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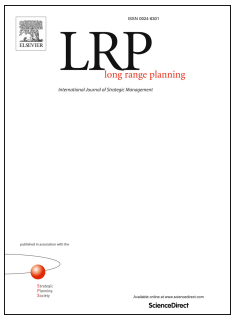

A Dual-Processing View of Three Cognitive Strategies in Strategic Decision Making: Intuition, Analytic Reasoning, and Reframing

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A Dual-Processing View of Three Cognitive Strategies in Strategic Decision Making: Intuition, Analytic Reasoning, and Reframing

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A dual-processing view of three cognitive strategies in strategic decision making: intuition, analytic reasoning, and reframing

Abstract

In making strategic decisions, managers implicitly or explicitly come to choose a cognitive strategy, by which we refer to the choices made as regards what type of information processing to engage in and rely on as the basis for a decision. Dual-processing theories of cognition recognize two types of information processing: non-conscious and conscious. There are two cognitive strategies—relying on intuition and engaging in analytic reasoning—that have a straightforward connection to the two types of information processing. However, managers often engage in reframing, that is, they deliberately attempt to rethink the background assumptions concerning how one approaches a decision-making situation. Despite the strategic importance of reframing, the foundations of this cognitive strategy remain theoretically underdeveloped. We argue that reframing involves both Type 1 and Type 2 processing in a complementary fashion. Specifically, reframing can be induced through conscious reflection and non-conscious processing during an incubation period. Furthermore, we argue that while reframing is a robust cognitive strategy across varying levels of environmental dynamism, dedicating time to reframing incurs significant opportunity costs, and can thus be employed only sparingly.

Keywords: decision making; managerial cognition; dual-processing theory; intuition; reflection

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Introduction

The ways in which executives and managers make strategic decisions shape the direction of organizational evolution and company performance (e.g., Baum and Wally, 2003; Bourgeois and Eisenhardt, 1988; Dean and Sharfman, 1996; Fredrickson and Mitchell, 1984; Helfat and Peteraf, 2015; Mitchell et al., 2011). There are many ways to arrive at a decision, ranging from relying on quick gut reactions to analytically calculating the potential outcomes of various alternatives. In making a decision, the manager thus implicitly or explicitly comes to choose a *cognitive strategy* for decision-making, by which we mean the choice made by the manager regarding the types of information processing to employ as the basis for a decision, and for what purposes to use them. In terms of dual-process theories of cognition (Dane and Pratt, 2007; Hodgkinson and Sadler-Smith, 2018; Hodgkinson et al. 2009), one can rely on non-conscious (Type 1) processing, conscious (Type 2) procssing, or some combination of the two. This article elaborates on the cognitive foundations and performance consequences of three distinct cognitive strategies that use these two types of information processing in different ways: relying on intuition, engaging in analytic reasoning, and dedicating time to reframing.

Existing scholarship assumes that, broadly speaking, managers can rely on intuition-based strategies and strategies based on analytic reasoning. Relying on intuition involves allowing automatic and, to a large degree, implicit associations to dominate the determination of the appropriate course of action. Analytic reasoning entails the identification and evaluation of alternatives in light of systematically collected and analyzed evidence, assumptions, and objectives. While the importance and complementarity of intuition and analytic reasoning has been recognized for quite some time (Maljers, 1990; Morecroft, 1984), there is a renewed interest in the topic thanks to the development of dual-processing theories of cognition and

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information processing in psychology (e.g., Dane and Pratt, 2007; Healey et al., 2015; Hodgkinson and Sadler-Smith, 2018; Sadler-Smith and Shefy, 2004; Salas, Rosen and DiazGranados 2010; Sinclair and Ashkanasy, 2005).

The dual-processing theories seemingly map neatly onto the cognitive strategies available to managers. Dual-processing theories distinguish between Type 1 information processing and Type 2 information processing (Epstein 2010, Evans, 2008; Evans and Frankish, 2009; Kahneman, 2003): Type 1 processes are fast, associative, parallel, operate outside cognitive awareness, and are capable of integrating a large amount of information; Type 2 processes are slow, effortful, serial, consciously monitored, and seriously limited in their processing capacity by the limitations of the working memory. Based on dual-processing theories, the manager's possible cognitive strategies can be conceptualized in terms of which of the two types of processes are given priority in driving the decision-making process, and how the manager arbitrates between competing alternatives produced by the two processes. Intuitive decision making prioritizes Type 1 processing, while analytic reasoning is reflected in giving primacy to Type 2 processing.

In this paper, we argue that this dualistic reading of the literature masks a third cognitive strategy which is crucial to effective decision making in the strategy context: reframing. Our work is inspired by Porac and Tschang's (2013: 251) critique of bounded rationality, in which they underscore the need to understand managers' ability to "creatively frame and reframe decision situations to serve their ends." Reframing refers to deliberate attempts to reflect on and rethink the parameters and background assumptions underlying how one approaches a particular situation. The importance of (re-) framing has been recognized decades ago in seminal studies of organizational decision making (e.g., Argyris, 1976; Mitroff and Mason, 1980; Mintzberg et al.,

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1976; Nutt, 1992, 1993). Indeed, many important drivers of organizational performance, such as business model innovation, outmaneuvering of competitors, and the building of capability portfolios can be argued to hinge on managers' ability to reframe the way in which they view their organization, competitors, and the environment (e.g., Dong et al., 2016; Gavetti, 2012; Laamanen and Wallin, 2009; Levine et al., 2017; Snihur and Zott, 2020).

Despite the strategic importance of reframing, its relation to intuition and analytic reasoning in the context of strategic decision making remains theoretically underdeveloped. Most research on the distinction between non-conscious and conscious reasoning has focused on explicating the nature of the former, taking the latter as the more established and understood form of information processing. However, we see a need to examine conscious reasoning in more detail. Building on recent advances in the cognitive psychology of decision making (e.g., (Dijksterhuis, 2004; Dijksterhuis and Strick, 2016: Evans and Stanovich, 2013; Stanovich, 2009), we argue that reframing is an important cognitive strategy that seems to utilize both Type 1 and Type 2 processing, and deserves more research attention within the field of managerial cognition. While we agree that it is important to understand the limits of intuition vis-à-vis analytic reasoning, and that "recognizing when to rely on intuition is a vital skill in itself" (Hodgkinson and Healey, 2011: 1506), we feel that it is equally important to recognize and elaborate on the differences between analytic reasoning and reframing. We follow Dong et al. (2006: 100), who conceptualize reframing as active rethinking of the "associations and dissociations between the facts of a situation, assumptions, and precedence to produce a schema for their interpretation." In so doing, our goal is to go beyond the notion of framing biases in decision making under uncertainty, which is a long-standing topic of interest in strategy (Hodgkinsson et al., 1999) and cognitive psychology (Tversky and Kahneman 1981). At the

same time, more sociologically oriented management scholarship has mostly focused on the role of language and social interaction of framing (e.g., Kaplan, 2008; for an overview, see Cornelissen and Werner, 2014), leaving the cognitive processes of reframing largely unexamined.

In view of this, we elaborate a typology of cognitive strategies that managers can employ in strategic decision making. We conceptualize cognitive strategies as patterns of cognitive processes that emerge from the interplay of meta-cognitive control (Ackerman and Thompson, 2017), cognitive predispositions and abilities (Sinclair and Ashkanasy, 2005; Stanovich and Toplak, 2019), as well as contextual factors. Unlike cognitive styles, which are relatively stable individual differences in people's preferences and habitual strategies for processing information (Kozhevnikov, 2007), a cognitive strategy refers to the choice made within a singular decision-making situation about which cognitive processes to rely on as well as to invest time and cognitive resources in as the basis for the decision. Like Dong et al. (2016), we understand cognitive strategies as sequences of cognitive acts that managers can at least partially choose to undertake. Although people have limited introspective access to the cognitive processes that shape their decisions (e.g., Nisbett and Wilson, 1977; Nokes and Hodgkinson, 2018), we assume people have some degree of agency over how they conduct themselves in a decision-making process (e.g., do they trust their intuitions, collect more data, or attempt to change how they see the situation).

Given the distinction between Type 1 processing and Type 2 processing, there are two cognitive strategies that are characterized by a relatively clear dominance of one type of processing: (1) rely on intuition, and (2) engage in analytic reasoning. An intuition-based cognitive strategy involves relying on one's "gut feelings," or affectively charged judgments that

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arise through rapid, non-conscious, and holistic associations (Dane and Pratt, 2007; Hodgkinson and Healey, 2011) either without attempting to analyze the situation more carefully or, if analytic and intuitive reasoning conflict, making one's decision based on the latter. Dane and Pratt (2009) call this problem-solving intuition. An intuition-based strategy is characterized by the dominance of Type 1 processes. Type 2 processing gains a more prominent role when a manager relies on analytic reasoning. Although non-conscious processing may produce hypotheses about appropriate courses of action, they are subjected to careful scrutiny. In addition, the manager may use mental simulation to develop and test alternatives, which are not suggested by non-conscious processing, in light of what they know about the resources, constraints, and objectives of the situation.

However, instead of making a quick, intuitive decision or engaging in analytic reasoning within a 'given' framing of the situation, the manager can make the decision to deliberately challenge the assumed presuppositions and to rethink the relevant decision-making parameters, as well as the way one approaches the whole situation (Nutt, 1992, 1993). We call this cognitive strategy reframing, and it is the focus of present article. It is distinguished from the other two cognitive strategies in having an explicit focus on not solving the 'given' problem at hand, and arriving at a decision, but rather in allocating attention to the way the problem itself is understood. Although reframing as a deliberate effort clearly indicates Type 2 processing, we show that reframing does not fit neatly into either side of the established dual-processing scheme. Rather, reframing seems to utilize both types of processing in specific ways. Broadly, there are two approaches to reframing: *conscious reflection* and *non-conscious processing.* Conscious reflection entails conscious deliberation on the boundaries of thought, potentially with the help of decision support tools (e.g., Hodgkinsson et al., 1999; Schoemaker, 1993; Sterman,

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2001) or other methods (e.g., Dong et al., 2016), whereas *non-conscious processing* of an issue involves limiting conscious thinking during an incubation period (e.g., Dijksterhuis, 2004; Dijksterhuis and Strick, 2016).

Further, we distinguish between certain characteristics of the environment to illuminate the consequences and relative benefits of using the three cognitive strategies (McCarthy et al., 2010). Prior literature suggests that intuition is generally applicable in ambiguous and complex environments, as long as they remain familiar. However, the strategy of relying on intuition is likely to fail in novel or rapidly changing situations. Analytic reasoning is effective in complex and rapidly changing situations but can be misleading in ambiguous environments. In contrast, reframing is robust across a wide range of environments, insofar as attempts to re-frame the situation are successful. However, the limits of reframing stem from (a) its high cognitive costs and long time periods required, and (b) uncertainty regarding its efficacy. Because of these limitations, reframing can be applied to only a handful of decision-making situations.

Theoretical background

Dual-process theories of information processing in psychology and management research

In identifying the general cognitive options available for human beings, our starting point is the dual-process theory of reasoning, which has received wide attention both within psychology (Epstein 2010, Evans, 2008; Evans and Frankish, 2009; Kahneman, 2003) and management research (e.g., Dane and Pratt, 2007; Hodgkinson Sadler-Smith, 2018). Although various types of dual-process theories have been presented, what is common to them is a distinction made between two qualitatively distinct forms of information processing (Evans and Stanovich, 2013; Hodgkinson and Sadler-Smith, 2018; Kahneman, 2003): Type 1 processing operates

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autonomously and effortlessly, outside of cognitive awareness, and is fast, associative, holistic, and emotionally charged. The individual is largely unaware of the functioning of Type 1 processes, which both saves cognitive resources as well as makes the individual unaware of the potential errors in reasoning made by using such processes. Instead of being one coherent system, there are a wide variety of Type 1 processes, including modular, habitual, and automated forms of processing, which operate relatively autonomously from each other (Evans and Stanovich, 2013). Type 2 processing is "slower, serial, effortful, more likely to be consciously monitored and deliberately controlled" (Kahneman, 2003: 698). Type 2 processing engages a singular central working memory resource that Type 1 processing is not dependent on (Evans and Stanovich, 2013: 226) and consumes a large amount of the individual's cognitive resources. Thus, it can handle only a limited number of cognitive operations that are handled serially. This is in contrast to Type 1 processing, which can handle several different reasoning processes in parallel.

While many labels have been used to describe these two forms of information processing, we will refer to them here as non-conscious and conscious processing. The strengths of non-conscious Type 1 processing include the ability to automatically learn from experience, to holistically take into account large quantities of situational information, and the speed of its functioning, while the strengths of conscious Type 2 processing include the capacity for logical inference and operating on high levels of abstraction, the ability to think about and plan for the long-term future, as well as the ability to transmit knowledge through language (e.g., Epstein, 2010). Often, researchers argue that these two types of information processing have distinct neural correlates (e.g. Lieberman, 2007; Satpute and Lieberman, 2006) and distinct evolutionary origins, with Type 1 being the older system that we share with other animals and Type 2 being

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the newer, characteristically human form of information processing, but neural or evolutionary assumptions are not necessary for the core distinction between the two types of information processing.

As regards how the two types of information processing interact, there are currently two schools of thought: default-interventionist and parallel-competitive (Evans and Stanovich, 2013; Hodgkinson and Sadler-Smith, 2018). *The default-interventionist theories* (e.g., Evans and Stanovich, 2013; Tversky and Kahneman, 1983) see that the default way of processing information is the faster and less costly Type 1, while more costly Type 2 processing intervenes under certain circumstances. Type 1 reasoning is prone to fall victim to various cognitive biases; not surprisingly, a large number of laboratory experiments have identified such biases as well as the conditions and individual traits that contribute to Type 2 processing, thus allowing it to intervene and produce a normatively correct response (see e.g., Kahneman, 2003). *Parallel-competitive theories* (e.g., Epstein, 2010; Satpute and Lieberman, 2006) assert that non-conscious and conscious processes operate in parallel, interact in many situations, and can compete for control of thinking and behavior. Sometimes, the interaction between these types of reasoning is simultaneous, which might be phenomenally reported by people as sensing a conflict between the two systems. At other times, they interact sequentially with, for example, non-conscious processing to provide the impetus for a certain action sequence, which is then justified by conscious thought processes. Alternatively, conscious processing can provide potential scenarios of what might happen if one were to engage in certain behaviors, with non-conscious processing making these scenarios emotionally charged—attractive for some, but horrifying for others—which fuels the conscious reasoning that leads to a decision (Epstein, 2010). Researchers within this stream of research are more prone to highlight the strengths and

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weaknesses of both non-conscious and conscious processing, instead of seeing the former as somehow inferior. In some situations, non-conscious processing can be superior, while conscious processing might be more effective in others. Nevertheless, in many everyday situations, both types of information processing can contribute and interact to provide successful behavior.

We side with the parallel-competitive theorists in believing that there are many situations where the bi-directional interaction of both types of reasoning is necessary for successful action. This is not to deny that there surely is a significant subclass of situations where human reasoning resembles quite closely the default-interventionist model. Nevertheless, the managerial decision-making context, in particular, involves complex problems without any normatively correct answer, in which situational awareness and pattern recognition can play a significant role. Thus, we believe that non-conscious processing can not only inhibit high-quality decision-making but can also often facilitate it, as has been argued by many management researchers. Accordingly, we agree with Hodgkinson and Sadler-Smith's (2018: 485) conclusion that parallel-competitive accounts "afford MOC researchers a considerably more insightful generative framework for theorizing and studying empirically the interplay of conscious and nonconscious processes in the workplace."

While conscious Type 2 processing is often treated as well understood, with most research focusing on the nature of intuition and non-conscious Type 1 processing, its exact nature has recently received more attention. In particular, Keith Stanovich (2009: 57) argued that Type 2 processing "needs to be understood in terms of two levels of processing—the algorithmic level and the reflective level." He thus suggests that we might need to divide Type 2 processing into two levels. Algorithmic thinking refers to the brain's ability to perform "explicit processing of rules through working memory" (Evans and Stanovich, 2013: 229), which is manifested, for

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example, in rational reasoning or mathematical calculations. In other words, it is a form of "mental simulation" (*ibid.*: 225) in which a person utilizes abstract concepts to mentally simulate what would be the outcomes, given certain components and rules of operation. This is the form of thinking measured by IQ tests and essentially concerns the ability to reason correctly in "constrained situations" (Stanovich and West, 2008: 688), which clearly establishes a problem context; given certain parameters and rules of operation, the person is then able to perform the necessary calculations to arrive at a correct answer.

However, even though this form of reasoning has proved successful in contexts where the problem boundaries are clearly outlined, it seems that a different form of cognitive processing is needed to identify the relevant parameters and rules of reasoning within which the algorithmic processing performs its calculations. In a number of experiments, Stanovich and West (2008) showed that a large number of thinking biases are uncorrelated with cognitive ability, as they mostly concern how we frame the decision-making situation in the first place, rather than about the calculations we make after this framing has been done.

Reframing in the context of dual-processing theory

In contrast to algorithmic Type 2 processing, reflective Type 2 processing refers to the thinking dispositions and higher level regulatory states that guide how we approach the decision process (Evans and Stanovich, 2013; Stanovich, 2009). In other words, it concerns the way we approach and frame an issue: what are the relevant parameters and information to be taken into account, and what are the relevant thinking dispositions and rules of reasoning to be applied in the situation? It is thus about the individual's "goals and epistemic values" that index "broad tendencies of pragmatic and epistemic self-regulation at a high level of cognitive control" (Evans and Stanovich, 2013: 230). This reflective level of processing can involve many dimensions and

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capacities, such as the habitual and learned ways used by the person to approach a problem situation, and the meta-cognitive decision of when the algorithmic level should override the response of the intuitive level (Evans and Stanovich, 2013: 230). Thus, while many dual process theorists in both psychology (e.g., Lieberman, 2007) and management research (e.g., Healey et al., 2015) use 'reflective' as a basic descriptor of Type 2 processing in general, Stanovich (2009) gives it a more particularized definition by distinguishing it from algorithmic Type 2 processing. In building on this distinction, we also come to use reflective in this more restricted sense.

Even though one may argue in favor or against splitting Type 2 processing into sub-types, Stanovich's work is important in drawing our attention to the human ability to take a cognitive step back, and change the way in which one approaches a decision-making situation (see also, e.g., Cattani et al., 2018; Dong et al., 2016; Porac and Tschang, 2013). In this article, we focus on one particular aspect of that capacity: *reframing*. We define reframing as the individual's attempt to reflect on as well as rethink the parameters and background assumptions of how one approaches a particular situation. Managerial decisions can be approached and framed in many different ways, taking or not taking into account certain parameters, and making or not making certain assumptions about how various factors interact and influence each other. The manager's framing of the situation is crucial for the operation of algorithmic thinking, as framing establishes the rules and boundaries for the algorithmic thinking operations that follow.

Reframing in a strategic decision-making context

We argue that in managerial decision making, where the problems typically are open, complex, and lacking any normatively correct answer or predetermined list of relevant parameters, a successful managerial response is often not dependent on mere quick gut feelings nor on mere calculative approaches based on a 'given' problem, but rather requires reflecting on the framing

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of the problem, as this significantly influences the types of solutions that will subsequently emerge as appropriate. As argued by Wedell-Wedellsborg (2017), the key challenge for most executive decision-making is not *solving* the problem but diagnosing and *framing* the problem in a useful way given one's purposes. He illustrates this in an example of an office building where the managers receive complaints about the elevator being too slow (see Ackoff, 1978). The obvious solution is to install a new and faster elevator, but this solution is quite expensive. If one reframes the problem as being about the wait being annoying, one can quickly identify much cheaper solutions: Put up mirrors, a TV or something else that would make the waiting time more entertaining.

In the strategy context, reframing is often essential when making decisions about the development of organizational capabilities. The need for reframing emerges from the complex interplay amongst individual capabilities (Laamanen and Wallin, 2009). If an organization faces the need to develop a new capability, managers must consider the implications of those decisions for the overall architecture of organizational capabilities. Those architectural impacts may not be readily apparent in the default framing of the situation. Similar reasoning can be applied to decisions about modifying business models (Zott and Amit, 2010: Teece, 2010). Technological development enables product and process innovations, but sometimes new technologies open the door for business model innovation. However, business model innovation may require reframing – challenging and reorganizing established, sometimes taken-for-granted assumptions and associations pertaining to value creation and capture. Snihur and Zott (2020) make a related argument by associating *complex system thinking style* with business model innovation. Conversely, by using the established business model to frame new technologies may lead to missed opportunities. For instance, Kodak's senior managers failed to see the value of digital

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imaging, in part because they assessed the value of the technology from the point of view of their razor-blade business model (Tripsas and Gavetti, 2000). Seeing the value of digital imaging would have required reframing.

Another notorious example of a lack of reframing is the Ford Pinto case in the seventies, in which the production team for a new, cheap car model found in crash tests that relatively low speed collisions from behind typically resulted in the fuel tank rupturing, leading to potential explosions (see e.g., Gioia, 1992). Although the solution would have cost only $11 to install, a cost-benefit analysis that valued human life at $200,000 indicated to the company that installing the solution to all its cars would cost 137 million dollars, while the benefit from preventing deaths and injuries due to the gas tank exploding would amount to less than 50 million dollars, thus leading them to not install the solution, but nevertheless to introduce the car to the market in 1970. This approach backfired in the late 70s, when increased media attention to the many Pinto fire fatalities and a few highly publicized court cases that charged Ford with reckless homicide (but ultimately found not guilty) led Ford to cease the production of the Pinto and left the company with having to deal with being portrayed by the media as a reckless, cynical company valuing profits over people's lives – even though some have argued that there was actually not too much fault with Ford itself, as the engineers and safety persons within the company were mainly just following the scripts and conventions prevalent in the car industry at that time (Lee and Ermann, 1999). Gioia, who starting from the summer of 1973 worked as Ford's Field Recall Coordinator received reports about some of these fire fatalities but failed to initiate a recall campaign, citing a lack of reframing as the key reason (Gioia, 1992: 385):

> *"My own schematized (scripted) knowledge influenced me to perceive recall issues in terms of the prevailing decision environment and to unconsciously overlook key features of the Pinto case, mainly because they did not fit an existing script. Although the outcomes of the case carry retrospectively obvious ethical overtones, the schemas driving my perceptions and*

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actions precluded consideration of the issues in ethical terms because the scripts did not include ethical dimensions."

An opposite example of successful reframing comes from Nickelodeon's software team who released a promising new app but found that they lost almost every customer – in this case kids – at the point when they needed to enter the household's cable TV password for the app to work properly (Wedell-Wedellsborg, 2017). Being experts of usability, the team approached this as a usability problem and ran hundreds of A/B tests on various sign-up flows to improve the usability but to no avail. The eventual solution required reframing the situation: The problem was not usability but the fact that to a 10-year-old kid, a password request signals forbidden territory. When the team added a short video explaining that it was OK to ask parents for the password, they quickly saw a 10-fold increase in the sign-up rate.

Existing research within management research has approached reframing mainly from two angles. One stream of research focuses on how cognitive frames and framing biases shape managerial judgment and decision making and, consequently, organizational action. Cornelissen and Werner (2014: 183) define a cognitive frame as a "knowledge structure that directs and guides information processing." This stream of literature focuses mostly on how cognitive frames are activated, how they impinge upon subsequent judgment and decision making, and how framing biases can be 'undone' (e.g., Cornelissen and Werner, 2014). For example, Benner and Tripsas (2012) examine how prior experiences shape managers' framing of new product markets and their consequent decisions about product features. However, managers can affect how much a given frame influences them. The so-called exposition effect describes the phenomenon in which a person's explication of the reasoning behind a decision reduces the framing effects (Sieck and Yates, 1997). In a similar vein, Hodgkinson and colleagues (1999) show that the susceptibility of individuals to how decision framing shapes risk preferences can

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be ameliorated by asking them to first perform a causal mapping of the situation. Minimization of framing biases aside, this line of work does not generally discuss how frames are actively constructed and shaped (Cornelissen and Werner, 2014). One exception is a paper by Dong et al. (2016), which draws from design research in an effort to examine how managers may be able to consciously promote the discovery of new, more productive cognitive frames.

The second main line of work is more sociologically oriented and focuses on how groups of individuals or organizations seek to influence how others frame a particular issue. This stream of research assumes that frames are primarily changed through social interaction between actors that hold differing points of view and emphasizes the role of language in framing (Cornelissen and Werner, 2014). For example, Kaplan (2008) examines how 'framing contests' are triggered and how they proceed when organizations face novel situations. During framing contests, organizational members attempt to change how other organizational members frame a situation, while at the same time being influenced by other organizational members' similar attempts. Jacobides and colleagues (2016) extend this idea to inter-organizational cooperation in the context of industry architecture change.

Reframing: Involving both non-conscious and conscious processing

Both non-conscious and conscious processing could provide the impetus for engaging in reframing. Sometimes, we can have an intuitive sense that something does not match, what philosopher John Dewey calls an indeterminate situation (Dewey, 1938; Martela, 2015). We might not be able to put our fingers on it, but some sort of uneasiness exists between the way we approach the situation and how the situations seems to be, leading us to check the assumptions we have for approaching the situation. Alternatively, conscious reasoning might lead to

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contradictions that clearly cannot be true, leading us realize that something about our assumptions must be wrong.

The actual process of reframing can also happen both consciously and non-consciously. First, we can decide to engage in *conscious reflection,* whereby we attempt to focus on our assumptions and to identify alternatives to these assumptions. Such reframing has been a topic of wide interest, especially for scholars focusing on identifying procedural prescriptions that could help practitioners identify better decision frames (Dong et al., 2016; Hodgkinson et al., 1999; Mitroff and Mason, 1980; Schoemaker, 1993). There is no guarantee of success for such reframing, as there typically is no easy way to identify which of one's current assumptions needs to be altered, nor is there any easy way to identify what would be a better, alternative, assumption. For engaging in conscious reflection, we can utilize various decision-making frameworks and tools to facilitate reframing in decision-making situations. Problem-diagnosis frameworks, such as root-cause analysis, 5 Whys and TRIZ, can help to ensure that we ask all the right questions about the situation and remember to take all the necessary parameters into account (Wedell-Wedellsborg, 2017).

Second, we can engage in *non-conscious processing* of an issue in hopes of identifying a more productive approach for framing the issue. This is achieved through incubation, during which we do not consciously focus on the problem at hand, but simply allow time to pass while waiting for a new solution to emerge (Dijksterhuis, 2004). Referred to in everyday life as 'sleeping over a decision' or taking time to think about it, incubation is a process that has received increasing attention in recent years in the fields of human cognition, decision making, and creativity (Dijksterhuis, 2004; Dijksterhuis and Strick, 2016), with a meta-analysis already ten years ago identifying 117 experimental studies on the topic (Sio and Ormerod, 2009). These

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studies show that a period of incubation during which the person focuses one's thinking on something else can enhance decision making in various tasks, especially those requiring creativity and divergent thinking, with problem restructuring being proposed as one of the key mechanisms through which incubation improves problem-solving (Sio and Ormerod, 2009). Creative intuition has been recognized as a potentially important managerial capability (Dane and Pratt, 2009), with research showing links between incubation and creativity (see Ritter and Dijksterhuis, 2013). Reframing can be seen as a particularly important mechanism for explaining the origins of the divergent thinking required for creativity, as reframing allows for new ways of approaching and viewing the situation. These mechanisms can help to explain the beneficial effect of incubation for a range of different decision-making situations. Incubation, for example, has been shown to improve people's ability to detect lies (Reinhard et al., 2013), to form accurate justice judgments (Ham et al., 2009), and experts' ability to predict the results of soccer matches (Dijksterhuis et al., 2009).

Dijksterhuis and Strick (2016) note that incubation has been strategically used by many artists and thinkers, including Mozart, Hemingway, and mathematician Henri Poincare, who made a point to work on math only two hours in the morning and two in the afternoon, believing that the five hours of incubation in between help him find solutions to the problems faced. Within the managerial context, we can also easily think of situations in which the manager decides to 'sleep over' a decision, waiting that new-found clarity to the question at hand will emerge by letting it incubate for a while. Phenomenologically, such incubation typically combines both non-conscious and conscious stages (Dijksterhuis and Strick, 2016). During the days as we incubate on a decision, new ideas can pop into our head, leading us to reflect on it for a while, only to let it incubate a bit more before the next reflective attempt to think about the

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question. Importantly, it is out of our control when such incubation leads to success. The crucial new way of looking at the situation might emerge while we are reflectively thinking about the situation, but it can as well emerge unannounced while we are jogging, showering, or even sleeping. However, for the non-conscious phase of incubation to be successful, it typically requires a conscious goal setting in which the person has decided to solve a problem, as has been clearly demonstrated by experimental research. Bos et al. (2008) presented three experiments, in each of which two groups engaged in identical distraction tasks, with one group being told that after the distraction, they would continue to solve a previously presented problem, while another group thought that they would not return to the previous problem. In each of the three cases, the group anticipating further problem solving performed better after the distraction period compared to a group not anticipating it.

Three cognitive strategies in strategic decision making

The previous discussion has shown that human beings have several different options regarding information processing and reasoning for use in arriving at a decision. When managers have a decision to make, they can rely on a quick, intuitive gut feeling, they can try to consciously reason which option to take by attempting to calculate the anticipated outcome of different courses of action, or they can decide to postpone the decision until they have 'slept on it' in the hope that this will help them to acquire a new perspective on the problem in order to clarify the decision. We refer to this choice as a *cognitive strategy* – a choice about which cognitive processes to rely on and invest time and cognitive resources in. While dual-processing theories recognize two distinctive types of information processing approaches, how these approaches are deployed by managers and whether these approaches will be applied in isolation or in

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combination can – and do – vary depending on the specifics of the decision-making situation at hand.

One aspect of cognitive strategies relates to the priority that is given to different types of information processing as the basis for a decision, even though real-life managerial decisions are rarely based on purely one type of information processing. For example, given a situation in which one's intuition and conscious reasoning give contrasting recommendations, one has to make a choice about which of them to rely on in the particular situation. There are many anecdotes in the literature of CEOs going with their gut feeling, sometimes abandoning the analytical view of the situation (e.g., Miller and Ireland, 2005; Schultz and Gordon, 2011), and for each such story, there probably are many more where, having done the conscious reasoning, managers have ignored their intuition to do what seems rational.

Another aspect of cognitive strategies pertains to choosing whether to dedicate resources to a certain type of information processing. Non-conscious processing is probably something we mainly cannot avoid engaging in. However, conscious reasoning requires effort and a certain amount of time. Thus, engaging in conscious resources involves a meta-level choice of whether one is willing to allocate the necessary cognitive and time-related resources. Reframing typically attempts to involve even longer time frames – incubation can take days – and for many managerial decisions, postponing the decision for days or for weeks poses considerable opportunity costs. These are real choices managers make almost daily in their work: How much time and effort should I dedicate to this decision? Should I just go with the first intuitive option to save resources for more important decisions? Should I analyze the options using conscious reasoning? Or is this a decision of such gravity, and are we currently so stuck and unable to reach a well-justified decision that it is best to let the decision incubate for a few days? Such

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choices are part of managerial everyday life and this phenomenon is what we aim to capture with the concept cognitive strategy.

Thus, we argue that when facing a decision-making situation, the manager faces a meta-level choice of which cognitive processes one should use and rely on to arrive at a decision. In part, choosing a cognitive strategy stems from our ability to use meta-cognitive control processes (Ackerman and Thompson, 2017). This is not to say that managers have full control or even that they generally make prudent choices regarding which cognitive strategy to choose. As already noted, while a manager may choose to rely on a particular cognitive strategy, they remain in part unaware of the cognitive operations that actually shape their decisions (Nisbett and Wilson, 1977). We acknowledge these limitations but focus analytically on the phenomenological reality of the manager, in which some degree of choice exists with regard to the processing of information and making decisions. We suggest that there are three broad cognitive strategies available to a manager facing a decision, namely rely on intuition, engage in analytic reasoning, or dedicate time to reframing.

Cognitive strategy 1: Rely on intuition

Relying on intuition refers to a cognitive strategy in which one gives considerable weight to the intuitive feeling one has concerning the right choice. Even if analytic reasoning would recommend another course of action, one decides to trust one's intuition. Or one trusts it to such a degree that one omits engaging in analytic reasoning or reframing and instead quickly follows one's intuition. Although intuition is often seen as the last resort when rational decision-making processes fail, there are certain situations in which intuitive decisions may be as good as or even superior to more conscious decision making (Dane and Pratt, 2007; Hammond et al., 1987; Hämäläinen and Saarinen, 2008; Khatri and Ng, 2000). In familiar contexts, through exposure to

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similar situations in the past, managers are able to intuitively detect patterns of which they are consciously unaware, but which nevertheless strongly affect their 'gut feeling' of the situation. Thus, there are situations when an experienced manager dismisses a course of action just because it 'doesn't feel right', even in those situations when all the data available for conscious reasoning points to another direction, and the manager is unable to articulate why it does not feel right.

Cognitive strategy 2: Engage in analytic reasoning

Analytic reasoning is a Type 2 process in which one seeks to consciously deduce the appropriate decision by inspecting different decision options in light of one's understanding of the decision-making situation. It is a form of "consequential decision making," which has been defined by Evans and Stanovich (2013: 238) as "choices that are determined by reasoning about or simulation of future consequences of anticipated actions, as opposed to choices driven by experiential learning and associative strength." Such decision processes include investment calculations, ranking potential employees according to hiring criteria, segmenting customers, or conducting project risk analysis. However, in its purest form, this cognitive strategy does not include any problematizing of the relevant decision-making parameters or problem boundaries. Business school curricula have traditionally focused on nurturing the analytic reasoning skills of future leaders (Atwater et al., 2008). However, by its very nature, analytic reasoning assumes that the decision-maker has correctly grasped the relevant variables and interdependencies of the decision-making situation. When engaging in analytic reasoning, the decision-maker does not explicitly try to address the influence of the decision context on the decision process or the potentially unexpected systemic repercussions of one's actions. Furthermore, the limited working memory of humans places an important constraint on analytic reasoning (Evans and Stanovich, 2013). Working memory is employed in analytic reasoning and has been defined as "a brain

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system that provides temporary storage and manipulation of the information necessary for such complex cognitive tasks as language comprehension, learning, and reasoning" (Baddeley, 1992: 556). Given these limitations, managers engaging in analytic reasoning can only entertain a few parameters in their mind, essentially reducing the complexity of the situation considerably to make it analyzable.

Cognitive strategy 3: Dedicate time to reframing

By the term reframing, we refer to the process of consciously going beyond one's conventional patterns of thought in an effort to understand previously unrecognized interdependencies of a situation and cognitively projecting the consequences of those interdependencies over time (Atwater et al., 2008). This process can reveal weaknesses in existing decision options and can even lead to the discovery of new options, thereby improving decision-making performance (e.g., Fredrickson and Mitchell, 1984; Gavetti, 2012; Schweiger et al., 1989; Sterman, 2001; Tsai et al., 2011). Reframing thus refers to the cognitive strategy whereby one recognizes and consciously attempts to go beyond one's intuitive as well as purely algorithmic (systematic, but uncritical) responses to a situation. The strategy of reframing describes our ability to think about thinking itself, reasoning about the ways we reason, and being sensitive to the fallibility of our assumptions regarding the decision-making situation. There might be several ways to achieve a successful reframing, with some of these being more accidental and indeliberate; nevertheless, when the manager decides to use reframing as a cognitive strategy, we see two main approaches that they can use to accomplish this.

First, the manager can decide to consciously reflect on issue framing. As reframing is typically not achieved by simply sitting and thinking about a problem, this often involves some form of a playful approach designed to entice divergent thinking around the topic (Runco, 2010),

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thus producing new ways of looking at it. The cognitive processes involved need to be ”exploratory or perhaps even playful” (Dijksterhuis and Strick, 2016: 129). This playful exploration can be used alone, though it is quite often used in situations when a decision-making group, such as a research and development team or board of directors, feel that they are stuck with a certain problem and need a new way of approaching it. In these situations, the group might attempt to visualize the problem using Lego bricks, they might try to dramatize it borrowing methods from creative arts, or they might just drink a few beers cracking jokes around the topic. The aim of such playfulness is to help relax various self-imposed inappropriate constraints on the problem representation, thus providing new ways for approaching the problem (Knoblich et al., 1999). Frame-breaking insights might also be achieved by using conceptual (Hodgkinson et al., 1999) or computational modeling (Sterman, 2001) that force one to expose one’s assumptions (see also Dong et al., 2016).

The second approach to reframing involves postponing decision-making to allow time for mainly non-conscious processing over the course of an incubation period (Dijksterhuis, 2004; Sio and Ormerod, 2009). During the period of incubation, although the problem might pop in and out of consciousness, most of the time one is focusing on something else. Thus, following the idea of ‘deep activation’, the problem receives cognitive attention even when it is not the conscious focus of one’s thinking (Dijksterhuis and Strick, 2016). This attention without conscious thought combined with occasional conscious thinking about the problem can help to rework the problem parameters, thus producing new perspectives, insights, and enhanced solutions to the problem.

The manager’s choice of cognitive strategy is not perfectly correlated with any singular set of cognitive processes. Non-conscious processing mostly takes place regardless of the

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cognitive strategy chosen by the manager, with the manager only choosing how much weight to give to their intuitions in decision making. Although managers can choose to ignore a gut feeling, they are generally not able to choose to not have a gut feeling. Similarly, incubation can take place whether or not the manager has decided to engage in it, as new insights can emerge unexpectedly and without invitation. Furthermore, human thinking in general and managerial thinking in particular involve more often than not reciprocal back-and-forth influences between various forms of information processing, thus making a pure reliance on any singular type of information processing a practical impossibility. For example, intuition inevitably plays a role in analytic reasoning by providing the initial direction and reference points for analysis and deliberation (e.g., Kahneman and Klein, 2009: 521). In a similar vein, it is possible that analytic reasoning unintentionally triggers reframing. Therefore, the cognitive strategies are not the same as cognitive processes as such, but describe the choice the manager makes in an individual decision-making situation with regards to the cognitive processes that are emphasized and prioritized in any particular decision-making situation.

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Performance implications of the cognitive strategies

Conceptual setup

Reliance on intuition can be effective in surprisingly complex tasks, provided that one has sufficient experience (Dane and Pratt, 2007; Klein 1999). At the same time, managers continuously face situations that are both novel and complex, hence requiring conscious reasoning and careful reflection. Consequently, managers' capacity to engage in both analytic reasoning and reframing is important in some situations. Yet, these cognitive strategies are time-

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consuming and cognitively taxing and, for all their apparent rationality, can occasionally lead to lower-quality decisions than those based on intuitive judgment.

In this paper, the basic unit of behavior investigated is a strategic decision made by an individual manager. Strategic decisions are important, difficult-to-reverse, involve considerable resource commitments and are usually made by senior managers (e.g., Miller and Chen, 1994: 11). Although managers do not make decisions in a social vacuum, the ultimate decision-making authority and responsibility often rests on the shoulders of an individual, typically the chief executive (see, e.g., Waytz, 2016). We assume that managers face a constant stream of decision opportunities (Weick et al., 2005), for which they can invest only a certain, limited amount of time and mental energy (Cohen et al., 1972; Rudolph and Repenning, 2002).

We conceptualize the strategic decision-making context in terms of three dimensions of environmental dynamism: *ambiguity*, *complexity*, and *rate of change*. We also consider the decision maker's *familiarity* with the situation, that is, the amount of experience and experiential knowledge that the actor has about the situation and environment in question. This conceptualization of the decision-making context is far from exhaustive and excludes dimensions such as lack of information (Daft and Lengel, 1986), unpredictability (Davis et al., 2009), and rare events (March et al., 1991). Our selection of the environmental dimensions is based on their centrality to strategic management scholarship. For example, ambiguity is a key construct in the resource-based view (Lippman and Rumelt, 1982), complexity is central to the behavioral strategy literature (Lenox et al., 2010), while the rate of change in the environment is a crucial consideration in the dynamic capabilities literature (Eisenhardt and Martin, 2000). This helps future research in these areas better incorporate our results into their respective literatures. Additionally, the selected set of environmental dimensions serves to illustrate the differential

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performance consequences of the different strategies – most importantly, to show how reframing is different from both intuition and analytic reasoning in terms of its implications for performance. From the point of view of practice, the environmental dimensions represent strategically relevant characteristics of the environment, which enables us to produce managerially meaningful results. However, since the 'net benefits' of cognitive strategies in real-world circumstances depend on the combination of environmental conditions, the overall effectiveness of different cognitive strategies will necessarily remain an empirical question.

Ambiguity is defined as a lack of clarity regarding the cause-and-effect relations in a system, or the inability to know the state of certain variables that form part of a causal structure (Mosakowski, 1997). The more ambiguity, the less certain the manager can be about one's knowledge and understanding of the environment. Ambiguity is a crucial dimension for strategic management, since a sustainable competitive advantage depends on it (Lippman and Rumelt, 1982). At the same time, a failure to understand one's own sources of competitive advantage can lead to decisions that erode those advantages (King, 2007). Examples of ambiguous decision-making situations include resource allocation decisions that require managers to balance concrete, financial objectives (e.g., sales, productivity) with fuzzy, non-financial objectives (e.g., brand, organizational culture). Ambiguity is also central to business model design decisions in nascent markets where it is still unknown how organizational activities affect customer value, and how customers respond to different monetization approaches (McDonald and Eisenhardt, 2020).

Complexity describes the number of factors that in combination determine the outcome of a decision (Levinthal, 1997). Simple systems can be understood through a limited number of parameters, while increased complexity indicates that an increasing number of potentially

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interacting parameters all play a role in determining the outcome of a certain decision. While ambiguity has aroused much interest in the field of strategic management due to the resource-based view of the firm, complexity has been a central concept of interest for behavioral strategy scholars (e.g., Lenox et al., 2010; Levinthal 2011). Complexity is an important concern in decisions concerning complex technological systems and products, where interactions between components and modules determine system/product-level performance (Henderson and Clark, 1990). Similarly, the quality of a decision to modify or change some aspect of a firm's business model hinges on the manager's ability to grasp relevant interdependencies in the business model – so that decisions that are reasonable at the level of individual organizational activities also enhance the performance of the overall activity system (Siggelkow, 2002; Zott and Amit, 2010).

Rate of change describes the speed of change in a set of environmental variables that can influence the outcomes of a decision (McCarthy et al., 2010). A high rate of change can indicate that the environment is transforming quickly, rendering strategies that have worked in the past potentially obsolete. The rate of change or velocity of environmental change have been of particular interest to students of dynamic capabilities (Eisenhardt and Martin, 2000) and organizational ecology (Barnett and Hansen, 1996). Examples of decision-making situations characterized by rapid change include those in which a firm must deal with major exogeneous changes in technology (e.g., emergence of artificial intelligence) or society (e.g., urbanization). One important feature of environmental change is the degree to which the change is systemic or not. By systemic change, we refer to a change in multiple environmental variables that is driven by the same, underlying cause(s). For example, urbanization causes the demand in rural area markets to decline and to increase in urban areas; the same underlying cause is reflected in multiple variables in a correlated fashion.

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Intuition vs. analytic reasoning

The potential benefits of relying on intuition include the ability to make high-quality decisions in ambiguous and complex environments, insofar as the decision maker is equipped with a sufficient experiential basis for relying on intuition (Hodgkinson et al., 2009; Kahneman and Klein, 2009). In general, a key benefit of intuition is that through repeated exposure to certain situations and environments, we can come to intuitively detect patterns in the environment that remain unnoticeable to our more conscious reasoning abilities. Thus, our intuitive capacities can provide 'gut feelings' about the right or wrong path, which can be surprisingly reliable when the environment and the situation works in a manner similar to that in the past. Such pattern recognition requires repeated exposure to similar situations, and thus familiarity with the environment is a key parameter affecting the reliability of our intuitive processes.

More specifically, the potential power of intuition in ambiguous environments hinges on the ability of intuitive processing to form holistic associations between a large number of variables to guide decisions. For example, brands are complex assets that rely on *customers'* intuitive associations related to the brand. Assessing how a firm's actions impacts those associations can be challenging following some analytic reasoning process (Lodish and Mela, 2007). Conversely, provided a sufficient experiential basis, a manager may be able to make decisions effectively in an ambiguous environment by relying on intuition (see, e.g., Schultz and Gordon, 2011: 24). Holistic associations linked to intuition can be highly productive in complex environments as well. The power of intuition is based on experience, and as complexity increases, the requisite experience for the effectiveness of intuition also increases. Under conditions of moderate or low familiarity, analytic reasoning can be used to suppress dysfunctional intuitions and systematically explore how multiple factors in combination can

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affect the likely outcomes of different decision options. The rate of change in the decision-making context reduces the effectiveness of intuition as a cognitive strategy relative to analytic reasoning. Since rapid change erodes one's ability to become familiar with the situation, the conditions of intuitive expertise are not met (Dane and Pratt, 2007; Kahneman and Klein, 2009), and the strategy of relying on intuition becomes unreliable. Finally, engaging in analytic reasoning is associated with a higher opportunity cost than the strategy of relying on intuition, due to the larger time and cognitive resource investments required by the former (Hodgkinson et al., 2009).

The benefits of reframing

Reframing can complement intuition in ambiguous environments. Reframing is particularly valuable when the decision-making context is ambiguous *and* unfamiliar. Reframing may help lift the veil of ambiguity by pointing to (previously ignored) factors that have been muddying causal reasoning (Martignoni et al., 2016), and by drawing attention to longer-term dynamics of a system (Luoma et al., 2017). Consider as a metaphor a regression model that is mis-specified so that one variable that influences the dependent variable is missing, and that this variable also correlates with an independent variable of interest. In such a model, the relationship between the independent variable of interest and the dependent variable will remain ambiguous regardless of the amount of data gathered, since the omitted variable is biasing the parameter estimates. However, through reframing, one may discover a missing variable and, by including data on that variable in the model, the ambiguity disappears. To summarize,

Proposition 1a: In strategic decision-making contexts with high ambiguity, the effectiveness of reframing relative to intuition increases when the decision maker's familiarity with the situation is low.

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Proposition 1b: In strategic decision-making contexts with high ambiguity, the effectiveness of reframing relative to analytic reasoning increases.

Reframing may also increase decision quality in complex situations. Reframing is likely to be superior to intuition in complex environments when the decision maker is not familiar with the situation. Moreover, it is beneficial to sporadically step outside the box, even in familiar environments, and to evaluate whether one's way of viewing the context could be more productive. The canonical NK landscape model demonstrates how firms evolve toward local optima in the fitness landscape through an incremental trial-and-error process, thus missing opportunities for greater performance improvement (Levinthal, 1997). In the context of intuition as a cognitive strategy, the holistic associations and non-conscious associations that have formed through repeated exposure to similar situations may have proved 'good enough', but there is generally no guarantee that the associations point to optimal decisions. Worse still, it is possible that intuition-based decisions are gradually creating problems, which do not become visible except after a considerable time delay, when remedial action is no longer possible (e.g., Rahmandad and Repenning, 2015). Thus, sporadically stopping and attempting to challenge one's current way of looking at the situation in order to gain a fresh look at it, and thinking of whether there are dynamics or parameters that one thus far has overlooked, could be beneficial for the manager in such familiar situations. Therefore, reframing is likely to be more effective than intuition. More formally,

Proposition 2a: In strategic decision-making contexts with high complexity, the effectiveness of reframing relative to intuition increases when the decision maker's familiarity with the situation is low.

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Proposition 2b: In strategic decision-making contexts with high complexity, the effectiveness of reframing relative to intuition increases with the temporal distance from the previous utilization of reframing.

Reframing is likely to outperform analytic reasoning in complex environments when exercised sporadically. Namely, reframing leads to a broader search in both the alternative space as well as in the space of potential contingencies that influence the effectiveness of a decision. Examples of complex situations where reframing is likely to be beneficial include (re-) designing capability architectures (Laamanen and Wallin, 2009) and business model innovation (Snihur & Zott, 2020). In both cases, multiple factors interact to influence overall performance outcomes of decisions. Reframing involves widening the scope of a cognitive search to look for thus far missed interdependencies, thereby increasing the chance that the most influential decision-making parameters are considered in the process. This can lead to identifying a few critical contingencies, which determine the ideal course of action—that is, reframing increases the likelihood that the decision maker understands 'what really matters'. However, a constant redefinition of the decision problem may also be detrimental if effective decision making requires disciplined focus on specific details of the situation. Therefore, we propose that

Proposition 2c: In strategic decision-making contexts with high complexity, the effectiveness of reframing relative to analytic reasoning increases with the temporal distance from the previous utilization of reframing.

The benefit of reframing relative to relying on intuition in rapidly changing environments mirrors the reasoning of Proposition 1b. Relying on intuition is hazardous in environments characterized by rapid change, and both reframing and analytic reasoning provide viable alternatives. The more challenging question is how reframing and analytic reasoning perform

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relative to each other in rapidly changing environments. We argue that reframing outperforms analytic reasoning when environmental change is systemic. While analytic reasoning may help deal with independent change patterns in the environment, reframing is required to identify the deeper, system-level changes that may require more radical decisions. Moreover, applying analytic reasoning in a rapidly changing environment can become cognitively overwhelming if the number of variables to consider increases; reframing may produce a remapping of the variables to fewer dimensions, thus rendering the environmental change cognitively more tractable (see, e.g., Porac and Tschang, 2013: 252). Thus,

Proposition 3a: In strategic decision-making contexts with a high rate of change, the effectiveness of reframing relative to intuition increases.

Proposition 3b: In strategic decision-making contexts with a high rate of change, the effectiveness of reframing relative to analytic reasoning increases when environmental change is systemic.

Limits of reframing

While Propositions 1-3 highlight the robustness of reframing, it is no panacea. As a cognitive strategy, reframing is not as straightforward a process as intuitive or analytic reasoning. As reframing involves challenging the very framework we use for our thinking, it metaphorically amounts to the feat of fixing a boat while sailing on it. Furthermore, as it requires inventing or building a new perspective to look at the situation in question, this creation of novelty cannot follow a predetermined path. Typically, the emergence of new insights is “sudden, unpredictable,” and the path through which one arrived at the insights is ”nonverbalizable” (Sio and Ormerod, 2009: 94).

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Intuition is automatic and provides results very quickly. The time frame for analytic thinking, though longer, can also be counted in minutes or hours. However, reframing often requires significantly longer time frames. When a decision is left to incubate, it is typically postponed by time periods counted in days: One decides to make the decision the next day or next week. Thus, deciding to engage in incubation to achieve reframing involves a significant opportunity cost: Since the decision is postponed by days, one loses time before one can start to implement the decision. It has been argued that in managerial contexts where decisions typically do not have to be made in seconds, the 'slowness' of analytic reasoning provides no significant constraint, as one can almost always wait the few minutes or hours required for analytic investigation of the alternatives (Vuori and Vuori, 2014). However, the time required for incubation is already long enough to affect the manager's ability to respond to situations in a timely manner. Similarly, the other strategy for reframing, conscious reflection, also requires more investment of time and cognitive resources than that required for trusting one's intuition or engaging in analytic reasoning. Insofar as conscious reflection is conducted in groups, its opportunity cost is even steeper. Putting the whole board of directors to play with Legos for an hour is an investment one can only make in the case of very serious problems. Same goes for running a model-building workshop with expert facilitators (Pessôa et al., 2015). In sum,

Boundary condition 1: Reframing requires greater time and cognitive resource investments than (a) relying on intuition and (b) engaging in analytic reasoning.

Intuitive processing typically produces its end-product, an intuition about something, quickly and quite reliably. Similarly, when engaging in analytic reasoning, one typically already has a quite good sense of what the end-product will look like; for example, a table of the pros and cons of various alternatives, represented in quantitative terms if possible. Analytic reasoning

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may lead to a cognitive dead-end, but it is still fairly reliable in terms of resulting in some kind of decision (recommendation). In contrast, reframing, as an attempt to plunge into the unknown, is by its very nature quite unpredictable. While processes involved in intuition are associative and in analytic thinking they are rule-based, in reframing they are exploratory (Dijksterhuis and Strick, 2016). When engaging in conscious reflection or letting a problem incubate, one cannot in advance know whether any new insights will emerge (Sio and Ormerod, 2009). Sometimes hours of conscious reflection or weeks of incubation do not produce any useful insight, and thus the time spent on reframing is essentially wasted. Therefore, even if the *expected* effectiveness and costs of dedicating time to reframing favors this strategy over relying on intuition or engaging in analytic reasoning, the *risk* of dedicating time to reframing may still be greater. To summarize,

Boundary condition 2: The efficacy of reframing, in terms of producing its intended outcomes, is more uncertain than that of (a) relying on intuition and (b) engaging in analytic reasoning.

Taken together, boundary conditions 1-2 point to important limitations associated with reframing, which may make it unprofitable to dedicate time to it. Not only is it more costly to dedicate time to reframing, but the expected benefits (as outlined in Propositions 1-3) are more uncertain. Thus, while the robustness of reframing with respect to environmental dynamism reduces the risk of dedicating time to reframing, the cognitive challenges associated with reframing have the reverse effect.

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Summary and conclusions

Our paper elaborates on the repertoire of cognitive strategies available to managers in strategic decision making, and discusses their likely performance consequences in different situations. Our results are summarized in Table 1. We build on the robust body of literature on dual-processing theories of cognition. In management, scholars drawing on dual-processing theories have focused on the conditions under which intuition is an effective guide toward decisions (Dane, 2010; Dane and Pratt, 2007; Hodgkinson et al., 2009). Thus, the choice for managers seems to be binary – whether one should follow intuition or engage in analytic reasoning. Indeed, considerable advances have been made in this regard (Hodgkinson et al., 2018; Hodgkinson and Sadler-Smith, 2018). However, we argue that the cognitive strategy options extend beyond a choice between intuition and analytic reasoning. Several streams of strategy research indicate that effective decisions are often the result of a third option, reframing. While the strategic importance of (re-) framing is nothing new (e.g., Hodgkinson et al., 1999; Kaplan, 2008; Nutt, 1992), its cognitive basis and the trade-offs associated with its use have remained theoretically underdeveloped. In particular, reframing has been mainly discussed separate from dual-processing theories of cognition. The present article seeks to bring reframing and dual-processing literatures closer together by showing how dual-processing theories can account for this cognitive strategy.

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We propose that it is useful to think of strategic decision making in terms of three different cognitive strategies: relying on intuition, engaging in analytic reasoning, and dedicating time to reframing. Our theoretical analysis elucidates how each cognitive strategy differs in terms of the underlying cognitive processes and likely effectiveness in different contexts. While

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it can be debated whether cognitive strategies are deliberate or emergent, we assume that managers have some degree of agency in choosing how they arrive at a decision. Psychologically, the ability to select among cognitive strategies depends on meta-cognitive control (Ackerman and Thompson, 2017). Pragmatically, highlighting the possibility of meta-level choice in strategic decision making may improve managers' meta-reflective capabilities, much in the same way as being aware of cognitive biases can reduce susceptibility to bias (Russo and Schoemaker, 1992).

Our article contributes to strategic management literature in three ways. First, we elaborate on the nature and cognitive underpinnings of reframing. We identify two sub-strategies for reframing: conscious reflection—potentially with the aid of tools such as causal mapping, computational modeling or facilitation methods that encourage playful exploration—and (largely) non-conscious processing over an incubation period. Both conscious reflection and non-conscious processing have been discussed at length in prior strategy research (e.g., Hodgkinson et al., 2009; Healey et al., 2015). Yet, much of the existing literature tacitly treats reframing as just another form of conscious reasoning. Although reframing involves conscious reasoning, conflating reframing and analytic reasoning misses important differences between them, and downplays the role of the non-conscious in reframing efforts. By presenting reframing alongside intuition and analytic reasoning, we also hope to direct managerial cognition researchers' attention to this important phenomenon.

Second, our analysis sheds light on the trade-offs associated with reframing vis-à-vis intuition and analytic reasoning. We consider the performance consequences of the three strategies under different levels of ambiguity, complexity, and rate of change, while also taking into account the decision-maker's varying familiarity with the situation. We show that reframing

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provides a pattern of performance effects that differs qualitatively from both intuition and analytic reasoning. Reframing is a robust strategy across different environmental conditions, although frequent use of reframing is likely to have decreasing marginal benefits. Additionally, since reframing is the costliest in terms of time and cognitive resources, as well as uncertain in its outcomes, reframing should be used conservatively when managers face a high volume of decision-making opportunities with significant costs associated with "errors of omission."

Third, our research informs discussions about the psychological foundations of competitive advantage (e.g., Helfat and Peteraf, 2015) and other strategic outcomes (Chatteerjee and Hambrick, 2007). Our results highlight that different types of environmental dynamism favor different cognitive strategies. As people have differential abilities and a proclivity to employ different cognitive strategies, our research provides direction for understanding the psychological profiles and experiential backgrounds of successful executives in different environments. While intuition improves with experience, analytic reasoning is supported by intelligence. Reframing may be supported by psychological traits such as actively open-minded thinking (Stanovich and Toplak, 2019), while intelligence may constitute a necessary but insufficient condition for effective reframing (Karwowski et al., 2016).

Our propositions can be tested and utilized in various research settings. First, since cognitive strategies can be subjected to experimental manipulation, future research could investigate the propositions in simulated decision-making settings (Levine et al., 2017). Second, it would also be interesting to use experimental designs to investigate the individual characteristics and contextual cues that lead managers to select certain cognitive strategies (Nokes and Hodgkinson, 2018). Third, an important line of future work would be to examine the neurological correlates of reframing. There is some preliminary evidence that default network

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connectivity during rest consolidates new social information (Meyer et al., 2019), thus default network would be an important candidate to examine. Fourth, combinations of verbal protocols and non-participant observation could be utilized to study the cognitive strategies in 'naturalistic' managerial settings. Fifth, our propositions can also inform studies of decision making that utilize secondary data sources (e.g., emails, diaries, instant messaging software, and other archival records) to reconstruct decision-making processes. Finally, computational studies can help further clarify and explore the theoretical mechanisms linking cognitive strategies to performance (Davis et al., 2009). Overall, we urge scholars to employ multiple methods because managerial cognition is extremely difficult to study empirically (Hodgkinson et al., 2018).

There are also broader theoretical questions that remain unanswered. First, we are not suggesting that our list of three cognitive strategies is necessarily exhaustive. By making a distinction between types of information processing (i.e., Type 1 vs. 2) and cognitive strategies (i.e., intuition, analytic reasoning, reframing), we aim to highlight the choices managers can make as to how they utilize the available information processing types. From this conceptual starting point, it is conceivable that future research will identify additional cognitive strategies that combine non-conscious and conscious thought processes in different ways.

Second, our conceptualization of reframing is consistent with the established dual-processing theory of cognition, but this position may be challenged in the future. In our view, reframing involves both Type 1 and Type 2 processes, which work together in a complementary fashion. It is possible that future research will uncover that the dual-processing theory needs to be extended to accommodate phenomena such as reframing. Both Stanovich, when discussing reflective processing as a potential third type of process, and Dijksterhuis and Strick, when discussing incubation as Type 3 thinking, emphasized that these notions were merely early

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speculations concerning cognitive phenomena not captured by the dual-type theories, rather than strongly proposing them as readymade alternative theories. In a similar vein, it is important to stress that we are in no way proposing here that reframing ought to be seen as a distinct third type of information processing approach; rather, we want to point out that reframing forms a crucial facet of managerial decision making, and thus something that the dual-processing theories of managerial cognition need to accommodate and explain. In a way, reframing might not be defined by the *type* of information processing but the *target* of information processing. As such, it is most probably accomplished through a combination of Type 1 and Type 2 processes, as we now have tried to make clear throughout this paper.

Rather than providing a comprehensive theory of reframing, more humbly, this article has merely pointed out that reframing is an important phenomenon that is currently not receiving the scholarly focus it deserves. In order to help remedy this situation, adopting a dual-processing perspective, we have offered a tentative account of why reframing is of importance and how it is accomplished. In doing so, our ultimate hope is that our theorizing will motivate fellow strategy researchers to join us in the quest to advance understanding of the basic processes through which reframing is accomplished, and no less importantly, its fundamental limitations. Although reframing is a robust cognitive strategy that can be deployed effectively across a range of varied environments, its use is limited by the cognitive intensity and time-relate costs associated with its use. The challenge for managers is thus to decide when the scarce resources consumed by its deployment ought to be used. Alfred North Whitehead (2012: 46) has summarized this challenge neatly: “Operations of thought are like cavalry charges in a battle—they are strictly limited in number, they require fresh horses, and must only be made at decisive moments.”

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Table 1. Comparison of cognitive strategies

	Rely on intuition	Engage in analytic reasoning	Dedicate time to reframing
Metaphor	"Gut feelings"	"Calculation"	"Out of the box"
Cognitive processes	Predominantly Type 1 • Type 2 processing may be involved in the decision-making process but in case of conflict, Type 1 processing is given primacy	Predominantly Type 2 • Type 1 processing may produce hypotheses about appropriate courses of action, but they are subjected to careful scrutiny	Type 1 + Type 2 • In conscious reflection, Type 2 processing dominates • In non-conscious processing, Type 1 processing dominates with occasional moments of Type 2 processing
Ways of reasoning	This feels like the right decision	Given that these are the relevant parameters, we can calculate that this is the right decision	What are the relevant parameters in this decision?
Environmental dynamism	• Effective in ambiguous and complex environments, given high level of familiarity • Ineffective in rapidly changing environments	• Effective in complex and rapidly changing environments • Ineffective in ambiguous environments	• Effective under a broad range of environmental conditions • Uniquely effective in ambiguous environments, when familiarity is low • In ambiguous and complex environments, the effectiveness of reframing increases with time from previous utilization of reframing • Uniquely effective in rapidly changing environments, when environmental change is systemic
Speed	High	Moderate	Low
Cognitive load	Low	Moderate	High
Uncertainty of efficacy	Low	Moderate	High

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