

The representativeness heuristic at work in decision-making: building blocks and individual-level cognitive and behavioral factors

Ilaria Galavotti, Andrea Lippi and Daniele Cerrato

Department of Economic and Social Sciences, Università Cattolica del Sacro Cuore, Piacenza, Italy

Abstract

Purpose – This paper aims to develop a conceptual framework on how the representativeness heuristic operates in the decision-making process. Specifically, the authors unbundle representativeness into its building blocks: search rule, stopping rule and decision rule. Furthermore, the focus is placed on how individual-level cognitive and behavioral factors, namely experience, intuition and overconfidence, affect the functioning of this heuristic.

Design/methodology/approach – From a theoretical standpoint, the authors build on dual-process theories and on the adaptive toolbox view from the “fast and frugal heuristics” perspective to develop an integrative conceptual framework that uncovers the mechanisms underlying the representativeness heuristic.

Findings – The authors’ conceptualization suggests that the search rule used in representativeness is based on analogical mapping from previous experience, the stopping rule is the representational stability of the analogs and the decision rule is the choice of the alternative upon which there is a convergence of representations and that exceeds the decision maker’s aspiration level. In this framework, intuition may help the decision maker to cross-map potentially competing analogies, while overconfidence affects the search time and costs and alters both the stopping and the decision rule.

Originality/value – The authors develop a conceptual framework on representativeness, as one of the most common, though still poorly investigated, heuristics. The model offers a nuanced perspective that explores the cognitive and behavioral mechanisms that shape the use of representativeness in decision-making. The authors also discuss the theoretical implications of their model and outline future research avenues that may further contribute to enriching their understanding of decision-making processes.

Keywords Decision making, Overconfidence, Intuition, Heuristics, Experience

Paper type Conceptual paper

Introduction

The dynamics that guide individual decision-making have for long represented a vibrant research focus in multiple fields. Acknowledging that the aim of decision-making is “to choose the most effective action given the current situation” (Sloman and Fernbach, 2017, p. 53), a well-established premise in the decision-making literature is that the effectiveness of decisions is inextricably intertwined with human cognitive limitations in processing information and with the time devoted to the decision process. The exploration of the cognitive mechanisms that enable to make high-quality decisions relatively quickly has therefore become a preferred research territory in studies on decision-making



(e.g. [Gigerenzer, 2008](#)). This line of inquiry lies at the core of dual-process theories, which suggest that cognitive processes may be categorized into two main families: Type 1 processes – being fast and intuitive- and Type 2 processes – being slower, reflective and analytical ([Sloman, 1996](#); [Kahneman and Frederick, 2002](#)). Dual-process theories recognize that a key tension exists between intuitive and analytical decision schemes and extensive academic efforts have been primarily devoted to understanding whether Type 1 and Type 2 occur in series or concurrently (e.g. [Hodgkinson and Sadler-Smith, 2018](#)).

Among the cognitive mechanisms that affect the decision-making process, heuristics, broadly defined as “any principle or device that contributes to the reduction in the average search to solution” ([Newell et al., 1962](#), p. 85), play a fundamental, though highly debated role. Yet, while the “heuristics and bias approach” has traditionally blamed heuristics for being inferior decision-making strategies (e.g. [Tversky and Kahneman, 1982](#)), a more positive approach, grounded in the “fast and frugal heuristics” perspective ([Gigerenzer, 2001](#)), has gradually emerged, suggesting that heuristics are not necessarily sub-optimal routes to a decision (e.g. [Gigerenzer, 2007](#)). Rather, they enable to navigate uncertainty and to solve complex decision situations at both individual and organizational levels ([Davis et al., 2009](#); [Mousavi and Gigerenzer, 2014](#); [Artinger et al., 2015](#)): since decision-making in business environments is inherently characterized by uncertainty ([Guercini and Milanesi, 2020](#)), using simple rules to make strategic decisions is not only justified but can be even more effective than more cognitively demanding approaches ([Bingham and Eisenhardt, 2011](#)). Hence, taking an opportunity-capturing perspective, firms learn portfolios of heuristics ([Bingham and Halebian, 2012](#)) that nurture the ability to flexibly seize opportunities in turbulent environments ([Eisenhardt and Sull, 2001](#)) and that consist of boundary rules (which opportunities to pursue), how-to rules (details on how to execute opportunities), priority rules (rank of acceptable opportunities), timing rules (the rhythm for executing opportunities) and exit rules (when to drop opportunities) ([Eisenhardt and Sull, 2001](#); [Bingham and Eisenhardt, 2011](#)).

Our paper, therefore, aims to contribute to the research on heuristics by specifically focusing on representativeness as one of the most common and extensively discussed heuristics in human judgment ([Hogarth, 1987](#)). Its relevance in entrepreneurial and managerial decision-making is indeed largely acknowledged ([Guercini and Milanesi, 2020](#)), as testified by several studies, such as [Kohlas \(1989\)](#) in real estate management, [Johnson \(1983\)](#) in predictions of corporate bankruptcy, [Maitland and Sammartino \(2015\)](#) in the assessment of potential acquisition candidates in conditions of uncertainty, [Guercini et al. \(2015\)](#) in customer–supplier interactions and [Luan et al. \(2019\)](#) in personnel selection. However, despite its popularity, the cognitive processes that underlie representativeness have been limitedly explored and remain vaguely defined and conceptualized ([Gigerenzer, 1996](#)). Thus, a major gap addressed in this paper concerns the process by which this heuristic operates.

Building on the perspective that the human mind is equipped with an adaptive toolbox of heuristics that are composed of building blocks ([Gigerenzer, 2008](#)), we explore the foundations of representativeness. From a theoretical standpoint, we propose a framework that, drawing upon dual-process theories of decision-making, elaborates the building blocks that form the architecture of representativeness. In other words, the analysis proposed in this paper is conducted by integrating elements of contrasting theoretical perspectives: our framework adopts a modeling approach based on building blocks, as developed by the “fast and frugal” perspective, to structure a heuristic rule that was introduced by the “heuristics and biases” approach.

Furthermore, given the complex and multifaceted nature of the decision-making process and the multiple cognitive and behavioral aspects involved, we explore how the representativeness heuristic is shaped by different intervening factors. Specifically, we

analyze how the decision maker's experience, intuition and overconfidence affect this heuristic.

To the best of our knowledge, this is the first attempt to develop an integrative framework of representativeness and to bring together two relevant bodies of literature on heuristics, namely dual-process theories and the adaptive toolbox perspective. Doing so, we offer a richer understanding of the cognitive and behavioral mechanisms underlying the use of representativeness in decision-making.

Dual-process theories of decision-making: the role of heuristics

The classical economic theory considers the *homo oeconomicus* as a perfectly rational entity able to perform mental simulations of future consequences of all possible alternatives and to choose the one that maximizes the expected utility (Von Neumann and Morgenstern, 1944). In reality, human behavior demonstrates violations of this paradigm (Kahneman and Tversky, 1979). The observation that decision-making is subject to deviations from expected utility has therefore encouraged the exploration of how judgments of subjective probability are formed. A plethora of experiments specifically designed to describe how decisions are made in an economic and financial setting (e.g. Thaler, 1991) confirm that the subjective perception of what is deemed fair in an economic transaction does not depend only on objective figures. Instead, it is guided by a framework of reference that is shaped by the magnitude of stimuli and the perceived subjective intensity of sensation (Deco et al., 2007).

The study of the microfoundational mechanisms that affect decision-making at the individual, group and organizational levels has revealed that humans make decisions based on two fundamental information-processing systems: Type 1 systems, faster and intuitive, and Type 2 systems, having an analytical nature that follows the laws of probability. Cognitive (e.g. Shiffrin and Schneider, 1977) and social (e.g. Chaiken, 1980) psychologists have long recognized the inherent tension between the activation of minimal cognitive efforts to improve the decision-making efficiency and the need for detailed information processing to maximize the quality and effectiveness of the final decision.

The distinction between the systems by which the human mind operates when making decisions is at the core of dual-process theories (Hodgkinson and Sadler-Smith, 2018). Such theories may be broadly grouped into two main classes, namely default–interventionist (e.g. Evans and Stanovich, 2013; Kahneman and Frederick, 2002) and parallel–competitive (e.g. Epstein et al., 1996; Lieberman, 2000; Sloman, 1996; Barbey and Sloman, 2007) theories, based on how the interplay between Type 1 and Type 2 systems is conceived.

Specifically, according to default–interventionist theories, the default approach in human decision-making is to rely on less costly Type 1 processes, while Type 2 processes may, though not necessarily, intervene depending on the focal task relative to the information processing capacity of the decision maker (Kahneman, 2011). As opposite, parallel–competitive theories, such as the cognitive–experiential self-theory of personality (Epstein et al., 1996) and social cognitive neuroscience (Lieberman, 2000), assume that Type 1 and Type 2 processes interact and operate in parallel. For instance, according to Epstein and colleagues' cognitive–experiential self-theory, human information processing is the product of a bidirectional and parallel interaction between an intuitive experiential system and an analytical rational system, the combination of which influences behavior (Epstein et al., 1996; Pacini and Epstein, 1999).

Research has suggested that, especially under conditions of uncertainty, heuristics play a significant role in decision-making (Guercini and Milanesi, 2020). The dominant tendency in the "heuristics and bias approach" (Tversky and Kahneman, 1982) has been to discredit heuristics as shortcut rules of thumb since they enact only Type 1 systems (Kahneman and Frederick, 2002): building on the assumption that decision accuracy is inversely related to

decision speed, heuristics have been traditionally blamed for being the manifestation of human cognitive limitations and hence inferior decision-making strategies that lead to nonrational and sub-optimal decision solutions. This logic has, however, been controverted by the “fast and frugal heuristics” paradigm (e.g. [Gigerenzer, 1991](#)), according to which the simple fact that heuristics enact less information-intensive and analytically complex paths to a decision does not automatically imply that they are less accurate. In other words, being cognitive shortcuts does not mean that they are the reflection of mental shortcomings nor do they necessarily result in second-best decisions ([Artinger et al., 2015](#)). This positive approach has encouraged the rehabilitation of heuristics as a cognitive tool with an adaptive value ([Guercini and Milanese, 2020](#)): heuristics are not irrational; rather they activate a different form of rationality, i.e. an ecological rationality, which occurs when there is a match between the heuristic and the decision environment ([Gigerenzer, 2001, 2004](#); [Lejarraga and Pindard-Lejarraga, 2020](#)).

Building on this more favorable viewpoint on heuristics, some scholars have argued that, although typically regarded as manifestations of the Type 1 system, heuristics are not necessarily unconscious ([Artinger et al., 2015](#)) and may actually involve also the Type 2 system as they are based on rules that, though simple, are explicit ([Betsch, 2008](#)). In fact, according to the “fast and frugal” perspective, the human mind is equipped with an adaptive toolbox of heuristics, composed of building blocks, that can be adjusted and adapted to fit a given situation ([Gigerenzer, 2008](#)). By specifying the building blocks that rule their inner workings, heuristics thus become even more objective and transparent than complex decision strategies ([Luan et al., 2019](#)). In this paper, we embrace this view and explore the foundations of the representativeness heuristic.

The representativeness heuristic: foundations and building blocks

First described by [Tversky and Kahneman \(1971\)](#), representativeness may be defined as the “[E]valuat[ion] of the probability of an uncertain event, or sample, by the degree to which it is: (1) similar in essential properties to a parent population, or, (2) reflects the process by which it is generated” ([Kahneman and Tversky, 1972](#)), i.e. the probability of an event, or sample, is based on how well it represents the population from which it is drawn or the process that produced it ([Kahneman and Tversky, 1972](#); [Tversky and Kahneman, 1982](#)). Representativeness is hence a cognitive simplification process that affects the evaluation and selection of alternatives ([Nisbett and Ross, 1980](#); [Schwenk, 1984](#)).

In the analysis of this heuristic, we build on the adaptive toolbox perspective ([Gigerenzer, 2001](#)), according to which individuals intuitively evaluate whether and to what extent a given heuristic fits a specific environment, i.e. its ecological rationality ([Gigerenzer, 2008](#)). Heuristics that match particular environments are ecologically rational because they allow decision makers to make adaptive decisions that are based on a combination of accuracy, speed and frugality ([Gigerenzer, 2001](#)). Therefore, the accuracy of a heuristic is a function of its degree of match with the specific decision domain in which it is used. To elaborate on the ecological rationality of representativeness, we follow an established route in the literature and disentangle its building blocks.

In general terms, [Gigerenzer \(2008\)](#) suggests that heuristics are composed of three building blocks, i.e. search rules, stopping rules and decision rules, which fulfill three main functions, namely giving search directions, stopping the search and making a decision, respectively. Search rules determine which information is searched for and in which order. Specifically, search may be regarded as the exploration of two different dimensions, i.e. the search for alternatives (the choice set) and the search for cues that allow the evaluation of the alternatives ([Gigerenzer, 2001](#)).

While traditional models of search include random search, ordered search and search by imitation, in the context of representativeness, search is rather guided by analogical thinking.

Making analogies is indeed the core impulse to a heuristic of representativeness (Schwenk, 1984), and when framing decisions in conditions of uncertainty, it becomes a “psychologically plausible” (Gigerenzer, 2001) problem-solving strategy. Theories of decision-making under uncertainty at both the individual (Gilovich, 1981) and organizational levels (Schwenk, 1984) suggest that, especially when faced with an unfamiliar and equivocal domain, decision makers tend to search for associations with past situations from which helpful directions may be drawn. The power of analogies derives from the fact that they allow the creation of matches between a familiar situation with an unfamiliar one in such a way that inferences may be projected from the former to the latter (Gavetti *et al.*, 2005). Because past information is used to assess possible alternative representations of the problem to make it consistent with the individual’s experience, the use of analogies compensates for the absence of immediate solutions and simplifies decision-making (Newell and Simon, 1972). Thus, experience plays an important role in search as it represents archival knowledge that is, more or less consciously, preserved in an individual’s memory and that hence serves as a basis for mapping the search (Gavetti *et al.*, 2005).

Information derived from experience includes both information that is relevant for the current decision problem and information that is irrelevant, i.e. noise (Gigerenzer, 2008). Identifying which information is irrelevant and needs to be ignored to avoid overfitting is fundamental to attain ecological rationality and represents a key imperative for the decision maker. Gigerenzer (2008) suggested that the quantity of noise is a function of the difficulty to predict a criterion: the greater the uncertainty, the greater the portion of past information that is potentially irrelevant. When heuristics reduce the chances of overfitting of past information, they are said to be robust (Gigerenzer, 2008); robustness may be spurred by either deliberately ignoring some pieces of information or by cognitive limitations such as forgetting.

The second building block consists of a stopping rule, which fulfills the function of terminating the search at a certain point. Stopping requires that the decision maker makes a judgment on the sufficiency of the acquired information compared to the need of gathering additional information.

According to theories of optimization under constraints, stopping rules require balancing the costs of acquiring additional information against the completeness and accuracy of that information (Browne and Pitts, 2004). Therefore, both overacquiring and underacquiring represent errors in the process of information gathering as they reflect a sub-optimal application of stopping rules (Connolly and Thorn, 1987).

In contrast, in the adaptive toolbox perspective, stopping rules “do not try to compute an optimal cost-benefit tradeoff” (Gigerenzer, 2001, p. 44): heuristics make guesses on the environment based on past experience or limited search, thus leading to choose the option that exceeds an aspiration level without attempting any exhaustive, optimization-oriented analysis (Gigerenzer, 2008).

The dual-process perspective provides a particularly helpful framework to specify which stopping rule is used when a representativeness heuristic is at play. According to parallel-competitive theories and, specifically, to cognitive-experiential self-theory of personality (Epstein, 2003), the experiential system is both adaptive and emotionally-driven. Within this framework, four human basic needs drive decision-making and behavior: the pleasure principle, i.e. the need to maximize pleasure and minimize pain, the need for relatedness, the need to maintain stability and coherence in a person’s conceptual system and the need to enhance self-esteem. While these needs may all be equally important, according to cognitive-experiential self-theory, decision-making results from their temporary compromise given the specific circumstances.

In the context of representativeness, where cues are searched for on the basis of a representational similarity with the situation at hand, we propose that the stopping rule that

will be activated is the representational stability of the problem situation. This stopping rule suggests that search is stopped when more cues point to the same problem representation, which is a signal that the problem situation is stable. In other words, search is stopped when a convergence upon a consistent representation of a decision problem is achieved, i.e. when additional information no longer changes the current representation. From an ecological rationality perspective, this additional information is irrelevant and can hence be ignored by the decision maker. The convergence of representations satisfies the need to maintain the stability and coherence of the decision maker's conceptual system.

The third building block is the decision rule, which implies that, once search is stopped, a decision is made. Building on the previous considerations, the decision rule for representativeness is to opt for the course of actions that has received the greatest stability in its representation and that satisfies, i.e. that exceeds the decision maker's aspiration level.

To exemplify how these building blocks work, we can draw from the international business field as a key context where heuristics operate (Guercini and Milanese, 2020). Let us consider foreign market entry mode decisions and specifically assume the case of a multinational firm that has to decide about an equity-based entry into an emerging market. The firm's track record of international operations indicates that previous entries in emerging markets were executed through joint ventures in order to share the risks with a partner, but in some cases the management faced difficulties in handling the relationship with the partner. The decision process starts by searching among previous experiences of international expansion those that are more relevant, i.e. similar, to the current decision. Similarity may be assessed in terms of (1) institutional, macroeconomic and cultural contexts, thus leading the decision maker to select only experiences in emerging markets or in the same geographic region of the target foreign location; (2) type of entry modes, thus suggesting the exclusion of prior entries via nonequity modes. In the search stage, prior entries into foreign markets are therefore ranked according to their degree of analogy with the current situation and those that are less representative are considered noise and are not taken into account. Once the selected prior experiences converge toward a stable and coherent course of action, search is stopped: in our example, previous experience in joint ventures will be considered more representative of the current foreign market entry decision. The management will choose the mode of entry that offers more opportunities to exceed the aspiration level, i.e. that has been more positively rewarded in the past. Specifically, in view of the previous difficulties in handling the relationship with the partner, the management will opt for a joint venture as long as this entry mode is expected to be satisfactory in terms of relationship management.

In the remainder of the paper, we explore the individual cognitive and behavioral mechanisms that are enacted during representativeness, and, in particular, we focus on how experience, intuition and overconfidence affect this heuristic in the decision-making process.

Figure 1 depicts the theoretical model on the three individual-level intervening factors – experience, intuition and overconfidence – that influence representativeness. To delve deeper into the mechanisms by which they shape the building blocks of representativeness, the following discussion elaborates on the dynamics associated with each factor.

The role of the decision maker's experience

Experience represents a key source of knowledge acquisition (Huber, 1991) and the primary stimulus for learning (Fenwick, 2000), creating the potential for analogical reasoning (Newell and Simon, 1972) and activating a process of human adaptation to the external environment (Kolb, 1984). It, therefore, plays a crucial role in determining the knowledge basis and the mechanisms of construction of social reality that support decision-making processes, as “learning informs subsequent decisions” (Winter and Szulanski, 2001, p. 734).

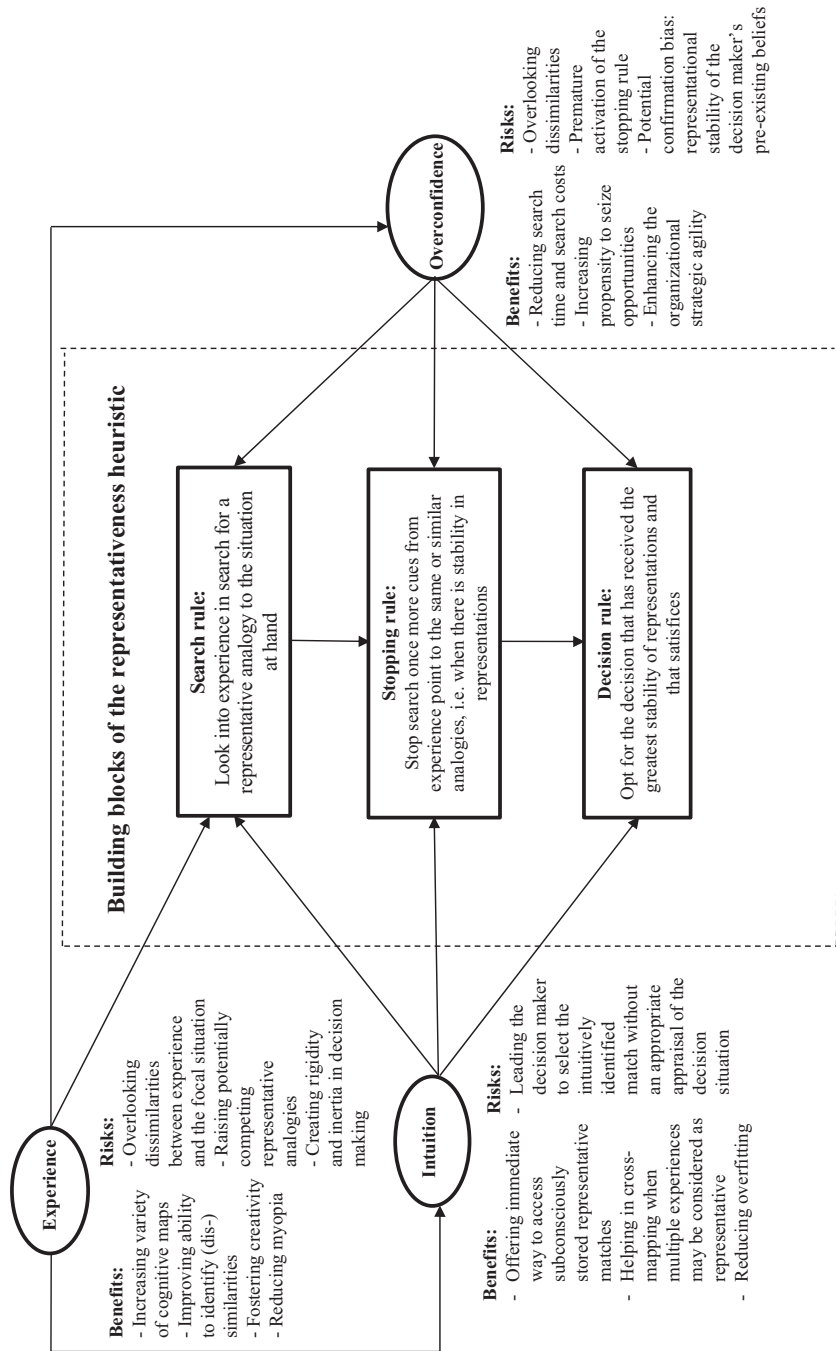


Figure 1.
Representativeness
heuristic in the
decision-making
process: A
conceptual model

Prior research highlighted that more experienced decision makers tend to adopt heuristics more frequently (e.g. [Luan and Reb, 2017](#)); hence, their behavior is closer to that of an ecologically rational and adaptive decision maker compared to less experienced decision makers ([Luan et al., 2019](#)). In fact, in their study on replication as a strategy, [Winter and Szulanski \(2001\)](#) argue that experience “drive the strategic recognition that there is a success and that it may be a replicable success, not attributable to local idiosyncratic factors or to good luck” (p. 734). Representativeness, therefore, assumes the possibility to generalize learning, i.e. to apply lessons learned from experience outside the situation-specific context in which they were originally acquired. Building on this argument, we suggest that experience may shape the effectiveness of the representativeness heuristic as it is associated with several potential benefits and risks.

Experience determines the variety and richness of the knowledge base used for drawing representative analogies. Limited experience may prevent exploration and generate competency traps ([Zollo, 2009](#)) that may ultimately undermine the ability to select nonconforming decision alternatives ([Hayward, 2002](#)). Instead, for more experienced decision makers, the range and variety of cognitive maps from which to draw connections increases, thus fostering healthy creativity and skepticism ([Keck and Tushman, 1993](#)) and incrementing the opportunities for the identification of relevant analogies. This notion has been examined, for example, in the literature on acquisitions, where experience has been found to reduce myopia ([Zollo, 2009](#)), to increase the ability to deal with heterogeneous information ([Shipilov, 2009](#)) and to improve the potential for positive transfer thanks to an increased ability to grasp latent differences between the past and the present ([Haleblian and Finkelstein, 1999](#)). Psychologists have long recognized that the ability to enact analogies and to identify those familiar circumstances that may be representative of a focal decision problem is a signal of intelligence and may potentially nurture the generation of creative solutions ([Huff, 1980](#)). In this view, grounded in a learning-by-doing approach, experience represents a repository of cognitive maps that enable the creation of analogies. When framing decisions in conditions of uncertainty, it provides the raw materials for the formation of associations linking the current decision problem to a familiar domain ([Newell and Simon, 1972](#); [Gilovich, 1981](#); [Schwenk, 1984](#)).

Experience indeed enables decision makers to improve their understanding of cause–effect linkages and reduces causal ambiguity ([Zollo and Winter, 2002](#)). Experienced decision makers may hence be better able to identify connections, with positive implications in terms of correct application of a representativeness heuristic. The benefits of experience, however, may not be unlimited. Rather, leveraging experience in decision-making may pose risks from three main respects: overlooking dissimilarities between the focal decision and the experience basis and raising potentially competing reference points, and creating rigidity and inertia in decision-making.

First, the appropriateness of applying a representativeness heuristic that allows forming associations with past experience is contingent upon the existence of similarities between the problem situation and the familiar domain with which the analogy is being formed ([Schwenk, 1984](#)). However, because a perfect analogy between the schemata that are enacted does not exist, decision makers may actually not recognize the existence of latent dissimilarities and develop a “simplistic” view of the problem situation ([Steinbruner, 1974](#)). Overestimating the degree to which the past may be representative of the present may cause decision makers to inappropriately transfer past experience to the current circumstance, potentially leading to sub-optimality ([Cohen and Bacdayan, 1994](#)). In this case, representativeness may produce biases as decision makers generalize based on simple analogies and past solutions are considered valid for the present problem situation regardless of possible underlying differences ([Nisbett and Ross, 1980](#); [Bazerman, 1990](#)). Second, while on the one hand extensive experience provides a richer number of available reference bases, which nurture the

potential for representative analogies, on the other this variety of “raw materials” may increase the chances of overfitting. Indeed, in formulating the problem situation when multiple competing matches exist, individuals interpret their experiences through a process of personal meaning-making (Fenwick, 2000). This may ultimately increase the chances of fitting noises. As a consequence, a large and heterogeneous sample of past experiences may increase search costs and, even if information would cost nothing, in conditions of uncertainty, cognitive processes should still ignore a portion of that information (Gigerenzer, 2008). Analogical cross-mapping may hence be jeopardized by the existence of competing, potential matches (Gentner, 2006), which, in turn, may increase search costs, undermine the ability to retrieve learned associations and, simultaneously, hamper the fluidity of analogical reasoning (Crouse, 1981).

Third, experience may generate rigidity and decision-making inertia: especially in organizational contexts, decisions are subject to inertial pressures, which increase the reluctance to deviate from established and familiar routines. Experience may therefore lead to path-dependent decisions that both create competency traps (Zollo, 2009) and overlook potential underlying dissimilarities between the current decision problem and the situation from which the decision maker generalizes (Heimeriks *et al.*, 2012).

Thus, the effect of experience on the effectiveness of representativeness is not positive or negative *per se*: it is associated with both benefits, due to a richer potential for selecting a representative analogy and risks, related to myopia and rigidity that may cause a sort of automation bias in decision-making. Adopting a risk-benefit approach obviously raises the question of what the net effect of experience could be. Following a contingency approach, we do not argue that the net effect is positive or negative in absolute terms. Instead, some circumstances shape whether the benefits outweigh the risks or vice versa. For instance, in decision tasks where there is not much variance in the context – i.e. where experiences are mostly consistent – and the feedback is rather unambiguous – i.e. there is little or no noise – then experience may have a positive net effect on representativeness. As opposite, relying on experience may prove less helpful when the feedback from experience is rather equivocal. This is more likely to happen in a dynamic and changing context, where there is a lot of irrelevant information that has to be ignored. In such circumstances, unlearning becomes necessary to stimulate a fruitful sensitivity to new solutions.

The role of the decision maker’s intuition

Building on the argument that a theory of decision-making should take into account both rational and intuitive processes (Simon, 1987), exploring the role played by intuitive thinking may shed light on important dynamics of decision-making. According to parallel-competitive theories (Epstein, 2003), intuition is regarded as a manifestation of the experiential system; however, it is not merely a function of Type 1 processing heuristics, activated on a default basis. Rather, intuitions have the potential to both inhibit and facilitate analysis (Hodgkinson and Healey, 2011).

Individuals extensively rely on intuitive processes, especially when faced with extreme time pressures (Suri and Monroe, 2003), with empirical evidence found in the context of decisions by military commanders (Kaempf *et al.*, 1996), emergency room surgeons (Abernathy and Hamm, 1995) and corporate executives operating under severe time constraints (Burke and Miller, 1999). Intuition is a component of “nonlogical mental processes” that are capable of handling a “mass of experience or a complex of abstractions in a flash” (Barnard, 1938, p. 305).

Despite the implicit assumption among many management scholars that, due to the hypersubjective nature of intuition, intuitive processes fall outside the boundaries of scientific inquiry, intuition does not represent the opposite of reason and rationality nor does it necessarily generate a random process of guessing. Indeed, while the use of intuition in

decision-making has been traditionally regarded as inferior to more rational and analytical models (e.g. Kahneman and Tversky, 1982; Russo and Schoenmaker, 1992), intuitive judgments “arise through rapid nonconscious and holistic associations” (Dane and Pratt, 2007, p. 40) that, besides not being the mere product of emotions (Simon, 1987; Vaughan, 1990), are founded upon a solid and complete grasp of the situation, subconsciously rooted in past experience (Khatri and Ng, 2000). Within this picture, intuition is a domain-specific manifestation of expertise (Sadler-Smith, 2016) and represents a relevant property of decision-making: it enacts a synthetic function based on fragments of experience that, although not crystallized as facts (Khatri and Ng, 2000), are still stored at the subconscious level. Intuition, therefore, apprehends the totality of a given situation and allows us to synthesize isolated bits of data and experiences into an integrated picture (Vaughan, 1990), thus representing the purest and most immediate way of knowing (Osbeck, 2001).

In our framework, we suggest that intuition plays an important role in the three building blocks of representativeness. During the search phase, intuition allows the emergence of latent but potentially relevant options: especially when there is a high level of uncertainty in the environment and there are several plausible alternative solutions to choose from with good factual support for each option, intuition may become particularly helpful (Agor, 1989). Indeed, while in a stable environment, data are more reliable, there is not much pressure to collect data quickly and, perhaps, data gathering is less costly, an unstable environment poses three challenges to fact-oriented information processing or data analysis: (1) time constraints on data collection; (2) the need to collect a large amount of data to cope with environmental instability and (3) the limited reliability of the data or information. In such turbulent environments, where variability and complexity generate high levels of uncertainty and outcome ambiguity, given that hard information may be limited or unreliable, mental processes using soft information may be more appropriate. Hence, the need for intuition may be especially acute in organizations embedded in turbulent environments (Khatri and Ng, 2000).

Second, because intuition allows us to perform a synthesis of the available “materials”, it is helpful when cross-mapping the multiple, potentially representative analogies as it may facilitate the identification of the most relevant cues and may hence also reduce the search time and costs. Intuition indeed relies on complex learning and retrieval processes that include storage of multiple exemplars in memory, matching of situations or objects to exemplars or prototypes and retrieval from multiple-trace memory (Dougherty *et al.*, 1999). As each experience is separately stored in memory as a single trace, intuition represents an “echo” that results from the automatic comparison of the current situation to all similar experiences stored in memory (Glöckner *et al.*, 2009). Decision makers may thus benefit from intuitive synthesis by drawing upon previously learned information associated with that situation to arrive at a decision (Quinn, 1980). Building on these arguments, we, therefore, posit that intuition may reduce overfitting, i.e. enhance the potential for robustness, as it enables to cross-map the potential conflicting associations generated by experience and to spontaneously recognize and recombine salient cues (Sadler-Smith, 2016). Therefore, intuition may inform the final decision.

These arguments suggest that, in its turn, the role of intuition on the decision rule may vary based on the decision maker’s experience: when the decision maker has no or a limited range of reference bases from which to project inferences to the current decision situation, intuition may provide an immediate clue to the identification of potentially relevant alternatives. As opposite, for more experienced decision makers, the increased number of reference bases among which to identify potential analogs generates difficulties in cross-mapping because it hinders the ability to select univocal matches. Hence, especially when two or more alternatives are highly similar, intuition may provide an immediate sense of the most ecologically rational decision.

In this view, intuition may counteract the potential overfitting generated by experience by orienting the mind across the multiple “raw materials” to select out nonrepresentative analogies. It may therefore represent a contingency factor that leads to a greater ecological rationality of representativeness.

The role of the decision maker's overconfidence

When making decisions, personality traits play a ubiquitous role, and, among them, the degree of one's self-confidence may represent a particularly salient factor. First described by [Oskamp \(1965\)](#), overconfidence is observed in a wide variety of settings and professional domains ([Bazerman, 1990](#)), namely clinical psychologists ([Oskamp, 1965](#)), physicians and nurses ([Baumann *et al.*, 1991](#)), as well as managers ([Russo and Schoemaker, 1992](#)) among others. As suggested by parallel-competitive dual-process theories and, in particular, by the cognitive-experiential self-theory of personality ([Epstein, 2003](#)), the need to enhance self-esteem is one of the basic emotions that guides human decision-making. Similarly, studies on perceived causation and attribution theory suggest that inferential processes, although driven by one's cognitive schemata, are a function of the affective consequences of attribution in terms of motivation and social desirability ([Ross, 1977](#)). In other words, decision makers are strongly affected by the motivation to both develop a self-positive presentation and to preserve self-esteem and self-protection. This implies that decision-making is affected by a dynamic tension between personal dispositions and external factors, in which individuals tend to attribute success to their trait ascriptions and failure to exogenous forces in virtue of a “pride for success and shame for failure” principle ([Ross, 1977](#)).

Extensive literature suggests that individuals make overly positive self-evaluations, possibly leading to overconfidence when they overestimate their skills, knowledge and capabilities in comparison to the average individual ([Kruger, 1999](#); [Malmendier and Tate, 2005](#)) and hence behave as if they had more abilities than those really possessed ([Yates, 1990](#)). This distorted self-perception may lead to dysfunctional behaviors in terms of overestimating the benefits and underestimating the costs of a given decision ([Fiol and Lyles, 1985](#)). Cognitive biases such as overconfidence are induced in decision makers by aspects of their experience, in addition to information overload, high uncertainty and high time pressure ([Baron, 1998](#)): especially when faced with uncertainty and causal ambiguity, decision makers may erroneously use their stock of experience as a proxy of their competence ([Zollo, 2009](#)). More experienced decision makers are thus more likely to overestimate their capabilities compared to less experienced decision makers.

Overconfidence plays a crucial role within our framework as it affects the search for representative analogies, the timing and criteria for stopping the search, as well as the decision rule that will be implemented. Profoundly persuaded of their capabilities and acumen, overconfident decision makers may be reluctant or unable to deviate from established convictions, as overconfidence is tremendously resistant to any information that may disconfirm the validity of preexisting beliefs. This, in turn, may increase the risk of overlooking dissimilarities and of ignoring feedback from the external environment with implications on the quality of the guidance that a certain analogy provides ([Gavetti *et al.*, 2005](#)). Overconfident decision makers may indeed incur a confirmation bias during search, which leads to retain only those analogies that confirm their beliefs, virtually at the expense of representational similarity.

We also suggest that overconfidence has implications in terms of both the time dedicated to search and the stopping rule that is activated. Specifically, building on the previous arguments, we argue that overconfidence may potentially speed up the search process and lead to the premature activation of the stopping rule, thus reducing both the search time and the associated search costs. Second, overconfidence may alter the stopping rule used by the

representativeness heuristic: the need to maintain and enhance self-esteem (Epstein *et al.*, 1996) may imply that representational stability of the situation as a stopping rule is substituted by the representational stability of self-perception and of only that information that confirms the preexisting beliefs of the decision maker. Thus, convergence and coherence are not sought for in the representations of the situations but rather in the representation of oneself, leading to only “superficial mappings” (Gavetti *et al.*, 2005). As an implication, the aspiration level used for the decision rule is guided by the need to satisfy one’s ego, thus possibly causing a convergence of the stopping rule and the aspiration level. In other words, in terms of decision rule, we suggest that the alternative that satisfices will be the one that allows preserving the stability of the decision maker’s self-perception. It is however worth noting that overconfidence may also carry positive implications in terms of enhancing the decision maker’s propensity to seize opportunities. For instance, the level of executives’ self-confidence is strongly connected with the organizational strategic agility, in terms of better sensing new opportunities, redeploying resources and creating a collective commitment to those opportunities (Doz, 2020).

Discussion and concluding remarks

Our framework provides a number of interesting implications and avenues for future research in the field of decision-making, which may be broadly ascribed to three main lines of inquiry.

Implications for research on the cognitive processes of decision-making

Research on the representativeness heuristic underlines that perceptual aspects and emotional states affect the decision process. For instance, interesting connections have been identified between representativeness and risk perception: representativeness leads investors to consider recent past returns as representative of what they can expect in the future (DeBondt, 1993) and mitigates the perception of risk, thus encouraging risk-taking behaviors even when the individual overall risk propensity is limited (Low and MacMillan, 1988). Judgments on representative analogies may also be contingent upon the perception of success or failure associated with the previous actions from which a representation is being drawn. Many studies indeed have acknowledged that performance feedback is a critical mechanism providing information about the effectiveness of actions (Cyert and March, 1963) and that may hence carry substantial implications in terms of consolidation or revision of decision rules.

This line of inquiry suggests that judgment is, though often involuntarily, a manifestation of the individual emotional state. Emotions may indeed shape the individual perceptions of the decision situation. In the specific context of the representativeness heuristic, we argue that the functioning and effectiveness of the three building blocks may be affected by the person’s emotional state. Fear, anxiety and anger, along with joy and love may indeed interfere with the process through which judgments are formed, for instance by amplifying or minimizing the receptivity to the subtle messages that can come into consciousness via intuition (Vaughan, 1990). In sum, we suggest that additional contingency factors may alter the inner workings and the effectiveness of representativeness and hence deserve further investigation.

Implications for research on self-confidence

Overconfidence changes dynamically as a function of perceived feedback from previous actions, in terms of success and failure (Daniel *et al.*, 1998; Barber and Odean, 2001). However, people usually fantasize that success reflects personal ability, while failure is due to misfortune or unfavorable situational factors (Gervais and Odean, 2001). Closely related to

the notion of overconfidence, studies on the self-assessment of competencies (e.g. [Graham et al., 2009](#)) suggest that people are more willing to bet on their judgments when they feel skillful or knowledgeable. Thus, a strong link between self-assessed competence and risk propensity is identifiable. Although we suggest in our framework that overconfidence may be detrimental, we do not claim that overconfidence is *per se* a negative attribute of the decision maker. While most studies support the view of overconfidence as a bias with negative implications on decision-making (e.g. [Bazerman, 1990](#); [Whyte et al., 1997](#)), it is worth noting that some empirical evidence indicates that it may yield positive effects (e.g. [Seligman and Schulman, 1986](#); [Baron, 1998](#); [Simon and Houghton, 2003](#); [Hirshleifer et al., 2012](#)). Specifically, some scholars have identified positive outcomes in terms of entrepreneurs' persistence ([Seligman and Schulman, 1986](#)), innovation ([Simon and Houghton, 2003](#)), motivation ([Baron, 1998](#)) and benefits to shareholders thanks to an increased propensity to venture in risky projects ([Hirshleifer et al., 2012](#)). For instance, [Hirshleifer et al. \(2012\)](#) found that companies with overconfident CEOs are better able to seize growth opportunities, experience greater return volatility and invest more in innovation. Similarly, the level of executives' self-confidence fosters organizational strategic agility ([Doz, 2020](#)). In this sense, it would be interesting to explore whether and to what extent the level of executives' self-confidence may mobilize firms to learn portfolios of opportunity-capturing heuristics ([Eisenhardt and Sull, 2001](#); [Bingham and Eisenhardt, 2011](#)). This is even more relevant considering that heuristics represent constraint-free responsive decision mechanisms in opposition to routine-based processes.

In view of the previous arguments, we also suggest that exploring the potential association between self-confidence and intuition may shed light on additional cognitive processes involved in decision-making. In particular, because experience represents the starting point for both overconfidence and intuition, the question is what kind of relationship may exist between them. For instance, high levels of self-confidence may elicit one's propensity to trust intuitive judgments. Future research could hence better examine whether there is a connection between overconfidence and intuition and how their combined effect shapes the relationship between experience and representativeness.

Implications for research on group-level decision-making

As we shift the focus from the individual to the group level, the role of experience needs further understanding. At the group level, rather than experience *per se*, the codification of experience becomes crucial. Codification transforms implicit knowledge into explicit and thus turns individual experience into a shared, collective experience, with benefits in terms of reduction of causal ambiguity and enhanced ability to understand cause–effect linkages ([Zollo and Winter, 2002](#)). In our view, the extent to which experience is codified may affect the capability to identify connections between past experience and the focal decision situation, with potentially positive implications on the ecological rationality of representativeness. Therefore, the role played by experience codification on the activation and the inner workings of representativeness deserves further investigation, especially when decisions are collectively made.

When decision-making occurs in a social context, group dynamics also need to be taken into account as they may pose additional challenges to the entire decision-making process. Because knowledge and stimuli are always individually construed and cognitively processed, the same experience could be interpreted in different ways by different people. Accordingly, in the context of group decisions, the construction of the reality used to frame a decision problem is the result of both a social negotiation of meaning-making and group-specific dynamics. This interconnection, we suggest, represents a fertile ground for future research. For instance, research could explore the potential effects occurring when group decision-making is guided by rules of homeostatic equilibrium. In this condition, indeed, the desire for

within-group harmony and the pressures for conformity to the group majority may result in groupthink or herding behavior, which jeopardizes the ability to critically evaluate alternatives (e.g. [Scharfstein and Stein, 1990](#)).

Studies on herding behavior have shown that the tendency to follow the crowd is driven by the desire to appear or simply to the fact that greater skills are recognized to another subject than to oneself ([Prechter, 2001](#); [Trueman, 1994](#)). Obviously, we do not argue that herding behavior is necessarily negative, as it may rather reflect an objective of conflict minimization. However, when groupthink persists, it could potentially undermine the quality of decisions in the long run. In this context, heuristics may disrupt the herding behavior by eliciting the individual's critical ability to express judgment rather than passively following the crowd.

A completely different scenario occurs when group decision-making is paralyzed by the existence of too many conflicting perspectives within the group. In this case, excessive reliance on an analytical approach to the decision may hinder the ability to reach a final decision. In fact, the maintenance of the status quo, and therefore the inaction, is a verified attitude of the human condition (e.g. [Samuelson and Zeckhauser, 1988](#)). Hence, whether heuristics may prove helpful in overcoming the stasis brought about by the inability of the group to identify a shared route to action represents an interesting area for future research.

Methodological remarks

Future empirical analysis of the mechanisms that rule the representativeness heuristic and of the lines of inquiry discussed above call for methodological refinements. In terms of research methodologies, the use of qualitative experiential methods such as fish bowl, role play and videotaping with feedback sessions practiced in real-life settings may represent an appealing approach to empirically test the dynamics underlying the building blocks of representativeness and its ecological rationality ([Mattare, 2010](#)). Experiments are indeed especially suited to analyze decision-making, particularly at entrepreneurial and managerial levels ([Schade and Burmeister-Lamp, 2009](#)). Compared to more traditional laboratory experiments, we also suggest that mobile labs, web-based experiments and virtual worlds experiments may be a good alternative to investigate decision makers' behavior under controlled conditions while also overcoming the difficulties of reaching professionals, as they do not require a specific time and place for the experiment (e.g. [Gatewood et al., 2002](#)).

Because decisions are often made in a context of close relationships with others, the emotional-relational sphere may create interdependencies that drive both the process and the outcomes of decision-making. This is especially true, for example, in the context of family businesses, where decision processes carry an emotional value and may be substantially shaped by several emotional aspects, including the emotional interdependence, the degree of harmony in the relationship and the intensity of dominance among the family members. In such conditions, relying on a dyadic or multiple perspective, such as the Vienna diary technique, seems particularly promising ([Penz and Kirchler, 2016](#)). With diaries indeed, individuals collect a real-time, detailed recording of experiences and decisions, which allows investigating the social component of the decision-making process.

Conclusions

Although representativeness is one of the most common heuristics in human judgment ([Hogart, 1987](#)), it has remained vaguely defined, loosely characterized and unspecified with respect to its underlying cognitive processes ([Gigerenzer, 1996](#)). This article extends our understanding of how representativeness operates in decision-making, by exploring its cognitive and behavioral mechanisms. Going beyond the approach to the study of heuristics

as inferior decision strategies (e.g. [Kahneman and Tversky, 1979](#)), we embrace the view that heuristics should not necessarily be associated with sub-optimal decisions ([Gigerenzer, 1991, 2004](#); [Guercini and Milanese, 2020](#); [Lejarraga and Pindard-Lejarraga, 2020](#)). From a theoretical perspective, our framework integrates elements that are often in contrast with the nature itself of heuristics. Indeed, we structure representativeness, being a heuristic proposed by the “heuristics and biases” approach, through the typical lenses of the “fast and frugal” perspective.

Furthermore, the novel model advanced here integrates decision makers’ experience, intuition and self-perception in the form of overconfidence to shed light on the dynamics that come into play in the use of representativeness. We suggest that the search rule used in representativeness is based on analogical mapping from previous experience, while the stopping rule is the representational stability of the analogs. Intuition may help the decision maker to cross-map potentially competing representative analogies drawn from experience. Furthermore, the decision maker’s overconfidence affects both the search time and costs.

We believe that our paper can be considered one of the first attempts to bridge dual-process theories ([Sloman, 1996](#)) and the adaptive toolbox perspective ([Gigerenzer, 2008](#)) into an integrative framework that offers a nuanced perspective on the use of representativeness in the decision-making process. Clearly, much more research is needed to investigate issues that were not addressed in this study and to explore the implications of our framework for decision-making both at individual and group levels. Overall, however, the ideas introduced in this paper can serve as a basis for further theoretical developments on the mechanisms through which heuristics operate in decision-making.

References

- Abernathy, C. and Hamm, R.M. (1995), *Surgical Intuition: What it Is and How to Get it*, Hanley and Belfus, Philadelphia.
- Agor, W.H. (1989), “The logic of intuitive decision making: an agenda for future research”, in Agor, W.H. (Ed.), *Intuition in Organizations*, Newbury Park, CA: Sage Publications, pp. 263-264.
- Artinger, F., Petersen, M., Gigerenzer, G. and Weibler, J. (2015), “Heuristics as adaptive decision strategies in management”, *Journal of Organizational Behavior*, Vol. 36 No. S1, pp. S33-S52.
- Barber, B.M. and Odean, T. (2001), “Boys will be boys: gender, overconfidence, and common stock investment”, *The Quarterly Journal of Economics*, Vol. 116 No. 1, pp. 261-292.
- Barbey, A.K. and Sloman, S.A. (2007), “Base-rate respect: from ecological rationality to dual processes”, *Behavioral and Brain Sciences*, Vol. 30 No. 3, pp. 241-254.
- Barnard, C. (1938), *The Functions of the Executive*, Harvard University Press, Boston, MA.
- Baron, R.A. (1998), “Cognitive mechanisms in entrepreneurship: why and when entrepreneurs think differently than other people”, *Journal of Business Venturing*, Vol. 13 No. 4, pp. 275-94.
- Baumann, A.O., Deber, R.B. and Thompson, G.G. (1991), “Overconfidence among physicians and nurses: the ‘micro-certainty’ macro-uncertainty’ phenomenon”, *Social Science and Medicine*, Vol. 32 No. 2, pp. 167-174.
- Bazerman, M.H. (1990), *Judgment in Managerial Decision-Making*, 2nd ed., John Wiley and Sons, New York.
- 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*, New York: Taylor and Francis Group, pp. 3-22.
- Bingham, C.B. and Eisenhardt, K.M. (2011), “Rational heuristics: the ‘simple rules’ that strategists learn from process experience”, *Strategic Management Journal*, Vol. 32 No. 13, pp. 1437-1464.
- Bingham, C.B. and Halebian, J. (2012), “How firms learn heuristics: uncovering missing components of organizational learning”, *Strategic Entrepreneurship Journal*, Vol. 6 No. 2, pp. 152-177.

- Browne, G.J. and Pitts, M.G. (2004), "Stopping rule use during information search in design problems", *Organizational Behavior and Human Decision Processes*, Vol. 95 No. 2, pp. 208-224.
- Burke, L.A. and Miller, M.K. (1999), "Taking the mystery out of intuitive decision making", *Academy of Management Perspectives*, Vol. 13 No. 4, pp. 91-99.
- Chaiken, S. (1980), "Heuristic versus systematic information processing and the use of source versus message cues in persuasion", *Journal of Personality and Social Psychology*, Vol. 39 No. 5, pp. 752-766.
- Cohen, M.D. and Bacdayan, P. (1994), "Organizational routines are stored as procedural memory: evidence from a laboratory study", *Organization Science*, Vol. 5, pp. 554-568.
- Connolly, T. and Thorn, B.K. (1987), "Predecisional information acquisition: effects of task variables on suboptimal search strategies", *Organizational Behavior and Human Decision Processes*, Vol. 39 No. 3, pp. 397-416.
- Crouse, J.H. (1981), "Retroactive interference in reading prose materials", *Journal of Educational Psychology*, Vol. 52, pp. 39-44.
- Cyert, R.M. and March, J.G. (1963), *A Behavioral Theory of the Firm*, Prentice-Hall, Englewood Cliffs, NJ.
- Dane, E. and Pratt, M.G. (2007), "Exploring intuition and its role in managerial decision making", *Academy of Management Review*, Vol. 32 No. 1, pp. 33-54.
- Daniel, K., Hirshleifer, D. and Subrahmanyam, A. (1998), "Investor psychology and security market under-and overreactions", *The Journal of Finance*, Vol. 53 No. 6, pp. 1839-1885.
- Davis, J.P., Eisenhardt, K.M. and Bingham, C.B. (2009), "Optimal structure, market dynamism, and the strategy of simple rules", *Administrative Science Quarterly*, Vol. 54 No. 3, pp. 413-452.
- DeBondt, W. (1993), "Betting on trends: intuitive forecasts of financial risk and return", *International Journal of Forecasting*, Vol. 9, pp. 355-371.
- Deco, G., Scarano, L. and Soto-Faraco, S. (2007), "Weber's law in decision making: integrating behavioral data in humans with a neurophysiological model", *Journal of Neuroscience*, Vol. 27 No. 42, pp. 11192-11200.
- Dougherty, M.R., Gettys, C.F. and Ogden, E.E. (1999), "Minerva-DM: a memory processes model for judgments of likelihood", *Psychological Review*, Vol. 106 No. 1, pp. 180-209.
- Doz, Y.L. (2020), "Fostering strategic agility: how individual executives and human resource practices contribute", *Human Resource Management Review*, Vol. 30 No. 1, p. 100693.
- Eisenhardt, K.M. and Sull, D.N. (2001), "Strategy as simple rules", *Harvard Business Review*, Vol. 79 No. 1, pp. 106-119.
- Epstein, S. (2003), "Cognitive-experiential self-theory of personality", in Weiner, I.B. (Ed.), *Handbook of psychology*, Vol. 5, pp. 159-184, John Wiley & Sons, Hoboken, NJ.
- Epstein, S., Pacini, R., Denes-Raj, V. and Heier, H. (1996), "Individual differences in intuitive-experiential and analytical-rational thinking styles", *Journal of Personality and Social Psychology*, Vol. 71 No. 2, pp. 390-405.
- Evans, J.S.B. and Stanovich, K.E. (2013), "Dual-process theories of higher cognition: advancing the debate", *Perspectives on Psychological Science*, Vol. 8 No. 3, pp. 223-241.
- Fenwick, T.J. (2000), "Expanding conceptions of experiential learning: a review of the five contemporary perspectives on cognition", *Adult Education Quarterly*, Vol. 50, pp. 243-272.
- Fiol, C.M. and Lyles, M.A. (1985), "Organizational learning", *Academy of Management Review*, Vol. 10, pp. 803-813.
- Gatewood, E.J., Shaver, K.G., Powers, J.B. and Gartner, W.B. (2002), "Entrepreneurial expectancy, task effort, and performance", *Entrepreneurship: Theory and Practice*, Vol. 27 No. 2, pp. 187-206.
- Gavetti, G., Levinthal, D.A. and Rivkin, J.W. (2005), "Strategy making in novel and complex worlds: the power of analogy", *Strategic Management Journal*, Vol. 26 No. 8, pp. 691-712.

- Gentner, D. (2006), "Analogical reasoning, psychology of", in Nadel, L. (Ed.), *Encyclopedia of Cognitive Science*.
- Gervais, S. and Odean, T. (2001), "Learning to be overconfident", *The Review of Financial Studies*, Vol. 14 No. 1, pp. 1-27.
- Gigerenzer, G. (1991), "How to make cognitive illusions disappear: beyond 'heuristics and biases'", *European Review of Social Psychology*, Vol. 2 No. 1, pp. 83-115.
- Gigerenzer, G. (1996), "On narrow norms and vague heuristics: a reply to Kahneman and Tversky", *Psychological Review*, Vol. 103 No. 3, pp. 592-596.
- Gigerenzer, G. (2001), "The adaptive toolbox: toward a Darwinian rationality", *Nebraska Symposium on Motivation*, Vol. 47, pp. 113-144.
- Gigerenzer, G. (2004), "Fast and frugal heuristics: the tools of bounded rationality", in Koehler, D. and Harvey, N. (Eds), *Blackwell Handbook of Judgment and Decision Making*, Blackwell, Oxford, pp. 62-88.
- Gigerenzer, G. (2007), *Gut Feelings: The Intelligence of the Unconscious*, Penguin, London.
- Gigerenzer, G. (2008), "Why heuristics work", *Perspectives on Psychological Science*, Vol. 3 No. 1, pp. 20-29.
- Gilovich, T. (1981), "Seeing the past in the present: the effect of associations to familiar events on judgments and decisions", *Journal of Personality and Social Psychology*, Vol. 40, pp. 797-808.
- Glöckner, A. (2009), "Multiple measure strategy classification", in Glöckner, A. and Witteman, C. (Eds), *Foundations for Tracing Intuition: Challenges and Methods*, pp. 83-105.
- Graham, J., Haidt, J. and Nosek, B.A. (2009), "Liberals and conservatives rely on different sets of moral foundations", *Journal of Personality and Social Psychology*, Vol. 96 No. 5, pp. 1029-1046.
- Guercini, S. and Milanese, M. (2020), "Heuristics in international business: a systematic literature review and directions for future research", *Journal of International Management*, Vol. 26 No. 4, p. 100782.
- Guercini, S., La Rocca, A., Runfola, A. and Snehota, I. (2015), "Heuristics in customer-supplier interaction", *Industrial Marketing Management*, Vol. 48, pp. 26-37.
- Haleblian, J. and Finkelstein, S. (1999), "The influence of organizational acquisition experience on acquisition performance: a behavioral learning perspective", *Administrative Science Quarterly*, Vol. 44, pp. 29-56.
- Hayward, M.L. (2002), "When do firms learn from their acquisition experience? Evidence from 1990 to 1995", *Strategic Management Journal*, Vol. 23 No. 1, pp. 21-39.
- Heimeriks, K.H., Schijven, M. and Gates, S. (2012), "Manifestations of higher-order routines: the underlying mechanisms of deliberate learning in the context of postacquisition integration", *Academy of Management Journal*, Vol. 55, pp. 703-726.
- Hirshleifer, D., Low, A. and Hong Teoh, S. (2012), "Are overconfident CEOs better innovators?", *The Journal of Finance*, Vol. 67 No. 54, pp. 1457-1498.
- Hodgkinson, G.P. and Healey, M.P. (2011), "Psychological foundations of dynamic capabilities: reflexion and reflection in strategic management", *Strategic Management Journal*, Vol. 32 No. 13, pp. 1500-1516.
- Hodgkinson, G.P. and Sadler-Smith, E. (2018), "The dynamics of intuition and analysis in managerial and organizational decision making", *Academy of Management Perspectives*, Vol. 32 No. 4, pp. 473-492.
- Hogarth, R.M. (1987), *Judgement and Choice: The Psychology of Decisions*, John Wiley and Sons, New York.
- Huber, G.P. (1991), "Organizational learning: the contributing processes and the literatures", *Organization Science*, Vol. 2, pp. 88-115.
- Huff, A.S. (1980), "Evocative metaphors", *Human Systems Management*, Vol. 1, pp. 1-10.
- Johnson, W.B. (1983), "Representativeness in judgmental predictions of corporate bankruptcy", *The Accounting Review*, Vol. 58 No. 1, pp. 78-97.

-
- Kaempf, G.L., Klein, G., Thordsen, M.L. and Wolf, S. (1996), "Decision making in complex naval command-and-control environments", *Human Factors*, Vol. 38 No. 2, pp. 220-231.
- Kahneman, D. (2011). "Thinking, fast and slow", *Journal of Management Research in Emerging Economies*, Vol. 2 No. 2, pp. 69-72.
- Kahneman, D. and Frederick, S. (2002), "Representativeness revisited: attribute substitution in intuitive judgment", *Heuristics and Biases: The Psychology of Intuitive Judgment*, Vol. 49, pp. 81-111.
- Kahneman, D. and Tversky, A. (1972), "Subjective probability: a judgment of representativeness", *Cognitive Psychology*, Vol. 3, pp. 430-454.
- Kahneman, D. and Tversky, A. (1979), "Intuitive prediction: biases and corrective procedures", in Markridakis, S. and Wheelwright, S.C. (Eds), *TIMS Studies in Management Science*, Vol. 12, pp. 313-327.
- Kahneman, D. and Tversky, A. (1982), "Evidential impact of base-rates", in Kahneman, D., Slovic, P. and Tversky, A. (Eds), *Judgment under Uncertainty: Heuristic and Biases*, Cambridge University Press, Cambridge, pp. 153-160.
- Keck, S.L. and Tushman, M.L. (1993), "Environmental and organizational context and executive team structure", *Academy of Management Journal*, Vol. 36, pp. 1314-1344.
- Khatri, N. and Ng, H.A. (2000), "The role of intuition in strategic decision making", *Human Relations*, Vol. 53, pp. 57-86.
- Kohlas, J. (1989), "Modelling uncertainty with belief functions in numerical models", *European Journal of Operations Research*, Vol. 40, pp. 377-388.
- Kolb, D. (1984), *Experiential Learning as the Science of Learning and Development*, Prentice Hall, Englewood Cliffs, NJ.
- Kruger, J. (1999), "Lake Wobegon be gone! The 'below-average effect' and the egocentric nature of comparative ability judgments", *Journal of Personality and Social Psychology*, Vol. 77 No. 2, pp. 221-232.
- Lejarraga, J. and Pindard-Lejarraga, M. (2020), "Bounded rationality: cognitive limitations or adaptation to the environment? The implications of ecological rationality for management learning", *The Academy of Management Learning and Education*, Vol. 19 No. 3, pp. 289-306.
- Lieberman, M.D. (2000), "Intuition: a social cognitive neuroscience approach", *Psychological Bulletin*, Vol. 126 No. 1, pp. 109-137.
- Low, M.B. and MacMillan, I.C. (1988), "Entrepreneurship: past research and future challenges", *Journal of Management*, Vol. 14 No. 2, pp. 139-161.
- Luan, S. and Reb, J. (2017), "Fast-and-frugal trees as noncompensatory models of performance-based personnel decisions", *Organizational Behavior and Human Decision Processes*, Vol. 141, pp. 29-42.
- Luan, S., Reb, J. and Gigerenzer, G. (2019), "Ecological rationality: fast-and-frugal heuristics for managerial decision making under uncertainty", *Academy of Management Journal*, Vol. 62 No. 6, pp. 1735-1759.
- 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*, Vol. 36 No. 10, pp. 1554-1578.
- Malmendier, U. and Tate, G. (2005), "CEO overconfidence and corporate investment", *The Journal of Finance*, Vol. 60 No. 6, pp. 2661-2770.
- Mattare, M. (2010), "Use of self 101: the case for teaching personal development in the entrepreneurship curriculum", *New England Journal of Entrepreneurship*, Vol. 13 No. 1, pp. 17-28.
- Mousavi, S. and Gigerenzer, G. (2014), "Risk, uncertainty, and heuristics", *Journal of Business Research*, Vol. 67 No. 8, pp. 1671-1678.
- Newell, A. and Simon, H.A. (1972), *Human Problem Solving*, Prentice-Hall, Englewood Cliffs, NJ.

- Newell, A., Shaw, J., Simon, H., Gruber, H.E., Terrell, G. and Werheimer, M. (1962), "The process of creative thinking, contemporary approaches to creative thinking", in Gruber, H., Terrell, G. and Wertheimer, M. (Eds), Atherton, New York.
- Nisbett, R. and Ross, L. (1980), *Human Inference*, Prentice-Hall, Englewood Cliffs, NJ.
- Osbeck, L.M. (2001), "Direct apprehension and social construction: revisiting the concept of intuition", *Journal of Theoretical and Philosophical Psychology*, Vol. 21 No. 2, pp. 118-131.
- Oskamp, S. (1965), "Overconfidence in case-study judgments", *Journal of Consulting Psychology*, Vol. 29, pp. 261-265.
- Pacini, R. and Epstein, S. (1999), "The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon", *Journal of Personality and Social Psychology*, Vol. 76 No. 6, pp. 972-987.
- Penz, E. and Kirchler, E. (2016), "Households in international marketing research", *International Marketing Review*, Vol. 33 No. 3, pp. 432-453.
- Pechter, R.R. Jr (2001), "Unconscious herding behavior as the psychological basis of financial market trends and patterns", *The Journal of Psychology and Financial Markets*, Vol. 2 No. 3, pp. 120-125.
- Quinn, J.B. (1980), *Strategies for Change: Logical Incrementalism*, Irwin Professional Publishing, Homewood, IL.
- Ross, L. (1977), "The intuitive psychologist and his shortcomings: distortions in the attribution process", *Advances in Experimental Social Psychology*, Vol. 10, pp. 173-220.
- Russo, J.E. and Schoemaker, P.J.H. (1992), "Managing overconfidence", *Sloan Management Review*, Vol. 33 No. 2, pp. 7-17.
- Sadler-Smith, E. (2016), "The role of intuition in entrepreneurship and business venturing decisions", *European Journal of Work and Organizational Psychology*, Vol. 25 No. 2, pp. 212-225.
- Samuelson, W. and Zeckhauser, R. (1988), "Status quo bias in decision making", *Journal of Risk and Uncertainty*, Vol. 1 No. 1, pp. 7-59.
- Shade, C. and Burmeister-Lamp, K. (2009), "Experiments on entrepreneurial decision making: a different lens through which to look at entrepreneurship", *Foundations and Trends in Entrepreneurship*, Vol. 5 No. 2, pp. 81-134.
- Scharfstein, D.S. and Stein, J.C. (1990), "Herd behavior and investment", *The American Economic Review*, Vol. 80 No. 3, pp. 465-479.
- Schwenk, C.R. (1984), "Cognitive simplification processes in strategic decision-making", *Strategic Management Journal*, Vol. 5, pp. 111-128.
- Seligman, M.E.P. and Schulman, P. (1986), "Explanatory style as a predictor of productivity and quitting amongst life insurance sales agents", *Journal of Personality and Social Psychology*, Vol. 50, pp. 832-838.
- Shiffrin, R.M. and Schneider, W. (1977), "Controlled and automatic human information processing: II. Perceptual learning, automatic attending and a general theory", *Psychological Review*, Vol. 84 No. 2, pp. 127-190.
- Shipilov, A.V. (2009), "Firm scope experience, historic multimarket contact with partners, centrality, and the relationship between structural holes and performance", *Organization Science*, Vol. 20, pp. 85-106.
- Simon, H.A. (1987), "Making management decisions: the role of intuition and emotion", *Academy of Management Perspective*, Vol. 1 No. 1, pp. 57-64.
- Simon, M. and Houghton, S.M. (2003), "The relationship between overconfidence and the introduction of risky products: evidence from a field study", *Academy of Management Journal*, Vol. 46 No. 2, pp. 139-149.
- Solman, S.A. (1996), "The empirical case for two systems of reasoning", *Psychological Bulletin*, Vol. 119 No. 1, pp. 3-22.

-
- Sloman, S. and Fernbach, P. (2017), *The Knowledge Illusion: Why We Never Think Alone*, Penguin, New York.
- Steinbruner, J.D. (1974), *The Cybernetic Theory of Decision*, Princeton, Princeton, NJ.
- Suri, R. and Monroe, K.B. (2003), "The effects of time constraints on consumers' judgments of prices and products", *Journal of Consumer Research*, Vol. 30 No. 1, pp. 92-104.
- Thaler, R.H. (1991), "Some empirical evidence on dynamic inconsistency", *Quasi Rational Economics*, Vol. 1, pp. 127-136.
- Trueman, B. (1994), "Analyst forecasts and herding behaviour", *The Review of Financial Studies*, Vol. 7 No. 1, pp. 97-124.
- Tversky, A. and Kahneman, D. (1971), "Belief in the law of small numbers", *Psychological Bulletin*, Vol. 76 No. 2, p. 105.
- Tversky, A. and Kahneman, D. (1982), "Judgment by and of representativeness", in Kahneman, D., Slovic, P. and Tversky, A. (Eds), *Judgment under Uncertainty: Heuristic and Biases*, Cambridge University Press, Cambridge, pp. 84-98.
- Vaughan, F.E. (1990), "Varieties of intuitive experience", in Agor, W.H. (Ed.), *Intuition in Organizations*, Sage Publications, Newbury Park, CA, pp. 40-61.
- Von Neumann, J. and Morgenstern, O. (1944), *Theory of Games and Economic Behavior*, Princeton University Press, New Jersey.
- Whyte, G., Saks, A. and Hook, S. (1997), "When success breeds failure: the role of self-efficacy in escalating commitment to a losing course of action", *Journal of Organizational Behavior*, Vol. 18 No. 5, pp. 415-432.
- Winter, S.G. and Szulanski, G. (2001), "Replication as strategy", *Organization Science*, Vol. 12 No. 6, pp. 730-743.
- Yates, J.F. (1990), *Judgment and Decision Making*, Prentice Hall, Englewood Cliffs, NJ.
- Zollo, M. (2009), "Superstitious learning with rare strategic decisions: theory and evidence from corporate acquisitions", *Organization Science*, Vol. 20, pp. 894-908.
- Zollo, M. and Winter, S.G. (2002), "Deliberate learning and the evolution of dynamic capabilities", *Organization Science*, Vol. 13, pp. 339-351.

About the authors

Ilaria Galavotti, PhD, is Assistant Professor in Management at the Università Cattolica del Sacro Cuore, Piacenza, Italy. Her research focuses on firms' growth strategies, mergers and acquisitions, and the role of firm experience. She has published in refereed journals including *European Management Review*, *Management Decision*, among others. Ilaria Galavotti is the corresponding author and can be contacted at: ilaria.galavotti@unicatt.it

Andrea Lippi, PhD, is Assistant Professor of Economics of Financial Intermediation at the Università Cattolica del Sacro Cuore, Piacenza, Italy. His main research interests focus on behavioral finance, private banking and, more broadly, the banking system. He has published in refereed journals including *Judgment and Decision Making*, *International Journal of Applied Decision Sciences* and *International Journal of Bank Marketing*, among others.

Daniele Cerrato, PhD, is Professor of Business Administration at the Università Cattolica del Sacro Cuore, Piacenza, Italy. His main research interests are in corporate strategy and international business, with a focus on the antecedents and outcomes of internationalization. He has published in refereed journals including *Global Strategy Journal*, *Long Range Planning* and *International Business Review*, among others.