. It did not find support for the proposition linking the *protective* cognition to the strategic choices.

To our knowledge, this is the first study in the field of Behavioral Operations to explore the association between operations executives’ strategic cognition and their strategic choices (Boudreau et al. 2003). Our research approach aligns with the call for more field-based investigations to complement the laboratory experiments that define the landscape of Behavioral Operations (Bendoly et al. 2006). The study advances the research on the role of operations executives in strategy making (Demeester et al. 2014, Swamidass and Newell 1987). Its findings complement the descriptions of processes that influence top management’s strategic intentions (Kim et al. 2014) by elaborating the origins of strategic initiatives proposed by executives.

Several of the strategic choices advocated by the executives in the qualitative study would change the design of Medford’s supply chain. These suggestions specify “what capabilities along the value chain [Medford should...] invest in and develop internally and which [it should...] allocate for development by suppliers” (Fine 2000, p. 213). Variation in the actions proposed by the study’s executives underscores the

importance of strategic cognition: executives of different cognitive types could lead the firm down different paths as it seeks to adapt its supply chain (Lee 2004) to a changing environment. While strategic choices advocated by the *pushing* executives seek to extend the traditional products and services as a matter of “incremental change” (Boyer et al. 2005), the *pioneering* executives are likely to advocate strategic choices that help the firm create novel products and set the firm on path to make “dramatic or non-incremental changes” (ibid, p. 447). In the case of Medford, executives close to the ideal type *pioneering* did recommend novel choices, such as acquiring generic drug manufacturing capability, selling information relevant to public health to medical practitioners, or selling information gathered from tracking the medicines through the supply chain to patients.

Our study also contributes to the literature on managerial cognition. Scholars argue that “understanding how managers perceive and (re)deploy existing capabilities toward new potential uses” is “an extremely promising direction for future research” (Eggers and Kaplan 2013, p. 326). Our study suggests that the ideas for redeployment of existing capabilities in new ways are likely to originate from executives with cognition similar to the type *pushing*. The study also highlights the importance of future outlook in strategic decision making. Our results show that executives attend to a wide range of potentially important issues, without knowing with certainty which ones would end up having the most impact on the firm. Furthermore, the executives with the same regulatory focus but different future outlook favor different types of strategic choices. For example, the *pushing* executives seek to *exploit the existing revenue sources* by creating new demands (e.g., one executive advocated an initiative to convince doctors to sell pharmaceuticals at clinics so Medford can generate revenue from their distribution), whereas the *protective* one focus on *protecting the existing revenue sources* by changing the firm (e.g., one executive urged Medford to focus on improving the cost-effectiveness of pharmaceutical delivery and not divert resources into initiatives unrelated to distribution). Similarly, the *pioneering* executives seek to *exploit the novel revenue opportunities* (e.g., one Medford executive advocated an initiative to sell data analytics based on patterns of drug demand), whereas the *provocative* one would seek to change the firm so that novel opportunities are not lost. No Medford executive in our study was adequately similar to the *provocative* type. Had we encountered any, we would expect them to recommend initiatives to change the firm’s culture or practices so they would not encumber its pursuit of novel opportunities. Thus, our study suggests how “future projections [of executives could] significantly shape outcomes” (Kaplan and Orlikowski 2013, p. 991).

The study’s findings have implications for practice. The association between strategic cognition and choices suggests that managers of different cognitive types, not just with different functional backgrounds, should be involved in strategy-making to have a diverse perspective of the environment and generate ideas for various types of strategic initiatives. Knowing their own and their colleagues’ cognitive profiles can also help executives understand why they may disagree about pursuing a certain course of action and appreciate the benefit of having the cognitive diversity within the team.

6.1. Limitations and Directions for Future Research

While the qualitative findings of this study were largely substantiated in the (quantitative) survey of senior operations executives, the survey remains the study’s secondary component. We highlight several limitations of the study and suggest directions for future research. First, the effect of *regulatory focus* when distinguishing between the *pioneering* and *pushing* types, or the *provocative* and *protective* types is not evident in the study’s quantitative strand. As discussed in the Results section, this could be due to the survey respondents’ answers being influenced by their organizations’ present strategic choices. A future study could use a hypothetical setting, such as a business case or a management simulation game, to test the study’s propositions to ensure that evaluation of strategic choices is not anchored in the choices already made by the respondents. Additionally, the cognitive types in our study are defined by the two dimensions of regulatory focus such that that executives scoring high on both promotion- and prevention-focus would be similar to two different ideal types of cognition. A future study could be designed to invoke a particular regulatory focus in isolation to study its bearing on strategic choice. Relatedly, the study’s quantitative strand did not support the proposition for the *protective* type. Therefore, the study’s propositions should be examined in a future empirical study.

Second, all measures of the dependent variable (‘Strategic choice’) in this study described generic actions. Future empirical tests of the propositions could measure the dependent variable using more concrete strategic choices specific to operations and supply chain management. Relatedly, a potential weakness in the questionnaire used in this study is the use of term “threat” in strategic choice S6, which is associated with the *provocative* cognition. Although wording of item S6 alludes to strategic choices to prevent losses of potential revenue from novel products, the term “threat” is not appropriate as *provocative* executives are defined to be promotion-focused.

Third, the individuals surveyed in this study were those registered in our Center's database and may not be representative of the general population of operations executives. Therefore, the study's quantitative strand should be replicated by surveying more representative samples of operations executives, such as those from Fortune-500 companies. Fourth, in aggregate the executives in the study's qualitative strand paid more attention to the factors they considered threats but were optimistic that many of the threats would not materialize in the future. It would be interesting to examine if this *pushing* cognition is more common among operations executives than the other three. Similarly, one may examine if individuals in different supply chain functions—customer service, production, safety, etc.—possess different types of strategic cognition, and whether individuals of certain types perform certain roles better than others. A study of practical benefit could explore if different cognitive types are better suited for different supply chain functions, for industries at different stages in the life cycle or with different levels of competitiveness.

Lastly, an in-depth examination of the ideal types themselves could refine our understanding of the types of strategic cognition in operations and supply chain management. Our study defines each ideal type with only two of the three available first-order constructs. This allows an executive's cognition to resemble two types simultaneously. The validity of this result needs to be examined empirically. A future study could also shed more light on the relative importance of different first-order constructs in each ideal type for operations management so the deviations from each first order construct in the ideal types could be weighed more precisely.

In summary, this study provides an initial look into the cognitive underpinnings of executives' choices regarding operations and supply chain strategy. If supply chain design is the ultimate core competence of an organization (Fine 2000), the exploration of strategic cognition of operations executives will not only enrich our theoretical understanding of the HRM-OM interface (Boudreau et al. 2003), but will also help understand the cognitive antecedents of supply chain adaptation by firms encountering changes in the business environment (Lee 2004).

Acknowledgments

We thank the Medford executives for participating in the study, and Lisa D'Ambrosio, Katie Date, Basak Kalkanچی, and Roberto Perez-Franco for their assistance in the research. We are grateful to the editor, the senior editor, and the anonymous reviewers for their insightful critique and suggestions that have significantly improved this study.

Notes

¹We also analyzed the data reported by the executives from the sectors most relevant to supply chain management, namely manufacturing, transportation and warehousing, and wholesale and retail trade ($n = 87$). Correlations in this data had the hypothesized polarity for all four types of cognition; all, except for type *pushing*, were significant ($p < 0.1$). Furthermore, analyses for the executives in wholesale and retail trade only ($n = 20$), and in wholesale and retail trade, and transportation and warehousing ($n = 40$) yielded identical results, although correlations of only *pioneering* and *provocative* types were significant ($p < 0.1$). Correlations in the data from executives in the manufacturing sector alone ($n = 47$) had the desired polarity for all four types, but were not significant at $p < 0.1$.

²We thank two anonymous reviewers for this insight.

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Supporting Information

Additional supporting information may be found online in the supporting information tab for this article:

Figure S1: Revenue and Profitability of the Industries in US Healthcare Sector.

Figure S2: Data Structure of Qualitative Coding Exercise.

Table S1: List of Environmental Factors from Phase I (Qualitative Study).

Table S2: Domains Covered in Medford Executives' Projections of Future Environment.

Table S3: Types of Revenue Sources Recommended by Medford Executives.

Table S4: Types of Strategic Actions Advocated by Medford Executives.

Table S5: Modified LOT-R Scale Used to Measure "Optimism".

Table S6: Modified Scale Used to Measure "Regulatory Focus".

Table S7: Items Used for Measuring Preferences for Strategic Choices (Study II).

Exhibit S1: An Illustrative Marker Sheet from an Interview with a Medford Executive.

Exhibit S2: Details of Validation Exercise in Qualitative Strand.