

A Simple Rule is Born: How CEOs Distill Heuristics

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ABSTRACT Managerial heuristics play an important role in decision-making and positively contribute to strategy, innovation, organizational learning, and even the survival of a firm. Little is known, though, about the process through which heuristics emerge. Following a grounded theory approach, we develop a process model of how managers create and develop heuristics from experience. The 4-step model – *dissonancing*, *realizing*, *crystallizing*, and *organizing* – captures the sequence of cognitive schemata that start with a flawed assumption, give rise to heuristics that tend to be born in pairs, and end with mature and shared heuristics. With these findings, we contribute to the literature on heuristics by offering a model for the process of their emergence, a view on how feelings initiate, guide, and strengthen this process, and a description of the role played by the environment, enriching the ecological rationality perspective.

Keywords: managerial heuristics, simple rules, insight, emotions, CEOs

INTRODUCTION

‘This is my main role as CEO: to see the overall picture, to understand it, and to create such guidelines.’ (respondent 11)

Managers learn heuristics from experience (Bingham and Haleblian, 2012) and employ them purposefully (Basel and Brühl, 2013) to guide their decisions in complex situations. Learned heuristics have been positively associated with effective decision-making (Åstebro and Elhedhli, 2006; Gigerenzer, 2008; Wübben and v. Wangenheim, 2008), but also with many aspects of management beyond decision-making, from strategy (Bingham and Eisenhardt, 2011; Eisenhardt and Sull, 2001) and innovation (Manimala, 1992) to organizational learning (Bingham and Haleblian, 2012) and the firm’s survival

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(Pieper et al., 2015). While we know a great deal about the usage of managerial heuristics (Bingham and Eisenhardt, 2011; Gigerenzer and Gaissmaier, 2011) and their outcomes, both in decision-making (Gigerenzer and Brighton, 2009) and beyond (Bingham et al., 2007), we know much less about the process through which they emerge. Despite various calls for research on how heuristics are born and evolve (Ehrig et al., 2021; Maitland and Sammartino, 2015; Ott et al., 2017), surprisingly few studies have investigated how these important cognitive tools emerge. Also, these few studies have either examined the process at team and organizational levels (Bingham and Eisenhardt, 2011; Bingham and Halebian, 2012; Bingham et al., 2019), have studied emergence as a secondary research focus (Guercini et al., 2015), or have proposed conceptual, rather than empirical, models of the emergence process (Atanasiu, 2021; Cavarretta, 2021). Overall, prior empirical research does not offer a clear perspective on the cognitive and associated processes through which heuristics emerge at the level of the individual manager. Models from the sensemaking (Weick et al., 2005) and learning literatures (Crossan et al., 1999) can be employed to describe how managers create heuristics, but these models do not offer a sufficiently granular or specific view of the process. Therefore, a process model of heuristic emergence at the level of the individual manager is needed. This is the key concern of our paper.

We employed a grounded theory approach and, following theoretical sampling principles, we chose CEOs as the managers most likely to generate heuristics from experience. Our research, guided by the question, ‘How do CEOs develop their managerial heuristics?’, details how cognitive and associated processes lead to changes in schemata and result in heuristics. We find that heuristics are born in pairs. After an unexpected problem sparks dissonance, CEOs have a triple insight that leads them to identify and unlearn the flawed assumption that caused the problem (what was not true), to learn a new principle (what is true instead) captured into a conceptual heuristic, and to devise a way to enact this principle (what to do about it) through an operative heuristic. Then, proverbialization, testing, and refining lead to mature heuristics, which, when appropriate, are shared and institutionalized.

This paper makes three theoretical contributions. First, it proposes an empirically grounded model for the complex process that leads to managerial heuristics. We use the patterns discovered in our data analysis to make sense of the flow of states and processes and to disentangle this apparently continuous flow into four discrete phases: *dissonancing*, *realizing*, *crystallizing*, and *organizing*. This contributes to the literature on managerial heuristics, but also to the literatures of organizational learning and sensemaking, as we discuss how we can integrate our model with classical models from these literatures. Second, we conceptualize the role of feelings that initiate, accompany, and facilitate the cognitive process, a veritable emotional roller coaster, from negative pressure at the beginning of the process, to a fulcrum of epiphany-like feelings at the insight, and to a spectrum of positive feelings after that, feelings that offer the heuristic a veritable validation stamp. Third, guided by the principles of ecological rationality (Gigerenzer and Brighton, 2009; Gigerenzer and Gaissmaier, 2011), we describe the role of the environment in sparking the creation, in shaping the development, and in bounding the usage of managerial heuristics.

THEORETICAL FOUNDATIONS

Three Streams of Research on Heuristics

The literature on heuristics can be organized in three streams of research (Bingham and Eisenhardt, 2014): a) the heuristics-and-biases approach, b) the fast-and-frugal approach, and c) the simple-rules approach.

- a) **The heuristics-and-biases approach**, initiated and developed by Amos Tversky and Daniel Kahneman, recognizes the effectiveness of heuristics, but emphasizes their fallibility, concluding: ‘heuristics are quite useful, but sometimes they lead to severe and systematic errors’ (Tversky and Kahneman, 1974, p. 1124). Heuristics studied in this vein – representativeness, availability, anchoring, base-rate neglect, etc. (Kahneman, 2012; Tversky and Kahneman, 1974) – are unintentional, consist of intuitive overgeneralizations or oversimplifications, are not personal, but universal, and are closely linked to error-inducing biases. The main paradigm is the accuracy/effort trade-off, which posits that heuristics may be efficient, but this benefit is counterbalanced by the fact that they lead to less accurate decisions (Devers et al., 2007; Hutchinson et al., 2010; Kahneman and Tversky, 1996; Kahneman, 2012; Tversky and Kahneman, 1973, 1974).
- b) **The fast-and-frugal approach**, led by Gerd Gigerenzer, sees the use of heuristics as an evolution-shaped strength and considers them efficient decision-making tools that do not always sacrifice accuracy; rather, they sometimes provide results as accurate as or even better than elaborate methods. This perspective denies the generality of the accuracy/effort trade-off (Gigerenzer and Gaissmaier, 2011) and focuses on testing the outcome of heuristics versus more complex decision-making algorithms (Gigerenzer, 2016). Using competitive testing, studies in this vein identified examples of heuristics that are more accurate (if only slightly) than more complex methods (DeMiguel et al., 2009; Katsikopoulos et al., 2021; Luan et al., 2019; Wübben and v. Wangenheim, 2008). Another key contribution of the fast-and-frugal approach is describing the heuristic as a decision strategy made of three rules: the search rule, stating where and how to look for information, the stopping rule, deciding when to stop the search, and the decision rule, stating what to do (Artinger et al., 2015; Gigerenzer and Gaissmaier, 2011).
- c) **The simple-rules approach**, advanced by Kathleen Eisenhardt and Christopher Bingham, goes beyond the debate on the immediate outcome of heuristics as decision strategies. Studies in this vein analyze the role of heuristics in capturing strategic opportunities and creating high-performing processes (Bingham et al., 2007; Eisenhardt and Sull, 2001), in organizational learning, showing that when firms learn, they learn heuristics (Bingham and Eisenhardt, 2011; Bingham and Halebian, 2012), in monitoring, and in the survival of family firms (Pieper et al., 2015). As a difference from the other two approaches, the simple-rules stream of literature focuses exclusively on ‘idiosyncratic heuristics that are often consciously understood (...) and can constitute strategy’ (Bingham and Eisenhardt, 2014, p.1698).

All three streams have a common understanding of heuristics as ‘cognitive shortcuts that emerge when information, time, and processing capacity are limited’ (Newell and Simon, 1972, definition cited in papers from all streams: Abatecola, 2014; Bingham and Eisenhardt, 2011; Guercini et al., 2015; Shah and Oppenheimer, 2008; Vuori and Vuori, 2014) and they all stress the important role of heuristics in human and managerial behaviour. The heuristics-and-biases approach and the fast-and-frugal approach share their focus on the immediate outcome of heuristics as decision-making tools, but differ in their conclusion (a negative view versus a positive view) and in the way the outcome (the accuracy of the decision or the prediction) should be assessed. The fast-and-frugal approach and the simple-rules approach share their view of heuristics

as useful tools and focus on the interaction between heuristics and the environment; however they differ on the domain: while the fast-and-frugal stream studies decision-making, the simple-rules stream studies the outcome beyond decision-making, in strategizing and organizing.

As may be inferred from its title, this paper belongs to the simple-rules approach. The research objects of our study are managerial heuristics which are personal, learned from experience, and employed purposefully, as studied in the simple-rules vein. In the rest of this paper, we will use the terms ‘heuristic’ and ‘simple rule’ interchangeably.

Individual vs. Collective Generation – a False Dilemma

The few studies on heuristic generation support two apparently opposing views: that learned heuristics originate either at individual level or collectively. Most of the studies in the simple-rules approach are done at a collective level and describe heuristic generation during discussions (Bingham et al., 2019) or in lessons-learned meetings (Bingham and Haleblian, 2012), admitting, however, that ‘heuristics move from individual-level rules of thumb (...) to firm-level understandings’ (Bingham et al., 2019, p. 121). On the other side, Guercini et al. (2015) showed that heuristics are initially personal, while Gigerenzer et al. (2008) label learning from experience as ‘individual learning’. If we inquire neighboring literatures, we find that sensemaking begins with a sensemaker (Weick, 1995) and that, in organizational learning, ‘insight and innovative ideas occur to individuals, not organizations’ (Crossan et al., 1999, p. 524), with the processes moving from the individual to the group and organization. Similarly, McMahan et al. (2016) describe how groups work better in developing existent ideas, but not necessarily in generating them.

We found two empirical studies on heuristics that may help settle this false dilemma. Eriksson and Kadefors (2017, p. 501) describe that heuristics generated collectively ‘arose ad hoc, as somebody in some meeting or discussion had the luck, or the capability, to summarise something very complex into something very simple’. Suarez and Montes (2019) describe how one member had the insight and acted upon it, but this insight was discussed, transformed into a simple rule, and adopted during a group meeting. This analysis of the literature leads us to believe that heuristics are born in individual or collective settings, but even when generated collectively, the initial insight originates with a single individual who uses the social context to spark it. This structure of the process that starts with one individual led us to conduct our research at the individual level of the managers.

Limited Research on How Heuristics Emerge

While the usage, content, and outcome of heuristics have been studied extensively, knowledge of how managerial heuristics emerge remains theoretically underdeveloped. Bingham and Eisenhardt (2011), Bingham and Haleblian (2012), and Bingham et al. (2019) conducted studies on this topic, looking at simple rules in the context of internationalization. However, they focus on creating taxonomies for simple rules and on describing their role in strategizing, organizational learning, and the microfoundations of capabilities, and only look at emergence as a secondary research focus. All

these three studies use a collective level of analysis. Guercini et al. (2015) have studied the simple rules used by sales-people to manage their meetings and they also address emergence as their secondary research focus, overshadowed by heuristic usage, content, and classification. In a recent special issue of *Management Decision* dedicated to heuristics, two conceptual papers, Cavarretta (2021) and Atanasiu (2021), offer theory-based models of how heuristic are created and evolve. Overall, prior empirical research within the heuristic literature does not offer a clear perspective on how managerial heuristics emerge. As simple rules are *learned* as the result of *sensemaking*, classical models from neighbouring literatures on organizational learning (Crossan et al., 1999) and sensemaking (Weick et al., 2005) can be employed to describe the emergence of managerial heuristics. Both models describe, in clearly delineated steps, processes that originate with the individual and progressively move to group and organization levels. However, the lenses are too general to offer a clear and particularized view on the process of heuristic emergence, supporting the case for our empirical research.

Gigerenzer et al. (2008) argue that the knowledge on how to order cues (a key factor in heuristics) can be the result of evolutionary learning, of social learning (through teaching, imitation, and language, a channel we will discuss while describing how managers share their heuristics), or of individual learning, through direct experience. Managerial simple rules are definitely not the result of evolutionary learning, they can be either learned from others or from our own experience. However, the heuristics learned socially, from others, have also, at some point, emerged from someone's experience. This emergence from individual experience is the focus of our study. Individual learning, which happens when 'evolution, culture, and the vicarious experience of others' (Katsikopoulos et al., 2010, p. 1260) cannot inform on a situation, is the slowest path and can sometimes be 'impossible, when the events are rare or feedback absent or unreliable' (Gigerenzer et al., 2008, p. 232). Our study aims to describe this slow path.

METHODS

Sample and Context

In their seminal paper on methodological fit (2007), Edmondson and McManus place the level of development of prior theory on a continuum between nascent and mature, passing through intermediate. The study of managerial heuristics has increased and diversified in recent years (for reviews, see Artinger et al., 2015; Basel and Brühl, 2013; Guercini et al., 2014; Hafenbrädl et al., 2016; Looock and Hinnen, 2015). Most research on heuristics draws on prior work to propose new concepts and relationships, focusing on identifying types of heuristics, documenting their usage, and assessing their outcome (Atanasiu and Ruotsalainen, 2019), which, according to Edmondson and McManus (2007), qualifies as intermediate theory. By contrast, the emergence of heuristics has received little scholarly attention. This renders the creation of heuristics an area of nascent theory within the larger,

arguably intermediate theory of heuristics. We employed, therefore, a grounded theory approach (Glaser and Strauss, 1967) to ensure methodological fit (Edmondson and McManus, 2007). In order to build and extend theory, we were guided by theoretical sampling principles: we searched for a sample that was 'likely to replicate or extend the emergent theory' (Eisenhardt, 1989, p. 537). Artinger et al. (2015) have found that greater uncertainty and a fast-changing environment are conditions under which heuristics have a better fit. We chose to interview CEOs, because among managers, CEOs are called on to address problems that have the highest degree of unpredictability, in fast-changing environments, making them most likely to generate heuristics. Specifically, we interviewed Romanian CEOs. While Romania is a member of the EU, it is still an 'emerging and developing economy' according to the IMF's World Economic Outlook (October 2018, p. 134), a context that adds uncertainty to its business environment, further ensuring adequate conditions for our study. Interviews were conducted in Romanian, the CEOs' as well as the first author's native language, which added richness to our perspective, mainly when studying the proverbialization phase of articulating insights into heuristics.

Our intention was to conduct four calibrating interviews with CEOs from our personal network and then to randomly select further respondents. However, the pilot interviews revealed that our research explores a highly intimate space for respondents, who may only open up to those they know and trust. Unsolicited remarks throughout the interviews confirmed this decision:

'People would not tell you about such private and intimate details if they did not already know you'. (respondent 26)

'If it had been someone other than you, I wouldn't have been so open, and I wouldn't have been able to formulate things so clearly. It is related to trust'. (respondent 14)

This prompted us to further select interviewees from the personal network of the main author. We therefore sacrificed some randomness for accuracy and depth while taking care to add variation to the sample. We assembled a sample of 31 respondents with stronger and weaker connections with the main researcher (from personal friends to recent acquaintances purposefully recommended by other managers using a snowball method) and we paid close attention to the sample's diversity. The CEOs vary in gender (11 women and 20 men), experience on the job (from less than one year to 22 years, with a mean of 11 years), experience in a managerial position (five to 28 years; the mean is 16 years), name of the position (CEO, co-CEO, managing partner, executive director), additional involvement (shareholder or owner; $n = 21$), domain (e.g., IT, financial services, construction, online retail), the number of employees (from four to 2,400, with a mean of 233), and yearly revenue (from €500,000 to €2 billion). Three of the CEOs no longer held this position at the time of the interview (for 2, 5, and 12 years) and instead pursued careers in academia and consulting. However, their experience with how their heuristics emerged remains valid, and the period of time out of the office adds a useful perspective. In four companies, led jointly by two executives, we interviewed both. The anonymized list of respondents is available in a table in Appendix 1.

Data Collection

We conducted 31 semi-structured interviews with Romanian CEOs in order to learn how they distilled their personal set of heuristics. The number of interactions ensured a rich description of the phenomenon, and we decided to stop collecting data once every emergent theme had enough supporting data and no new themes emerged. We continuously adapted the questions in the interviews to investigate themes that emerged in previous ones. A list of guiding questions can be found in Appendix 2.

We did not use the term ‘heuristic’ to describe the simple rules that we seek; rather, we provided examples (e.g., Jeff Bezos’ two-pizza rule) and played scenarios (the CEO prepares to take a year off to explore a dream destination and chooses a replacement/successor. On the last day of their induction period, the CEO would tell the successor, ‘I will tell you three simple rules that I have learned during my experience here, rules that you cannot find in books. They are:...’; the respondent is encouraged to finish the sentence). After identifying an initial simple rule that the respondent generated, the interview explored context, timeline, feelings, development, etc. The discussion naturally produced additional heuristics that were explored in a similar way. Conversations were intimate and illuminating (respondent 10 said that the interview was ‘*like therapy, it makes me uncover things inside me that I do not access when I think alone*’), which gave us rich details, colorful descriptions of the process, and a large sample of 202 heuristics.

Interviews, lasting between 17 and 70 minutes (mean = 41 minutes), were recorded and transcribed, totaling more than 400 single-spaced pages. A technical issue prevented the recording of the second half of one interview. Upon realizing this, at the end of that session, the main ideas of that segment were reconstructed from memory, written as notes, and confirmed with the respondent.

Data Analysis

We employed inductive coding methodologies (Corbin and Strauss, 2008), specifically the Gioia method (Gioia et al., 2013), to identify themes as they emerge from the data. We performed our analysis in four major steps:

Step one: First order concepts. We started coding the interviews using open coding (a short note containing our understanding of a passage of text) and, where appropriate, in vivo coding (the very words of the informant). Coding was done in English to ensure data access for all authors. We obtained 1059 short codes, which we then placed into an excel sheet. As our interviews describe the stages of a process, we employed a matrix view and paid equal attention to the descriptions of similar aspects by different informants (e.g., answers from multiple respondents concerning the feelings associated with generating a simple rule) and to the complex links between aspects as recounted by the same informant (e.g., in the same interview, the relationship between her feelings and her further use of the simple rule). This matrix view allowed us to group together codes describing the same aspect (e.g., the negative pressure many respondents felt before having an insight) or performing the same function (e.g., what makes the manager more confident in applying the simple rule). A number of 41 such groups (or, as Gioia et al., 2013, call them – ‘categories’) emerged naturally. We ‘then

gave those categories labels or phrasal descriptors, preferably retaining informant terms' (Gioia et al., 2013, p. 20), obtaining 41 *first order concepts* like 'negative pressure' or 'problem is always top of mind'. We generally followed the grounded theory principle of labelling constructs using words from our informants. This paper uses in its title the word 'distilling' as one of several synonyms for 'creating' or 'generating', informed by respondent 20's metaphor for this process: '*you put some things in a barrel, and, after a while, you have a distilled product*'.

Step two: Second order themes. We then observed that the first order concepts depict a flowing process, either describing a state of the process (e.g., a mature schema), a dynamic step between two such states (e.g., sharing), or factors that enable the process (e.g., feelings). We grouped first order concepts in bundles that describe states, steps, or enablers, obtaining 13 *second order themes*, and then we returned to the interviews to verify consistency. In labelling these second order themes, we followed the Gioia method to either use 'existing concepts that leap out because of their relevance to a new domain' (Gioia et al., 2013, p. 20), such as 'dissonance' (Festinger, 1957, 1962) or 'readiness' (Dane, 2020) or to employ 'nascent concepts that don't seem to have adequate theoretical referents in the existing literature' (Dane, 2020) such as 'clarifier'.

Step three: Aggregate theoretical dimensions. We continued by organizing second order themes into aggregate theoretical dimensions that could build a process model and give a straight answer to our research question. We grouped second order themes in *four aggregate dimensions*, 'dissonancing', 'realizing', 'crystallizing', and 'organizing', that correspond to the four steps of the process. Each such aggregate dimension describes one step (the dynamic change in a schema), one state (the resulting schema), and any environmental factors that catalyze the process. The resulting four aggregate theoretical dimensions offer a straight answer to our research question: How do CEOs develop their managerial heuristics? Through dissonancing, realizing, crystallizing, and organizing. The structure of this data is presented in Figure 1.

The fifth aggregate dimension results from aggregating the *enablers* of this process, as presented in Figure 2.

Step four: From data structure to grounded theory. This paper aims to describe the dynamic process of how heuristics emerge. We, therefore, found this quote illuminating: 'As important as the data structure might be, and as much energy as we put into developing it, it is nonetheless a static picture of a dynamic phenomenon, and process research doesn't actually investigate processes unless the static picture – a photograph, if you will – can be made into a motion picture' (Gioia et al., 2013, p. 22). We, therefore, set to translate the data structure into a dynamic process model that can describe the phenomenon we focus upon. An upfront illustration of this process model is depicted in Figure 3.

FINDINGS

In his schema-based perspective on sensemaking, Harris (1994) borrows the concept 'schema' from the social cognition literature and defines it as a cognitive structure that characterizes

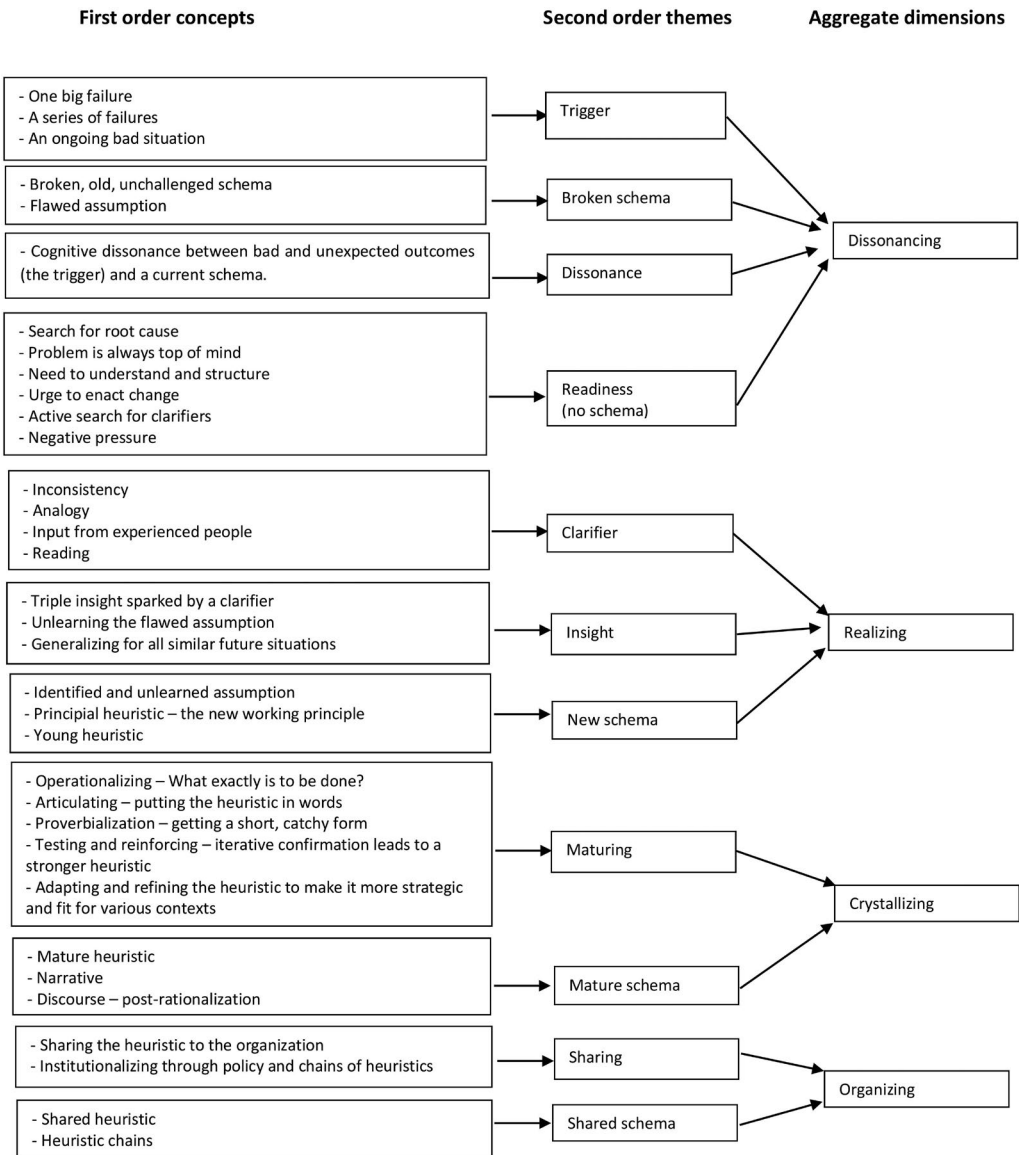


Figure 1. Data structure. Process dimensions

a person’s entire view on a topic, in which existing knowledge is organized and incoming information is encoded. Schemata are dynamic; they constantly adapt to incorporate new information, in a mechanism labelled ‘first-order change’. However, when new information ‘conflicts with the knowledge in a person’s schema’ (Harris, 1994, p. 311), it may lead to a fundamental alteration of that schema, labelled ‘second-order change’ (Bartunek and Moch, 1987, cited in Harris, 1994, p. 311), in which we completely change our perspective on the matter. We found that heuristics are born in pairs from a second-order change in

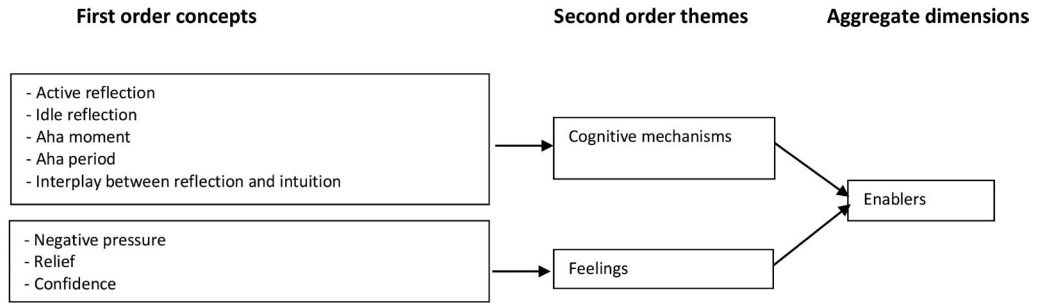


Figure 2. Data structure. Enablers

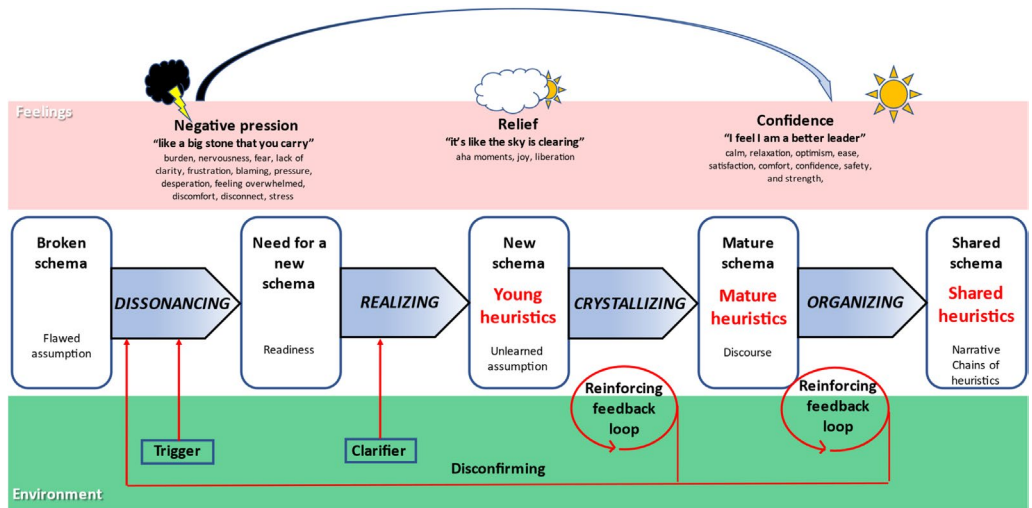


Figure 3. The creation and development of a heuristic

a mental schema (a complete change of perspective) and further develop through a series of first-order changes. Our data describe the states of this process as a sequence of schemata. In between them, our data reveal the complex processes that enable the second-order change (*dissonancing*, from a broken schema to a lack of any schema, and then *realizing*, from this empty state to creating a new schema) and the series of first order changes (*crystallizing*, from a young schema to a mature schema, and *organizing*, from a mature schema to a shared schema), as illustrated in Figure 3.

Our data show how the emergence of simple rules is triggered by a negative outcome that contradicts a current mental schema. This dissonance, along with readiness (Dane, 2020) and an external clarifier, changes the old schema with a new one by producing a triple insight:

- a) an insight about what was flawed in the old schema (the flawed assumption which is identified and consciously unlearned). The manager (in this illustration, respondent 23) is able to say, ‘Previously, I thought

- X, but X was not true' (*'we thought that a client's creditworthiness can be financially calculated, but during the crisis, usual client appraisal methods failed. I realized that you cannot assess a client from a distance, by looking at numbers'*)
- b) an insight about what is true instead, a new principle, captured in the conceptual heuristic, which is less operationable, more guiding – 'I realized that, in fact, Y is true' (*'I realized that the person is more important than numbers'*)

and

- c) an insight about how to translate this new conceptual heuristic into daily behaviour, yielding the operative heuristic – 'I/we must do Z' (*'we don't send offers; we meet people face to face'*).

This is a process of second-order schema change that has heuristics as main byproducts. The new schema is a new way of thinking which is captured in three main building blocks: the identified and unlearned flawed assumption, the new conceptual heuristic, and the new operative heuristic. Then, first-order schema changes occur: the new schema crystallizes, with the young heuristics becoming mature (well-articulated, tested and reinforced, adapted). Then, sometimes, heuristics are shared, accompanied by a narrative (how it all happened), and institutionalized. This schema change process offers the manager a completely different perspective on decision situations. Its products are heuristics, simple rules that help crystallize the new understanding in easy to remember forms that guide behavior. In our example above, before the schema change, clients were evaluated from a distance, using financial tools. After the schema change, the conceptual heuristic *'the person is more important than numbers'* is a newly learned general principle that may guide the respective CEO not only in evaluating new clients, but also in other situations like solving employee-related issues, while the operative heuristic *'we don't send offers; we meet people face to face'*, which, in this illustrative case, is shared into the organization as policy, pragmatically guides the firm's first approach to prospective clients.

The rest of this chapter will detail the four steps of the process and its enablers.

Dissonancing. From a Broken Schema to a Lack of and a Need for a New Schema. Discomfort

'A rule occurs when there is some unresolved issue in your head'. (respondent 4)

Dissonance. What sparks the process of generating a simple rule is a cognitive dissonance between an unexpected outcome and a current schema. First described by the social psychologist Leon Festinger (1957), cognitive dissonance is the psychological discomfort that occurs when we hold beliefs, ideas, or information that are not consistent with each other. In the words of Festinger (1962, p. 94), 'dissonance occurs when an expectation is not fulfilled'. The CEO realizes that an unexpected outcome of their activity is not consistent with the way they currently think; however, they cannot yet identify which assumption of their current schema is flawed. In Festinger's theory, when we do not rationalize away or ignore the new information, cognitive dissonance is the main factor that motivates us, through discomfort, to replace a broken schema. This is the process described by our respondents. For all of them, the trigger of the

Table I. The trigger

<i>Interview samples and examples</i>	<i>First order concept</i>	<i>Second order theme</i>
<i>'5 people quit in a week' (respondent 14)</i> <i>conflict with a client</i>	One big failure	Trigger
<i>'ending up with zero clients' (respondent 7)</i> <i>'entering the red zone' (respondent 11)</i> <i>'200 million-euro project closed mid-way' (respondent 4)</i> <i>'I inherited my father's company and it is failing' (respondent 29)</i>		
<i>'not at first incident, because you may say that it was an exception. After the third incident, if you still didn't get it, you have a problem' (respondent 22)</i>	A series of failures	
<i>poor results</i> <i>lack of performance</i> <i>projects lagging</i> <i>a stream of employees leaving for slightly bigger salaries</i>	An ongoing bad situation	

process was a negative experience: *'all the things I have learned, I learned after banging my head against the wall' (respondent 21)*. This aligns with the findings of Madsen and Desai (2010) and Bingham and Halebian (2012) that managers mainly learn from a negative experience. The trigger can be one major failure (most often), a series of failures, or an ongoing negative situation, as illustrated in Table I.

Readiness. The old schema operates unchallenged, in default mode, until the negative event sparks the process of dissonance. The executive realizes that this trigger contradicts something in her current schema but cannot make sense what exactly, leading to a state of readiness – a search for an explanation and a solution. Dane (2020) has described 'readiness' as a state that precedes insight, characterized by openness to epiphanies and attunement to unfolding events. Our respondents describe it as a state of constant search, in an effort to make sense and structure the problem, which is constantly at the front of the mind – *'it was a problem that kept bothering me' (respondent 17)*. Readiness is also characterized by heightened attention to the environment and a constant search for clarifiers – *'I listen to audiobooks, I read stuff, and things jump out and help me systemize. It's a need that draws cues from the environment' (respondent 28)* and is accompanied by a negative pressure that initiates the urge to change something – *'I was pulling a weight. It made me tired, I didn't sleep well, I kept waking up every hour. I wanted to stop this feeling, so I searched for solutions' (respondent 14)*. A sample of our coding for the features of readiness is presented in Table II.

Readiness characterizes the lack of and the need for a new schema, an uncomfortable intermediate mental state between a broken schema that no longer functions and a new one that has not yet been built; it can last for minutes or months, until a clarifier sparks an insight. The dissonance described by our respondents parallels at an individual level the process depicted at organizational level by the behavioural theory of the firm (Argote and Greve, 2007; Cyert and March, 1992; Gavetti et al., 2012) in which

Table II. Readiness

<i>Interview samples</i>	<i>First order concept</i>	<i>Second order theme</i>
<i>'I felt that there is something there, but I cannot reach it' (respondent 17)</i>	Search for a root cause	Readiness
<i>'because it was such an important topic, it kept coming back to my mind' (respondent 4)</i>	Problem is top of mind	
<i>'I felt the need to systemize it' (respondent 28)</i>	Need to understand and structure the problem	
<i>'if a matter is pressing I solve it much better' (respondent 30)</i>		
<i>'I felt the need to get out of my comfort zone and change something' (respondent 3)</i>	Urge to enact change	
<i>'it's a concern that runs in the background and it needs something to illuminate thing'" (respondent 17)</i>	Active lookout for clarifiers	
<i>'you hear the things that interest you in that moment. If you look for red cars, you only see red cars' (respondent 12)</i>		
<i>'like a big stone that you carry, that is defocusing you from business' (respondent 3)</i>	Negative pressure	

current performance which falls below an aspiration level (organizational cognitive dissonance) leads to problemistic search (organizational readiness) that ultimately generates standard operating procedures (the organizational family of heuristics).

Realizing. From no Schema to a New Schema and a Pair of Young Heuristics. Relief

'It's like living under a roof that leaks and, when such a rule comes to you, it's like replacing the tiles and stopping the leak'. (respondent 24)

CEOs make sense of the negative situation by having a complex triple insight catalysed by a clarifying cue from the environment. The insight results in *identifying* and *unlearning* a flawed assumption (what was wrong), *learning* a new principle and capturing it into a conceptual heuristic (what is true instead), and *enacting* it with an operative heuristic (what to do about it). Heuristics are born during this phase of the process; the fact that they are born in pairs (one conceptual heuristic and one operative heuristic) is a key finding of our research. In accordance with grounded theory principles, we labelled this step 'realizing' based on the fact that most of our respondents gave an account of their insights in sentences beginning with *'I realized'*.

Vignette. Respondent 24, the CEO of an educational services provider, was worried and puzzled by a series of prospective clients who contacted the institution and declared their interest in one of the programs, only to disappear later without any explanation (*the trigger*). She was frustrated by the loss of potential clients, but even more so because she could not understand their behaviour; this frustration and search for a clue

constantly ran in her mind (*readiness*). One day, she saw an ad for a gym, liked it, and called for details. A trainer answered her call, gave her details, and invited her for an activity session. The call ended with the trainer saying he would follow up via email with more information. A few days passed, then more, and the email did not arrive. Her bemusement turned to disappointment; in the end, she decided to never go to that gym. Then, in a veritable aha moment, the first insight hit her, sparked by an analogy (*clarifier*) – *I connected the events with my personal experience, and that is how it came to me*, making her *identify and unlearn* her flawed assumption (what was wrong): *‘previously, I believed that, if you are interested in something, you are interested forever. But then I realized that, in fact, interests come and go and that what happened to me also applies to my clients. The series of lost contracts may have been caused by our answering late, when prospects were no longer interested’*. Then, the CEO had a second insight which made her *learn* a new principle (what is true instead), captured into a conceptual heuristic: *‘my clients have peaks of enthusiasm, which are a good instrument for me to work with’*, later reformulated by adopting the proverb *‘strike while the iron is hot’* to guide her relationship with prospecting customers. The third insight came to guide her how to *enact* the newly learned principle (what to do about it), generating the operative heuristic *‘we answer emails from prospects ASAP, even with just a line’*.

Clarifier. Dissonance generates readiness, characterized by increased attention to the environment, where CEOs look for clarifiers, clues to help them solve the puzzle. In our illustrative case in the vignette, the clarifier is an analogy between two situations. Our respondents remember that insight was sparked by different types of clarifiers: an analogy – *‘mastermind teams must be small to function well, and we realized that business teams must have the same size, as they function similarly’* (respondent 18), an inconsistency, input from someone experienced, or reading something illuminating. A sample of our coding for clarifiers is presented in Table III.

Previous research has identified the power of analogy in sensemaking and strategizing (Cornelissen and Clarke, 2010; Gavetti et al., 2005). Maitlis and Christianson (2014, p. 58) have also acknowledged that the sensemaker needs to extract and interpret cues from the environment, but what they describe is triggers, not clarifiers, which are used ‘as the basis for a plausible account that provides order and makes sense of what has occurred (...) and through which they continue to enact the environment’. Our new construct – clarifier – contributes to a better description of how insight and sensemaking occur.

Triple insight. The term ‘insight’ has been used in many ways in the psychological literature (Ash et al., 2012; Klein and Jarosz, 2011). We favour the definition that describes insight as ‘the reorientation of one’s thinking, including breaking of the unwarranted fixation and forming of novel (...) associations’ (Luo and Niki, 2003, p. 316), which corresponds to a second-order change of a schema. Our data reveal that this second-order change consists of not one, but three insights that lead to *unlearning* the old schema, to *learning* a new one, and to finding a way to *enacting* it. Heuristics are central to this new schema, which consists of three elements: the identified and unlearned flawed assumption, a young conceptual heuristic that captures a new principle, and a young operative heuristic to enact it.

Identifying and unlearning the flawed assumption does not leave an empty space, but rather a clear acknowledgement that the old assumption is wrong. This is the first

Table III. The clarifier

<i>Interview samples and insights</i>	<i>First order concept</i>	<i>Second order theme</i>
<i>'a few years ago, after a failure, I wanted to understand how come the person responsible made such stupid decisions and I kept asking him why? until he started crying in my office. Before that I had this image of myself as this humanistic, encouraging leader, so I said to myself: I am miles away, I need to change something' (respondent 23)</i>	Inconsistency	Clarifier
<i>'mastermind teams must be small to function well, and we realized that business teams must have the same size, as they function similarly. We recognized the parallel with mastermind teams and we said, it just works' (respondent 18)</i>	Analogy	
<i>'a friend who used to be country manager at a big corporation told me about micromanagement' (respondent 2)</i>	Input from experienced people	
<i>'I must follow them, for I am their leader' (Gandhi) (respondent 3)</i>	Reading	

element of the new schema. Developed and introduced to management literature in the 1970s (Nguyen, 2017), the concept of unlearning is important to describe how managers and firms abandon old beliefs, attitudes, and behaviour. Identifying and discarding the flawed assumption is consistent with the construct of 'deep unlearning' (Hislop et al., 2014; Rushmer and Davies, 2004), which occurs rapidly by questioning a basic assumption as a consequence of a direct experience.

Klein and Jarosz (2011) have clearly described the link between insight and the identification of a flawed assumption. We develop extant theory by showing what happens after the flawed assumption is identified: it is purposefully and declaratively unlearned, then a new principle is learned and enacted. After they realize where their schema was wrong (what was not true) – *'I realized that people would not work on projects just because we call them strategic' (respondent 6)*, the executives reconsider their view on the matter, learn the new principle (what is true instead), captured into the conceptual heuristic – *'strategic projects need daily attention'*, and distill the operative heuristic to enact it (what to do about it) – *'strategic projects need to be integrated into processes'*, which aligns with Weick's view that 'sensemaking is about action' (Weick et al., 2005, p. 412). To illustrate further, the CEO and founder of a software company (respondent 2) operationalized the conceptual heuristic *'in order to write good code, developers need to take ownership for their work'* into the operative heuristic *'every time someone writes code, they need to sign it'*. The conceptual heuristic and the operative heuristic help the executive decide on the current situation, but they are also automatically generalized for future similar situations, having, therefore, precedence on future decision strategy selection *'It's not a hard decision anymore, you don't go through all the process, you know what the rule is and you apply it like a banking procedure' (respondent 17)*. This future-oriented role differentiates heuristics from other decision strategies, which inform solely on the current decision.

The insights can occur simultaneously, as happened to the CEO of an online retailer – *'I cannot separate my making sense of the principle from finding a way to do it' (respondent 14)*, or at

distinct moments that are separated by further sensemaking efforts. For some respondents, it happens when alone – ‘*everything happened in my head, I never found conversations very helpful for this*’ (respondent 25); for others during one-on-one conversations ‘*with people I resonate with*’ (respondent 12), leading this CEO to purposefully schedule ‘*monthly one-on-one meetings with people from outside the company*’; yet in other cases, insights happen during group meetings. Our data confirmed our theory-based conclusion that, even when the rule is collectively generated and the trigger is a collective experience, the original insight and its uttering come from one individual. The insight is closely intertwined with a feeling of relief, like a ‘eureka!’ moment (‘eureka’ and ‘heuristic’ have, in fact, a common etymology).

The cognitive path forward, from a flawed assumption, its expected outcome that never appears, the trigger that sparks dissonance, and the clarifier that sparks insight, to identifying and unlearning the flawed assumption, learning a new principle captured in a conceptual heuristics, and devising a way to enact it through an operative heuristic is illustrated with eight coherent examples in Table IV.

The pair of young heuristics. The triple insight is the moment when heuristics are born. The conceptual heuristic and the operative heuristic are central to the managers’ new schema. A heuristic is young, as opposed to mature, when it has not gone through articulating, proverbialization, testing and reinforcing, adapting, and refining (all described in next sections). Fresh out of the generation process, it still carries the imprint of the negative event (the trigger) and the flawed assumption it prompts to unlearn by being formulated as ‘don’t do this anymore’. This restrictive, negative form – ‘*don’t let peaks of enthusiasm pass*’ (respondent 24) is often further refined into a prescriptive rule – ‘*my clients have peaks of enthusiasm which are a good instrument for me to work with*’. Many rules remain restrictive, even after maturing – ‘*don’t make somebody else’s decisions*’ (respondent 25), ‘*we don’t send offers, we meet people face to face*’ (respondent 23), signalling the unlearning process.

A key finding of our study is that heuristics learned from experience come in pairs. Table IV presents eight illustrative cases of such pairs. We assembled a total sample of 202 heuristics, out of which just 13 are not paired with something mentioned in the interview (but their pair can be easily inferred). All the other 189 heuristics are paired, with some conceptual heuristics leading to more than one operative heuristics. For instance, after realizing that a sale involves more than a rational transaction, a CEO (respondent 13) distilled his conceptual heuristic ‘*sales is psychology*’. Further insights led him to four operative heuristics: ‘*first meeting sells the product*’, ‘*client discovery is crucial*’, ‘*in order to sell, you need to build a beautiful story*’, and ‘*all our clients must have, at the moment of decision, a lower offer on the table. If they don’t know where to get a lower offer, we tell them*’. We organized this sample of 202 managerial heuristics in a table in Appendix 3.

Crystallizing. From the New Schema to a Mature Schema and Mature Heuristics. Confidence

‘Then, if you want to check your intuition, you take the numbers and analyze them, and that’s how the magic is validated’. (respondent 7)

Table IV. The cognitive path forward in eight examples

<i>Flawed assumption</i>	<i>Expected outcome</i>	<i>Trigger – unexpected bad outcome</i>	<i>Clarifier</i>	<i>Unlearned assumption</i>	<i>Conceptual heuristic</i>	<i>Operative heuristic</i>
Call projects 'strategic' and people will do them	Strategic projects implemented	Strategic projects lagging	People addressed them rarely, only after completing daily tasks	People will not do projects just because they are called 'strategic'	Strategic projects need daily attention	Strategic projects need to be integrated into processes
Initially I tried to have a less experienced team but still to achieve big results by assigning many tasks to myself.	Big results	GEO overwhelmed, poor sales	Gandhi quote: 'I must follow them, for I am their leader'	I cannot be good at everything, so I should stop trying	It's better to hire experts who can do what you can't, even if they are expensive	A good expert with a big salary is worth more than three average employees with half of that salary
Skills are the only important thing in assessing employees	Skilful people make up performant teams	A skilful employee did not integrate, and I had to fire her	What to tell her when I let her go?	The integration of an employee in the team is more important than skills	Don't hire for skills, hire for attitude	I hire together with my team
If developers can write good code, they will	Good code	Bad code	Nobody takes responsibility for bugs	Code is anonymized, so they don't care if it's bad	Developers need to take ownership and responsibility for what they code	Every time someone writes code, they must sign 'Coded by X'
A client's creditworthiness can be financially calculated	Good assessment of clients	During financial crisis, usual client appraisal methods failed	NA	You cannot assess a client from a distance, by looking at numbers	The person is more important than numbers	We don't send offers; we meet people face to face
The owner is the best manager	Good results	GEO is overwhelmed, bottleneck, not delivering	Consultant	I cannot have in-finite competence and bandwidth	My roles of owner and CEO should not be mixed up	I ask myself weekly if I, as owner, would hire myself as manager

(Continues)

Table IV. (Continued)

<i>Flawed assumption</i>	<i>Expected outcome</i>	<i>Trigger – unexpected bad outcome</i>	<i>Clarifier</i>	<i>Unlearned assumption</i>	<i>Conceptual heuristic</i>	<i>Operative heuristic</i>
Enthusiasm is constant in time	Once they said they are interested, prospects will follow through	Failing to sign prospects who were initially interested	My gym did not respond in time, so I decided not to subscribe	Enthusiasm is not constant, but in peaks	Don't let peaks of enthusiasm pass/ Strike the iron while hot	Email back immediately
Team wants to do the tasks I allocate for them if I pay them well	Team is happy and motivated	Five people quitting in a week	Quitting employees refused a salary counteroffer	It's not about money: they lacked motivation	Team members must take on responsibilities, which leads to motivation	Each member picks tasks in front of the team, without me intervening

Heuristics crystallize through a process of articulation and proverbialization, which renders them more memorable and more able to disseminate, then through continuous testing, which, when confirmed, leads to reinforcing, wider adoption, and broader application, and through constant refining and adapting to the environment.

Articulation and proverbialization. Often, heuristics are enacted without being articulated, but they exist clearly in the CEO's mind – *‘for five years, we acted on it without discussing it; it was not written or acknowledged in any way’* (respondent 21). In the words of a respondent, *‘there certainly is a period between realizing such a principle and verbalizing it’* (respondent 25), which shows that articulation is not a necessary condition for enacting. Weick et al. (2005, p. 413) have defined articulation as the process ‘by which tacit knowledge is made more explicit or usable’. Articulation eventually happens when managers need to share the rule: *‘I got it, but I articulated it much later, when I needed to transfer it to team coaches’* (respondent 28). In a few instances, our interview itself sparked the articulation process: *‘now it’s the first time I verbalized it. But we were practicing it already’* (respondent 31).

In time, the heuristic undergoes a process of proverbialization to become short, clear, and catchy. There is an inherent link between heuristics and proverbs (Atanasiu, 2021), as they are both short, memorable decision-making rules, which gives them ‘mnemonic robustness’ (Shapin, 2001). Eriksson and Kadefors have empirically documented (2017, p. 501) that ‘shared heuristics may take the form of short catchphrases, (...) expressed in common language, thought-provoking, and preferably with a humorous twist’. Katsikopoulos (2011, p. 11; 2016, p. 29) has included some of these traits and their purpose into the very definition of heuristics: ‘models for making decisions (...) that are easy to understand, apply, and explain’. Our respondents characterize the proverbial form of their simple rules as ‘*compressed wisdom*’ (respondent 18) and emphasized brevity as the key feature – ‘*the shorter, the stronger*’ (respondent 4). CEOs proverbialize their heuristics for several reasons: to make them easy to understand and to act upon by others – ‘*they must make people vibrate, understand, and apply them daily*’ (respondent 6); to be easily recalled by their author – ‘*it sounds simple, it’s easy to keep it in mind*’ (respondent 1) and by those with whom it is shared – ‘*I want it to be heard by many and remembered by many*’ (respondent 7); to be easily communicated – ‘*it helps me being concise and inspirational*’ (respondent 9) and further disseminated – ‘*present in everyday language*’ (respondent 23); and for easy adoption – ‘*the shorter, the better accepted. If you explain for 10 minutes, you give opportunity for doubt*’ (respondent 4). In some cases, (n = 22) proverbialization was done in English, making it more impactful – ‘*English is the word of wisdom*’ (respondent 17) and providing a more explicit call to action – ‘*English is more assertive*’ (respondent 28). Two executives captured their conceptual heuristics in actual proverbs: ‘*strike while the iron is hot*’ (respondent 24) and ‘*the fish rots from the head down*’ (respondent 15). Other heuristics are verbalized in proverb-like ways: ‘*try not to walk alone*’ (respondent 27), ‘*look at the person behind the position*’ (respondent 24) and ‘*we don’t send offers, we meet people face to face*’ (respondent 23).

Katsikopoulos et al. (2021) posit that, aside from simplicity, a second reason why heuristics do well under uncertainty and in unstable environments is their transparency, which makes them easy to ‘understand, memorize, teach, and execute’ (Katsikopoulos et al., 2021, p. 150). Proverbialization increases transparency for the creator of the

simple rule, for the ones the simple rule is shared with, and for the ones impacted by its enactment.

Testing, confirming, reinforcing The CEOs test and reinforce their new heuristics – ‘*insight is like the sky is clearing. Then you can’t wait to test it and validate it*’ (respondent 11). Our data describe the constant interaction with the environment via a testing-confirming-reinforcing feedback loop – ‘*when we build something that works, it needs validation through testing. If that works as well, we adopt it, so we don’t have to reinvent it each time*’ (respondent 12). Rieskamp and Otto (2006) also describe how heuristics are selected based on reinforcement learning. Literatures on sensemaking and organizational learning emphasize the role of enactment in acquiring new information. Crossan et al. (1999) have described a loop in which ‘understanding guides action, but action also informs understanding’ (Crossan et al., 1999, p. 524). The role of enactment in sensemaking is crucial, ‘as people play a role in constructing the very situations they attempt to comprehend’ (Maitlis and Christianson, 2014, p. 58).

Testing happens not only at the beginning, but in a constant adapting effort – ‘*it’s in perpetual testing*’ (respondent 26). Confirmation can occur in four different ways: by reaching a positive outcome – ‘*it worked, so I implemented it as a rule*’ (respondent 12); by observing positive side effects – ‘*I also observed that people got better at making decisions, I could see that making their own decisions trains their brain muscle, and this reinforced my principle*’ (respondent 25); by seeing it working elsewhere – ‘*after a while, I saw a successful transformation where incentives were aligned. I certainly would apply it in any big transformation*’ (respondent 4); and by observing the negative effect of not following the rule – ‘*we didn’t follow the rule. Later, we realized that we should have, so it was confirmed*’ (respondent 4). Reinforcing leads to stronger adhesion – ‘*each new hiring brings more validation, the principle is clearly stronger now*’ (respondent 3), wider adoption – ‘*it was confirmed and this made it be adopted by all managers*’ (respondent 6), broader application – ‘*I applied this rule to more situations and bigger budgets*’ (respondent 20), and easier implementation.

Adapting and refining The feedback loop changes the heuristic, making it more generally applicable, more operational, and better adapted to context – ‘*on this new job, we perfected it; it’s already version 3.0*’ (respondent 26) and able to fit larger contexts – from ‘*accounting must understand production*’ to ‘*every administrative department must understand production*’ (respondent 9). Executives may refine the heuristic to allow exceptions: when she realized that a decision involved a large number of sales representatives, a CEO completed the rule ‘*those affected by a decision must always be part of the discussion*’ with the adage ‘*if many people are affected, then we bring in samples*’ (respondent 6). Finally, a heuristic can be refined after obtaining a clearer understanding of the situation. The CEO of a large tech company (respondent 25) initially enacted his conceptual heuristic ‘*I don’t make other people’s decisions*’ through a straightforward operative heuristic: ‘*if the decision is mine, I make it; if it’s yours, I send you away*’. According to the respondent, ‘*I later realized that sometimes they were blocked somehow, and I could help them with information or an intervention, so their request was legitimate. But I still let them make their own decision after giving them what they needed for that. This nuance came to me afterwards*’, making him refine a more empowering version: ‘*if the decision is mine, I make it; if it’s yours, I try to help you make it by providing what you lack*’.

Ecological rationality. The process of heuristic generation and development is closely linked to its environment, as depicted in Figure 3. Heuristics function according to ecological rationality (Gigerenzer, 2008), they are selected from the adaptive toolbox depending on the characteristics of the environment they must serve in and are ecologically fit (Gigerenzer, 2016), functioning best in the environment they were born in.

We have described in the previous subsections how heuristics are automatically generalized for similar future situations and are constantly adapted based on iterative feedback from the environment; while we could not find evidence of discarded heuristics, CEOs declared that future possible disconfirmation would eventually lead to abandoning the rule – *‘if I see it doesn’t work anymore, I will discard it’* (respondent 30). Our model in Figure 3 captures this possibility with an arrow that allows mature and shared schemata to be challenged. However, not all negative feedback results in the adaptation, changing, or discarding the heuristic. One CEO mentioned that *‘even when the immediate outcome is not good, applying the rule makes me feel true to my principles’* (respondent 19). This is coherent with McElreath et al. (2013, p. 381): ‘heuristics succeed or fail depending upon long-term survival and reproduction in a population, not atomistic one-shot payoffs’. However, ‘not only the question of how heuristic strategies are initially selected, but particularly how they are switched after they have become maladapted largely remains a central but not yet sufficiently answered question’ (Artinger et al., 2015, p. 45). The possibility of managers falling in love with their own heuristics and keeping them even after they become maladapted introduces the topic of heuristic stickiness, discussed further below, and opens an interesting path for future research.

In terms of ecological fitness (Gigerenzer, 2016), the capacity of heuristics to function best in an environment similar to the original one, several CEOs mentioned limits of applicability for their simple rules, from the person – *‘some rules are personal, it doesn’t make sense to share them if they don’t fit the other’* (respondent 17), to the business – *‘recipes must be devised in harmony with the business, within the business, you cannot copy them from somewhere else’* (respondent 6), to the size of the business – *‘I work in a small organization, so the rules I have do not apply to large organizations’* (respondent 19), and to the trade – *‘these rules are strictly for salespeople. For someone working in production, they are useless’* (respondent 13).

In its original sense, employed by the fast-and-frugal approach, the ecological rationality of heuristics is discussed and quantified in comparison with more complex algorithms, usually through competitive testing (Gigerenzer, 2016). This paper treats ecological rationality in less detail. Given the qualitative approach of our study, and mainly its focus on heuristics’ emergence and not on heuristics’ outcome, our aim is just to unite the two perspectives by showing that the simple rules we describe are shaped by the environment and obey the principles of ecological rationality. The investigation of the link between ecological rationality and CEOs’ decision-making and simple rules is an interesting path for future research.

The discourse. CEOs rationalize their new schema in a discourse for self- and social-justification, discourse that may emphasize expected benefits – *‘a good commercial will eventually be profitable’* (respondent 10); unexpected benefits – *‘if you involve people in decisions that affect them, they later become ambassadors for the cause’* (respondent 6); why the old assumption was flawed – *‘excessive pressure on*

results makes people cut corners and forget the fundamentals' (respondent 25); how the rule aligns with their values or personal style – 'I would like to be treated this way' (respondent 20); or how the rule is needed for the grand purpose – 'we want a decentralized organization that can scale. Small teams that are aligned on vision, operations, system, and culture allow scaling' (respondent 18). The mature schema is associated with feelings of confidence.

Organizing. From the Mature Schema to a Shared Schema and Shared Heuristics. Strength

'The role of the CEO is to create systems that work and to communicate them in metaphors that can make people vibrate, understand, and apply them daily'. (respondent 6)

Still maintaining the analysis at individual level and the manager as sole informer, we move towards describing shared heuristics that are institutionalized and become part of a shared schema. When appropriate, executives share their heuristics, either explicitly, along with a narrative, cascaded down the organization, or implicitly, by example and by common experiencing and enacting. An interesting finding is that, sometimes, a shared heuristic leads to the birth of subsequent heuristics in the organization – chains of heuristics that help its institutionalization at different levels.

Sharing. Heuristics are shared – 'all our salespeople know that' (respondent 13), leading to a common organizational understanding of how to respond to a category of complex problems. CEOs first share their heuristics to their top management – 'top management team knows it' (respondent 6) and continue to other levels – 'we are cascading this to middle management' (respondent 26). Heuristics are shared explicitly – 'I share them in one-on-one meetings' (respondent 14), or implicitly, by experiencing and enacting the rule together – 'I didn't always tell, but they all know it, we reached a common way of doing things' (respondent 6). The purpose of sharing is to guide client selection, client approach, partner interaction, task allocation, organizational restructuring, team relationships, recruiting and hiring, and people engagement. Given the special setting of our research, we often found that shared heuristics are automatically institutionalized into policies, based on the CEO's hierarchical authority. Sharing is accompanied by feelings of strength and good leadership – 'I feel that I am a better leader' (respondent 14).

The narrative. The CEO embeds the whole story into a coherent narrative, which is crucial for sharing it – 'when I share it, I also share its story, what I did wrong before' (respondent 30), making it easier to adopt – 'if shared without its story, the rule would be ignored. If the story is there, they pay more attention, and they remember better' (respondent 30). This last example is, in fact, a heuristic for sharing heuristics.

Organizing through chains of heuristics. The shared schema sometimes includes a chain of heuristics that institutionalizes the same principle at different levels. We illustrate this with the example of a film production company. One of its main business lines is producing commercials, for which there always is pressure on the budget. The CEO of this company (respondent 10), troubled by the quality/budget trade-off, was inspired by a strange event: a high-quality ad that they initially produced at a loss ended up bringing more money than

expected because its quality made the client broadcast it for a longer period. Sparked by this clarifier, the CEO devised the conceptual heuristic *'a good commercial eventually pays off'*, which led to an operational heuristic for himself – *'I prefer to lose money and make a good commercial than to produce a bad one on a profit'*. This simple rule was institutionalized through two subsequent rules: one created by the CEO for the producers – *'only make cost cuts that do not affect the quality of the production'*, and the other, distilled by the production team themselves in order to prioritize quality over savings – *'we do what the commercial requires'*.

Enablers

The process of creating and developing managerial heuristics is enabled by feelings and by the interplay between reflection and intuition. The data structure for this section is described in Figure 2.

Feelings. A clear emotional journey enables the process and validates the resulting heuristics – *'both my rules were definitely born from feeling'* (respondent 24). The relationship between intuition and feelings has been amply theorized. Dane and Pratt (2007, p. 38) have posited that *'intuiting results in affectively charged judgments'*, while Betsch (2008, p. 4) showed that the outcome of intuition is *'a feeling that can serve as a basis for judgments and decisions'*. The intuition literature only accounts for the positive feelings during and after the insight, but the sensemaking literature (Maitlis and Christianson, 2014) acknowledges the role of emotions in every stage of the sensemaking process, from signalling the need to fuelling the process and finally to increasing the plausibility of the sensemaking account.

Similarly, we found that feelings accompany and facilitate all steps of the process. Heuristic creation is ignited by negative pressure – *'a big stone that you carry and that is defocusing you from business'* (respondent 3) – which characterizes both *dissonancing* and the state of *readiness* and contribute to the active search for a solution; our respondents used descriptors like nervousness, fear, lack of clarity, frustration, blaming, pressure, desperation, feeling overwhelmed, discomfort, disconnect, and stress. Then, in *realizing*, when an insight is reached, there is an epiphany-like sensation – *'like the sky is clearing'* (respondent 11), creating a fulcrum that separates the negative feelings from the subsequent positive ones. Immediately after insight, our informants describe satisfaction, relief, and liberation – *'the pressure is no longer there'* (respondent 14). This “eureka!” feeling and the subsequent sensation of relief contribute to this phase by increasing adherence to the new schema. During the *crystallizing* phase, confidence-type feelings (e.g., calm, optimism, ease, relaxation, safety, comfort) contribute, along with the positive feedback from testing, to reinforcing the new schema into a mature one. The *organizing* phase is associated with feelings of strength and good leadership which encourage and facilitate sharing the heuristics. This emotional roller coaster, illustrated in Figure 3, is, therefore, not merely accompanying the distilling of a heuristic, but actively enabling each of its phases, being crucial for the process.

Moreover, the particular ‘eureka!’ sensation at the moment of insight, coupled with the positive emotions immediately after, result in a veritable validation stamp for the respective heuristics – *'if I feel really fulfilled, proud of myself, liberated, it's a sign that a valuable*

principle was born' (respondent 26). This validation stamp may, in certain situations, make a too strong connection between the heuristic and the manager's identity, becoming an obstacle for revising or discarding a heuristic through the feedback loop and making the heuristic 'sticky'.

Intuition and reflection. Heuristics emerge and develop through a complex interplay between intuition – *'coming up with them has a strong intuitive component: when things connect, it just clicks, and I gain a better understanding of reality'* (respondent 25) and reflection, with heuristic generation being predominantly intuitive and heuristic development mostly reflective. The interplay between intuition and reflection has been intensively studied and theorized (Dane and Pratt, 2007; Hodgkinson and Sadler-Smith, 2018; Sadler-Smith and Hodgkinson, 2016; Salas et al., 2010). The majority of our respondents described the interplay between intuition and reflection in succession – *'first it was intuition, but adopting and implementing it came rationally'* (respondent 17). Reflection is involved in the processes of articulating – *'articulation has to do with reason'* (respondent 26), testing – *'intuition first, because intuition is when you like an idea. Reason comes second and validates'* (respondent 1), and refining – *'the rules came instinctively, but then reason helped me calibrate them'* (respondent 24). This is coherent with the default-interventionist hypothesis (Basel and Brühl, 2013) stating that we first decide based on intuition and the decision is further analyzed by reflection. Other respondents described a less sequential, more intricate interplay between reflection and intuition: *'reason and emotion make up the same circle. They are not opposite, they inform each other'* (respondent 16). Sadler-Smith and Hodgkinson (2016, p. 6) describe a relationship similar to our findings, in which 'intuition catalyzes deeper analysis, and intuition and analysis are complicitous jointly in decision making', a process called 'deep analytic intervention'.

In many instances, CEOs can identify and recall a precise moment in which intuition generated insight – *'I can pinpoint the exact day in the calendar'* (respondent 14) when *'things click[ed]'* (respondent 25) and *'clear ideas kept pouring in my head'* (respondent 17). Other executives had gradual insights (Klein and Jarosz, 2011) – *'it wasn't an "aha" moment, it was an "aha" period'* (respondent 6) with *'small drops that keep adding up, and the moment when I can articulate is months after they happen'* (respondent 16). When asked to describe their reflexive activities that generated heuristics, some CEOs described periods of purposeful, active reflection – *'strategic thinking practiced daily'* (respondent 18) with *'detachment from operational tasks'* (respondent 24), which is not easy to do – *'we are caught in buzz work and don't pay attention to higher order themes'* (respondent 3). Other informants described periods of idle reflection – *'these things are generated during idle time because, as CEO, you are never unplugged'* (respondent 22).

DISCUSSION

We began our article by discussing how our knowledge of managerial heuristics cannot be complete without an understanding of the process through which they emerge; describing it was the key concern that guided our research. Specifically, this study answers the research question 'How do CEOs develop their managerial heuristics?' by outlining a complex process of cognitive schema changes in four phases: *dissonancing, realizing,*

crystallizing, and *organizing*. The process is sparked and guided by the manager's feelings, by interaction with the environment, and is the result of a complex cognitive interplay between intuition and reflection. By combining the four phases and their enablers, we develop a coherent process model that conceptualizes how executives distill heuristics, depicted in Figure 3.

Theoretical Contribution





The main contribution of our research is the process model for heuristic emergence. This study primarily contributes to the heuristics literature, which lacks descriptions of how managerial heuristics are generated at individual level. We build upon previous work that shows how heuristics are born from a negative experience (Bingham and Halebian, 2012) by describing what are the cognitive consequences of that negative experience for the managers themselves and what other processes accompany this cognitive journey at individual level. We show that heuristics are born in pairs, out of a triple insight, and we assemble a database of 202 heuristics that distill managerial experience. We detail the Elaborating phase of the model proposed by Bingham et al. (2019), when managers elaborate their understanding and the heuristics are improved by experience, by showing how managerial heuristics go through a constant feedback loop of testing, adapting, and refining, leading to reinforcing, wider adoption, and broader application. We detail how 'heuristics move from individual-level rules of thumb (...) to firm-level understandings' (Bingham et al., 2019, p. 121) through implicit or explicit sharing and how managers use, when sharing explicitly, the narrative of how the heuristic was born from experienced failure.

The model described in our study can be paralleled with the model proposed by Bingham et al. (2019) to describe how capabilities are created through heuristics and, enlarging our perspective to other literatures, with classical models from the literatures on sensemaking (Weick et al., 2005) and organizational learning (Crossan et al., 1999). This theory integration, depicted in Table V, aims to showcase through different theoretical lenses the journey of a simple rule from an individual creator to a collective use, to make sense of the overlapping phases, and to add empirical support and granular enrichment to these models in the particular setting of the emergence of heuristics. Most research on simple rules focuses upon the collective. By departing from this trend, we reinstate the individual manager in the protagonist role and we show how simple rules connect the two levels of analysis.

Specifically, in our model we show that simple rules have an individual author (a view also supported by Bingham et al., 2019; Guercini et al., 2015) and are born out of a very complex, very personal, and very intense individual process. The process imprints both the simple rule and its author and we explore here some of the effects this imprinting has on the simple rule (e.g. stickiness). We propose researchers to continue on this path and study the effects of this imprinting on the manager, by addressing the question 'What are the consequences of creating simple rules for the manager personally and for her leadership approach?'

We showed that, far from being cold, pragmatic rules designed exclusively for deciding, strategizing, and organizing, simple rules both reflect and enrich the experience of their authors. We therefore believe that shifting the focus to the individual

Table V. Integrating four theoretical models

The 4I model of organizational learning <i>Crossan et al., 1999</i>	Intuiting Experiences Images Metaphors		Interpreting Language Cognitive map Conversation/dialogue		Integrating Shared understandings Mutual adjustment Interactive systems		Institutionalizing Routines Diagnostic systems Rules and procedures	
	Initial presumption	Ecological change	Ongoing updating Sensing anomalies Disruptive ambiguity	Enactment Noticing and bracketing	Selection Retrospective attention New presumption Mental models Articulation	Organizing through communication		
The sensemaking model <i>Weick et al., 2005</i>	Seeding Executives begin by seeding the process with imperfect heuristics							
Capability creation through heuristics <i>Bingham et al., 2019</i>	Elaborating Managers elaborate their understanding of what task to perform and how to perform it							
	Broken schema Flawed assumption	Dissonancing Trigger	Need for a new schema Readiness	Realizing Clarifier Triple Insight	New schema Unlearned assumption Conceptual Heuristic Operational heuristic	Crystallizing Articulating, testing, Refining	Mature schema Mature heuristics Discourse	Abstracting Abstracting key heuristics away from any one experience
This study								

and researching simple rules and the managers who create them as dyads may yield important insights that cannot be perceived in separate analyzing. Consequently, we invite scholars of simple rules to utilize a bifocal lens that can focus upon both levels of analysis, collective and individual, in an attempt to detail the microfoundations of strategizing and organizing.

The second contribution of our study is the description of the central role played by feelings in the process of heuristic creation, thus opening a first path between these previously disconnected literatures. We believe that future research following this path will yield interesting insights. We also show how feelings interact in the specific context of heuristic creation with insight, intuition, and sensemaking, thus enriching not only the knowledge on heuristics, but also these respective literatures. Recent research on sensemaking (Meziani and Cabantous, 2020) extends this contribution by describing, in a different setting, the interaction between feelings, intuition, sensemaking, cognition, and discourse. We show that the emotional roller coaster not only accompanies the process of heuristic emergence, but plays a central role in sparking it, in validating the heuristic, and in encouraging its further development and application. We posit that, coming after a negative pressure, the relief felt at insight and the confidence and strength associated with later stages put a veritable validation stamp on the heuristic. The ‘stickiness’ of heuristics caused by the emotional validation stamp may partially explain the fact that none of our respondents could recall discarding a heuristic. Recent experiments (Laukkonen et al., 2020, 2022) have shown that the feeling associated with an aha moment can make the new belief seem more true or valuable than it really is, even when the aha moment was artificially induced. The benefits and pitfalls of this validation stamp and, generally, of the feelings associated with generating heuristics constitute an interesting topic for future research.

Our research makes a third contribution to the heuristics literature by shedding additional light on aspects concerning ecological rationality (Gigerenzer, 2008) and ecological fitness (Gigerenzer and Brighton, 2009; Gigerenzer and Gaissmaier, 2011), core concepts of the fast-and-frugal approach. While recent research (Luan et al., 2019) shows that heuristics perform better when they fit the environment, we describe the process through which they become ecologically fit. Our study describes how the manager’s adaptive toolbox (Artinger et al., 2015) is initially populated with heuristics; how heuristics mature in repeated contact with the environment through loops of testing, adapting, and reinforcing; and how they have limits of applicability at person-, business-, or trade-level. Finally, we hint upon the limited power of feedback to change a heuristic when it becomes imprinted in the identity of its creator, with good long-term effects (ignoring one instance of negative feedback may be beneficial for the long-term survival of the heuristic, as posited by McElreath et al., 2013), or with bad long-term effects (a too-strong affective validation stamp can lead to a heuristic becoming sticky). Consequently, future research can address this paradoxical lack of adaptability of a previously adaptable tool in an attempt to answer the questions ‘When, how, and to what effect do heuristics survive negative feedback from the environment?’.

Practical Implications

Aside from scholarly impact, our phenomenon-based research aims for practical impact (Wickert et al., 2021) through two practical applications. Our findings show that, despite considering them valuable, managers acknowledge, articulate, and share their simple rules less often than they wish. The fact that our interviews were considered illuminating and that in some cases *'helped verbalize ideas that are still unformed in my head'* (respondent 10) leads us to propose two useful tools for practitioners, one for individual managers and one for teams.

The first is based on our findings about the triple insight and it helps managers acknowledge and articulate their own simple rules. The tool consists in encouraging the manager to write down the lessons they learned from experience in a given format that maps the triple insight: 'Previously, I thought that (...), but then I realized that (...). Now, I/we (...)'. This format yields concrete forms of a) the acknowledged and unlearned false assumption, b) the conceptual heuristic, and, respectively, c) the operative heuristic. This simple framework can be used to encode existing lessons into an ever growing personal portfolio of simple rules.

The second beneficial use of our study, this time for teams, was revealed to us through one of the interviews. The CEO of a tech company, respondent 3, said, *'this kind of discussion is good for creating a repository of lessons learned, a reminder to apply them and to communicate them to the team for alignment'*. McClory et al. (2017) have found that few organizations identify and capture lessons learned. According to Love et al. (2016), one way to make the lessons-learned process efficient is having lessons documented, communicated, and archived. As our findings show that the articulation and proverbialization of a heuristic increases both its future use and its future sharing, we believe that teams could use heuristics to document, communicate, and store their lessons-learned as managerial proverbs in the collective memory of teams. We, therefore, recommend the project manager conducting the lessons-learned meeting to explore our model and to conclude the meeting by guiding the team to articulate a simple proverb-like rule to encompass each lesson.

Limitations and Other Directions for Future Research

We have discussed in other sections of this paper several limitations and several paths for future research. More generally, our findings are based on subjective accounts. Self-reporting can lead to a distorted view of a phenomenon, especially of one so intimate as the one we study. Also, as our respondents recalled events, cognitive processes, and emotions from the past, they may have reconstructed some of the details by retrospective sensemaking, leading to recall bias. However, we have tried to minimize these shortcomings by having identified patterns and similarities in different accounts and by distilling our theoretical aspects after comparing and integrating all of them. Further methods of investigation may bypass these shortcomings.

A longitudinal study is often required to accurately describe how a process unfolds. The initial insights of our process, however, may sometimes occur more or less simultaneously or in a matter of minutes, making a timeline irrelevant. The passing of a

heuristic from an individual to the team and organization, which is only described briefly in our paper, would surely benefit from future longitudinal research.

While maintaining focus on the individual level, our research did not explore all the aspects of collective generation by harvesting different perspectives from more participants. Previous research in the simple-rules approach has described this process at a meso-level; our study aims to complement it by detailing the individual perspective. Future empirical research at different levels of analysis may enrich our findings and refine our theoretical conclusions.

Methodologically, the relationships between the concepts we distilled could have been better explored and described using cognitive mapping and graphical representations (e.g. Maitland and Sammartino, 2015) and we believe that future studies using this kind of techniques may refine our findings and yield interesting new insights.

The scope of our study is to describe how CEOs develop their managerial heuristics. However, an interesting question is whether our findings can be generalized to any type of manager, given that the CEO is a special position and this may have a particular influence on the process. For instance, with notable exceptions, CEOs usually share their heuristics based on their hierarchical authority, and not based on their expert authority, which leaves little space for questioning and testing at the organizational level. Nevertheless, while our study is clearly about CEOs, we believe that most of our findings may apply to heuristics developed by any type of manager; this is surely an interesting path for future research.

CONCLUSION

We return to the opening quote of this paper – *‘this is my main role as CEO: to see the overall picture, to understand it, and to create such guidelines’ (respondent 11)*. Far from being a secondary process, we found that the creation and development of heuristics is a core role of a leader. Counterintuitively, our data show that it is a role that leaders themselves rarely acknowledge or control. We have started to unveil a process that will benefit both science, by better understanding heuristics as decision-making and leading tools, and practice, by making explicit the art of making implicit knowledge explicit through managerial heuristics.

APPENDIX 1

LIST OF RESPONDENTS

	<i>Gender</i>	<i>Position</i>	<i>Industry</i>	<i>Sales (mil Euros)</i>	<i>No. of employees</i>	<i>Years of experience on the job</i>	<i>Years of experience in a managerial position</i>
Respondent 1	m	CEO and owner	automotive	160	2400	20	20
Respondent 2	m	CEO and owner	software development	2.5	50	18	20
Respondent 3	m	CEO and shareholder	recruitment	2	32	6	9
Respondent 4	f	CEO (former)	insurance	2000	800	6	20
Respondent 5	m	co-CEO	online marketing	3	30	7	14
Respondent 6	f	CEO	marketing	9	150	3	8
Respondent 7	f	CEO	online publishing	na	50	4	8
Respondent 8	f	CEO and owner	education	0.9	70	14	14
Respondent 9	f	co-CEO and owner	film production	1.5	25	19	19
Respondent 10	m	co-CEO and owner	film production	1.5	25	19	22
Respondent 11	m	CEO and shareholder	transport	0.3	15	8	15
Respondent 12	m	co-CEO and shareholder	online marketing	3	30	9	23
Respondent 13	m	CEO and owner	furniture	4.2	50	10	15
Respondent 14	m	CEO and shareholder	online retail	1.5	11	2	6
Respondent 15	m	CEO and owner	online retail	21	60	14	14
Respondent 16	m	CEO and owner	software development	200	1500	15	15

APPENDIX I. (Continued)

	<i>Gender</i>	<i>Position</i>	<i>Industry</i>	<i>Sales (mil Euros)</i>	<i>No. of employees</i>	<i>Years of experience on the job</i>	<i>Years of experience in a managerial position</i>
Respondent 17	f	Executive Director	NGO funding	1	8	7	12
Respondent 18	m	co-CEO and shareholder	leasing	54	600	13	18
Respondent 19	f	Managing Partner	education services	0.5	4	9	14
Respondent 20	m	co-CEO and shareholder	education services	6 zeroes	50	15	20
Respondent 21	m	co-CEO and shareholder	education services	6 zeroes	50	10	10
Respondent 22	m	CEO and owner	constructions	6 zeroes	35	22	22
Respondent 23	m	co-CEO and shareholder	leasing	54	600	13	23
Respondent 24	f	CEO	education services	0.5	4	3	8
Respondent 25	m	CEO (former)	technology	100	100	10	28
Respondent 26	f	CEO and shareholder	real estate	8	100	19	25
Respondent 27	f	CEO and owner	financial services	40	200	20	20
Respondent 28 (former)	m	CEO and shareholder					
	market research	6 zeroes	40	17	17		
Respondent 29	f	CEO	real estate	7 zeroes	72	4	10
Respondent 30	m	CEO and shareholder	software development	0.5	25	4	12
Respondent 31	m	CEO	online marketing	0.5	25	1	5

APPENDIX 2

INTERVIEW GUIDE

Preliminary

- What is your position in this company?
- What does the company do?
- What is the sales figure?
- How many employees?
- How many years of experience do you have in this position?
- How many years of experience do you have in a managerial position?

Core

Context: You win the lottery, become a millionaire and leave for (the Bahamas), after successfully selecting the best candidate to take your job – someone just like you when you started. What three advices/principles/guiding rules that you have learned on the job would you tell them that would help them in this job? Examples: Jeff Bezos devised a rule for the size of internal teams at Amazon: *Every internal team should be small enough that it can be fed with two pizzas*. Another example: *when looking to open a new restaurant, owners do not want to pay more than 4 days revenue*. Yet another one: I heard Daniel Dines, from UiPath, saying that his guiding principle is to *push the decision as low as possible in the organization*. Did you develop such strategies, principles, simple rules? Can you name 3?

For rule 1, then 2, then 3:

- Can you tell me how did you come up with it? And why?
- Tell me about the problem and the context.
- When exactly did this guiding rule occur to you?
- What was the context?
- How did finding and articulating it made you feel?
- What lead to you finding it?
- Was there a trigger experience?
- Why this solution? Why then?
- Why did it occur to you? Why then?
- What happened between the aha moment and the final articulation?
- Did it have a previous form? Did you adapt it, modify, generalize it?
- How did you articulate it? And why?
- When would you change this rule?
- Did you ever give up on such a rule? Why?
- Can you sum up in one phrase how did you come up with this rule?

Wrapping up

- If you were to use a metaphor for this process of rule creation, what would that be?
- How is coming up with such rules related to the job of manager/CEO?
- Do you consider these rules as guiding rational or intuitive decision-making?
- Do you share these guiding rules with others? With whom? Why?
- Do you/your company have a lessons learned process? Did it ever spark the collective creation of such rules?
- Was this conversation helpful to you? Why?

APPENDIX 3

THE COLLECTION OF HEURISTICS

Conceptual heuristic	Operative heuristic
I must hire people better than me.	It's better to hire expensive experts who can do what you can't
It's better to hire expensive experts who can do what you can't	A good expert with a big salary is worth more than three average employees with half that salary.
Focus more on scaling than on financing	I don't allow myself to worry that we're running out of money more than an hour a day.
I should be closer to the people in my team.	I organize beer evenings every Wednesday
I should curb my risk avoidance, because companies tend to look like their leaders.	Between two tasks we should choose the riskier one, not the more defensive one.
I should curb my risk avoidance, because companies tend to look like their leaders.	We shouldn't be busy with defensive stuff (GDPR, upgrades) that does not bring any value.
Even without consensus, disagree, but decide and commit.	We discuss, and if there is no consensus, someone needs to assume/undertake a decision, while the others trust and help him/her.
We always need to have code review.	We (management) pick the person to do code review and they are not allowed to do anything else until that is done
The accounting department must understand production	In order to prevent mishaps, people from administrative departments need to keep asking 'why' until they understand.
Treat people as their best profile.	When hiring, I don't look for weaknesses, I look at how that person can shine.
Just f@#%ing do it	When discussion about whether and how to start a new project lingers, we test with a pilot.
A good commercial pays off in the end.	I prefer to lose money and make a good commercial than to produce a bad one on a profit (CEO level)
I prefer to lose money and make a good commercial than to produce a bad one on a profit (CEO level)	Only make cuts that do not affect the quality of the production (producer level)
Only make cuts that do not affect the quality of the production (producer level)	We do what the spot requires (team level)
It doesn't make sense to force yourself in times of day when your energy is down	In my schedule I put important things, things when I need to think clearly, in the morning, before 11am.
The core goal of the Foundation is to help people with initiative	Criterion for selecting to finance projects: is it from the bigger picture?
It's ok to fail	I give people the responsibility to do their work as they see fit
I give people the responsibility to do their work as they see fit	I don't tell people how to do their tasks

(Continues)

APPENDIX 3. (Continued)

Conceptual heuristic	Operative heuristic
Value the people more than anything else	I had a switch from valuing the process, the activity, to valuing the relationship with the people/team
Your people are in the center of the business.	If you don't build a team, you can have as many clients as you want, it doesn't help.
Managers have to earn their spot as leaders.	I give them responsibilities to lead a team after they work as team member for 2–3 months.
Don't spend more than you can afford	Costs with employees (salaries, trainings, bonuses) must not be more than 40% of total costs.
If you involve people in decisions that affect them, they later become ambassadors for the cause.	Those affected by a decision must be part of the discussion
Those affected by a decision must be part of the discussion	Everybody should be at the table. If many people are affected, then we bring in samples.
Objectives should be over-communicated rather than under-communicated	It's better to say it 10 times in order to be executed once.
Strategic projects need daily attention	Strategic projects must be integrated in processes
Sales is psychology	First meeting sells the product.
Sales is psychology	Client discovery is crucial
Sales is psychology	In order to sell, you need to also build a beautiful story
Sales is psychology	All our clients must have, at the moment of decision, a lower offer on the table. If they don't know where to get a lower offer, we tell them.
Intuition is crucial in assessing clients.	The person is more important than numbers
The person is more important than numbers	We don't send offers, we meet people face to face.
The roles of owner and CEO should not be mixed up	I ask myself weekly if I, as owner, would hire myself as manager.
The client's interest takes precedent over the firm's interest.	If they are opposite, I investigate why.
I only recruit people that have the potential to someday become the CEO of the company.	I only communicate decisions along with CEO-level explanation.
Motivating the team without making them accountable does not work	The best way is when people themselves take responsibility. My role is to guide them to do it. Each member takes on tasks in front of the team, without me intervening
A person needs three touchpoints to become a client	A lead needs to come in contact with our brand three times, through three different channels.
A lead needs to come in contact with our brand three times, through three different channels.	The lead must find out about us from somebody: an influencer, some PR, then he needs to search for something and, during the search, to find us through AdWords, and finally we target him on Facebook or somewhere
Clients have peaks of enthusiasm and we must identify them and act while they last.	Strike while the iron is hot (actual proverb)
Strike while the iron is hot (actual proverb)	Email back immediately

APPENDIX 3. (Continued)

Conceptual heuristic	Operative heuristic
I don't know better than the people in my team and it's cool to learn from them	Listen to your people.
Listen to your people.	It is better to allow people in my team to find their own solutions than to tell them what to do.
Look at the person behind the position.	Ask personal questions during recruitment interviews.
Don't make somebody else's decisions.	If the decision is mine, I take it, if it's yours, I try to help you make it by providing what you lack
Evil is three times more powerful than good.	In a transformation effort you need three time more allies than enemies.
Evil is three times more powerful than good.	In a sales process, if the decision to buy is made by a group, you need to have three times more sponsors than adversaries.
Evil is three times more powerful than good.	You need to give positive feedback three times more often than negative feedback for a good work relationship.
The fish rots from the head down (proverb)	I structure the company so that it can function without me
Managers should share their knowledge	If my managers don't share their knowledge, I create contexts.
I need to value instinct more.	In assessing a project, it's either 'Hell yeah! or no'
There needs to be a constant alignment process within the management team.	Before every decision-making meeting, we align the state of mind and the motivation around the table.
Try not to walk alone. But also, be aware who you walk with.	I motivate the top line of managers by transforming them in entrepreneurs (taking them as partners)
Try not to walk alone. But also, be aware who you walk with	Protect your private space.
Recurrent revenue must cover the salaries	No new hiring until increase in recurrent revenue
Hire for attitude not for skills	The integration of an employee in the team is more important than skills
The integration of an employee in the team is more important than skills	I hire together with the team
Developers need to take ownership and responsibility for what they code.	Every time someone writes code, he needs to sign 'Coded by X'
Teams function based on respecting and accepting differences, the other's quirkiness.	'Allow each other, dears!' (quote from Grandmother)
Don't be afraid to sell expensive	Big companies have big budgets, it's important how you frame the problem
I find capable people as pillars for the company, I delegate, and I leave them do their job.	Don't be in their way and be sure they have resources
In constructions, the client wants to be always right	Even if you know better, you need to pretend that he is

(Continues)

APPENDIX 3. (Continued)

Conceptual heuristic	Operative heuristic
People in the team should not delegate upwards	When subordinates come to you with a problem, you must hold advice until they also propose 3 alternative solutions.
No one specific thing that we do is a key contributor to our success	If it were, someone would have copied. I am not afraid of that.
Root cause for all any problem is miscommunication with the client	The client must never say they didn't know
In this organization, we want people to be at work the way they are outside the office	When recruiting, we look for people with a relaxed attitude and who do not take themselves too seriously.
When small teams grow, their dynamics change	A team must not have more than 10 members. And it must have a leader.
1) we did the same thing for all users; 2) few got results, many didn't. 3) I believed that it's easy and anyone can do it. All these could not be true together.	There is no talent, everybody needs to work hard.
A decision that you feel is right pushes you to give your best for that thing to happen	I listen to my instinct, even if I don't have data to support my decisions
No bargaining like at the marketplace	When a prospect tries to obtain a discount without an explanation, we say no
Things do not turn out well just because you are experienced or good or you deserve it.	For each important task we need to make a detailed step-by-step scenario.
Never start huge transformations unless you have aligned incentives.	If a manager seems to agree, but at the end asks, 'What does this mean for me and my team?', that manager is not aligned and will block the process
If cash is low, we pay those who call	When credit line reaches 10%, I only pay suppliers if they call three times
Expectations that are not addresses from the beginning are hard to mend later	All our discussions with a client start with asking what are their expectations.
Expectations that are not addresses from the beginning are hard to mend later	I tell clients brutally honest, from the beginning, what to expect.
With clients, the fact that I am right should not count.	In a dispute with a client I no longer say what comes to mind first, I take my time.
If you can detach yourself from a tense situation and look beyond the harsh behavior of the other, you realize that they all are frightened children that don't know what to do with their lives	I treat employees and clients with the same kindness I treat children
Most people build trust by expecting trust or by showing that they are trustworthy and this is harmful for the organization.	Start building trust by giving it
Excessive pressure on results makes people cut corners and forget the fundamentals	Management by progress is better than management by objectives

APPENDIX 3. (Continued)

Conceptual heuristic	Operative heuristic
Management by progress is better than management by objectives	If you didn't reach your objective, but made progress, I emphasize your progress. I will not say it's ok to miss your objective, but I will praise your progress.
The employees are more important than the clients	I want to build a company I would have liked to work for.
In any business you must choose one key indicator	What's your number?
What's your number?	Renting rate must be over 80%
1-on-1 discussions are key for learning and insight	I spend 50% of my time outside of the office, talking to people outside the company
When things go wrong, I do not look for the one responsible, because that person is me	When analyzing a failure I open conversation with stating this, in order to take the blame out of the room
Every team must have a noble purpose, beyond the business goal	Every internal team must choose an educational project to fund
Managers' tendency is to avoid admitting a mistake for fear of losing authority. In fact, that's when they lose authority, when everybody realize they made a mistake and they don't want to admit it.	Managers should accept that they can err and should welcome criticism from their team.
Don't put more than one objective at a time	You need to prioritize objectives and take them one by one
It is impossible to design successful complex products	The only way to create a successful complex product or process or system is through evolution
The only way to create a successful complex product or process or system is through evolution	Start with identifying the most important assumption that can be tested and validated with the least effort. Then go to the next one.
I refuse to finance people who lie.	We refuse clients in default who come to ask for a grace period in a limo and wearing a 100k watch.
Any new idea generates an initial wave of enthusiasm, then, during analysis, people find reasons to drop it.	Don't let them choose not to do something
Conversations tend to be drowned in interesting things and we miss the point.	It's important to make the difference between what's interesting and what's important
In teams, sometimes good people create less and less value because of toxic members who fill all the space	My responsibility goes first towards the team and then towards the individuals
My responsibility goes first towards the team and then towards the individuals	Coaching the team is more important than coaching 1-on-1
A position of leadership is a position of support, not of authority.	A leader's role is to support the success of those around her
Teams function based on respecting and accepting the other's quirkiness	We are all different and we must respect that / Allow the other to be imperfect / 'Allow each other, dears!' (quote from Grandmother)

(Continues)

APPENDIX 3. (Continued)

Conceptual heuristic	Operative heuristic
Business communication is similar to communication in a relationship	We must translate for our clients tech language into business language, because that's what they care about.
Business communication is similar to communication in a relationship	When you want your wife, mother, friend to do something, you follow some steps. It should be the same in business
Business communication is similar to communication in a relationship	If we don't communicate our perspective and our efforts, the other may take things easily or for granted /
If we don't communicate our perspective and our efforts, the other may take things easily or for granted /	if we don't say what we did, the client may perceive our efforts as too little for our fee
We grow personal brands	We send our tech specialists to be Google trainers, speakers at events, they publish on our blog
I should force myself to delegate	I prioritize the tasks that which I cannot delegate and which, left undone, can block the whole process
If shared without its story, the rule would be ignored. If the story is there, they pay more attention and they remember better	When I share a rule, I also share its story, what I did wrong before
I realized that you cannot be good at everything, you cannot improve that much, it's better to hire someone who can do what you can't	I hire people who complement my skills set
Not paired	
In a project, it's better to avoid having more than one crucial variable at the same time.	
Law does not allow for the specificities of our sector (construction)	
You are not in competition with your service suppliers	
You don't sue your regulator	
It's important that the firm can function without me.	
I should build a structure that can function without me	
Each agency is like the agency manager.	
No matter how difficult the situation, things are not as bad as they seem	
Managers should accept that they can err and should welcome criticism from their team.	
The cool factor does not pay the salaries.	
Decisions are influenced by your momentary state of mind	
Solve the simple problem	

REFERENCES

- Abatecola, G. (2014). ‘Untangling self-reinforcing processes in managerial decision making. Co-evolving heuristics?’. *Management Decision*, **52**, 934–49.
- Argote, L. and Greve, H. R. (2007). ‘A behavioral theory of the firm – 40 years and counting: Introduction and impact’. *Organization Science*, **18**, 337–49.
- Artinger, F., Petersen, M., Gigerenzer, G. and Weibler, J. (2015). ‘Heuristics as adaptive decision strategies in management’. *Journal of Organizational Behavior*, **36**, S33–52.
- Ash, I. K., Jee, B. D. and Wiley, J. (2012). ‘Investigating insight as sudden learning’. *The Journal of Problem Solving*, **4**, 1–27.
- Åstebro, T. and Elhedhli, S. (2006). ‘The effectiveness of simple decision heuristics: Forecasting commercial success for early-stage ventures’. *Management Science*, **52**, 395–409.
- Atanasiu, R. (2021). ‘The lifecycle of heuristics as managerial proverbs’. *Management Decision*, **59**, 1617–41.
- Atanasiu, R. and Ruotsalainen, R. (2019). ‘The role of managerial heuristics in organizational decision-making and beyond’. *Academy of Management Proceedings*, 11516–56.
- Basel, J. S. and Brühl, R. (2013). ‘Rationality and dual process models of reasoning in managerial cognition and decision-making’. *European Management Journal*, **31**, 745–54.
- Betsch, T. (2008). ‘The nature of intuition and its neglect in research on judgment and decision making’. In Plessner, H., Betsch, C. and Betsch, T. (Eds), *Intuition in Judgment and Decision Making*. Mahwah, NJ: Lawrence Erlbaum, 3–22.
- Bingham, C. B. and Eisenhardt, K. M. (2011). ‘Rational heuristics: The “simple rules” that strategists learn from process experience’. *Strategic Management Journal*, **32**, 1437–64.
- Bingham, C. B. and Eisenhardt, K. M. (2014). ‘Response to Vuori and Vuori commentary on “Heuristics in the strategy context”’. *Strategic Management Journal*, **35**, 1698–702.
- Bingham, C. B., Eisenhardt, K. M. and Furr, N. R. (2007). ‘What makes a process a capability? Heuristics, strategy, and effective capture of opportunities’. *Strategic Entrepreneurship Journal*, **1**, 27–47.
- Bingham, C. B. and Halebian, J. (2012). ‘How firms learn heuristics: Uncovering missing components of organizational learning’. *Strategic Entrepreneurship Journal*, **6**, 152–77.
- Bingham, C. B., Howell, T. and Ott, T. E. (2019). ‘Capability creation: Heuristics as microfoundations’. *Strategic Entrepreneurship Journal*, **13**, 121–53.
- Cavarretta, F. L. (2021). ‘On the hard problem of selecting bundles of rules: A conceptual exploration of heuristic emergence processes’. *Management Decision*, **59**, 1598–616.
- Corbin, J. and Strauss, A. (2008). *Basics of Qualitative Research*, 3rd edition. Thousand Oaks, CA: Sage.
- Cornelissen, J. P. and Clarke, J. S. (2010). ‘Imagining and rationalizing opportunities: Inductive reasoning and the creation and justification of new ventures’. *Academy of Management Review*, **35**, 539–57.
- Crossan, M. M., Lane, H. W. and White, R. E. (1999). ‘An organizational learning framework: From intuition to institution’. *Academy of Management Review*, **24**, 522–37.
- Cyert, R. M. and March, J. G. (1992). *A Behavioral Theory of the Firm*, 2nd edition. Malden: Blackwell Business.
- Dane, E. (2020). ‘Suddenly everything became clear: How people make sense of epiphanies surrounding their work and careers’. *Academy of Management Discoveries*, **6**, 39–60.
- Dane, E. and Pratt, M. G. (2007). ‘Exploring intuition and its role in managerial decision making’. *Academy of Management Review*, **32**, 33–54.
- DeMiguel, V., Garlappi, L. and Uppal, R. (2009). ‘Optimal versus Naive diversification: How inefficient is the 1/N portfolio strategy?’. *The Review of Financial Studies*, **22**, 1915–53.
- Devers, C. E., Wiseman, R. M. and Holmes, R. M. (2007). ‘The effects of endowment and loss aversion in managerial stock option valuation’. *Academy of Management Journal*, **50**, 191–208.
- Edmondson, A. C. and McManus, S. E. (2007). ‘Methodological fit in management field research’. *Academy of Management Review*, **32**, 1246–64.
- Ehrig, T., Katsikopoulos, K. V., Jost, J. and Gigerenzer, G. (2021). ‘An exploratory study of heuristics for anticipating prices’. *Management Decision*, **59**, 1750–61.
- Eisenhardt, K. M. (1989). ‘Building theories from case study research’. *Academy of Management Review*, **14**, 532–50.
- Eisenhardt, K. M. and Sull, D. N. (2001). ‘Strategy as simple rules’. *Harvard Business Review*, **79**, 100–16.
- Eriksson, T. and Kadefors, A. (2017). ‘Organisational design and development in a large rail tunnel project - Influence of heuristics and mantras’. *International Journal of Project Management*, **35**, 492–503.
- Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Evanston: Row, Peterson.
- Festinger, L. (1962). ‘Cognitive dissonance’. *Scientific American*, **207**, 93–106.

- Gavetti, G., Greve, H. R., Levinthal, D. A. and Ocasio, W. (2012). 'The behavioral theory of the firm: Assessment and prospects'. *Academy of Management Annals*, **6**, 1–40.
- Gavetti, G., Levinthal, D. A. and Rivkin, J. W. (2005). 'Strategy making in novel and complex worlds: The power of analogy'. *Strategic Management Journal*, **26**, 691–712.
- Gigerenzer, G. (2008). 'Why heuristics work'. *Perspectives on Psychological Science*, **3**, 20–29.
- Gigerenzer, G. (2016). 'Towards a rational theory of heuristics'. In Frantz, R. and Marsh, L. (Eds), *Minds, Models and Milieux, Archival Insights into the Evolution of Economics*. London: Palgrave Macmillan, 34–60.
- Gigerenzer, G. and Brighton, H. (2009). 'Homo heuristics: Why biased minds make better inferences'. *Topics in Cognitive Science*, **1**, 107–43.
- Gigerenzer, G. and Gaissmaier, W. (2011). 'Heuristic decision making'. *Annual Review of Psychology*, **62**, 451–82.
- Gigerenzer, G., Hoffrage, U. and Goldstein, D. G. (2008). 'Fast and frugal heuristics are plausible models of cognition: Reply to Dougherty, Franco-Watkins, and Thomas (2008)'. *Psychological Review*, **115**, 230–39.
- Gioia, D. A., Corley, K. G. and Hamilton, A. L. (2013). 'Seeking qualitative rigor in inductive research: Notes on the Gioia methodology'. *Organizational Research Methods*, **16**, 15–31.
- Glaser, B. and Strauss, A. (1967). *The Discovery of Grounded Theory*. Chicago, IL: Aldine.
- Guercini, S., La Rocca, A., Runfola, A. and Snehota, I. (2014). 'Interaction behaviors in business relationships and heuristics: Issues for management and research agenda'. *Industrial Marketing Management*, **43**, 929–37.
- Guercini, S., La Rocca, A., Runfola, A. and Snehota, I. (2015). 'Heuristics in customer-supplier interaction'. *Industrial Marketing Management*, **48**, 26–37.
- Hafenbrädl, S., Waeger, D., Marewski, J. N. and Gigerenzer, G. (2016). 'Applied decision making with fast-and-frugal heuristics'. *Journal of Applied Research in Memory and Cognition*, **5**, 215–31.
- Harris, S. G. (1994). 'Organizational culture and individual sensemaking: A schema-based perspective'. *Organizational Science*, **5**, 309–21.
- Hislop, D., Bosley, S., Coombs, C. R. and Holland, J. (2014). 'The process of individual unlearning: A neglected topic in an under-researched field'. *Management Learning*, **45**, 540–60.
- Hodgkinson, G. P. and Sadler-Smith, E. (2018). 'The dynamics of intuition and analysis in managerial and organizational decision making'. *Academy of Management Perspectives*, **32**, 473–92.
- Hutchinson, J. W., Alba, J. W. and Eisenstein, E. M. (2010). 'Heuristics and biases in data-based decision making: Effects of experience, training, and graphical data displays'. *Journal of Marketing Research*, **47**, 627–42.
- IMF. (2018). *World Economic Outlook, October 2018*. Washington: World Economic and Financial Surveys.
- Kahneman, D. (2012). *Thinking, Fast and Slow*. London: Penguin.
- Kahneman, D. and Tversky, A. (1996). 'On the reality of cognitive illusions'. *Psychological Review*, **103**, 582–91.
- Katsikopoulos, K. V. (2011). 'Psychological heuristics for making inferences: Definition, performance, and the emerging theory and practice'. *Decision Analysis*, **8**, 10–29.
- Katsikopoulos, K. V. (2016). 'Behavior with models: The role of psychological heuristics in operational research'. In Kunc, M., Malpass, J. and White, L. (Eds), *Behavioral Operational Research*. London: Palgrave Macmillan, 27–45.
- Katsikopoulos, K. V., Schooler, L. J. and Hertwig, R. (2010). 'The robust beauty of ordinary information'. *Psychological Review*, **117**, 1259–66.
- Katsikopoulos, K. V., Simsek, O., Buckmann, M. and Gigerenzer, G. (2021). 'Transparent modeling of influenza incidence: Big data or a single data point from psychological theory?'. *International Journal of Forecasting*, **38**, 613–19.
- Klein, G. and Jarosz, A. (2011). 'A Naturalistic study of insight'. *Journal of Cognitive Engineering and Decision Making*, **5**, 335–51.
- Laukkonen, R. E., Kaveladze, B. T., Protzko, J., Tangen, J. M., von Hippel, W. and Schooler, J. W. (2022). 'Irrelevant insights make worldviews ring true'. *Scientific Reports*, **12**, 1–9.
- Laukkonen, R. E., Kaveladze, B. T., Tangen, J. M. and Schooler, J. W. (2020). 'The dark side of Eureka: Artificially induced aha moments make facts feel true'. *Cognition*, **196**, 104122.
- Loock, M. and Hinnen, G. (2015). 'Heuristics in organizations: A review and a research agenda'. *Journal of Business Research*, **68**, 2027–36.
- Love, P. E. D., Teo, P., Davidson, M., Cumming, S. and Morrison, J. (2016). 'Building absorptive capacity in an alliance: Process improvement through lessons learned'. *International Journal of Project Management*, **34**, 1123–37.
- Luan, S., Reb, J. and Gigerenzer, G. (2019). 'Ecological rationality: Fast-and-frugal heuristics for managerial decision making under uncertainty'. *Academy of Management Journal*, **62**, 1735–59.

- Luo, J. and Niki, K. (2003). 'Function of Hippocampus in "Insight" of problem solving'. *Hippocampus*, **13**, 316–23.
- Madsen, P. M. and Desai, V. (2010). 'Failing to learn? The effects of failure and success on organizational learning in the global orbital launch vehicle industry'. *Academy of Management Journal*, **53**, 451–76.
- Maitland, E. and Sammartino, A. (2015). 'Decision making and uncertainty: The role of heuristics and experience in assessing a politically hazardous environment'. *Strategic Management Journal*, **36**, 1554–78.
- Maitlis, S. and Christianson, M. (2014). 'Sensemaking in organizations: Taking stock and moving forward'. *Academy of Management Annals*, **8**, 57–125.
- Manimala, M. J. (1992). 'Entrepreneurial heuristics: A comparison between high PI (pioneering-innovative) and low PI ventures'. *Journal of Business Venturing*, **7**, 477–504.
- McClory, S., Read, M. and Labib, A. (2017). 'Conceptualising the lessons-learned process in project management: Towards a triple-loop learning framework'. *International Journal of Project Management*, **35**, 1322–35.
- McElreath, R., Wallin, A. and Fasolo, B. (2013). 'The evolutionary rationality of social learning'. In Hertwig, R. and Hoffrage, U. (Eds), *Simple Heuristics in a Social World*. New York: Oxford University Press, 381–408.
- McMahon, K., Ruggeri, A., Kämmer, J. E. and Katsikopoulos, K. V. (2016). 'Beyond idea generation: The power of groups in developing ideas'. *Creativity Research Journal*, **28**, 247–57.
- Meziani, N. and Cabantous, L. (2020). 'Acting intuition into sense: How film crews make sense with embodied ways of knowing'. *Journal of Management Studies*, **57**, 1384–419.
- Newell, A. and Simon, H. A. (1972). *Human Problem Solving*. Englewood Cliffs, NJ: Prentice-Hall.
- Nguyen, N. (2017). 'The journey of organizational unlearning: A conversation with William H. Starbuck'. *The Learning Organization*, **24**, 58–66.
- Ott, T. E., Eisenhardt, K. M. and Bingham, C. B. (2017). 'Strategy formation in entrepreneurial settings: Past insights and future directions'. *Strategic Entrepreneurship Journal*, **11**, 306–25.
- Pieper, T. M., Smith, A. D., Kudlats, J. and Astrachan, J. H. (2015). 'The persistence of multifamily firms: Founder imprinting, simple rules, and monitoring processes'. *Entrepreneurship Theory and Practice*, **39**, 1313–37.
- Rieskamp, J. and Otto, P. E. (2006). 'SSL: A theory of how people learn to select strategies'. *Journal of Experimental Psychology: General*, **135**, 207–36.
- Rushmer, R. and Davies, H. (2004). 'Unlearning in healthcare: Nature, importance and painful lessons'. *Quality and Safety in Health Care*, **13**, 10–15.
- Sadler-Smith, E. and Hodgkinson, G. P. (2016). 'An analytic-intervention model of managerial intuition'. *Academy of Management Proceedings*, **1**, 11831–36.
- Salas, E., Rosen, M. A. and DiazGranados, D. (2010). 'Expertise-based intuition and decision making in organizations'. *Journal of Management*, **36**, 941–73.
- Shah, A. K. and Oppenheimer, D. M. (2008). 'Heuristics made easy: An effort-reduction framework'. *Psychological Bulletin*, **134**, 207–22.
- Shapin, S. (2001). 'Proverbial economies: How an understanding of some linguistic and social features of common sense can throw light on more prestigious bodies of knowledge, science for example'. *Social Studies of Science*, **31**, 731–69.
- Suarez, F. F. and Montes, J. S. (2019). 'An integrative perspective of organizational responses: Routines, heuristics, and improvisations in a mount everest expedition'. *Organization Science*, **33**, 537–73.
- Tversky, A. and Kahneman, D. (1973). 'Availability: A heuristic for judging frequency and probability'. *Cognitive Psychology*, **5**, 207–32.
- Tversky, A. and Kahneman, D. (1974). 'Judgment under uncertainty: Heuristics and biases'. *Science*, **185**, 1124–31.
- Vuori, N. and Vuori, T. (2014). 'Comment on "Heuristics in the strategy context" by Bingham and Eisenhardt (2011)'. *Strategic Management Journal*, **35**, 1689–97.
- Weick, K. E. (1995). 'The collapse of sensemaking in organizations: The Mann Gulch disaster'. *Administrative Science Quarterly*, **38**, 628–52.
- Weick, K. E., Sutcliffe, K. M. and Obstfeld, D. (2005). 'Organizing and the process of sensemaking'. *Organization Science*, **16**, 409–21.
- Wickert, C., Post, C., Doh, J., Prescott, J. and Prencipe, A. (2021). 'Management research that makes a difference: Broadening the meaning of impact'. *Journal of Management Studies*, **58**, 297–320.
- Wübben, M. and von Wangenheim, F. (2008). 'Instant customer base analysis: Managerial heuristics often get it right'. *Journal of Marketing*, **72**, 82–93.