Essays on Proactive Decision-Making

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Alice: *"Would you tell me, please, which way I ought to go from here?"*

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where—" said Alice.

"Then it doesn't matter which way you go," said the Cat.

"—so long as I get somewhere," Alice added as an explanation.

"Oh, you're sure to do that," said the Cat, *"if you only walk long enough."*

Lewis Carrol, Alice's Adventures in Wonderland (1865)

FOREWORD

The cumulative dissertation presented by Mr. Philipp Rolf is devoted to PROACTIVE DECISION-MAKING—a concept that encompasses both the personality traits associated with the proactivity of decision-makers and the required cognitive abilities for such decision-making—as well as the application of PROACTIVE DECISION-MAKING in fields relevant to the decision sciences. Despite its great importance in different disciplines (i.e., decision analysis, operations research, management science), research focusing on the decision-making process has been limited primarily to the steps of evaluation and problem-solving so far. The crucial tasks of problem-structuring and generating alternatives have been relatively little researched. However, behavioral operations research, in particular, has recently dedicated itself to research on the latter tasks.

With his dissertation, Philipp Rolf addresses relevant research gaps and aims to advance the knowledge regarding the effective decision-making of individuals in problem-structuring and alternative generation. He claims to confirm the conceptual and measurement applicability of PROACTIVE DECISION-MAKING as well as to validate the concept in an extended nomological network. In addition, he aims to highlight the practical significance of this concept in the context of decision-making effectiveness.

This dissertation contains three articles, two of which have already been published in a top-tier journal, the *European Journal of Operational Research*. These articles are briefly summarized in an abstract and a synopsis, motivated and comprehensibly contextualized in an introduction, and finally acknowledged in a detailed conclusion. I like to stress that in his dissertation, Philipp Rolf also complemented his articles with an extensive background chapter, which deals thoroughly with the scientific positioning, lays an in-depth and sound theoretical-conceptual foundation of interdisciplinary relevance, and presents further definition and operationalization of the PROACTIVE DECISION-MAKING concept. Thus, he places decision-making proactivity on a broader theoretical basis.

Overall, this dissertation pays special attention to an under-researched, yet scientifically and equally practically relevant topic, provides an extensive literature review, considers current issues in empirical studies using both qualitative and primarily quantitative methods, and therefore makes significant research contributions to effective decision-making. All three articles demonstrate methodological expertise in selecting and implementing empirical research proce-

dures. They are also convincing because of the detail and care with which the quality and robustness criteria are observed and assessed. Following a comprehensible line of argument and detailed discussions, the derivation of implications based on the findings of the empirical studies and the reflected appreciation of the limitations and the addressing of starting points for future research are to be emphasized as particularly successful.

This dissertation advances the knowledge and understanding in the field of decision-making. It offers an extraordinary degree of originality and may inspire future intra- and interdisciplinary research in the decision sciences, specifically related to effective decision-making concerning problem-structuring and generating alternatives. The findings have the potential to be acknowledged by both scholars and practitioners and utilized in the future by a variety of decision-makers and decision analysts in academia and management.

I would like to thank Philipp Rolf for his excellent cooperation during the last few years, and I wish him all the best for the publication and recognition of his dissertation, as well as for his future projects in business and research.

Prof. Dr. Reinhard Kunz

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Third, I would like to thank Prof. Dr. Jörg Schlüchtermann, not least for stepping in as chair of the audit committee of my thesis defense, my dear BWL V colleagues, and my friends for supporting me throughout this research journey. I am glad I had the chance to experience the academic world from a new perspective while working on this doctoral thesis.

Finally, my deepest thanks go to my parents. You gave me the opportunity, faith, and strength to pursue my passion. I dedicate this doctoral thesis to you.

Philipp Rolf

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The following sections partly comprise content from essays included in this doctoral thesis. To improve the readability of the text, I omit the standard labeling of citations at these points.

ABSTRACT

The consensus emerging from the decision sciences, including operations research/ management science and decision analysis, is that problem structuring and generating alternatives are the most crucial tasks in decision-making processes. However, unlike their evaluation and the subsequent problem-solving, they are given short shrift in extant research. That is noteworthy as a good choice based on the well-considered alternatives evaluation cannot compensate for an underdeveloped set of alternatives; in that case, the likely result will be sub-optimal or deficient decision-making.

Against this background and research gap, this cumulative doctoral thesis adopts the recently introduced PROACTIVE DECISION-MAKING concept, which addresses effective decision-making during its phase of problem structuring and generating alternatives, as a reference frame. In three essays, it seeks to confirm that concept's measurement- and context-related applicability, test potential nomological relationships, and, eventually, add to the practical meaning of effective decision-making. To that end, it employs three empirical studies with almost 3,000 participants, which feature research questions and problems at the interface of different scientific fields by combining the decision sciences with (1) happiness economics, (2) education sciences, and (3) vocational psychology. Methodologically, this doctoral thesis uses a cross-sectional survey-based, a repeated-measures quasi-experimental field study-based, and an experimental mixed-method-based research design.

The results, equally of value for decision scientists, corporate practitioners, and individual decision-makers, suggest that PROACTIVE DECISION-MAKING is a reliable and valid concept in measurement terms worth establishing in a broader scientific context. Further, they indicate multiple positive effects on commonly desirable outcomes, thereby demonstrating the nomological relevance of that concept. Enhanced decision and life satisfaction and subjective and objective career success should motivate anyone interested to contemplate adopting a more proactive approach in their decision-making. Finally, the results imply that participating in dedicated decision-making courses can help to become a more proficient proactive decision-maker. Accordingly, organizations might wish to implement respective training programs. Educational institutions, on the other side, should critically ask themselves whether they can impart the appropriate decision-making knowledge and skills to their students without such courses.

KEYWORDS: Proactive decision-making; life satisfaction; career success; decision training; decision sciences

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"It is perhaps accurate to say that the purpose of reasoning is deciding and that the essence of deciding is selecting a response option, that is, choosing a nonverbal action, a word, a sentence, or some combination thereof, among the many possible at the moment, in connection with a given situation."
(Damasio, 1995, p. 165)

1 Introduction

What Antonio Damasio, one of the world's leading neuroscientists, expresses should be self-evident to most people. Yet, it is fundamental for this doctoral thesis and far beyond, precisely because more than a few of these people, in contradiction to this self-evidence, repeatedly practically seem to forget to behave accordingly: decision-making gives thinking meaning; as such, it is the only means by which individuals, and organizations alike, can self-determined and purposefully influence preferred or undesired outcomes (Keeney, 2008, 2020). Hence it is hardly surprising that researchers from many different academic fields have long attempted to understand the mechanisms of individual and organizational decision-making. They have sought to characterize good choices, develop methods for better decision-making, and propose ways to help individuals and organizations make so (Bell, Raiffa, & Tversky, 1988). Achieving the latter two goals is the particular focus of the applied interdisciplinary disciplines of operations research and decision analysis (Edwards, Miles Jr., & Winterfeldt, 2007).

Operations research has long primarily concentrated on developing and evaluating mathematically grounded approaches and analytical tools—to structure decisions and solve problems—that enable decision-makers to derive reasonable or even optimal solutions in complex systems (Becker, 2016). More recently, however, some researchers have begun to rethink the discipline's predominantly choice-centric and often purely normative orientation. By likewise considering the individuals involved in decision-making processes (Hämäläinen, Luoma, & Saarinen, 2013), they have initiated a slow return to the roots of operations research (e.g., Churchman, 1970) while moving somewhat closer to the immediately related discipline of decision analysis (Howard, 1988). Instead of assuming uniformity of decision-makers beyond individual risk preferences and ignoring social contexts, there is an increasing number of studies that account for personal differences among decision-makers and that pay attention to their actual decision-making (Franco & Hämäläinen, 2016; White, 2016). Collectively referred to as behavioral operations research, one part of these papers examines the influence of behavioral aspects on the decision-making problems to be structured and solved. The other part analyzes behavioral effects in applications of the respective problem-solving techniques and decision

support tools (e.g., Franco, Hämäläinen, Rouwette, & Leppänen, 2021; Keller & Katsikopoulos, 2016; Korhonen et al., 2018; White, Burger, & Yearworth, 2016).

Contributing to that shift in operations research, Siebert and Kunz (2016) have analyzed and determined the behaviors and trait characteristics most associated with *effective* decision-making in its problem structuring phase up to and including the stage of generating alternatives. To do so, they have combined insights from decision quality (e.g., Howard, 1988; Spetzler, Winter, & Meyer, 2016), value-focused thinking (e.g., Keeney, 1992, 1996), and the psychology of human agency (e.g., Grant & Ashford, 2008; S. K. Parker, Bindl, & Strauss, 2010). As a result, Siebert and Kunz have been able to specify four cognitive skills—systematic identification of OBJECTIVES, systematic identification of ALTERNATIVES, systematic search for INFORMATION, and using a DECISION RADAR—as well as two personality traits—striving for IMPROVEMENT and taking the INITIATIVE. They summarized them conceptually as PROACTIVE DECISION-MAKING and validated a corresponding psychometrically sound measurement instrument. That way, these authors have offered a probed starting point to address the decision-making phase of problem structuring and generating alternatives holistically and provide the reference frame for this doctoral thesis. That is particularly intriguing and conducive from both a scientific and an applied perspective. In contrast to the evaluation phase, problem structuring and generating alternatives are generally considered the most crucial in decision-making. Yet, they are given short shrift in most extant research on this topic (see Beach, 1993; Bond, Carlson, & Keeney, 2008; Gettys, Pliske, Manning, & Casey, 1987; Siebert & Keeney, 2015).

In this respect, the *theoretical* position adopted in this doctoral thesis aligns with a view prevailing in decision analysis: success in the choice phase of a decision depends, for the most part, on the quality of alternatives from which the decision-maker can select—in other words, regardless of employing any method provided by operations research to quantitatively aid the choice process and solve the decision problem (Butler & Scherer, 1997). Suppose there are better options that someone has unconsciously excluded from the set of alternatives (cf. Farquhar & Pratkanis, 1993; Montibeller & Winterfeldt, 2015). Then, one can logically conclude that any choice among the available, arguably inferior, options and their respective consequences will be suboptimal (or less satisficing), even if the decision-maker has evaluated these alternatives correctly and selected the technically best option. What follows is that effective decision-making, more generally, is subject to excelling in the problem structuring and alternative generating task (Mellers & Locke, 2007; Mintzberg, Raisinghani, & Theoret, 1976). To put it figuratively in terms of the quote that precedes this thesis: If Alice does not know what she inherently wants, does not thoroughly understand the decision situation she faces, and is unable

to develop the alternatives that are best suited to her goals, it does neither matter much what piece of decision aid the Cat gives to her, nor which path she takes or not.

Against this background, and with PROACTIVE DECISION-MAKING as a new conceptualization that still needs to establish in a broader scientific context, this doctoral thesis intentionally bears the universal title *Essays on Proactive Decision-Making* and is cumulative in its structure. It pursues two overarching research objectives by attempting to find answers to the all-encompassing question of how the application of the PROACTIVE DECISION-MAKING concept can provide insights to inform and contribute to the decision sciences and applied research on the psychology of human agency. First, it aims to expand the scientific knowledge of effective decision-making of individuals regarding structuring problems and generating alternatives. To that objective, it seeks to confirm the conceptual and measurement-related applicability of PROACTIVE DECISION-MAKING and progressively relate and test that decision-making approach within the context of an extended nomological network. Second, once it establishes such nomological relationships empirically, this doctoral thesis intends to add to the practical meaning of effective decision-making and emphasize its merits.

Thought of more broadly and transcending the scope of this thesis to the future, these contributions could, at best, help individuals render their thinking more *meaningful*. Some might accordingly revisit or improve their decision-making, directly or indirectly, when encouraged by educational institutions or organizations to which they belong. Especially in the case of important decisions with far-reaching consequences that likewise affect future choices, there should be a practical need for this (Keeney, 2020). Few persons have formally learned what constitutes good decisions (Hammond, Keeney, & Raiffa, 1999) or have much experience in being overly proficient decision-makers (Bond et al., 2008). Likewise, many people do not know how biased their decision-making is (Scopelliti et al., 2015) and how they overestimate their respective abilities (Keeney, 1992). In other words, there are more Alices than we probably wish to admit, equally in crucial professional and personal decision-making situations—a fact that this doctoral thesis ultimately wishes to address by taking one of the proverbial first steps.

The remainder of the synopsis of this cumulative doctoral thesis organizes as follows. Chapter 2 is devoted to the background of the PROACTIVE DECISION-MAKING concept. That covers its scientific positioning, theoretical and conceptual roots, and operationalization. The application of PROACTIVE DECISION-MAKING, reflected in the three constitutive essays of this thesis, is subject to Chapter 3. Finally, Chapter 4 contains an overall discussion of their implications, reflects limitations and suggests avenues for future research.

2 BACKGROUND OF THE PROACTIVE DECISION-MAKING CONCEPT

2.1 SCIENTIFIC POSITIONING

Concerning its scientific positioning, taking an interpretive *ex-post* view of Siebert and Kunz's (2016) conceptualization, inter- and cross-disciplinarity best describe PROACTIVE DECISION-MAKING. As illustrated in **Figure 1**, from one side, decision-scientific insights, foremost provided by behavioral operations research and decision analysis, shape the understanding of the concept. So does, from the other side, research on the psychology of human agency (i.e., proactivity), specifically in the applied domains of vocational and organizational behavior. Despite different emphases and occasionally divergent onto-epistemological assumptions, not least regarding their exegetical depth, these two branches of social science are neither mutually exclusive nor entirely separable. Instead, in terms of PROACTIVE DECISION-MAKING, they complement each other by allowing a more complete, person-centric grasp of effective decision-making as a true-to-life behavioral phenomenon. From a *philosophical* perspective, in line with Meinard and Cailloux (2020), the latter—whether intended by Siebert and Kunz or not—should axiologically facilitate the legitimacy and justification of the norms inherent in the concept.

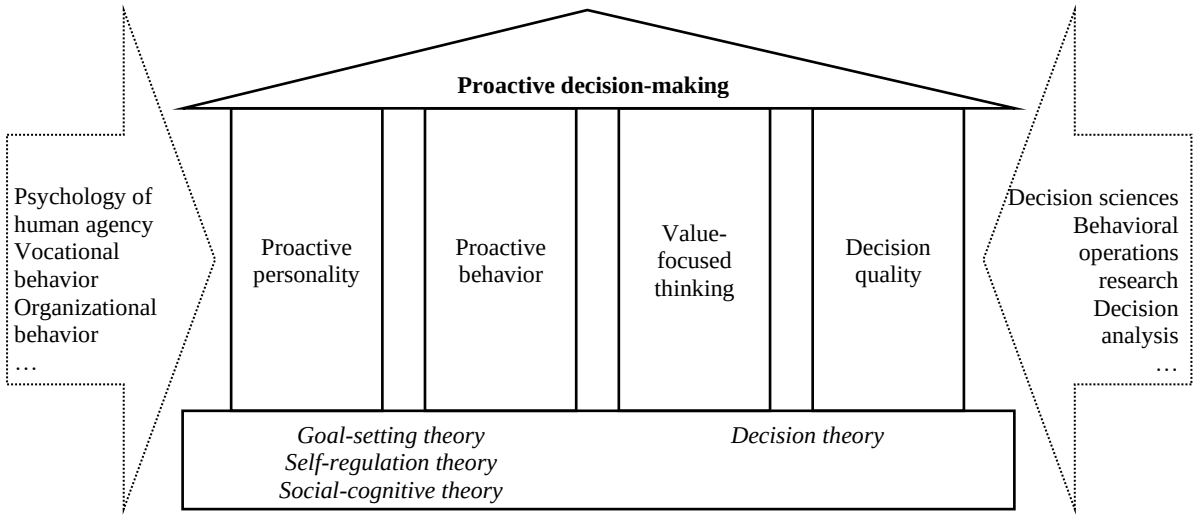

Figure 1: Background of proactive decision-making

DECISION SCIENCES

The first side, the *decision sciences*, rarely in a narrower sense referred to as decision-aid sciences (Roy, 1993), concerns studies of the nature of individual and organizational judgment and decision-making and, ultimately, ways that help improve both (Fischhoff & Broomell, 2020; Little, 1986). Although the decision sciences—including operations research/ management science and decision analysis, among others—have gradually established themselves a

distinct academic discipline, they remain highly interdisciplinary. They still borrow from various scientific fields such as economics, statistics, engineering, behavioral science, cognitive science, and computer science (Busemeyer, 2015; Roy, 1994; Tsoukiàs, 2008).

In practice, the discipline lacks comprehensive clarifications of its *ontological* stance in many studies and textbooks. In theory, however, the decision sciences usually take an axiomatic approach, following one of two possible paths. The first is more closely related to realism. The second is closer to nominalism toward constructivism, sometimes not entirely correctly called relativism (Keys, 1997; Meredith, 2001; Roy, 1993). On the one side, therefore, the discipline deems decision-making as primarily deterministic (i.e., exogenous and beyond the control of the individual)—a view that should inherently apply to most of its descriptive parts. On the other side, it considers decision-making primarily voluntarist (i.e., self-initiated and agentic; Franco et al., 2021)—a view essential to PROACTIVE DECISION-MAKING. To thwart this evident paradigmatic contradiction within the decision sciences, few studies, mainly in behavioral operations research, have begun to adopt a critical realist view (cf. Bhaskar & Hartwig, 2010). In so doing, these studies reinvite the objectivity of decision-making while at the same time accepting the epistemological relativism of knowledge about decision-making as socially and historically conditioned (Mingers, 2000; White, 2016).

Epistemologically, there is also no definite consensus within the decision sciences, culminating in ongoing discourses about decision model validation in operations research (Ackoff, 1979; Déry, Landry, & Banville, 1993; Merrick & Weyant, 2019; van Gigch, 1989). Yet, in terms of actual decision-making, being less of mathematical optimization and more of a behavioral issue, the epistemological positions become more apparent. To that end, the discipline more clearly conforms to the dichotomy of positivism and anti-positivism (Keys, 1997). Unlike several other contributions to the decision sciences, Siebert and Kunz's (2016) PROACTIVE DECISION-MAKING concept relies not primarily on the hermeneutical narrative of practical decision-analytical experiences. Instead, in determining what constitutes effective decision-making, it consequently subscribes to the former empiricist view—thus allowing generalizing cause-effect rather than purely subject- and context-dependent statements (Keys, 1997).

Publication-wise, the decision science side of the PROACTIVE DECISION-MAKING concept draws equally on more comprehensive textbooks of leading experts in the discipline and more selective research papers in various leading academic journals. Examples of the former—essentially compilations of longstanding decision-aid research journeys and related practical applications—are *Value-Focused Thinking: A Path to Creative Decisionmaking* (Keeney, 1992)

and *Decision Quality: Value Creation from Better Business Decisions* (Spetzler et al., 2016). The latter, academic journals, broadly fall into two categories (J. E. Smith & Winterfeldt, 2004): (1) Operations research/ management science and decision analysis, with outlets such as *Management Science*, *Operations Research*, *Decision Analysis*, or the *European Journal of Operational Research;* (2) Psychological accounts of fundamental decision processes, with outlets such as the *Journal of Behavioral Decision Making*, *Organizational Behavior and Human Decision Processes*, *Organizational Behavior and Human Performance*, or the *Journal of Personality and Social Psychology*.

PSYCHOLOGY OF HUMAN AGENCY

The second side, *the psychology of human agency*, concerns studies of individuals' evolutionarily advanced symbolizing capacities to influence their functioning or life circumstances intentionally—and thus the causal mechanisms underlying being agentic (Bandura, 2006). In applied contexts such as vocational or organizational behavior, the respective studies analyze conditions facilitating human agency (e.g., Wu, Parker, Wu, & Lee, 2018), characteristic traits and behaviors (e.g., S. K. Parker & Collins, 2010), or consequences of behaving agentic (e.g., Seibert, Kraimer, & Crant, 2001). Notwithstanding a presumably growing number of scholars who consider the psychology of human agency a stand-alone branch of psychological science, it essentially encompasses and unifies findings from cognitive, developmental, and social psychology (Bandura, 2006, 2018).

The fundamental *onto-epistemological* question that research on human agency, in the first place, inevitably confronts is that of reductionism (cf. Barendregt & van Rappard, 2004; M. Thompson, 2011). However, in the wake of Bandura's (2006) reasoning, agentic behaviors of humans are too complex to be adequately reducible to entities less abstract in their natures. Henceforth, laws governing physical processes could, if any, only insufficiently capture that psychosocial phenomenon. Accordingly, that branch of psychological research cannot provide single factual explanations in a natural-scientific sense. Yet, it can claim ontological realism and objectively account for the subjectivity of human agency (Michell, 2003; Teo, 2018). In this sense, the psychological side of the PROACTIVE DECISION-MAKING concept seems compatible with its presumably less coherent decision-scientific counterpart. Even more importantly, it shows a way to resolve the determinism-voluntarism dilemma, as outlined before and similarly discussed by Buchanan, Henig, and Henig (1998), in the direction of an epistemic-ontological alignment that accommodates PROACTIVE DECISION-MAKING (cf. Shepherd & Suddaby, 2017).

What is the case in most domains of psychological science also applies to research on human agency. Historically, it has been rooted deeply in the *epistemological* paradigm of positivism (Johnson & Cassell, 2001; Teo, 2018). In this regard, however, one should not confuse that research-related view of knowledge with the objects of inquiry themselves. Agentic individuals are virtually assumed to interact with and shape their environments, arguably creating their unique reality and understanding of it (Young & Valach, 2004). That aside, applied researchers in occupational contexts have begun to challenge this dominant paradigm for its inability to adequately encompass human agency in the light of the subjectivity of twenty-first-century career trajectories (Klehe, Fasbender, & van der Horst, 2021; Savickas, 2001). If nothing else, that should offer promising application avenues for PROACTIVE DECISION-MAKING. Conceivably that concept could be used to bridge the opposing views of positivism and constructivism. While being positivist about the process of effective decision-making, PROACTIVE DECISION-MAKING is indeterminate to subjective decision content and contexts, whether socially constructed or not.

Concerning *publication* media, the psychological side of the PROACTIVE DECISION-MAKING concept mainly leans on leading scientific journals at the interface of applied psychology and management. Examples of respective outlets include the *Journal of Applied Psychology*, *Journal of Organizational Behavior*, *Journal of Vocational Behavior*, *Journal of Management*, and the *Academy of Management Journal*.

2.2 THEORETICAL FOUNDATIONS

Unlike other behavioral phenomena, PROACTIVE DECISION-MAKING cannot rely on a single comprehensive theory to anchor its conceptualization. No theoretical model can sufficiently explain effective decision-making beyond well-defined classroom problems (i.e., decision problems that one must solve, not identify, define and structure; cf. Keeney, 2004). Nor, despite efforts to do so (Crant, 2000; S. K. Parker et al., 2010), is there a theory of proactivity that can satisfactorily explain the effectiveness of proactive goal processes in human agency (i.e., the processes that determine the efficacy of agentic behavior). Accordingly, Siebert and Kunz's (2016) PROACTIVE DECISION-MAKING concept eventually builds on theories that more fundamentally address decision-making and human agency, as introduced below.

DECISION THEORY

Generally, the decision sciences differentiate, depending on the school of thought they belong to, among two or three different theoretical perspectives in the study of decision-making (Bell et al., 1988; Edwards et al., 2007; Vazsonyi, 1990): normative, descriptive, and prescriptive. The first, *normative* decision theory, concentrates on inherently consistent decision-making procedures and how rational individuals would decide. Hence normative decision models consist of specific rules or norms, which people consider to represent logical guidelines for their decisions (J. E. Smith & Winterfeldt, 2004). Dominant models of rational choice under risk or uncertainty are Neumann and Morgenstern's (1944) expected utility model and the subjective expected utility model of Savage (1954)—particularly relevant to shaping the prescriptive knowledge of decision-making (Simon et al., 1987). Probability theory and Bayesian statistics build the primary normative foundations in the judgments and beliefs domain of the decision sciences (Edwards et al., 2007).

In contrast, the second perspective, *descriptive* decision theory, emphasizes the kinds of decisions real people face and how they naturally make judgments and decisions. The characteristic of that view is the assumption of exogenous rationality (Tsoukiàs, 2008), against which researchers usually develop models to test how the human mind functions and to what extent it leads to deviations from rational choice. In this regard, beliefs, values, and how individuals incorporate them into their decisions are often of central interest (Einhorn & Hogarth, 1981; Slovic, Fischhoff, & Lichtenstein, 1977). Eventually, that also involves studies of socio- and geo-cultural decision-making differences (e.g., Fong & Wyer, 2003; Weber & Hsee, 1998).

Seminal contributions to the descriptive behavioral decision theory are Tversky and Kahneman's (1974) work on heuristics and biases and Kahneman and Tversky's (1979) prospect theory model (later advanced by Tversky & Kahneman, 1992).

The third perspective, *prescriptive* decision theory, finally most closely and directly provides the decision-theoretical basis of the PROACTIVE DECISION-MAKING concept. Often referred to as decision analysis in applied contexts, the focus is on helping individuals (or decision units) make better (i.e., more effective) decisions (Fischhoff, 2008; Keeney & Raiffa, 1976; J. E. Smith & Winterfeldt, 2004). The prescriptive perspective essentially operates on and seeks to develop normative models under the constraint of the descriptive realities of actual decision-making behavior (Bell et al., 1988). In other words, it is aware of the practical problems of implementing rational choice in a complex and uncertain world characterized by, among others, limited cognitive capacities, information asymmetries, and often multiple decision objectives (Keeney, 2004; Miller, 1956). Hence prescriptive decision theory assumes that rationality can, if any, be endogenous due to coherence with the specific decision situation (Keeney, 1982; Tsoukiàs, 2007, 2008). In line with Savage's (1954) example of small world realities, such situation-dependency requires simplifying complex decision environments to manageable analytical entities while ensuring that their representations remain unbiased (Corner, Buchanan, & Henig, 2001; Edwards et al., 2007).

Unlike their normative and descriptive counterparts, the evaluation of prescriptive approaches is much more pragmatic by asking whether the respective models or concepts are perceived as helpful by the decision-maker and subsequently lead to better decision-making (Schilling, Oeser, & Schaub, 2007; J. E. Smith & Winterfeldt, 2004). It follows for PROACTIVE DECISION-MAKING that primarily its practical significance (i.e., ultimately, the ability to explain positive decision outcomes) should establish and justify the concept's applicability (and retrospectively, its effectiveness). Among the most recognized contributions with roots in the prescriptive view of decision theory is Keeney and Raiffa's (1976) modeling of decisions with multiple objectives. Another widely applied in practice, yet axiomatically at least debatable example is Saaty's (1980) analytic hierarchy process method (Hämäläinen, 2004; Saaty, 1986, 1990; J. E. Smith & Winterfeldt, 2004).

In sum, the three branches of decision theory yield several implications for the PROACTIVE DECISION-MAKING conceptualization. The first, arguably the most fundamental but least evident, is related to the insights offered by the dual-processing accounts of cognitive function-

ing prevalent in cognitive psychology (e.g., Evans, 2008; Kahneman, 2003). Given this descriptive theory of reasoning and judgment modes, PROACTIVE DECISION-MAKING epitomizes not an intuitive and tacit (system 1-mode) but a deliberate and analytic process (system 2-mode). Accordingly, it seems safe to assume that individuals are required to pursue that decision-making approach conscientiously and willingly take on the cognitive efforts involved (Epstein, Pacini, Denes-Raj, & Heier, 1996; E. R. Smith & DeCoster, 2000). On the one hand, that implies that Siebert and Kunz's concept should be particularly relevant for personally important and complex decisions that immanently warrant enhanced mental efforts (Keeney, 2020; Payne, Samper, Bettman, & Luce, 2008). On the other hand, such thinking in and about cognitive processes establishes the theoretical underpinning of the view inherent to PROACTIVE DECISION-MAKING: effectively structuring problems and generating alternatives requires rational thinking that processual manifests primarily in corresponding general cognitive skills and less in applying explicit and context-dependent methods (cf. Evans, 2008).

As far as these cognitive skills are concerned, further implications arise from findings attributable to prescriptive decision theory. For the first part, the PROACTIVE DECISION-MAKING conceptualization builds on the studies of Bond et al. (2008, 2010), which examine the decision-makers capacity to understand and articulate their *decision objectives*. For the other part, it draws on the works of Siebert and Keeney (2015) and Siebert (2016), which address the abilities of individuals to generate *alternatives* in decision-making processes. From a descriptive perspective, the central outcomes of these studies are that individuals commonly seem to make significant decisions without considering many personally relevant objectives, and they omit a large portion of high-quality alternatives in their respective decision-making processes. From a prescriptive perspective, these strands of research suggest that more systematic and reiterative thinking of objectives and the process of generating them help identify their decision objectives. Further, they indicate that using objectives in decision-making processes stimulates the quality of alternatives. Hence, Siebert and Kunz (2016) presume that individuals, to render their decision-making effective, are obliged to engage in a conscious process of thinking about their decision objectives to develop those alternatives most promising toward their goal striving.

SOCIAL COGNITIVE, SELF-REGULATION, AND GOAL-SETTING THEORY

In its studies of the psychosocial functioning of individuals as active and conscious shapers of themselves and their environments, the psychology of human agency, for the most part, builds on Bandura's (1986) social cognitive theory and related theoretical accounts of self-regulation and goal-setting. In so doing, it adopts the view that the causes of human behavior reside neither

exclusively in the individual as dispositional nor the environment as situational (Bandura, 2018). Instead, the psychology of human agency and its theoretical roots subscribe to a triadic co-determination theory of causation, as shown in **Figure 2**. In this threefold interplay (cf. Bowers, 1973; Terborg, 1981), psychosocial functioning is a product of intrapersonal determinants, the behaviors exhibited by the individual, and external environmental forces. Accordingly, a situation is as much a function of an individual as the individual's behavior is a function of the circumstances (Bandura, 1977).

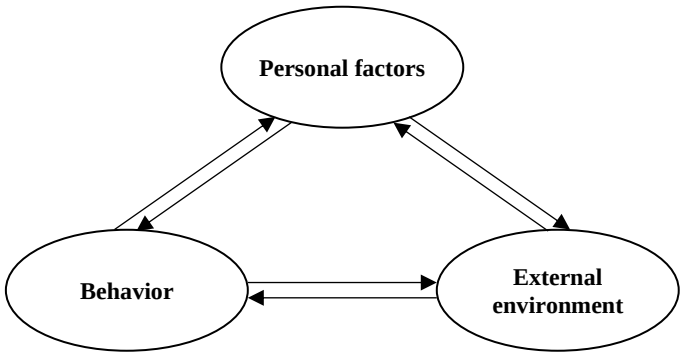

Figure 2: Triadic co-determination of social cognitive theory

The fundamental theoretical consequence of this view toward understanding human agency and, ultimately, proactivity at the individual level is that humans are not merely passive, reactive responders to their contexts and onlookers to their behavior (Crant, 2000). Instead, they possess the ability to intentionally shape their environments to encourage desired outcomes by behaving accordingly (Bandura, 1989; Grant & Ashford, 2008). This ability implies that people hold self-organizing, proactive, and self-regulating capacities (Bandura, 2006). In the light of social cognitive theory, these manifest through three main properties: forethought, self-reactiveness, and self-reflectiveness (Bandura, 2018).

*Forethough*t relates to the ability to extend intentionality temporally to the future. It involves that people motivate themselves and govern their behaviors by envisioning future states as visualized objectives and anticipated outcomes. A forethoughtful perspective enables them to transcend the constraints of immediate circumstances and, in the long run, provides direction, consistency, and purpose to their lives (Bandura, 2006). The second property, *self-reactiveness*, means the self-regulatory ability to construct appropriate courses of action and to manage their execution within a self-governing system based on self-sanctions. To this end, people establish their unique behavioral norms against which they evaluate their performances and initiate either confirming or adjusting self-reactions accordingly (Bagozzi, 1992; Bandura, 1991). *Self-reflectiveness*, at last, implies that people not only have self-regulatory authority over their actions but also possess the ability to self-examine their functioning. On a meta-

cognitive level, this self-awareness is about reflecting on personal efficacy, adequacy of thoughts and actions, and their respective meanings, and making corrective adjustments if necessary (Bandura, 2018).

With recourse to the three main properties of human agency, self-regulation theory (Bandura, 1991) provides a pivotal explanation of the motivational processes that underlie the notion of proactivity. Traditional views of human motivation and performance (e.g., equity theory and early goal-setting theory) have tended to see the objectives of individuals as given by the context to be accepted and as reactive causes of their behaviors (Locke & Latham, 2002; S. K. Parker et al., 2010). In line with the perspective of triadic co-determination of behavior, self-regulation theory, in contrast, posits a dual control system of motivation. This control mechanism involves, on the one hand, a feed-forward (i.e., proactive) discrepancy production system and, on the other hand, a reactive discrepancy reduction system (Bandura, 1991). The first system means that people motivate themselves through proactive control by setting themselves challenging goals and performance standards (based on their forethought abilities), creating a state of disequilibrium to be mastered. Subsequently, it implies that people mobilize their efforts and personal resources based on their anticipatory estimation of what it would take to meet the self-set performance standards. The second system, on the contrary, connotes reactive feedback control, which comes into play when later adjustments of effort to achieve the desired outcomes are necessary (Bandura & Locke, 2003).

The social-cognitive and self-regulatory theoretical accounts of human agency provide at least three implications for Siebert and Kunz's (2016) PROACTIVE DECISION-MAKING concept. The first, most apparent yet most fundamental implication is that decision-makers virtually have the choice to be proactive. Conversely, in support of the voluntarist view of decision-making (Franco et al., 2021), any non-proactive decision-making approach may not be seen as externally determined. Instead, it could be an expression of not proactively having decided on a PROACTIVE DECISION-MAKING approach (or vice versa, e.g., when the additional cognitive effort to do so would not pay off, Keeney, 2020). That said, such a standpoint presupposes that the persons in question possess sufficient self-reflection abilities that Bandura (2006) generally attributes to them but also posits as the baseline for proactivity.

The second implication relates to the capacity for forethought that enables and, ultimately, requires, in self-coherence terms, agentic individuals to make their envisioned objectives and anticipated outcomes a salient part of themselves (Gollwitzer, 1990; Locke & Latham, 1990). From a PROACTIVE DECISION-MAKING perspective, this means that individuals should

have and use the ability to likewise incorporate these objectives consistently and actively into their decision-making—and precisely not only short-term preferences (Hsee & Hastie, 2006; Keeney, 1992). Since PROACTIVE DECISION-MAKING is very likely subject to a conscious choice in the first place, this objectives awareness should not be at odds with the realization that people occasionally also unconsciously pursue goals and self-regulate their behavior commensurately (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Carlson, Tanner, Meloy, & Russo, 2014).

The third implication, at last, stems from the self-regulatory abilities of agentic individuals to self-govern their efforts and personal resources. In this iterative pursuit of coping with their proactively created states of disequilibrium, they are, by definition, supposed to identify and engage in behaviors that meet their performance standard best or adjust their behaviors accordingly (Lent, Brown, & Hackett, 1994). Strictly speaking, this requires the awareness of decision-making as a continuous and non-narrowly framed process and equally the ability to shape that process proactively, provided one is interested in successful change (Gollwitzer, 1999; Kahneman & Lovallo, 1993; Larrick, 2012). Accordingly, self-coherently proactive individuals can be presumed not to accept any tasks or parts (e.g., alternatives or information) in their decision-making as merely given, excepting their objectives. In other words, they should strive to adopt a more PROACTIVE DECISION-MAKING approach.

2.3 CONCEPTUAL FOUNDATIONS

On a more concrete level, Siebert and Kunz's (2016) PROACTIVE DECISION-MAKING conceptualization stands on four conceptual pillars, evenly related to the sides of the decision sciences and the psychology of human agency. As presented in **Figure 1**, these include, for one part, decision quality and value-focused thinking, which signify effective and forward-looking decision-making (Keeney, 1992; Spetzler et al., 2016). For the other part, they include proactive personality and proactive behavior as more explicit manifestations of human agency (Bateman & Crant, 1993; Grant & Ashford, 2008).

DECISION QUALITY AND VALUE-FOCUSED THINKING

The first conceptual pillar, *decision quality*, concerns the question of what distinguishes a good decision from a bad one (Edwards, 1984). While most people and organizations naturally judge a decision retrospectively by outcome (and the associated consequences), this view often implies a bias in thinking (Baron & Hershey, 1988; Keren & Bruine de Bruin, 2003). In most cases, it mistakenly supposes a decision under certainty against the uncertainty that virtually characterizes those decisions (Howard, 1988). It neglects that the outcome (e.g., a plane crash) usually remains outside the control of the decision-maker (e.g., someone who wants to travel overseas as fast as possible), even if the person has chosen the best option (e.g., traveling by plane with a reliable airline). Likewise, such an ex-post outcome-related view can lead to biased perceptions of the decision that preceded the experienced consequences (e.g., hindsight or self-serving bias; Roese & Vohs, 2012; Spetzler et al., 2016). Accordingly, the consensus that has emerged from the decision sciences is a distinction between *decision* and *outcome* (Baron, 2008; Keren & Bruine de Bruin, 2003). In this view, a good outcome is a future state compared to other possibilities, whereas a good decision is a choice that follows from effective decision-making—that is, decision-making based on the principles of decision quality (Frisch & Clemen, 1994; Howard, 1988; Spetzler et al., 2016). Yet, the decision sciences also agree that better decision-making usually increases the likelihood of achieving the desired outcomes (Hammond et al., 1999; Keren & Bruine de Bruin, 2003; Spetzler et al., 2016).

According to Spetzler et al. (2016) and Howard (1988), decision quality consists of six (resp. seven) elements: proper framing, informational excellence, creative alternatives, clear values, integration and evaluation with logic, commitment to action, and balance of basis. Satisfying these elements requires exploiting a distinctive set of different yet interrelated (cognitive) skills across all decision-making tasks; it also demands the willingness to change decision-

related behavioral routines accordingly (Ericsson, Krampe, & Tesch-Römer, 1993; Keeney, 2004). Finally, decision quality reflects the extent to which the decision-maker systematically approaches and excels at each step of the decision-making process (cf. Keeney, 2020; Mellers & Locke, 2007). At the front end, these are recognizing, defining, and structuring the problem, including the generation of alternatives. At the back end, these steps involve evaluating and selecting among options, and implementing and reviewing the chosen solution. Avoiding common decision biases (for overviews, see Baron, 2008; Montibeller & Winterfeldt, 2015) is necessary but insufficient for decision quality (Spetzler et al., 2016). In this sense, the notion of decision quality, as understood by Spetzler et al. and Howard, contrasts with or exceeds what is implied by the predominant conceptualizations of decision-making competence. By considering skills like the resistance to framing or consistency in risk perception, these conceptualizations more generally address the ability of individuals to follow normative principles of rationality in decision-making (Bruine de Bruin, Parker, & Fischhoff, 2007; A. M. Parker, Bruine de Bruin, Fischhoff, & Weller, 2018).

The second decision-scientific pillar of PROACTIVE DECISION-MAKING embodies Keeney's (1992) *value-focused thinking* conceptualization. In this prescriptive thinking and decision-making paradigm, Keeney emphasizes clear values—and the objectives derived from them—as the primary source of effective decision-making. If so, there is no self-evident way to guide the additional cognitive efforts necessary for effective decision-making when individuals are unaware of what they inherently want (Locke & Latham, 2002). However, rather than focusing on fundamental values first, most people start thinking about decisions and potential objectives only when confronted with the need to choose among a set of alternatives that involves one or more specific courses of action (Keeney, 1996; León, 1999). This prevailing decision-making approach, which Keeney (1992) subsumes under the term *alternative-focused thinking*, causes individuals to perceive decisions as context-specific problems to be solved and not their framing as broader opportunities they can seize (Ley-Borrás, 2015). In other words, most people understand their decision-making as a function of cure rather than a concern of prevention. Hence inherent in this approach is essentially a reactive response to an externally imposed narrow set of alternatives (Larrick, 2012), frequently based on the insufficient elicitation of short-term preferences (Fischhoff, 2008; Hsee & Hastie, 2006). New options that are not immediately available to the decision-maker (e.g., contemplating a new flat closer to the workplace instead of choosing among different car models) most often remain outside the scope of the decision process (Selart & Johansen, 2011).

Logically, such a backward-oriented mode of thinking is deficient in taking control of one's decision-making and the decision situations one faces—and, thus, is at odds with effective decision-making (Brown, Ryan, & Creswell, 2007; Karelaia & Reb, 2015). In essence, it neglects that decision alternatives are relevant only because they are means to achieve objectives and, eventually, values (Keeney, 1994). Therefore, Keeney (1992, 2020) proposes that values and exactly not alternatives are fundamental for effective decision-making just as they more naturally pervade most decision support and problem-solving tools found in operations research, management science, and decision analysis. Unlike the reactive experimental accumulation of goals by initially acting without reflecting on them (cf. March, 1971), thinking of values, while challenging for many (Bond et al., 2008; Wright & Goodwin, 1999), is inasmuch crucial as it is the only self-determined way to identify objectives. Systematically doing so helps uncover hidden goals and develop objectives hierarchies vital to effectively navigating decisions with multiple objectives (Keeney, 1996).

Apart from serving as a self-nudge of actions more generally (Keeney, 2020), the awareness of objectives is also crucial to identifying decision opportunities and creating alternatives. According to Keeney (1992), there are two ways to find and develop such decision opportunities. One is to convert an existing decision problem into an opportunity by broadening the decision frame (Larrick, 2012). The other way is to create them from scratch by creatively reflecting on how to achieve one's objectives better. Numerous value-focused thinking guidelines facilitate the search for more and better options (Keeney, 1992; Siebert & Keeney, 2015). Their basic principle, however, is to create alternatives considering at least one of the values specified for the decision situation first to remain rationally unconstrained by the circumstances and potential mental shortcuts (e.g., anchoring) as much as possible (Moreau & Dahl, 2005; Tversky & Kahneman, 1974). Finally, the awareness of one's objectives facilitates the collection of decision-relevant information and is mandatory to evaluate alternatives consistently at the back end of the decision-making process. And, as the case of Alice and the Cat presented at the outset of this thesis should illustrate, it also improves communication toward decision aid or in situations involving multiple stakeholders (Keeney, 1996).

Supported by the respective prescriptive decision-theoretical foundations, the implications following the notions of decision quality and value-focused thinking for Siebert and Kunz's (2016) PROACTIVE DECISION-MAKING concept are somewhat obvious. Rationality and effectiveness in the problem structuring and generating alternatives require that individuals clearly perceive what they inherently want (Keeney, 1992). Based on their clearly expressed objectives, they should subsequently be able to understand and frame their decision-making

accordingly (Howard, 1988; Spetzler et al., 2016). Further, effective decision-makers possess and utilize cognitive skills that enable them to create more and better alternatives by themselves and to find the most relevant and reliable information to aid their decision-making process (Howard, 2007; Siebert & Keeney, 2015).

PROACTIVE PERSONALITY AND PROACTIVE BEHAVIOR

Against the background of social cognitive theory, the psychology of human agency perceives proactivity as both a disposition and actual behavior of agentic individuals (S. K. Parker, Wang, & Liao, 2019; Tornau & Frese, 2013). Consistently, proactive personality and proactive behavior represent the remaining two closely intertwined pillars of Siebert and Kunz's (2016) concept.

Turning to the first, Bateman and Crant (1993, p. 103) provide the most widely established conceptualization of *proactive personality*, which they define as a "relatively stable tendency to effect environmental change". They further specify that this inclination for change involves striving for improvement, taking the initiative, and scanning for opportunities. Similarly, Schmitz and Schwarzer (1999) consider proactivity as an attitude that implies that proactive persons are value-driven, visionary, and focused on goal attainment. By definition, agentic individuals believe in their ideas of positive change and stick to their confidence in making them happen (Chan, 2006). Accordingly, S. K. Parker et al. (2010) highlight three main features of proactivity: self-starting, change-orientation, and future focus; and Seibert et al. (2001) and J. A. Thompson (2005), among others, more practically add to the understanding of proactive personality. They explicate that these stereotypical agentic traits manifest themselves in specific behaviors and cognitions, which, in turn, relate to positive outcomes, such as career success or job performance.

Concerning the second human agency-related conceptual pillar, Fay and Frese (2001, p. 98) account for *proactive behaviors* more directly. In so doing, these authors conceptualize and define personal initiative as a behavior "characterized by its self-starting and proactive nature and by overcoming difficulties that arise in the pursuit of a goal". By distinguishing their concept from passive and reactive behaviors, they point out that proactive behavior implies acting in advance (Frese & Fay, 2001; Rank, Pace, & Frese, 2004), anticipation, and a forward-looking mindset (Karniol & Ross, 1996). Further frequently studied behavioral manifestations of proactivity in work and career contexts include the concepts of voice and taking charge (Fuller & Marler, 2009; Thomas, Whitman, & Viswesvaran, 2010). According to van Dyne and

LePine (1998, p. 109), voice means a "promotive behavior that emphasizes expression of constructive challenge intended to improve rather than merely criticize". Very similarly, Morrison and Phelps' (1999) concept of taking charge involves a voluntary and constructive extra-role behavior at the workplace intended to effect functional organizational changes. Implicitly, these two concepts and their inherent behaviors, which naturally come along with the social risk of organizational resistance, point to an additional characteristic of proactive individuals, the readiness to take risks (Thomas et al., 2010).

In conceptualizing proactive coping as a forward-looking, risk-evaluative process of personal quality of life management in the face of potentially stressful and complex situations, Aspinwall and Taylor (1997) and Greenglass (2002) provide a slightly different perspective on proactive behavior. Unlike the concepts of voice or taking charge, these authors don't focus on manifestations of agentic behavior in actual goal-attainment. Instead, they more fundamentally address proactive behaviors toward the self-regulatory property of human agency that are required to create opportunities for (personal) growth and to identify activities to take advantage of them. In this sense, proactive coping represents a proactive reflection process that enables proactive individuals eventually to accumulate (personal) resources (e.g., skills or knowledge) so that they remain self-coherent with their dispositions in the future (S. K. Parker et al., 2019)

Referring to proactive activities in actual goal-striving, S. K. Parker, Williams, and Turner (2006) differentiate among two categories: (1) proactive idea implementation and (2) proactive problem-solving. The first category describes future-oriented actions aiming for improvement irrespective of present situations and thus connotes proactivity in the narrower sense. In contrast, the second category, if any, constitutes proactivity in the broader sense according to self-regulation theory (Bandura, 1991). Proactive problem solving refers to context-dependent interventions meant to help prevent the reoccurrence of previous issue or difficulties (Aspinwall, 2005; Aspinwall & Taylor, 1997).

After all, Grant and Ashford (2008, p. 9) ascertain that proactivity jointly involves "thinking, deliberating, planning, calculating, and acting in advance with foresight about future states before they occur" to make a meaningful impact (Buss, 1987; Grant, 2007) either on the self or on the environment (Bateman & Crant, 1993). Moreover, these authors emphasize that proactivity is generally not limited to a single set of actions. Instead, it is a self-referent cognitive process adaptable to any activity through anticipating, informed planning, and endeavoring to have an impact. Insofar Grant and Ashford (2008) stress the fact that any behavior can be

carried out more or less proactively depending on whether human activity is, in the end, agentic or not (Bandura, 2001).

Viewed together, these conceptual accounts of proactive personality and behavior bear two overarching implications for Siebert and Kunz's (2016) PROACTIVE DECISION-MAKING concept. First, drawing on the triadic co-determination of behavior, they establish that each agentic and proactive approach has a dispositional and behavioral facet (S. K. Parker et al., 2019). In a strict reading, the corollary is that the decision-maker personality alone cannot render a decision proactive without the corresponding decision-making behavior. In other words, PROACTIVE DECISION-MAKING requires more than a self-referent interest in positive change. Second, in practical terms, this agentic approach to decision-making to be self-starting, future-focused, and opportunity-oriented cannot be grounded on the inherently reactive evaluation or selection tasks at the back end of decision-making processes (Bateman & Crant, 1993; Keeney, 1992). Instead, as Siebert and Kunz (2016) only implicitly suggest, PROACTIVE DECISION-MAKING presupposes proactivity-aligned decision-making at the front end during the phase of problem-structuring and generating alternatives.

2.4 DEFINITION AND OPERATIONALIZATION

Drawing upon the theoretical and conceptual foundations mentioned before, Siebert and Kunz (2016) have conceptualized PROACTIVE DECISION-MAKING and developed a corresponding multi-dimensional measurement instrument. In contrast to other decision-analytical approaches that prescriptively focus on a logically consistent decomposition of complex decision problems (Edwards et al., 2007), Siebert and Kunz examine the actual decision-making behavior (resp. the specific cognitive skills involved) and trait characteristics required for equally effective and forward-looking decision-making. More precisely, in doing so, they focus on problem structuring up to and including generating alternatives, commonly considered to be the most crucial but in the decision sciences largely understudied phase during decision processes (Arbel & Tong, 1982; Colorni & Tsoukiàs, 2020; León, 1999; Siebert & Keeney, 2015). Notwithstanding the likely transferability of the PROACTIVE DECISION-MAKING concept to group and organizational decision-making contexts, it emphasizes individual decision-makers.

As illustrated in **Figure 3**, Siebert and Kunz (2016, p. 875) account for the two-dimensional nature of proactivity, as previously discussed, in defining PROACTIVE DECISION-MAKING as "the purposeful use of [proactive] cognitive skills and certain foresighted personality traits of the decision maker". They also specify that PROACTIVE DECISION-MAKING connotes the value-orientated and self-initiated decision-making of individuals who strive for improvement and, toward that end, adopt these means: systematically identifying objectives; generating a variety of suitable alternatives; gathering information about opportunities and threats; and anticipating the outcomes that might follow from any chosen course of actions.

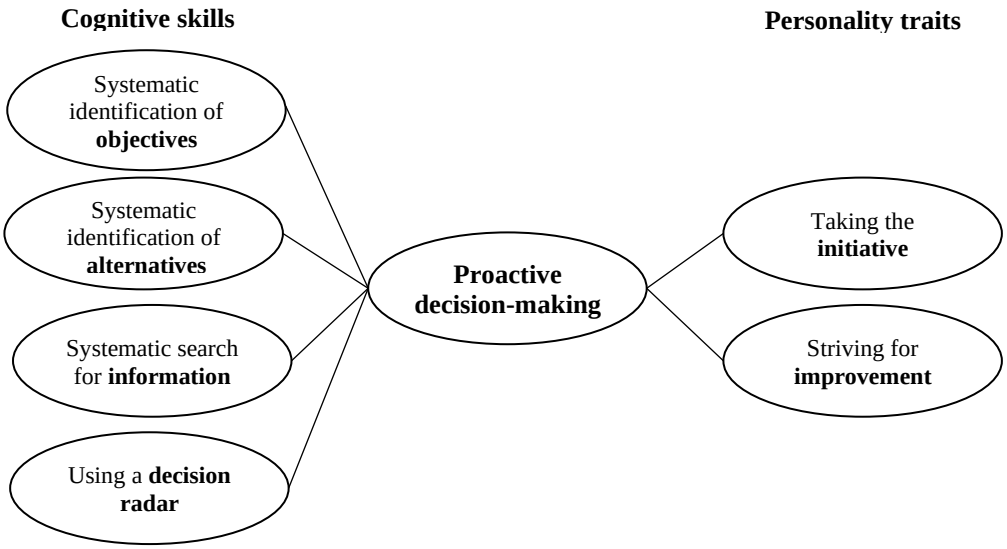

Figure 3: The proactive decision-making concept

More specifically, Siebert and Kunz (2016) elaborate on two general personality traits and four cognitive skills that distinguish proactive and effective from reactive decision-making during the phase of problem structuring and generating alternatives. Concerning the two *personality traits*, Siebert and Kunz differentiate between (1) striving for IMPROVEMENT and (2) taking the INITIATIVE, which they regard as distinct but complementary facets of one's commitment to proactive behavior during decision-making processes (see also Tornau & Frese, 2013). Proactive decision-makers are presumed to be interested in effecting meaningful outcomes (Grant & Ashford, 2008) and expected to strive for improvement in decision situations (Bateman & Crant, 1993; S. K. Parker et al., 2010). Further, these authors assume that—in the absence of this pursuit of improvement as exemplified by humans' proactive capacity for self-regulation (Bandura, 1991)—there would be no reason or particular motivation for anyone to undertake the additional cognitive effort required for a PROACTIVE DECISION-MAKING approach. Note also that decision-makers are viewed as proactive only if they apply the four respective cognitive skills; it is not enough merely to be given that opportunity situationally or as a matter of cognitive control (Del Missier, Mäntylä, & Bruine de Bruin, 2012). Hence, according to Siebert and Kunz, proactive decision-makers take the initiative in decision situations (Fay & Frese, 2001) and wish to actively shape themselves or their environment (Grant & Ashford, 2008).

Regarding proactive *cognitive skills*, Siebert and Kunz (2016) distinguish four interdependent abilities: (1) systematic identification of OBJECTIVES, (2) systematic identification of ALTERNATIVES, (3) systematic search for INFORMATION, and (4) using a DECISION RADAR. These epitomize learned behavioral manifestations of proactivity and decision quality during decision-making processes based on value-oriented, analytical thinking and logical reasoning (Keeney, 1992; E. R. Smith & DeCoster, 2000; Spetzler et al., 2016).

The *first skill*, systematic identification of OBJECTIVES, is closely linked to the perception that proactivity is a goal-directed process (S. K. Parker et al., 2010) of visionary individuals (Grant & Ashford, 2008) guided by their values (Keeney, 1992). Without an active understanding of the objectives derived from their vision and the ability to make them a salient part of decision-making processes (Bond et al., 2008, 2010), individuals cannot or can only insufficiently encourage and direct their behavior toward those objectives (Bargh et al., 2001; Locke & Latham, 2002). Conversely, an alignment with the paradigm of value-based thinking enables decision-makers to transcend the constraints of the immediate decision-making situation (Brown et al., 2007; Keeney, 1992). Systematically thinking about objectives fosters the resilience to being overly influenced by contextual irrelevancies such as framing effects, which is

necessary to identify desirable decision opportunities (Carlson & Bond, 2006; Keeney, 1996). In this sense, clarity concerning goals is crucial for systematically creating alternatives, gathering information, and anticipating future decisions (Siebert & Keeney, 2015).

The *second skill*, systematic development of ALTERNATIVES, is rooted in the view that proactive decision-makers differ from their reactive counterparts in that the formers do not unconditionally accept the options given in a specific context, especially if they do not match their objectives. Instead, to render their decision-making effective in decision quality terms, individuals should be able to create more and better alternatives themselves (Keeney, 1992). And more importantly, they should be able to do so using their objectives as a starting point for two reasons. First, as already indicated, empirical studies in the realm of prescriptive decision theory have shown that using objectives in creating alternatives results in more and better alternatives (Siebert & Keeney, 2015). Second, choosing among objectives-based options not only a priori avoids inconsistencies in goal-striving but also increases the likelihood that individuals will effectively achieve their objectives (Grant & Ashford, 2008; Keeney, 1992).

The *third proactive cognitive skill* that Siebert and Kunz (2016) identified, systematic search for INFORMATION, makes the commonly held assumption that proactive behavior is implicitly information-driven (e.g., S. K. Parker et al., 2010) an explicit feature of proactivity-aligned, effective decision-making. Applying that skill implies that individuals should not rely on easily accessible or immediately available information alone but use their fundamental values to self-determinedly collect relevant and reliable information in decision situations. Achieving such informational excellence (cf. Howard, 1988; Spetzler et al., 2016) facilitates evaluating how well the self-created alternatives fit one's goal-striving (Keeney, 1992; S. K. Parker et al., 2006). Moreover, searching for information systematically helps to avoid any state of indecision caused by a lack of information or information overload (Sauermann, 2005), which is at odds with proactive behavior and effective decision-making.

Finally, the *fourth skill*, using a DECISION RADAR, is based on the future-oriented characteristic of proactive individuals (Fay & Frese, 2001; Grant & Ashford, 2008). As defined by Siebert and Kunz (2016), it captures the continuous search for future decision contexts, which involves the anticipatory prevention of potential problems (Aspinwall, 2005) and the self-directed effort to create future opportunities (Keeney, 1992, 2020). Accordingly, proactive decision-makers should understand their decision-making as an ongoing process and be capable of framing decisions in a broader context without distracting themselves from relevant attributes

(Larrick, 2012). Otherwise they may be unable to actively ensure making the right decisions at the right time in the right way in their goal-striving (Howard, 1988; Ley-Borrás, 2015).

As shown in **Table 1**, in measurement terms, 21 self-report items capture PROACTIVE DECISION-MAKING.

Table 1: Proactive decision-making scale

Dimension	Item	Content
INITIATIVE (Reverse coded)	Ini_1	I usually wait for something to happen rather than taking the initiative myself.
	Ini_2	I don't like to challenge the status quo.
	Ini_3	I tend to react to given circumstances rather than changing them actively.
IMPROVEMENT	Imp_1	I am always looking for better ways to do things.
	Imp_2	I am constantly on the lookout for new ways to improve my life.
	Imp_3	I continually try to improve my current situation.
OBJECTIVES	Obj_1	I try to be clear about my objectives before choosing.
	Obj_2	In general, I am aware of my objectives in a decision situation.
	Obj_3	For important decisions, I engage in systematic reflection, what I wish to achieve.
ALTERNATIVES	Alt_1	I excel at identifying opportunities.
	Alt_2	I systematically use my objectives to create alternatives.
	Alt_3	I am good at finding ways to achieve my objectives.
	Alt_4*	I think twice how I can achieve my objectives.
INFORMATION	Inf_2	I actively seek for information to improve my decision making.
	Inf_3	I systematically collect the decision-relevant information.
	Inf_4	I double check my information sources to be sure to have the right facts before making decisions.
DECISION RADAR	Rad_1	I thoroughly think about when I make which decision.
	Rad_2*	I spend a lot of time identifying long-range goals for myself.
	Rad_3*	I consider future events in my current decisions.
	Rad_4	I am very aware of my thinking process in a decision situation.
	Rad_5	I thoroughly consider how best to carry out a decision.

Notes: * Post-hoc excluded in the three studies of this doctoral thesis.

3 APPLICATION OF THE PROACTIVE DECISION-MAKING CONCEPT

3.1 OVERVIEW OF ESSAYS

Overall, this cumulative doctoral thesis consists of three essays that have tested the application of the PROACTIVE DECISION-MAKING concept in various research settings, with different methodological approaches and emphases, and given different sample types and characteristics. Consistent with its overarching research objectives, this thesis has thereby been able to make substantial contributions to the decision sciences and applied psychological research on human agency in the realm of vocational behavior. Analogous to the interdisciplinary scientific background of PROACTIVE DECISION-MAKING, all three essays and the studies they involve feature research questions and problems at the interface of different scientific fields. They combine the decision sciences with (1) happiness economics, (2) education sciences, and (3) vocational psychology. **Table 2** provides an overview of the publication status of these essays and outlines the doctoral candidate's original contributions according to the Contributor Roles Taxonomy (CRediT; Allen, O'Connell, & Kiermer, 2019). Subsequently, the respective purposes, methodologies, findings, and implications of the essays are briefly summarized.

Table 2: Publication status of essays and CRediT authorship

#	Title	Authors	Journal	Relevance	Status *(license)*
1	Effects of proactive decision-making on life-satisfaction	Johannes U. Siebert, Reinhard E. Kunz, Philipp Rolf	European Journal of Operational Research	VHBJQ3: A SJR: 2.35 (Q1) IF: 6.36	Published *(CC BY-NC-ND 4.0)*
	ORIGINAL CONTRIBUTION: Conceptualization*;* Investigation; Formal analysis; Writing – Original Draft; Writing – Review and Editing; Visualization				
2	Effects of decision training on individuals' decision-making proactivity	Johannes U. Siebert, Reinhard E. Kunz, Philipp Rolf	European Journal of Operational Research	VHBJQ3: A SJR: 2.35 (Q1) IF: 6.36	Published *(CC BY 4.0)*
	ORIGINAL CONTRIBUTION: Conceptualization*;* Methodology; Formal analysis; Writing – Original Draft; Writing – Review and Editing; Visualization				
3	Career success and proactive career behavior: A matter of effective decision-making	Philipp Rolf, Johannes U. Siebert, Reinhard E. Kunz	Working paper, set up for submission		
	ORIGINAL CONTRIBUTION: Conceptualization*;* Methodology; Investigation; Formal analysis; Writing – Original Draft; Writing – Review and Editing; Visualization; Supervision; Project administration				

Notes. VHBJQ3 = VHB-JOURQUAL 3 Ranking; SJR = Scimago Journal & Country Rank; IF = Impact Factor (Clarivate Analytics 2022).

SUMMARY OF ESSAY 1: EFFECTS OF PROACTIVE DECISION-MAKING ON LIFE SATISFACTION

PURPOSE

Surprisingly—aside from the platitude that happiness is a matter of choice—previous research in operations research/management science and decision analysis largely has neglected to analyze how individual differences in decision-making behavior contribute to higher levels of subjective well-being. Moreover, even those studies that address this relationship have not provided satisfactory answers about its nature. From a decision-analytic perspective, the question remains of how effective decision-making (i.e., decisions made according to the principles of decision quality) influences a state of subjective well-being. Against this background, this study seeks to provide further insights into the nature of the relationship between life satisfaction and effective decision-making in its phase of problem structuring up to and including the stage of generating alternatives, as epitomized by the recently introduced PROACTIVE DECISION-MAKING concept. For this purpose, it proposes and empirically tests a model in which general self-efficacy and decision satisfaction constitute mediators that provide the previously missing link.

DESIGN/METHODOLOGY/APPROACH

This empirical study employed a cross-sectional research strategy based on three independent surveys. To collect data, it used an online questionnaire. The first survey served as a pre-study whose purpose was to revalidate Siebert and Kunz's (2016) PROACTIVE DECISION-MAKING scale and to perform some preliminary hypothesis testing. The second two surveys constituted the main study; they used different data sets to confirm those initial results. Amazon's Mechanical Turk allowed recruiting participants for the first two surveys. Participants in the third survey were attendees of an undergraduate course at a German university. After removing incomplete data sets, the total sample included 1,300 participants. For testing its hypotheses, this study followed a two-stage analytic procedure. The first stage consisted of covariance-based confirmatory factor analyses. These confirmed the psychometric properties and dimensionality of the employed latent variables and fitted a measurement model to the data. In the second stage, covariance-based structural equation modeling assessed the strength and significance of the hypothesized paths, tested for indirect effects, and determined the model fit of the several posited structural models.

FINDINGS

The results of this study, replicated in all three samples, first confirm that the PROACTIVE DECISION-MAKING scale has good psychometric properties, meaning that it is a reliable and valid measurement instrument. They establish that PROACTIVE DECISION-MAKING is a three-dimensional construct consisting of two distinct traits and four closely related cognitive skills, which underlie a common higher-order factor. Second, the results indicate that PROACTIVE DECISION-MAKING promotes positive personal outcomes in the form of (1) general self-efficacy, (2) decision satisfaction, and (3) life satisfaction. Finally, they suggest that PROACTIVE DECISION-MAKING affects life satisfaction not directly but through the individual's experience of decision satisfaction and general self-efficacy.

ORIGINALITY/VALUE

This study extends the literature at the interface of behavioral operations research, decision analysis, and happiness economics by examining the relationship between effective decision-making and life satisfaction. First, the results further substantiate the baseline argument that subjective well-being (as proxied by life satisfaction) is a matter of choice. That implies that individuals can positively influence their life satisfaction by intentionally choosing to follow a more effective decision-making approach. Second, given that previous studies have not adequately explained the relationship between effective decision-making and subjective well-being, the results highlight how crucial the phase of problem structuring and generating alternatives is—for subjective decision outcomes and effective decision-making. Accordingly, decision scientists should expand their definitions of decision-making competence by explicitly considering this decision-making phase and its associated skills. Third, the results underscore the advantage in decision processes of not only following decision quality principles but also being proactive in problem structuring and generating alternatives. That implies that PROACTIVE DECISION-MAKING is meaningful at the individual level toward enhanced life satisfaction, decision satisfaction, and general self-efficacy; it also highlights the relevance of operations research and decision analysis to individuals and their lives. Finally, the results establish how crucial it is for operations research (and decision analysis) to become more interdisciplinary when analyzing the applicability and usefulness of its proposed decision structuring and problem-solving models and techniques. There are direct effects between one's decision-making and expected outcomes. Yet, there are also indirect effects that can influence that relationship.

SUMMARY OF ESSAY 2: EFFECTS OF DECISION TRAINING ON INDIVIDUALS' DECISION-MAKING PROACTIVITY

PURPOSE

Decision scientists generally agree on the theoretical relevance of decision training in nudging individuals toward more effective decision-making and capitalizing on the full potential of decision-support methods and problem-solving tools. Yet, despite that consensus, there is scant robust empirical research into the effectiveness and practical usefulness of decision-making courses. In particular, scholars have neither systematically nor sufficiently addressed the impact of training interventions on individuals' decision-making behavior related to structuring problems up to and including the stage of generating alternatives—tasks that are prerequisites for effective decision-making. The question remains whether decision training promotes effective decision-making concerning that decision-making phase. Against this background, this study tests the effects of decision training on the two facets of PROACTIVE DECISION-MAKING—cognitive skills and personality traits—and on decision satisfaction.

DESIGN/METHODOLOGY/APPROACH

This empirical study employed a quasi-experimental field study research strategy in conjunction with a repeated-measures design. Using an online questionnaire, participants in three different types of decision-making courses—(1) massive online, (2) large university, and (3) small business school—were asked to answer questions about their decision-making behavior before taking the intervention and shortly after. Further, an external control group that received no training and an internal control group, composed of prospective participants of the third course three months before that course, were included in the study. Finally, it incorporated peer ratings and collected data approximately one year after the intervention. After matching pre- and post-intervention (and non-intervention) data and removing incomplete data sets, the total sample retained 1,013 participants. For testing its hypotheses, this study followed a two-stage analytic procedure. Covariance-based confirmatory factor analyses characterized the first stage. They evaluated the psychometric properties and dimensionality of the employed latent variables. Moreover, they confirmed the comparability of measurements across the two primary samples: the one before the courses and the other shortly after. In the second stage, paired-sample *t*-tests and repeated measures ANOVAs tested the strength and significance of the hypothesized effects.

FINDINGS

The results of this study, replicated across three distinct intervention types, support the hypothesized positive impact of decision training on proactive cognitive skills and decision satisfaction. Also, as expected, there are no such effects on the two proactive traits (viz., taking the INITIATIVE and striving for IMPROVEMENT). Further, they indicate that course workload, non-course participation, self-evaluation measures, and test time do not provide alternative explanations for the observed effects. Finally, the results suggest that the impact of decision training on proactive cognitive skills is mainly independent of the participant's professional decision-making experience and responsibility to make (or analyze) decisions professionally.

ORIGINALITY/VALUE

This study extends the literature at the interface of behavioral operations research, decision analysis, and educational research by assessing the effectiveness of decision training in promoting effective individual decision-making. First, the results substantiate the assumption that participation in decision-making courses is of practical relevance, even for more experienced decision-makers, and beyond what other (university) courses can provide. That should give operations research lecturers and decision analysts a good starting point to discuss the insufficient number of such classes in school and university curricula, with many institutions even discarding them altogether. Second, the results accentuate the multi-faceted nature of PROACTIVE DECISION-MAKING. Finding divergent intervention effects on proactive cognitive skills and proactive traits answers the question about the extent of decision training's effects. Yet it also contributes to proactivity-related research more generally, which has provided inconsistent answers to the question of whether it is possible to teach proactivity. Finally, the results showcase the value of decision-making courses from an individual's perspective. Learning what constitutes effective decision-making is almost certainly required to capitalize on the full potential of decision-support methods and problem-solving tools. And even more importantly, such learning may also positively impact the participants' lives in general, as previous studies strongly suggest positive relationships between proactive decision-making, decision satisfaction, and life satisfaction.

SUMMARY OF ESSAY 3: CAREER SUCCESS AND PROACTIVE CAREER BEHAVIOR: A MATTER OF EFFECTIVE DECISION-MAKING

PURPOSE

In recent decades, research on proactivity and proactive behaviors has become a pivotal field in vocational psychology. As an expression of the field's maturation, a consensus has emerged about the characteristics of proactivity and related stereotypical behaviors. At the same time, however, this field has somewhat lost a person-centric perspective that examines the implementation or non-implementation of these theoretically proactive behaviors against preceding decision-making processes. It remains the question of how exactly individuals deliberatively decide or should decide on those behaviors, labeled proactive, that help them best achieve career outcomes in line with personal goals. Against this background, this study proposes that (1) career success and (2) proactive career behavior are matters of effective decision-making.

DESIGN/METHODOLOGY/APPROACH

This empirical study employed a mixed-method research approach, integrating a cross-sectional survey into an experimental design. To collect data, it used an online questionnaire. A professional panel service provider distributed the questionnaire in two surveys, excluding multiple participations. The first survey constituted the control condition. The second survey, which was effectively identical in content, served two purposes. First, it tested the results' robustness to two experimentally manipulated conditions based on the availability heuristic in human judgment and the underlying ease-of-recall bias. Second, it served as the source for qualitative data. After removing incomplete data sets and screening out nonsensical responses to the experimental task, the total sample included 655 participants. A two-stage quantitative analytic procedure served to test the first part of the study's proposition. The first stage consisted of covariance-based confirmatory factor analyses. These confirmed the properties and dimensionalities of the employed latent variables and fitted a measurement model to the data. Likewise, they established measurement invariance across the experimental conditions. In the second stage, multigroup covariance-based structural equation modeling ruled out multigroup moderation effects, assessed the strength and significance of the hypothesized paths, and determined indirect effects. Finally, a phenomenological content analysis based on open, axial, and selective coding made it possible to address the second part of the study's proposition.

FINDINGS

The quantitative results of this study, robust to experimental ad hoc manipulations of PROACTIVE DECISION-MAKING, predominantly support the hypothesized relationships. They indicate significant positive effects of PROACTIVE DECISION-MAKING on different indicators of subjective career success (career authenticity and satisfaction, recognition for work quality, (positive) career goal discrepancy, and overall career success). Likewise, they suggest positive, yet slightly weaker, associations with objective career success (promotions, job level, salary). Further, the results show that the effects of the proactive cognitive skills are considerably more profound than those of the two related personality traits. The qualitative results reveal a substantial overlap between behaviors commonly thought to indicate career proactivity and behaviors that result not only theoretically but also de facto from deliberately and proactively made decisions. Yet, they also uncover behaviors that the common conceptualizations of proactive career behaviors do not sufficiently reflect.

ORIGINALITY/VALUE

This study extends the literature at the interface of behavioral operations research, decision analysis, and vocational psychology by examining the relationship between effective decision-making and career success and analyzing the lived experiences with PROACTIVE DECISION-MAKING in career contexts. First, the results substantiate that career success is a matter of effective decision-making. In particular, the skills required for proactively approaching career decisions may constitute career self-management competencies that transcend more general problem-solving and decision-making abilities. That implies that career counseling should treat career self-management and effective career decision-making as inseparable. Careerists, in contrast, should have a valid argument to invest in developing proactive cognitive skills. Second, given the relative robustness of the observed effects to the ease-of-recall bias, this study successfully controls this potential endogeneity restriction. That should also endorse the validity of previous research on proactive behavior, which has neglected potential confounds due to such biases in human judgment. Finally, the results also substantiate that proactive career behaviors are a matter of effective decision-making. The salient heterogeneity in recalling career decisions made proactively, and associated actions, indicate that proactive career behaviors acquire real meaning only through subjective interpretation relative to career goals or circumstances. That underscores the relevance of adopting a more conscientious and person-centered view of proactive career behavior, and PROACTIVE DECISION-MAKING is one way to do so.

3.2 ESSAY 1: EFFECTS OF PROACTIVE DECISION MAKING ON LIFE-SATISFACTION

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ABSTRACT

Proactive decision making, a concept recently introduced to behavioural operational research and decision analysis, addresses effective decision making during its phase of generating alternatives. It is measured on a scale comprising six dimensions grouped into two categories: proactive *personality traits* and proactive *cognitive skills*. Personality traits are grounded on theoretical constructs such as proactive attitude and proactive behaviour; cognitive skills reflect value-focused thinking and decision quality. These traits and skills have been used to explain decision satisfaction, although their antecedents and other consequences have not yet been the subject of rigorous hypotheses and testing.

This paper embeds proactive decision making within a model of three possible consequences. We consider—and empirically test—decision satisfaction, general self-efficacy, and life satisfaction by conducting three studies with 1,300 participants. We then apply structural equation modelling to show that proactive decision making helps to account for life satisfaction, an explanation mediated by general self-efficacy and decision satisfaction. Thus proactive decision making fosters greater belief in one's abilities and increases satisfaction with one's decisions and with life more generally. These results imply that it is worthwhile to help individuals enhance their decision-making proactivity.

Demonstrating the positive effects of proactive decision making at the individual level underscores how important the phase of generating alternatives is, and it also highlights the merit of employing "decision quality" principles and being proactive during that phase. Hence the findings presented here confirm the relevance of OR, and of decision-analytic principles, to the lives of ordinary people.

KEYWORDS: Behavioural OR; Decision satisfaction; Life satisfaction; General self-efficacy; Proactive decision making

Making good decisions is a crucial skill at every level.

— Peter F. Drucker (1909–2005)

1. INTRODUCTION

Individual and organisational decision making has long attracted the attention of academics from various disciplines (Bell, Tversky, & Raiffa, 1988). This interest is hardly surprising given that it is only by making decisions that individuals and organisations can purposefully affect the outcomes that are relevant to them (Keeney, 2013). Hence understanding the mechanisms of decision making, deriving suitable techniques to structure and solve decision problems, and then applying those methods appropriately is widely viewed as the key to better decision making and hence to better decisions (Hämäläinen, Luoma, & Saarinen, 2013; Roy, 2005). The importance of this topic is clear when one considers that many individuals overestimate their decision-making abilities (Keeney, 1992).

The field of operational research has for some time focused mainly on the development and evaluation of approaches—to structuring decisions and solving problems—that facilitate systematic thinking and so enable decision makers to derive viable solutions in complex settings (Becker, 2016). Yet OR researchers have begun to rethink their field's predominantly choice-centric and often normative orientation; in so doing, they have initiated a return to the OR profession's roots (e.g., Dutton & Walton, 1964) by considering the individuals actually involved in decision-making processes (cf. Hämäläinen et al., 2013.) There is an increasing number of studies that account for personal differences among decision makers and that focus on their actual decision making (Franco & Hämäläinen, 2016; White, 2016); such research does not assume any uniformity of decision makers beyond individual risk preferences. These studies adopt an interdisciplinary perspective and examine, for instance, psychological heuristics in OR (Keller & Katsikopoulos, 2016), behaviour observed during problem-structuring method interventions (White, Burger, & Yearworth, 2016), and the effects of emotions and of information overload on decision quality (Korhonen et al., 2018).

Along similar lines, OR has become increasingly interested in issues related to happiness and well-being—as in the context of sustainability (Barbosa-Póvoa, da Silva, & Carvalho, 2018) or community development (Johnson, Midgley, & Chichirau, 2018). So rather than focusing only on those decision-making problems that affect particular organisations or their functions, OR also examines decision-making issues germane to the betterment of society in general and, ultimately, to the betterment of individuals (e.g., Cook, 1973). For instance,

Baucells and Sarin (2012) develop a comprehensive framework for arguing that happiness can be engineered; their key premise is that "the very essence of attaining a happier life is choice" (p. 4). In other words, individuals can improve their outlook on life simply by deliberately choosing to follow that framework's "six laws of happiness" (cf. Baucells & Sarin, 2013). Cordero, Salinas-Jiménez, and Salinas-Jiménez (2017) similarly integrate the fields of OR and happiness economics (Kahneman & Krueger, 2006) by exploring factors, across countries, that affect *individual* levels of happiness. In terms of *social* well-being, recent work has studied decision-making competence and its value for building resilience in youth (Taylor, 2018) and has emphasised the importance of OR for overcoming social problems such as human trafficking (Konrad, Trapp, Palmbach, & Blom, 2017).

It is surprising that, despite the growing interest in these two offshoots of OR, few scholars have sought to integrate them. Previous research has largely neglected to analyse how individual differences in decision-making behaviour contribute to higher levels of happiness and subjective well-being. Moreover, even those studies that address this relationship (e.g., Geisler & Allwood, 2015) have not provided satisfactory answers about its nature. From a decision-analytic perspective, the question remains of just how a state of subjective well-being is influenced by effective decision-making behaviour (as defined e.g., by Howard, 1988; Keeney, 1992).

This paper contributes to both of these developments in OR by focusing on individual differences in decision making and their effect on individual well-being. Thus we are inspired by the idea of linking decisions and happiness (Baucells & Sarin, 2012) and ask: *How does effective decision making contribute to life satisfaction?* Although the task of generating alternatives—unlike that of evaluating those alternatives—is commonly considered to be the most crucial phase of decision making, the former is given short shrift in most of the extant research on this topic (see Arbel & Tong, 1982; Siebert & Keeney, 2015). Hence we are motivated to analyse how individuals' differences that become manifest during this phase are related to the life satisfaction of those decision makers. Of course, even a good choice (i.e., one based on the well-considered evaluation of alternatives) cannot compensate for a set of "bad" alternatives; in that case, the likely result will be inferior decision making (Ackoff, 1978). We therefore posit that individuals' differences in this phase yield different decision-making outcomes and also, as a consequence, varied self-perceptions of well-being.

In analysing this relationship, we pursue three main research objectives. First, we seek further insight into the nature of the relationship between effective decision making and life

satisfaction—that is, beyond the platitude that choice is key to individual happiness (Schwartz et al., 2002). For this purpose, we propose a model in which the mediators are self-efficacy and decision satisfaction. Second, we aim to offer empirical support for the widely (but so far only theoretically) assumed importance of the "generating alternatives" task in terms of subjectively positive decision outcomes. Finally, we stress the utility of skilled behaviour during the phase of generating alternatives by establishing the existence of a positive association between effective individual decision making and increased life satisfaction.

In order to accomplish our research objectives, we build on two strands of research. First, we rely on the *descriptive* research related to subjective well-being, life satisfaction, and relevant determinants (e.g., Diener, 1984) and, more generally, on insights gleaned from research in the areas of personality and cognitive psychology (e.g., Bandura, 1986; Lent et al., 2005). Second, our paper incorporates the *prescriptive* principles of decision analysis and exploits the recently introduced concept of proactive decision making (Siebert & Kunz, 2016), which captures the skills and personality traits most strongly related to effective decision making during its phase of generating alternatives. Thus we answer repeated calls by OR scholars (e.g., Corbett & van Wassenhove, 1993; Franco & Hämäläinen, 2016) to adopt an interdisciplinary research approach.

This paper proceeds as follows. Section 2 presents our study's theoretical and conceptual background. We review the literature devoted to decision making and its effect on life satisfaction in Section 3, where we also develop our formal research hypotheses. Section 4 is dedicated to describing our research procedure, the measures used, and our analytical strategy. The empirical results of our hypotheses testing are summarised in Section 5, and in Section 6 we discuss their implications. Section 7 outlines the study's limitations and suggests possible avenues for further research. Finally, we conclude in Section 8 with an overall summary.

2. THEORETICAL AND CONCEPTUAL BACKGROUND

We aim to establish that, in a decision-making process, individual-level differences arise during the phase of generating alternatives (Siebert & Kunz, 2016) and hence differentially affect life satisfaction (Diener, 1984). In order to substantiate this claim, we start by introducing our study's conceptual background.

2.1. THE PHASE OF GENERATING ALTERNATIVES AND PROACTIVE DECISION MAKING

Most research in the field of decision science agrees that the phase of generating alternatives is a critical determinant of the decisions made by both individuals and organisations (e.g., Gettys, Pliske, Manning, & Casey, 1987; Siebert, 2016; Siebert & Keeney, 2015). This task is especially important for decisions that have far-reaching consequences, which tend to affect (directly and/or indirectly) future choices as well. From a decision-analytic perspective, success in the choice phase of a decision depends in no small part on the quality of alternatives from which the decision maker can choose—in other words, regardless of any particular method employed to make that choice and solve the decision problem (Siebert & Kunz, 2016). Yet suppose there are better options that have been excluded from the set of alternatives (cf. Montibeller & von Winterfeldt, 2015); then one can reasonably suppose that any choice among the available (inferior) options, and their respective consequences, will be suboptimal *even if* the evaluation of alternatives itself was handled properly. To a great extent, then, effective decision making depends on obtaining a good result in the phase of generating alternatives.

Although the importance of that phase has been emphasized by scholars (e.g., Howard, 1988), there are only a few studies that either concern it specifically or examine individual differences in performing the task of generating alternatives (Butler & Scherer, 1997; Pitz, Sachs, & Heerboth, 1980). For example, Keeney (1992) observes that many decision makers devote most of their decision-making efforts to solving the presented problem. Thus individuals often merely identify the most obvious alternatives, or those that their experiences have already shown to be appropriate. Yet this *alternatives*-focused, *reactive* approach cannot ensure that the decision maker identifies the best possible alternatives. Keeney therefore recommends a *value*-focused, *proactive* approach whereby values guide efforts to solve the decision problem. Siebert and Keeney (2015) show that the use of objectives stimulates the process of generating alternatives and increases both their number and quality; however, Selart and Johansen (2011) report that decision makers frequently have little or no experience with using objectives to generate alternatives.

Siebert and Kunz (2016) adopt a more holistic perspective in their discussion of generating alternatives by analysing the traits and decision-making skills of those who are actually engaged in this phase. In particular, these authors seek to identify the traits most associated with the successful performance of that task—that is, in terms of "decision quality" principles (Howard, 1988). They propose, and validate empirically, a multi-dimensional model of proactive decision making (PDM). In describing the real-world, decision-related behaviour (i.e., specific skills) and traits of proactive decision makers, Siebert and Kunz draw on three distinct sources: previously elaborated notions that the concept of proactivity applies to a dispositional personality trait as well as to actual behaviour (Grant & Ashford, 2008); related scholars' insights into decision analysis (e.g., Bell et al., 1988; Howard, 1988); and research on value-focused thinking (Keeney, 1992, in press).

Siebert and Kunz (2016, p. 875) account for the two-dimensional nature of proactivity in defining *proactive decision making* as "the purposeful use of [proactive] cognitive skills and certain foresighted personality traits of the decision maker". They also specify that PDM connotes the value-orientated and self-initiated decision making of individuals who strive for improvement and, toward that end, adopt these means: systematically identifying objectives; generating a variety of suitable alternatives; gathering information about opportunities and threats; and anticipating the outcomes that might follow from any chosen course of actions.

More specifically, Siebert and Kunz (2016) elaborate two general personality traits and four cognitive skills that distinguish—during the phase of generating alternatives—proactive from reactive decision making. Concerning the *proactive personality traits*, Siebert and Kunz distinguish between "striving for improvement" and "taking the initiative", which they regard as distinct but complementary facets of one's commitment to proactive behaviour during decision processes. Proactive decision makers are presumed to be interested in effecting meaningful outcomes (Grant & Ashford, 2008) and are expected to strive for improvement in decision situations (S. K. Parker, Bindl, & Strauss, 2010). Siebert and Kunz assume that—in the absence of this pursuit of improvement as exemplified by humans' proactive capacity for self-regulation (Bandura, 1991)—there would be no reason or particular motivation for individuals to behave proactively and to apply their PDM skills accordingly. Note also that decision makers are viewed as proactive only if they actually apply those skills; it is not enough merely to be given that opportunity. Hence, according to Siebert and Kunz, proactive decision makers take the initiative in decision situations (Frese & Fay, 2001) and wish to actively shape their environment (Grant & Ashford, 2008).

In terms of *proactive cognitive skills*, which reflect the notion that analytical thinking entails deliberate reasoning processes (Novak & Hoffman, 2009; Smith & DeCoster, 2000), Siebert and Kunz (2016) identify four complementary skills: "systematic identification of objectives", "systematic identification of alternatives", "systematic search for information", and "using a decision radar". Unlike other aspects of decision making, such as the evaluation of alternatives, these skills are not employed by reactive decision makers. Rather, they are behavioural requirements for proactive decision making during the phase of generating alternatives.

The first skill, *systematic identification of objectives*, is based on the idea that proactive individuals are value-driven, are often "visionary", and clearly perceive their future (Keeney, 1992). Hence Siebert and Kunz (2016) reason that PDM requires an awareness of the objectives derived from one's vision, which ultimately gives purpose to life (Emmons, 2004) while both encouraging and directing behaviour toward the pursuit of those objectives (Locke & Latham, 2002). With respect to decision making, clarity concerning goals is crucial for systematically creating alternatives and gathering information and for anticipating future decisions (Siebert & Keeney, 2015).

According to social cognitive theory (Bandura, 1986), proactive decision makers differ from their reactive counterparts in that the former refuse to accept unconditionally the alternatives already given in a specific context—and especially if those options are poorly matched to their own objectives. Siebert and Kunz (2016) therefore argue that proactive individuals engage in the *systematic identification of alternatives* and so task themselves with creating more and better alternatives (see also Keeney, 1992). Considering their own objectives is a critical aspect of this activity for two reasons. First, recall that there is empirical support for the hypothesis that using objectives when identifying alternatives results in more and also better alternatives (Siebert & Keeney, 2015). Second, the use of objectives-oriented alternatives has been shown to increase the likelihood that individuals will actually achieve their objectives (Gollwitzer & Brandstätter, 1997; Grant & Ashford, 2008).

Siebert and Kunz (2016) suppose further that proactive decision makers will undertake a *systematic search for information*—a process that facilitates the evaluation of how well each identified alternative matches their objectives. The implication, per Keeney (1992), is that proactive decision makers do not rely solely on apparent or easily accessible information; instead, they pursue a policy of informed decision making (Becker, 2016).

Finally, PDM is rooted in the tendency of proactive individuals to be future oriented (Frese & Fay, 2001; Greenglass, 2002) and is therefore assumed to involve what amounts to a

continuous search for future decision contexts; this skill is captured by the phrase *using a decision radar*. Taking into account the two dimensions of proactive (coping) activity distinguished by S. K. Parker, Williams, and Turner (2006), Siebert and Kunz (2016) expect that this search involves the anticipation and prevention of potential problems (Aspinwall, 2005) as well as the self-determined creation of decision opportunities (Frese & Fay, 2001; Keeney, 1992). In short, proactive decision makers are presumed to be actively engaged in a continuous process of decision making. Hence such individuals should be able to plan their decisions in a relatively broad context, which is conducive to ensuring that they "sort out" problems and make correct decisions (Howard, 1988).

In tests of its nomological validity, research has documented that proactive decision making has a significant effect on individuals' satisfaction with their decisions. So in addition to its relevance to explaining decision satisfaction, PDM should be considered as a means to account for other constructs and variables—and to predict their effects—in the context of behavioural OR (Siebert & Kunz, 2016). As mentioned previously, the relation between PDM and its potential consequences has yet to be established.

2.2. SUBJECTIVE WELL-BEING AND LIFE SATISFACTION

Along with affective balance, *life satisfaction* (LSA) is a key dimension of subjective well-being (SWB). Unlike moods or emotions, LSA is not considered to be an ongoing affective self-evaluation of or response to events that occur in a person's life. Life satisfaction is instead viewed as a cognitive process involving global judgements about an individual's overall quality of life (Diener, Suh, Lucas, & Smith, 1999). The causal logic underlying such judgements can be described from either a top-down or a bottom-up perspective (Diener, 1984), approaches that are the subject of a vibrant discourse in extant literature (e.g., Mallard, Lance, & Michalos, 2017).

The top-down causal perspective views LSA in static, trait-like terms (Lent & Brown, 2008) and supposes that LSA *leads* to certain outcomes, such as satisfaction with a particular life domain (Headey, Veenhoven, & Wearing, 1991). In other words, persons are (say) satisfied with their job because they are mainly satisfied with life—and not vice versa. From the bottom-up perspective, in contrast, certain variables cause LSA; thus individuals are satisfied overall *because* of their aggregate satisfaction with various aspects or domains in their life (Lance, Lautenschlager, Sloan, & Varca, 1989). Examples of such aspects include job satisfaction

(Judge & Watanabe, 1993), family satisfaction (Schimmack & Oishi, 2005), and health satisfaction (Dolan, Peasgood, & White, 2008).

However, there is another perspective that questions this dichotomous assessment and favors a more complex, bi-directional or reciprocal relationship between LSA and satisfaction with life domains (Rojas, 2006). Thus it proposes that, even when individuals are satisfied with their job because they are satisfied with life, it is also the case that their LSA is influenced by domain-specific satisfaction(s) (Diener, 1984). Although they use different sets of data, Lance et al. (1989) and Scherpenzeel and Saris (1996) both show empirically that neither of the two traditional models can itself fully explain variations in the best solutions that follow from assuming a one-directional causal path between domain satisfaction and satisfaction with life in general.

In line with recent research (Mallard et al., 2017; Steel, Schmidt, Bosco, & Uggerslev, 2019), the theoretical position adopted in our study is one allowing for logic that transcends beyond the top-down perspective. Implicit in this position is the assumption that LSA is not entirely static (Lent & Brown, 2008). Recalling the premise stated in our paper's introductory paragraph (viz., that one's life can be purposefully influenced only by making decisions), we assume that differences in the effectiveness of decision making—especially during the phase when alternatives are generated—therefore result in different levels of life satisfaction. Also, we show that this postulated connection is most likely mediated by two other factors: general self-efficacy and decision satisfaction.

3. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

3.1. LIFE SATISFACTION AND ITS CORRELATES

In recent decades, researchers from different disciplines have identified numerous correlates of LSA beyond domain-specific satisfaction (Rojas, 2006) and demographics (Dolan et al., 2008). Among these additional correlates, those that have arguably received the most attention are personality traits and motivational processes (e.g., Emmons & Diener, 1985; Proctor, Linley, & Maltby, 2009) as well as socio-economic and socio-cultural factors (e.g., Cordero et al., 2017; Diener & Suh, 2000; Dolan et al., 2008).

Although there is broad agreement that personality plays a significant role in LSA (e.g., Schimmack, Oishi, Furr, & Funder, 2004; for a review, see Steel, Schmidt, & Shultz, 2008), other relevant psychological determinants include cognition and beliefs (e.g., Lent et al., 2005).

In particular, examining LSA from a dynamic perspective reveals that self-efficacy is a construct of even greater relevance (Lent & Brown, 2008). Self-efficacy, as defined by Bandura (1977), is one of several cognitive processes that many view as essential to human self-regulation and motivation. Thus self-efficacy, a focus primarily of scholars who advocate social cognitive theory (e.g., Bandura, 1986; Lent et al., 2005), is described as a comprehensive, reciprocal mechanism of the individual's cognitive drivers of behaviour (Gist & Mitchell, 1992). This notion captures a "person's self-constructed judgment about his or her ability to execute certain behaviours or [to] reach certain goals" (Ormrod, 2008, p. 356). Several studies have documented that those who are confident about achieving their aims—in other words, who self-report higher levels of self-efficacy—experience significantly higher degrees of LSA (see e.g. Luszczynska, Gutiérrez-Doña, & Schwarzer, 2005).

The socio-economic and socio-cultural factors most frequently studied in relation to LSA are education level, employment status, health, income, and social relationships (Diener & Suh, 2000; Dolan et al., 2008). It is interesting that, as suggested by the reported results, among these factors there are no relationships that persist—when other effects are controlled for—except for those involving employment status (Frey & Stutzer, 2000) or health status (Dolan et al., 2008). Effects on LSA of the other listed factors are comparatively ambiguous. For example, LSA is seldom increased in a linear way when income rises to particular levels (Dolan et al., 2008); there may exist (often unobserved) factors that alter the general trend, such as one's perception of goal attainment (Lent et al., 2005). In other words, we can assume that life satisfaction's relation to socio-economic and socio-cultural factors depends at least in part on how individuals evaluate these factors vis-à-vis their goals.

Despite the prevailing agreement that goals are a determinant of LSA (e.g., Oishi, 2000), there is a surprising paucity of research that directly analyses the relationship between actual behaviour as a means to achieve goals and life satisfaction. Some studies do address factors that might indicate a relationship between certain activities and LSA (Dolan et al., 2008), but the particular behaviours that characterize those activities are rarely considered. This gap in the literature is puzzling given that, within the interactionist paradigm (Bandura, 1977; Terborg, 1981), humans are not considered to be mere passive and reactive respondents to their personality, context, and externally defined goals (Crant, 2000). Rather, humans are viewed as taking an active role in shaping their situation (e.g., health status) for the purpose of facilitating such desired outcomes as increased satisfaction (Grant & Ashford, 2008). It follows that goal-directed behaviour, when guided by effective decision making, should also help determine LSA (Lent & Brown, 2008; Locke, 2002).

3.2. EFFECTIVE DECISION MAKING AND LIFE SATISFACTION

Most scholars consider decision-making competence (A. M. Parker & Fischhoff, 2005) and making decisions in accordance with the principles of decision quality (Howard, 1988) to be indicators of effective decision making. However, only a few studies link these two skills to life satisfaction. One such work (Deniz, 2006) finds low correlations among LSA, decision self-esteem, and the decision-making styles described by Mann, Burnett, Radford, and Ford (1997). His results suggest that individuals with higher decision self-esteem and/or a more effective, or "vigilant", decision-making style are more satisfied with their lives. Another example is the study of Cenkseven-Önder and Çolakkadıoğlu (2013), who present similar results regarding the positive correlation between LSA and the vigilant decision-making style. Yet their stepwise multiple regression analysis indicates that—unlike problem-solving skills (Heppner & Petersen, 1982) and decision self-esteem, which explain 7 percent of the total variance—the vigilant decision-making style is not a statistically significant predictor of life satisfaction. The authors offer no explanation for this finding, but our consideration of the examined constructs leads us to suppose that it probably reflects the similarity (in terms of item content) between the problem-solving and vigilance scales. For this reason, we question the informational value of the Cenkseven-Önder and Çolakkadıoğlu's results.

Geisler and Allwood (2015) look for a direct relationship between decision-making competence and life satisfaction. They employ a cognitively oriented definition of competence, the Adult Decision-Making Competence (ADMC) scale of Bruine de Bruin, Parker, and Fischhoff (2007), to measure decision-making competence. Their surprising result is that decision-making competence accounts for only a non-significant percentage (7%) of the variance in life satisfaction. We believe that this finding indicates that researchers should either expand the definition of decision-making competence—for example, by following the claim of Del Missier, Mäntylä, and Bruine de Bruin (2012) about its multifaceted nature and considering abilities or traits relevant to decision making *other* than those that constitute the ADMC scale (cf. Dewberry, Juanchich, & Narendran, 2013)—or revise the theoretical model of how LSA is affected by decision-making competence and thus effective decision making.

We remark that nearly all previous studies link decision-making competence and skills to antecedent *upstream* constructs: decision-making styles (Bavol'ár & Orosová, 2015; Galotti et al., 2006; A. M. Parker, Bruine de Bruin, & Fischhoff, 2007), general cognitive abilities (Bruine de Bruin et al., 2007; Del Missier et al., 2012; A. M. Parker & Fischhoff, 2005; Stanovich & West, 2008), or personality traits (Davis, Patte, Tweed, & Curtis, 2007; Dewberry et

al., 2013). Rarely examined are *downstream* constructs—that is, direct and indirect consequences of effective decision making such as decision satisfaction (E. A. Anderson, 1992) and objective life outcomes (Bruine de Bruin et al., 2007; A. M. Parker et al., 2007).

3.3. HYPOTHESES AND RESEARCH MODEL

The consensus that emerges from research in decision analysis is that a sound decision process, or a choice based on decision-analytic guidelines is more likely to be a good one and so increases the odds of achieving the desired outcome (Hammond, Keeney, & Raiffa, 2007; Keren & Bruine de Bruin, 2005; Larrick, 2011). It is therefore safe to assume that effective decision makers are more satisfied with their recently made choices (E. A. Anderson, 1992), and with the "life domains" affected by their decisions, than are less competent decision makers.

In all likelihood, proactive individuals are effective decision makers who generate more and better alternatives to choose from as well as a greater number of decision opportunities (Keeney, 1992). Selecting among better alternatives increases the odds that a decision will achieve an individual's objectives than if one approached decisions with a reactive mindset. In turn, achieving one's objectives is naturally expected to enhance satisfaction more generally (Sheldon & Elliot, 1999)—provided those objectives are self-concordant (Judge, Bono, Erez, & Locke, 2005; Sheldon & Kasser, 1998). We therefore posit that proactive decision making is positively related to life satisfaction.

Although the direct effect of PDM on LSA might be only moderate or even low, the total effect—when one considers also their indirect relationships—is presumed to be strong and significant. Given this presumption, we suppose that other constructs mediate the relationship between PDM and LSA; that is, we hypothesize the existence of additional antecedents of LSA that are closely related enough to help account for life satisfaction (see Fig. 1, to follow).

In the decision-making context, *decision satisfaction* (DSA) could well be one such antecedent of LSA. Decision satisfaction is a domain-specific form of subjective decision success that conforms to "success" as defined in other disciplines (e.g., Seibert, Kraimer, & Crant, 2001). Similarly to LSA (Diener, Emmons, Larsen, & Griffin, 1985), DSA does not connote a repeated affective evaluation of and response to one's own decision making. Instead, DSA is a cognitive process involving global judgements about the overall quality of one's decision making.

In comparison with reactive decision making, PDM is a more systematic and structured approach: it requires active engagement, deliberate thinking, and enhanced cognitive effort.

There are several reasons why an awareness of these aspects should increase the individual's perceived satisfaction with one's decision making (cf. E. A. Anderson, 1992). First, we argue that proactive decision makers can more easily achieve their objectives and therefore experience better decision outcomes; those positive outcomes likely yield, in retrospect, a satisfying decision-making experience (Sainfort & Booske, 2000). Second, individuals who undertake the additional cognitive effort necessary for PDM are also more likely to experience positive self-belief in terms of their decisions. In other words, DSA can serve to affirm one's adoption of PDM by reinforcing the advantages of exerting the cognitive effort required by that approach. Third, we assume that proactive decision makers are more confident about their decision making—that is, given their conscious choice to employ a structured and forward-looking decision strategy—and, as shown elsewhere, decision confidence can be linked to DSA (Heitmann, Lehmann, & Herrmann, 2007). Finally, the mainly information-driven nature of PDM is indicative of reduced decision *uncertainty*, which can have only a positive effect on any judgements about DSA (Small & Venkatesh, 2000).

Whereas LSA considers the satisfaction that could result from all previous decisions and their outcomes, DSA is related more closely to current decision making and so, in the short term, is less dependent on the long-term consequences of decisions. Suppose, for example, that individuals choose a reasonable alternative that turns out—for reasons beyond their control—to yield poor outcomes; under these circumstances, these decision makers may nonetheless be (at least temporarily) satisfied with their choice (Howard, 1988). Yet one can argue from the long-term perspective that DSA, just like LSA, declines for individuals whose decisions consistently result in poor outcomes. In that event, the decision makers' assessments of DSA will probably be affected by the negative feedback they receive from their previous decision making. Conversely, we have the intuitive result that decision makers are seldom unsatisfied when their decisions result in positive outcomes. So if the decision outcomes that drive DSA produce accessible and persistently positive feedback to the LSA judgement process (Schimmack & Oishi, 2005), then the decision makers in question will almost certainly be satisfied with their lives. These considerations, which are supported by the findings of Greguras and Diefendorff (2010) and Siebert and Kunz (2016), motivate our first hypothesis.

> ***Hypothesis 1.*** *Proactive decision making is positively related to decision satisfaction, which positively mediates the relationship between proactive decision making and life satisfaction.*

Next we posit that also general self-efficacy (GSE), which is an equally relevant contributor to LSA (Sherer et al., 1982), can help account for decision satisfaction. Individuals with high levels of GSE believe in their abilities to cope with a wide range of novel and demanding situations (Schwarzer, Bassler, Kwiatek, Schröder, & Zhang, 1997), to complete the most challenging tasks, and ultimately to reach their goals (Ormrod, 2008). With such a generally positive belief in one's competence, which encourages increased effort and persistence when faced with taxing situations, such a decision maker should perform better than individuals characterized by low self-efficacy (Jiang, Hu, Wang, & Jiang, 2017). With regard to human thinking, the strong sense of competence epitomized by GSE facilitates cognitive processes and increases performance (Schwarzer et al., 1997). Also, high-GSE individuals are more likely—than are their low-GSE counterparts—to acknowledge their responsibility for failures; in turn, that realisation fosters motivation to review their capabilities and thus to remedy and overcome any weaknesses revealed by such failure (Azizli, Atkinson, Baughman, & Giammarco, 2015).

For example, Stajkovic and Luthans (1998) provide empirical support for these effects by documenting a significantly positive association between GSE and work-related performance. Luszczynska, Gutiérrez-Doña et al. (2005) similarly demonstrate a positive relationship between GSE and performance in school. Beyond actual performance, research has also shown that GSE is positively and significantly correlated not only with LSA (e.g., Azizli et al., 2015) but also with domain-specific satisfaction (e.g., Judge et al., 2005), where the latter is a likely mediator of the GSE–LSA relationship. In other words, GSE is linked to the positive emotions and satisfaction experienced when performing well in a particular situation or domain, which naturally contributes to LSA (Jiang et al., 2017; Lent et al., 2005). So in terms of decision making, and in line with results reported by Schwarzer et al. (1997), individuals of high GSE—unlike those of low GSE—are expected to perform better and to be more satisfied with their decisions.

Finally, we assume that PDM at least partly contributes to explaining GSE (and vice versa). Although GSE is commonly regarded as a relatively stable factor (Mikkelsen & Einarsen, 2002; S. K. Parker, 2007; Sherer et al., 1982), an association can be shown between PDM and one's internal attributional analysis of previous positive experiences; such analysis is a highly predictive antecedent of GSE (Gist & Mitchell, 1992; Shelton, 1990). If we suppose that PDM leads to better decision making and hence to more positive decision outcomes, then the experience of those outcomes—namely, in terms of increased DSA and/or LSA—can be attributed to the individual's decision-making capability. This dynamic increases the decision maker's belief in the own competence and thereby increases one's level of general self-efficacy.

It follows that GSE is itself a probable mediator of the PDM–DSA relation because it facilitates cognitive processes related to PDM, and thereby increases the commitment of individuals to their own proactive decision making (cf. Ozgen & Baron, 2007). In this regard, it seems that especially the PDM traits "striving for improvement" and "taking the initiative" must be, in common with GSE, strongly future oriented (Luszczynska, Gutiérrez-Doña et al., 2005). Hence we can formalize our second hypothesis, which is (indirectly) supported by the findings of Krueger and Dickson (1994) and Tumasjan and Braun (2012) that suggest a positive relationship between higher levels of self-efficacy and identified (decision) opportunities.

> ***Hypothesis 2.*** *Proactive decision making is positively related to general self-efficacy, which positively mediates the relationship between proactive decision making and decision satisfaction.*

In Fig. 1 we depict the model and illustrate the relation between Hypotheses 1 and 2.

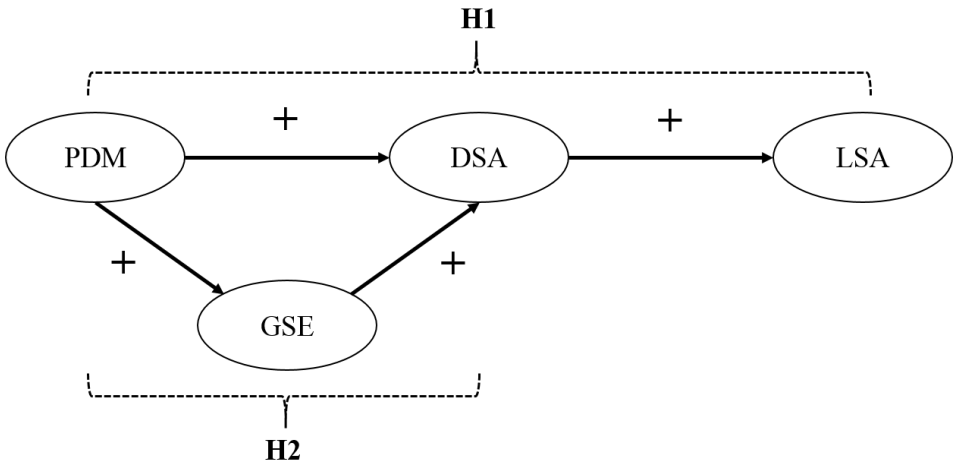

Fig. 1. Research model.

4. METHODOLOGY

4.1. PARTICIPANTS AND PROCEDURE

We employed a cross-sectional survey research strategy and conducted our study electronically. In order to collect data, we used Qualtrics (an "experience management" platform) for the design of an online questionnaire to which participants responded by answering questions about themselves and their decision-making behaviour. At the beginning of each questionnaire, we informed participants about the purpose of our study. Likewise, they were told that participation was voluntary, that there were no right or wrong answers, and that their privacy would be protected. The "intrinsic" nature of the phenomena we investigated dictated that all our measures

consist of respondent self-evaluations (cf. Chan, 2009; Conway & Lance, 2010; Spector, 1994), which means that common method bias could have been an issue (Feldman & Lynch, 1988; Lindell & Whitney, 2001; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). We addressed this concern ex ante by following the recommendations of Podsakoff, MacKenzie, and Podsakoff (2012). More specifically, we separated predictor and criterion variables in different blocks of the questionnaire, ensured the anonymity of respondents, reduced ambiguity by devising applied measures of reasonably low complexity, and used different scale types to reduce the number of common scale properties.

The online questionnaire, which participants could complete in about 10 minutes, was administered in three independent surveys. We used the first survey as a pre-study whose purpose was to re-validate the PDM scale of Siebert and Kunz (2016) and to perform some preliminary hypotheses testing. The second two surveys constituted the main study; they used different data sets and were meant to confirm the results of our initial hypotheses.

For the first two surveys—that is, for the pre-study and main study 1—we recruited participants from Amazon's Mechanical Turk (MTurk). In order to ensure a high quality of participants and results, we followed previous studies (e.g., Goodman, Cryder, & Cheema, 2013) in selecting only individuals who had previously (a) completed at least 5,000 (pre-study) and 1,000 (main study 1) of MTurk's Human Intelligence Tasks and (b) garnered an approval rate of no less than 98 percent across all tasks. Another restriction on those who participated in these two surveys was that they currently reside in the United States. All participants that were recruited via MTurk received a fair financial reward of $2 for their participation (approximating or exceeding the average US hourly minimum wage). Participants in the third survey (main study 2) were attendees of an undergraduate course at a German university. Data collection took place in (respectively) February 2015, July–August 2016, and October 2017. After removing incomplete data sets, we were left with a total of exactly 1,300 study participants.

Our pre-study survey sample consisted of 420 participants (180 females and 240 males) aged between 20 and 76 years; the average individual was 37.4 years old, for which the standard deviation was 11.9 years. Most participants were either employees (38.3%), self-employed (16.2%), managers (13.3%), or contract laborers (10.0%); the rest were students (6.2%), temporarily without work (5.5%), homemakers (4.0%), or retirees (3.6%). Among this sample, 11.7 percent had finished high school, 26 percent had completed some college courses, 51.5 percent possessed a bachelor's degree, and 10.2 percent had earned a master's, doctoral, or professional degree.

Main study 1's survey sample included 474 participants (226 females and 248 males) between the ages of 18 and 73; the average age was 37.1 years with a standard deviation of 11.3 years. Most of these individuals were employees (43.8%), self-employed (16.7%), contract laborers (9.7%), or managers (9.5%); the others were homemakers (6.1%), temporarily without work (5.5%), students (4.9%), or retirees (1.7%). In this group, 11.8 percent had finished high school, 25.5 percent had attended college, 50.8 percent had earned a college degree, and 11.2 percent had a master's, doctoral, or professional degree.

The sample for main study 2's survey consisted of 406 participants (115 females and 291 males) who were between 17 and 46 years of age. On average, these participants were 21.08 years old with a standard deviation of 3.04 years. Most (94.1%) of them were citizens of Germany, although a few (2.21%) hailed from other European countries and several more (3.69%) came from a country outside Europe. All of the participants in this third survey were students.

4.2. MEASURES

Our questionnaire's measures had all been previously established and shown to exhibit adequate levels of reliability and validity. We viewed the fulfilment of these criteria as a credible indicator of the measures' suitability for capturing the underlying theoretical constructs of interest (Kelley, Clark, Brown, & Sitzia, 2003).

Proactive decision making (PDM) was assessed using the Proactive Decision-Making Scale (Siebert & Kunz, 2016). It consists of six dimensions—"systematic identification of objectives", "systematic identification of alternatives", "systematic search for information", "using a decision radar", "taking the initiative", and "striving for improvement"—as represented by 21 items that participants rated on a Likert scale from 1 ("disagree very strongly") to 7 (agree very strongly). The 7-point Likert scale is a reliable measure whose internal consistency, as measured by Cronbach's alpha, ranges from .63 to .80 (Siebert & Kunz, 2016).

Life satisfaction (LSA) was assessed using the Satisfaction with Life Scale (SWLS; Diener et al., 1985). The SWLS is well established and widely used (Pavot & Diener, 1993); this scale is a single-factor global measure of LSA that consists of five items rated on the same 7-point Likert scale used to evaluate PDM. Various studies have established that the SWLS has favourable psychometric properties (see e.g. Pavot, Diener, Colvin, & Sandvik, 1991): Cronbach's alpha values show that its internal consistency typically lies between .77 and .89 (Gouveia, Milfont, da Fonseca, & Coelho, 2009; Sachs, 2003).

Decision satisfaction (DSA) was assessed using a revised form (Siebert & Kunz, 2016) of the Fitzsimons (2000) Decision Satisfaction Scale (DSAS). This adjusted form of the DSAS is a single-factor global measure of DSA that asks respondents to indicate their satisfaction with three different aspects of decisions—namely, final sets of alternatives, decision processes, and choice—on a scale ranging from 0 ("extremely unsatisfied") to 10 ("extremely satisfied"). Both the original and adjusted form of this scale are reported to be reliable, as their Cronbach's alphas range from .82 to .84 (Fitzsimons, 2000; Siebert & Kunz, 2016).

General self-efficacy (GSE) was assessed using the Schwarzer–Jerusalem General Self-Efficacy Scale (GSES; Schwarzer & Jerusalem, 1995). The GSES is a frequently used single-factor measure of GSE (Cheung & Sun, 1999; Leganger, Kraft, & Røysamb, 2000)—that is, of the global strength of an individual's belief in her own capacity to cope with novel or challenging situations. This scale consists of 10 items rated on a 7-point Likert scale in the first and third survey; in the second survey, however, respondents rated each item on a 4-point scale ranging from 1 ("not at all true") to 4 ("exactly true"). The GSES exhibits favorable psychological properties across extensive cross-cultural research (e.g., Luszczynska, Gutiérrez-Doña et al., 2005) in addition to high Cronbach's alphas, whose values are usually between .75 and .94 (Luszczynska, Scholz, & Schwarzer, 2005; Schwarzer et al., 1997; Schwarzer & Jerusalem, 1995).

4.3. ANALYSES

Following the recommendations of J. C. Anderson and Gerbing (1988), we tested our hypotheses by way of a two-stage analytic procedure. In the first stage, covariance-based confirmatory factor analyses (CFAs) were conducted to confirm the psychometric properties and dimensionalities of the employed constructs (viz., PDM, GSE, DSA, and LSA) and to fit a measurement model to the data. In the second stage, covariance-based structural equation modelling was applied to assess the strength and significance of the hypothesised paths among the constructs, to test for mediation, and to determine the model fit of the several posited structural models. We employed the full-information maximum likelihood method to estimate parameters. All analyses were performed using IBM's "SPSS Amos 25" statistical software.

Our elimination of non-fitting items was based on low factor loadings and indicated cross-loadings. We evaluated the psychometric properties of our employed constructs by computing composite reliability (CR $\geq$ .6; see Bagozzi & Yi, 1988), average variance extracted

(AVE ≥ .5; Fornell & Larcker, 1981), and the Fornell and Larcker (1981) criterion that compares AVE with maximum shared variance (MSV). In order to determine how well the data are fit by the measurement and structural models, we used the ratio of chi square to degrees of freedom ($\chi 2/df \leq 3$), the Root Mean Square Error of Approximation (RMSEA ≤ .10), the Standardized Root Mean Square Residual (SRMR ≤ .08), the Comparative Fit Index (CFI ≥ .9), and the Tucker–Lewis Index (TLI ≥ .9). The fit statistics were gauged according to the parenthetical thresholds just given—that is, as recommended by Browne and Cudeck (1992), Homburg and Baumgartner (1995), and Hu and Bentler (1999).

All structural models were tested by assessing standardised gamma values, the significance of relationships, and endogenous constructs' coefficients of determination (i.e., R^2). We tested mediation—and enabled calculation of confidence intervals for the indirect effects—via a bootstrapping procedure, which is a non-parametric approach to hypotheses testing whereby a model's parameters (and their standard errors) are tested only through statistical re-sampling of the available data (Preacher & Hayes, 2008). Following standard recommendations (Mooney & Duval, 1993), we used 1,000 bootstrap samples with 95% bias-corrected confidence intervals. Finally, a model comparison approach consistent with Kelloway (1998) was chosen to test whether the proposed model or instead alternative models better fit the data. In this approach, each model included either (i) one or more distinct freed (i.e., "direct") paths or (ii) no fewer than one constrained (i.e., "zero") paths. The unmediated models were not nested within the mediated models and contained the identical set of variables; hence models were compared in terms of values computed for the Akaike Information Criterion (AIC), the Consistent Akaike's Information Criterion (CAIC), and the Bayesian Information Criterion (BIC). For each criterion, smaller values indicate a better fit (Bozdogan, 1987; Rust, Lee, & Valente, 1995).

We addressed the issue of common method bias analytically by applying Harman's single-factor test (Podsakoff et al., 2003). When we considered all items included in the final measurement models, the one-factor solutions extracted via unrotated principal component analyses explained 45.49 percent (pre-study), 39.11 percent (main study 1), and 28.96 percent (main study 2) of the total variance. As a consequence, we cannot rule out the possibility of an influential common method bias inherent to the data. Yet after comparing our results with the widely used "majority of variance" criterion of Harman's test (Podsakoff & Organ, 1986), we concluded that the level of possible shared variances was acceptable.

Finally, we tested all predictor variables in each study for multicollinearity by computing variance inflation factors (VIFs) based on those factors, which were obtained after identifying the final measurement models (cf. Hair, Black, Babin, & Anderson, 2010). Our rationale for adopting this approach was that severe multicollinearity—as indicated by VIF scores greater than 10 (O'Brien, 2007)—has been shown to yield, in causal models, both inaccurate parameter estimates and an increase in the likelihood of Type II errors (Grewal, Cote, & Baumgartner, 2004). Our calculated VIF scores were all below that threshold: they ranged from 1.853 to 3.677 in the pre-study, from 1.719 to 3.179 in main study 1, and from 1.495 to 4.056 in main study 2. We therefore concluded that multicollinearity was not a major issue, even if the stricter threshold of VIF < 5 (as used in Menard, 1995) was applied.

5. RESULTS

5.1. PRE-STUDY

Given *measurement* model 1, which matches the first model proposed by Siebert and Kunz (2016), we began by subjecting the six hypothesised dimensions of PDM (INITIATIVE, IMPROVEMENT, OBJECTIVES, INFORMATION, ALTERNATIVES, RADAR)—as well as PDM's three presumed consequences—to a first-order confirmatory factor analysis. Thus all 39 items were constrained to load on their predicted factor. Scale items that did not represent their predicted factor reliably or validly were excluded from further analyses. During this iterative process, five items (ALT_4, LSA_5, RAD_2, RAD_3, and GSE_2) were deleted because either their factor loadings were low or their cross-loadings with other factors were high.

Table 1 shows that the final, 34-item first-order factor measurement model exhibited fit statistics that were well within commonly accepted thresholds. The CR values of all constructs were clearly above the threshold of .60 (Bagozzi & Yi, 1988). Adopting Netemeyer, Bearden, and Sharma's (2003) criterion that the AVE of a recently developed scale should exceed .45, we saw evidence for the convergent validity of all examined factors. Except for INITIATIVE (.494), all other factors were above the acceptable threshold of .50 (Fornell & Larcker, 1981). That said, there were discriminant validity issues with the three factors related to the PDM dimensions of OBJECTIVES, INFORMATION, and RADAR.

Table 1
Pre-study: Confirmatory factor analysis.

		n = 420							
		First-order model (measurement model 1)				Second-order model (measurement model 2)			
Factors/ Constructs/ Dimensions	Item	Std. factor loading	CR	AVE	MSV	Std. factor loading	CR	AVE	MSV
INITIATIVE	INI_1	.841				.845			
	INI_3	.442	.734	.494	.362	.443	.734	.495	.361
	INI_5	.762				.758			
IMPROVEMENT	IMP_1	.754				.754			
	IMP_2	.900	.878	.707	.537	.900	.878	.708	.486
	IMP_3	.862				.863			
OBJECTIVES	OBJ_1	.788							
	OBJ_2	.794	.806	.581	.733				
	OBJ_3	.701							
INFORMATION	INF_2	.730							
	INF_3	.813	.790	.558	.704				
	INF_4	.692							
ALTERNATIVES	ALT_1	.800							
	ALT_2	.762	.843	.642	.619				
	ALT_3	.839							
	ALT_4								
DECISION RADAR	RAD_1	.745							
	RAD_2								
	RAD_3		.826	.613	.733				
	RAD_4	.769							
	RAD_5	.833							
SKILLS	OBJECTIVES					.965			
	INFORMATION					.912	.947	.819	.486
	ALTERNATIVES					.820			
	RADAR					.916			
DECISION SATISFACTION	DSA_S	.821				.821			
	DSA_P	.918	.912	.775	.496	.917	.912	.775	.504
	DSA_D	.899				.900			
GENERAL SELF-EFFICACY	GSE_1	.789				.778			
	GSE_2								
	GSE_3	.757				.762			
	GSE_4	.876				.871			
	GSE_5	.866	.949	.672	.619	.860	.947	.665	.504
	GSE_6	.802				.796			
	GSE_7	.795				.797			
	GSE_8	.792				.778			
	GSE_9	.852				.844			
	GSE_10	.843				.846			
LIFE SATISFACTION	LSA_1	.929				.889			
	LSA_2	.832				.770			
	LSA_3	.911	.937	.789	.375	.937	.929	.767	.379
	LSA_4	.878				.899			
	LSA_5								
Overall model fit		RMSEA = .066, SRMR = 050, χ^2/df = 2.803, TLI = .908, CFI = .920				RMSEA = .065, SRMR = .0747, χ^2/df = 2.751, TLI = .911, CFI = .920			

We addressed the observed discriminant validity issues by testing an alternative measurement model. So in line with measurement model 2, which also was proposed by Siebert and Kunz (2016), we aggregated the four factors associated with the proactive cognitive skills to the higher-order factor SKILLS. For those four sub-dimensions of SKILLS, a CFA yielded standardised factor loadings that ranged from .820 to .965—at the same time, the loadings of items related to the other factors remained almost constant. Overall, then, most loadings were

within the desired range. All CR values were also above the acceptable threshold (of .60), indicating that the factors were sufficiently reliable. The AVE value of this alternative model's second-order factor cleared the .50 threshold, so the convergent validity of that factor was sufficient. We observed no discriminant validity issues resulting from reduced inter-factor correlations.

Given the good fit statistics of the pre-study's second-order factor measurement model, as summarised in Table 1, we next tested our *structural* model. Table 2 presents our findings for the hypothesised direct and indirect paths between PDM and its proposed consequences (Model 1). This table reveals that there is, for the most part, solid statistical support for both hypotheses. All direct and indirect paths (except for those originating from IMPROVEMENT) were statistically significant; furthermore, they exhibited our hypothesised algebraic signs and no standardised path coefficient was less than .15. Altogether, this structural model explained 60.1 percent of the variance in DSA, 51.0 percent in GSE, and 32.1 percent in LSA.

Table 2
Pre-study: Path analysis (structural model 1).

Predictor	Outcome					
	GENERAL SELF EFFICACY		DECISION SATISFACTION		LIFE SATISFACTION	
	Direct	Indirect	Direct	Indirect	Direct	Indirect
IMPROVEMENT	.021 (–.152; .193)		–.095 (–.234; .045)	.010 (–.069; .094)		–.048 (–.143; .054)
INITIATIVE	.326*** (.219; .471)		.164* (.026; .307)	.150*** (.090; .250)		.178** (.096; .273)
SKILLS	.488** (.317; .677)		.349** (.186; .514)	.225*** (.138; .338)		.325*** (.234; .442)
GENERAL SELF-EFFICACY			.461** (.324; .603)			.261*** (.175; .371)
DECISION SATISFACTION					.566** (.476; .653)	
R^2	.510		.601		.321	

Notes: Values reported in parentheses are the lower level (first number) and upper level (second number) of 95% bias-corrected confidence intervals of 1,000 bootstrap re-samples.

* $p < .05$, ** $p < .01$, *** $p < .001$

As a further test for the possibility of full or partial mediation effects, we also tested several alternative structural models; see Table 3. A comparison of each alternative model's AIC, CAIC, and BIC values with those derived for the hypothesised structural model showed that the existence of a freed direct path from GSE to LSA (Model 3) resulted in the greatest improvement in model fit; this outcome is illustrated in Fig. 2. Hence these results suggest that PDM's effect on LSA is fully mediated and that the effect of GSE on LSA is partially mediated. The results also indicate that GSE partially mediates the effect of PDM on DSA—that is, when one considers that neither of the (more constrained) Models 5 and 6 exhibit a better fit. Note

that the statistical values obtained for Models 7–9 support our assumption that GSE is probably the dependent rather than the independent variable in the PDM–GSE relationship. In short: the fit statistics of the hypothesised and alternative structural models were, by large, within the recommended thresholds.

Table 3
Pre-study: Comparison of structural models.

Structural model	χ^2/df	TLI	CFI	RMSEA	BIC	AIC	CAIC
1. Hypothesised model	2.846	.906	.915	.066	1974.52	1618.98	2062.52
Freed path(s)							
2. PDM → LSA	2.838	.906	.916	.066	1979.86	1612.19	2070.86
3. GSE → LSA	2.751	.911	.920	.065	1929.36	1569.78	2018.36
4. PDM + GSE → LSA	2.751	.911	.920	.065	1939.40	1567.70	2031.40
Constrained path(s)							
5. PDM → DSA (= 0)	2.909	.903	.912	.067	1996.94	1653.52	2081.94
Constrained path(s) and freed path(s)							
6. PDM → DSA (= 0) and GSE → LSA	2.820	.907	.916	.066	1954.90	1607.44	2040.90
Other alternative models							
7. GSE (= IV) → PDM (= DV), GSE + PDM → DSA, and DSA → LSA	3.088	.894	.903	.071	2088.29	1744.87	2173.29
8. GSE (= IV) → PDM (= DV), GSE + PDM → DSA, and GSE + DSA → LSA	2.994	.898	.908	.069	2043.32	1695.85	2129.32
9. GSE (= IV) → PDM (= DV), GSE + PDM → DSA, and PDM + GSE + DSA → LSA	2.994	.898	.908	.069	2052.60	1693.02	2141.60

Notes: IV = independent variable, DV = dependent variable.

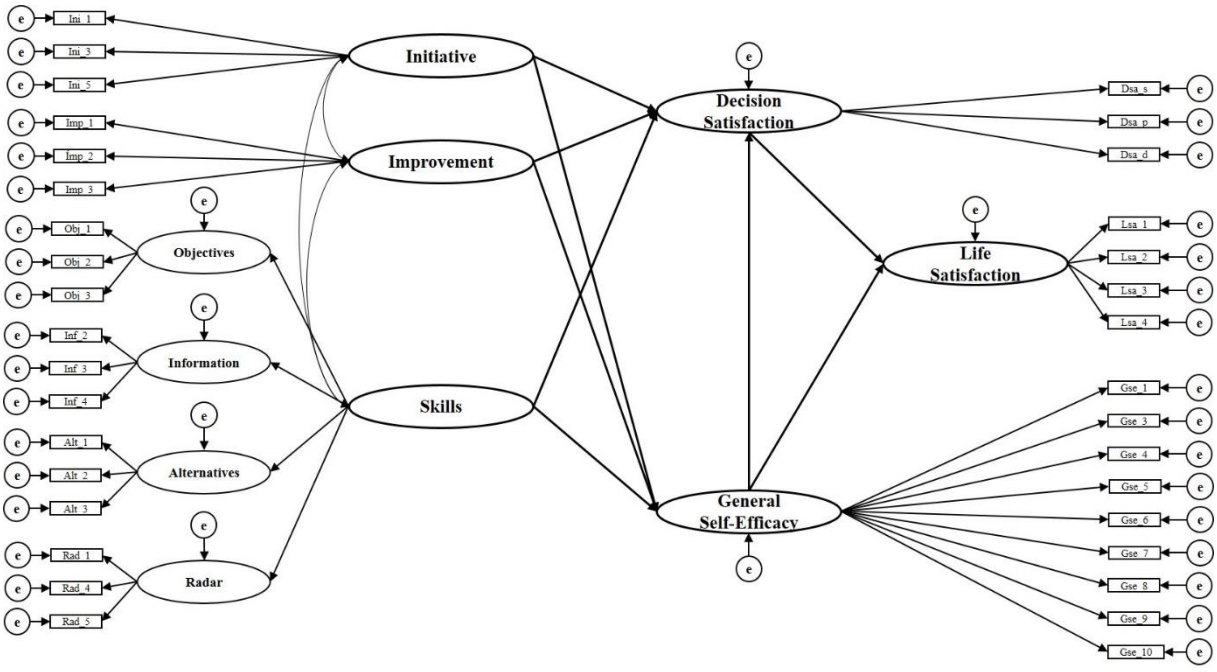

Fig. 2. Best structural model (Model 3) in terms of data fit.

5.2. MAIN STUDIES

After iteratively removing the same items omitted from the pre-study (viz., ALT_4, LSA_5, RAD_2, RAD_3, and GSE_2) and also removing GSE_1 and GSE_3 from main study 2 (because of low factor loadings high cross-loadings with other factors, as explained in Section 5.1), we tested the measurement models corresponding to the pre-study model. Thus we examined the two models—labelled "Study 1" and "Study 2"—in which the four factors related to proactive cognitive skills were modelled to load on the higher-order factor SKILLS. Results are reported in Table 4. Running a CFA with these second-order measurement models yielded standardised factor loadings that were within the desired range (i.e., from .533 to .931 and from .607 to .916 for Studies 1 and 2, respectively). Furthermore, all CR values were above the .60 threshold, indicating sufficient reliability of the factors. The AVE value of the second-order factor exceeded the acceptance threshold of .50, so that the factor's convergent validity was considered to be sufficient. No discriminant validity issues were observed, and each model's fit statistics met all criteria for a good fit to the data.

Table 4
Main studies: Confirmatory factor analyses (measurement model 2).

		Study 1 (n = 474)				Study 2 (n = 406)			
Factors/ Constructs/ Dimensions	Item	Std. factor loading	CR	AVE	MSV	Std. factor loading	CR	AVE	MSV
INITIATIVE	INI_1	.748				.781			
	INI_3	.533	.741	.495	.392	.801	.803	.577	.419
	INI_5	.800				.693			
IMPROVEMENT	IMP_1	.793				.700			
	IMP_2	.929	.899	.749	.356	.887	.848	.653	.448
	IMP_3	.869				.826			
SKILLS	OBJECTIVES	.783				.822			
	INFORMATION	.824	.906	.707	.445	.654	.881	.652	.448
	ALTERNATIVES	.856				.916			
	RADAR	.897				.815			
DECISION SATISFACTION	DSA_S	.750				.607			
	DSA_P	.875	.885	.721	.445	.760	.760	.517	.419
	DSA_D	.914				.777			
GENERAL SELF-EFFICACY	GSE_1	.770							
	GSE_2								
	GSE_3	.681							
	GSE_4	.812				.719			
	GSE_5	.836	.931	.600	.423	.751	.884	.522	.398
	GSE_6	.726				.641			
	GSE_7	.750				.658			
	GSE_8	.751				.708			
	GSE_9	.807				.784			
	GSE_10	.823				.781			
LIFE SATISFACTION	LSA_1	.931				.772			
	LSA_2	.884				.710			
	LSA_3	.923	.946	.813	.366	.780	.824	.540	.320
	LSA_4	.867				.672			
	LSA_5								
Overall model fit		RMSEA = .057, SRMR = .058, χ^2/df = 2.562, TLI = .923, CFI = .930				RMSEA = .042, SRMR = .053, χ^2/df = 1.716, TLI = .931, CFI = .938			

Table 5
Main studies: Path analysis (structural model 1).

Predictor	Outcome											
	Study 1 (*n* = 474)						Study 2 (*n* = 406)					
	GENERAL SELF-EFFICACY		DECISION SATISFACTION		LIFE SATISFACTION		GENERAL SELF-EFFICACY		DECISION SATISFACTION		LIFE SATISFACTION	
	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
IMPROVEMENT	0.047		–.113	0.0018		–.059	0.009		–.102	0.002		–.059
	(–.083; .169)		(–.246; .013)	(–.027; .072)		(–.143; .025)	(–.161; .172)		(–.275; .072)	(–.041; .055)		(–.168; .055)
INITIATIVE	.426**		0.109	.158***		.165**	.240**		.457***	.059**		.308***
	(.295; .533)		(–.015; .246)	(.094; .254)		(.084; .258)	(.021; .387)		(.329; .598)	(.005; .138)		(.216; .408)
SKILLS	.342**		.463**	.127***		.365***	.531**		.277*	.132**		.244**
	(.193; .506)		(.293; .613)	(.067; .221)		(.260; .481)	(.342; .732)		(.009; .487)	(.045; .284)		(.115; .360)
GENERAL SELF-EFFICACY			.372**		.230**				.248**			.148**
			(.236; .511)		(.143; .328)				(.052; .447)			(.032; .281)
DECISION SATISFACTION					.618***						.597**	
					(.533; .699)						(.475; .685)	
R^2	0.490		0.570		0.382		0.464		0.567		0.356	

Notes: Values reported in parentheses are the lower level (first number) and upper level (second number) of 95% bias-corrected confidence intervals of 1,000 bootstrap re-samples.

*p < .05, **p < .01, ***p < .001

Table 6
Main studies: Comparison of structural models.

Structural model	Study 1 (*n* = 474)							Study 2 (*n* = 406)						
	χ^2/df	TLI	CFI	RMSEA	BIC	AIC	CAIC	χ^2/df	TLI	CFI	RMSEA	BIC	AIC	CAIC
1. Hypothesised model	2.57	.923	.929	.058	1825.9	1480.6	1908.9	1.85	.916	.924	.046	1376.1	1051.6	1457.1
Freed path(s)														
2. PDM → LSA	2.58	.922	.929	.058	1841.4	1483.5	1927.4	1.86	.915	.923	.046	1392.7	1056.2	1476.7
3. GSE → LSA	2.55	.924	.930	.057	1819.2	1469.7	1903.2	1.84	.918	.925	.045	1372.3	1043.8	1454.3
4. PDM + GSE → LSA	2.56	.923	.930	.057	1837.5	1475.5	1924.5	1.85	.917	.925	.046	1389.3	1048.7	1474.3
Constrained path(s)														
5. PDM → DSA (= 0)	2.70	.916	.923	.060	1881.3	1584.4	1961.3	1.99	.903	.911	.049	1427.9	1115.5	1505.9
Constrained path(s) and freed path(s)														
6. PDM → DSA (= 0) and GSE → LSA	2.68	.917	.924	.060	1874.3	1537.3	1955.3	1.97	.905	.913	.049	1424.3	1107.8	1503.3
Other alternative models														
7. GSE (= IV) → PDM (= DV), GSE + PDM → DSA, and DSA → LSA	2.74	.914	.921	.061	1904.9	1572.0	1984.9	2.02	.899	.908	.050	1445.8	1133.3	1523.8
8. GSE (= IV) → PDM (= DV), GSE + PDM → DSA, and GSE + DSA → LSA	2.72	.915	.922	.060	1898.1	1561.1	1979.1	2.01	.901	.910	.050	1442.3	1125.8	1521.3
9. GSE (= IV) → PDM (= DV), GSE + PDM → DSA, and PDM + GSE + DSA → LSA	2.74	.914	.922	.061	1916.4	1566.9	2000.4	2.02	.900	.909	.050	1458.9	1130.4	1540.9

Notes: IV = independent variable, DV = dependent variable.

With the results from these second-order *measurement* models in hand, we next tested our *structural* models—all of which likewise yielded good fit-statistics. Table 5 presents our findings for the hypothesised direct and indirect paths between PDM and its proposed consequences (Model 1). Just as we had observed in the pre-study, both hypotheses were mostly supported. All direct and indirect paths, except for those originating from IMPROVEMENT and for the direct path between INITIATIVE and DSA (Study 1 only), were statistically significant; they also had the hypothesised algebraic signs, and no standardised path coefficient was less than .12. These structural models explained about 57 percent of the variance in DSA, between 46.4 and 49 percent of the variance in GSE, and between 35.6 and 38.2 percent in LSA.

Once again, we checked for full or partial mediation effects by testing several alternative structural models; see Table 6 for the results. Comparing these models' AIC, CAIC, and BIC values with those of the hypothesised structural model revealed, as before, that the best-fitting model was one that included a freed direct path from GSE to LSA. These results tend to confirm our findings obtained from the pre-study in that (i) the effect of PDM on LSA (excepting the IMPROVEMENT factor) is fully mediated and (ii) the effect of GSE on LSA is partially mediated. They also lend additional support to our previous finding that GSE partially mediates the effect of PDM on DSA (again considering that neither of the more constrained Models 5 and 6 fit the data any better; see Table 6). Our assumption regarding the PDM–GSE relationship likewise received further support.

6. DISCUSSION

Despite OR's increased interest in behaviour and well-being, hardly any research has sought either to integrate these topics or to investigate the impact of effective decision making on life satisfaction. This paper has systematically analyzed that impact by examining the relationships among PDM, DSA, GSE, and LSA. The hypothesised mediation effects of DSA on the relationship between PDM and LSA (Hypothesis 1), and of GSE on the relationship between PDM and DSA (Hypothesis 2), are largely supported by the results not only of the pre-study but also of our main studies. These results bear three implications as detailed next.

First, our findings establish that PDM promotes generally positive personal outcomes in the form of enhanced life satisfaction. On the one hand, this result supports our assumption that effective decision making is a multifaceted task (Del Missier et al., 2012) that requires more than the seven skills enumerated by Bruine de Bruin et al. (2007) as being necessary for decision-making competence. In light of Geisler and Allwood's (2015) non-significant LSA-

related results based on the ADMC scale, our own findings underscore the importance, in decision processes, of the "generating alternatives" phase for effective decision making (Siebert & Keeney, 2015). Our results also demonstrate how individual differences in that phase, as reflected in PDM, can have a positive effect on LSA. By actively and systematically developing decision alternatives that are aligned with personal goals, proactive decision makers increase their odds of achieving desired outcomes; that increase contributes in turn to the positive self-evaluations of their life, which naturally follow from the positive experiences associated with those outcomes (e.g., Hammond et al., 2007). On the other hand, the observed positive relationship between PDM and LSA empirically substantiates—from a decision-analytic perspective—the merit of considering antecedents to PDM and of asking whether (and, if so, how) proactive decision making might be taught.

Second, the results reported here indicate that PDM affects LSA not directly but rather through the individual's experience of DSA. This finding is notable because it extends existing research that has investigated the relationship between decision making and LSA yet without generating useful insights or a deeper understanding of the connection. Thus our study addresses the call of Geisler and Allwood (2015) for answers to the question of how effective decision making is most likely to influence an individual's subjective well-being; we do so by positing and then establishing DSA as a central determinant in that relationship.

Third, in line with with previous research (Siebert & Kunz, 2016), our findings strongly suggest that proactive decision makers are more able to achieve their objectives and therefore experience better decision outcomes—outcomes that can be expected to positively shape perceptions of their own decision making (Sainfort & Booske, 2000). These results similarly lead us to conclude that the additional cognitive effort necessary for PDM might stimulate DSA in this sense: satisfaction with one's own decision making serves as a self-affirmation to employ a more structured decision-making approach as well as confirmation that exerting the additional cognitive effort needed for PDM was worthwhile. That positive decision-making experience, which yields easily accessible positive information (Schimmack & Oishi, 2005), then has a positive effect on LSA and thereby gives credence to the bottom-up perspective on life satisfaction (Lance et al., 1989). Moreover, showing that PDM has a greater impact on a decision domain-specific type of satisfaction (here, DSA) than on LSA itself supports the PDM measure's nomological validity and also argues (cf. Franco & Hämäläinen, 2016) for the usefulness of PDM in behavioural OR.

Beyond its central role of DSA, the observed mediation effects of GSE underpin the notion that GSE facilitates the cognitive processes required for effective decision making. These mediation effects point to the complex nature of the interaction between PDM and its consequences—to the extent that it is hardly possible to consider decision behaviour, personality, and (cognitive) motivational processes in isolation from each other. Because they are inclined to take the initiative in decision situations and to approach the phase of generating alternatives more effectively, proactive decision makers tend to be more convinced (than their reactive counterparts) that their decision behaviours will result in desired outcomes. Given this strong positive effect of PDM, one can argue that self-efficacy is increased by following the principles of decision quality. Previous studies (e.g., Stajkovic & Luthans, 1998) have identified significant positive effects of GSE on different performance measures, from which it follows that effective decision making in the phase of creating alternatives might well increase other (objective) measures of performance; of course, that possibility needs to be tested empirically. Finally, we remark that the results presented here confirm the importance of self-efficacy for any study of decision-making behaviour in an OR context (as assumed, e.g., by Arumugam, Antony, & Linderman, 2016; Taylor, 2018).

Notwithstanding the significantly positive overall effect of PDM, only two of that construct's dimensions (INITIATIVE and SKILLS) were positively correlated with either LSA and DSA. When one considers that the *zero-order* correlations between IMPROVEMENT and each satisfaction type were significantly positive and that there were no collinearity issues these results speak to an intricate relationship among PDM's three dimensions—a common phenomenon in multiple regression analysis (Kennedy, 2005). The negative and non-significant effect of IMPROVEMENT in our proposed structural model suggests that individuals express a desire for improvement by behaving in accordance with the principles of proactive decision making. So depending on their inclination (or aversion) to improvement, individuals are likely to adjust their behaviour with regard to the identification of objectives, the search for information and future decision situations, and the development of alternatives. That dynamic explains why any striving for improvement in excess of the effort made during the phase of generating alternatives enhances neither LSA nor DSA, a finding in at least partial concordance with prior research. Those studies have shown that being disposed to maximise, or to strive continuously for improvement in particular decision situations regardless of whether such efforts align with one's fundamental objectives, actually has a *negative* correlation with DSA (Dar-Nimrod, Rawn, Lehman, & Schwartz, 2009) and also with LSA (Schwartz et al., 2002). Perhaps more importantly, this finding likewise implies that meaningful, effective decision making during the phase of

generating alternatives does require, to some extent, a match between skills and traits. In other words, it is not enough to apply the four proactive cognitive skills essential to the pursuit of improvement (Siebert & Kunz, 2016); individuals must also engage in that pursuit by applying those skills in a way that has a personally meaningful impact.

Finally, the effect sizes found for the SKILLS component outcomes—namely, GSE, DSA, and LSA—were (on average) significantly higher across the three studies than were those found for traits (e.g., INITIATIVE); thus our results highlight the importance of proactive cognitive skills for proactive decision making. These results provide further support for the argument that skilled decision behaviour in the phase of generating alternatives is the key to effective decision making. We therefore conclude that, for such effectiveness, the application of foresighted decision-making skills counts for more than does possessing traits that might in themselves encourage proactive decision behaviour at the outset. Given the relatively less importance of traits for effective decision making and the consensus view that traits are fairly stable factors (McCrae & Costa, 1997), our findings shed new light on the question of whether proactive cognitive skills can be learned. Enhancing such skills while considering their interdependence with "striving for improvement" and "taking the initiative" could increase life satisfaction; such enhancement might also boost other performance indicators in response to the consequent increased levels of general self-efficacy.

In addition to those results obtained from the structural analyses, we have provided evidence that confirms Siebert and Kunz's (2016) finding that the PDM scale has good psychometric properties; in other words, as a measure it is both reliable and valid. In terms of measurement models, our results suggest that PDM is a three-dimensional construct consisting of two distinct traits and four closely related cognitive skills that relate to a higher-order factor. Although by definition those skills apply to different decision-making aspects and hence should be separable, our results clearly indicate that they are barely noticeable in isolation. That is to say: individuals typically apply all four skills to a similar extent during the phase of generating alternatives—the phase that determines the effectiveness of their decision making. The process of generating our conclusions about the nature of PDM and effective decision making merits a more detailed examination by interested scholars. In any event, the implications following from the co-occurrence of these four skills seem to align with prior psychological research on proactivity, such as Bandura's (1991) self-regulation theory.

7. LIMITATIONS AND FUTURE RESEARCH

In common with nearly all research designs, our study is characterized by several limitations. The first is that all data were collected from single sources via self-reported measures. Although most researchers agree on the usefulness and preferability of self-evaluations when analysing, as we did, phenomena of an intrinsic nature (Chan, 2009; Conway & Lance, 2010; Spector, 2006), such measures have some well-known shortcomings (Podsakoff & Organ, 1986). Among these downsides, the most relevant is their possible threat to internal validity. Hence common method bias could have been an issue. We account for this possibility by following the recommendations given by Podsakoff et al. (2012). Other potential biases in this regard could be the confounding effects of participants' overconfidence or penchant for social desirability. Hence future research should control for these potential problems by taking peer evaluations and experimental decision settings into consideration. However, both alternative research approaches may cause further issues, since our purpose was to study how individual decision makers approach the phase of generating alternatives in general and not to analyse decision-specific behaviour at a given moment in time.

This study's second limitation concerns the generalisability of our findings, which mainly reflects the composition of our samples. In the three studies, most of the participants either lived in the United States or were from Germany. It is therefore hardly possible that our results could be generalised to different cultural contexts (e.g., Asia or Africa). Hence examining the effect of cultural differences on PDM offers intriguing avenues for future research, which could extend previous studies on national differences with regard to happiness (e.g., Cordero et al., 2017). Scholars might explore, for instance, how different types of cultural socialisation affect the observed positive relationship between proactive decision making and life satisfaction. Answering such questions would increase our understanding of individuals' perceptions of their approach to the phase of generating alternatives during decision processes, which in turn might yield new insight into the intrinsic motivation to behave as a proactive decision maker. Finally, the high level of education among the three samples' constituent members was likewise relatively homogeneous; also, being highly educated is itself often viewed as an indicator of enhanced decision-making abilities (Bruine de Bruin et al., 2007; Klein, 1999). It follows that future studies should examine whether our findings hold also for samples consisting of less educated individuals.

A third limitation involves causality, an issue that plagues most non-experimental studies (R. D. Anderson & Vastag, 2004). The cross-sectional design of our studies, which examined PDM and its proposed consequences as measured at a particular given time, precluded any assessment of temporal priority. Therefore, confirming those of our conclusions that involve PDM's "consequences" is advisable. Even though we can cite the results of our three independent surveys to substantiate those conclusions empirically—and despite the theoretical soundness of the relationships we hypothesize—longitudinal research is needed to establish the true causal ordering of the constructs examined here.

Apart from the research possibilities stemming from these methodological limitations, there is also considerable potential for work on related topics. For example, future research could scrutinise the relationships between PDM and other measures, such as the Big Five personality traits (John & Srivastava, 1999). Also, identifying and analysing the possible antecedents of PDM would help us better understand why some individuals are more effective than others when applying proactive cognitive skills during the phase of generating alternatives. Research along those lines would also provide educators, decision analysts, and recruiters with valuable information about the conditions under which decision training is likely to help individuals—even those who have already been taught how to make decisions in accordance with the principles of decision quality—become more effective proactive decision makers.

8. CONCLUSION

In this paper we sought to integrate two current OR streams, and to extend the literature at the interface of well-being and behavioural OR, by examining the relationship between life satisfaction and effective decision making (i.e., decisions made according to the principles of decision quality). Given the widely held opinion in decision sciences that generating alternatives may be the most critical phase of decision making, we focused the analysis on whether—and, if so, in what way—behavioural differences during that phase are related to an individual's life satisfaction.

Analysing empirical data obtained from three independent surveys revealed the existence of a significant positive relationship between PDM and LSA. From this finding we drew three conclusions. First, our results further substantiate the baseline argument that subjective well-being (as proxied by LSA) is, in part, a matter of choice. However, this choice reflects not only the "six laws of happiness" proposed by Baucells and Sarin (2012, 2013) but also one's fundamental approach to decision making. In support of the notion that humans do not merely

respond passively to their environment and personality, our results imply that individuals can have a positive effect on their life satisfaction by deliberately choosing to follow a more effective decision making approach. We therefore conclude that also the goal-directed behaviour driven by effective decision making is a meaningful determinant of life satisfaction.

Second, given that previous studies have not adequately explained the relation between effective decision making and subjective well-being, our results highlight how important the phase of generating alternatives is—for subjective decision outcomes and also for effective decision making. For the latter, it is not sufficient to make a good choice based on appropriate evaluations of alternatives (i.e., even when suitable problem-solving methods are used); being able to choose among good alternatives is also necessary. This requirement implies that decision analysts and decision scientists should expand their definitions of decision-making competence by explicitly considering the "generating alternatives" phase and the skills related thereto. Such augmented definitions should encourage further research on this understudied phase of decision making.

Our third and most important conclusion is that these findings underscore the advantage, in decision processes, of not only following decision quality principles but also being proactive in the phase of generating alternatives. The result that applying proactive decision-making skills leads to effective decision making in this phase is meaningful at the individual level in terms of enhanced LSA, DSA, and GSE; it also highlights the relevance of OR and decision sciences to individuals and their lives. From a *social* perspective, we thus have a good starting point from which to argue that the topics of decision quality and effective decision-making should be integrated into educational programs. In this way, OR and decision analysis can make a positive contribution to community development: providing methods and principles that enable individuals to avoid socially undesirable and other negative outcomes (e.g., a low level of subjective well-being) that result from their decision making. From a *decision-analytic* perspective, that claim raises the questions of (i) how decision scientists and OR scholars can help individuals become more effective in the phase of generating alternatives, (ii) how well such individual-level effectiveness carries over to organisational and group decision-making contexts, and (iii) how this effectivness is related to other objective indicators of performance.

Finally, our finding that the relationship between PDM and LSA is not direct—and instead is mediated by DSA and GSE—establishes how crucial it is for OR to become more interdisciplinary when analysing the applicability and usefulness of its proposed decision structuring and of its problem-solving models and techniques. There are direct effects between one's

decision-making and expected outcomes, yet there also exist indirect effects that can influence that relation. Hence we argue that behavioural OR and decision sciences would benefit from further considering factors (e.g., job satisfaction) that affect well-being in a reciprocal way, since doing so would expand our knowledge of how individual decision making is related to the decision maker. The strong relationship we document between PDM and GSE backs the argument that, in addition to other psychological and cognitive factors and personality variables, especially personal incentive aspects should be considered when analysing the processes and consequences of an individual's decision making. In order to support effective decision making, as suggested by our paper's opening quotation, it is critical for OR and decision analysis to understand it at all levels.

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SUPPLEMENTARY MATERIALS

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.ejor.2019.08.011.

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3.3 ESSAY 2: EFFECTS OF DECISION TRAINING ON INDIVIDUALS' DECISION-MAKING PROACTIVITY

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ABSTRACT

Decision sciences are in general agreement on the theoretical relevance of decision training. From an empirical standpoint, however, only a few studies test its effectiveness or practical usefulness, and even less address the impact of decision training on the structuring of problems systematically. Yet that task is widely considered to be the most crucial in decision-making processes, and current research suggests that effectively structuring problems and generating alternatives—as epitomized by the concept of proactive decision making—increases satisfaction with the decision as well as life satisfaction more generally.

This paper empirically tests the effect of decision training on two facets of proactive decision making—cognitive skills and personality traits—and on decision satisfaction. In quasi-experimental field studies based on three distinct decision-making courses and two control groups, we analyze longitudinal data on 1,013 decision makers/analysts with different levels of experience. The results reveal positive training effects on proactive cognitive skills and decision satisfaction, but we find no effect on proactive personality traits and mostly non-significant interactions between training and experience. These results imply the practical relevance of decision training as a means to promote effective decision making even by more experienced decision makers.

The findings presented here may be helpful for operations research scholars who advocate for specific instruction concerning proactive cognitive skills in courses dedicated to decision quality and/or decision theory and also for increasing, in such courses, participants' proactive decision making and decision satisfaction. Our results should also promote more positive decision outcomes.

KEYWORDS: Behavioral OR; Decision analysis; Proactive decision making; Training

1. INTRODUCTION

Throughout the past decades, operations research (OR) has developed a plethora of approaches and methods to help individuals (and also organizations) structure and systematically evaluate decision problems, thereby making it possible—at least in theory—to derive preferable solutions in complex settings (Becker, 2016; Simon et al., 1987). In practice, however, the usefulness of these methods and decision support tools is typically limited by the abilities of the decision makers themselves (Keeney, 2004; White, Burger, & Yearworth, 2016). If those who apply an OR tool lack an understanding of what characterizes *effective* decision making (i.e., decisions made in accordance with the principles of decision quality; Howard, 1988) and if so much as one better alternative is overlooked in the decision-making process (cf. Montibeller & von Winterfeldt, 2015; Siebert, 2016; Siebert & Keeney, 2015), then even technically optimal choices based on appropriate alternative evaluations will result in suboptimal decisions (Siebert & Kunz, 2016). In other words, it is likely that even the most sophisticated OR methods cannot compensate for underdeveloped individual decision-making skills and behavior (see also Korhonen et al., 2018; Ormerod, 2014).

In fact, many individuals' decision-making skills are insufficient when confronted with situations that are not well structured (Thaler & Sunstein, 2009). Most people never formally learn to be effective decision makers (Hammond, Keeney, & Raiffa, 2007; Keeney, 2020) and/or have little practice in that skill (Bond, Carlson, & Keeney, 2008; Larrick, 2011). Also, few are aware of the extent to which their decision making is biased (Scopelliti et al., 2015) and deviates from the principles of decision quality (Spetzler, Winter, & Meyer, 2016). When one considers that experience alone is an inefficient teacher of decision making (Hammond et al., 2007), it is suprising that general courses on decision making—that is, as a means to improve individual decision-making skills—are now rarely included in school or university curricula.

There is little doubt among OR scholars, and also decision analysts, about the theoretical relevance of such decision-making courses (Taylor, 2018) in terms of nudging individuals toward more effective decision making (Keeney, 2020) and capitalizing on the full potential of OR methods (Ormerod, 2014). Yet despite that consensus, there is scant (robust) empirical research into the effectiveness and practical usefulness of decision-making courses. In particular, scholars have neither systematically nor sufficiently addressed the impact of training interventions on individuals' decision-making skills and behavior related to structuring problems up to and including the stage of generating alternatives—a task that is prerequisite for effective decision making (Ferretti, Pluchinotta, & Tsoukiàs, 2019; Howard, 1988; Keeney, 1996; Siebert &

Keeney, 2015). These deficiencies motivate our attempt to close this research gap and we ask: *Does decision training promote effective decision making with regard to structuring problems and generating alternatives?*

In analyzing the effects of decision training, we contribute to the fields of behavioral OR (Franco & Hämäläinen, 2016; White, 2016) and decision analysis while pursuing two key research objectives. First, from the supply-side view of decision training, we enhance the debate over its value proposition by testing whether general courses in decision making have measurable positive effects. The test results should give OR lecturers and decision analysts a good starting point from which to discuss the evidently insufficient number of such courses in school and university curricula, with many institutions even discarding them altogether (O'Brien, Dyson, & Kunc, 2011). Our findings will likewise inform, by way of their quantitative aspect, the debate concerning whether soft OR methods are useful and effective (see e.g. Ackermann, Alexander, Stephens, & Pincombe, 2019; Ormerod, 2014). Also, knowing whether it is possible to promote effective decision making vis-à-vis structuring problems is relevant to assessing the value of more sophisticated ("hard") OR methods and related courses (Mingers & Rosenhead, 2011). The latter's effectiveness ultimately depends on the decision maker's fundamental abilities—for example, to actively generate the most suitable alternatives. Second, from a demand-side view of decision training, we similarly aim to provide an initial empirical basis regarding its relevance to individuals and to organizations looking for capable decision makers. We shall have a first argument for the usefulness of participating in decision-making courses once we (a) account for the importance of problem structuring in effective decision making (Siebert & Keeney, 2015; Siebert, Kunz, & Rolf, 2020) and (b) establish that training improves skills and/or causes more effective behavioral routines related to the problem-structuring phase.

To answer our research question and achieve our research objectives, we adopt the interdisciplinary approach for which OR scholars (e.g., Franco & Hämäläinen, 2016) have frequently called. First, we rely on the prescriptive principles of decision analysis and exploit the recently introduced concept of *proactive* decision making (Siebert & Kunz, 2016). This concept—which integrates insights from research on decision quality (Howard, 1988), value-focused thinking (Keeney, 1992), and proactivity (Grant & Ashford, 2008)—captures the skills and personality traits most strongly related to effective decision making during its phase of structuring problems and generating alternatives (see also Siebert et al., 2020). Second, our paper incorporates educational research and results related to knowledge transfer and training effectiveness. More specifically, we borrow from Kirkpatrick and Kirkpatrick's (2006) four-

level model, which is probably the method most often used to evaluate training effectiveness and thus the impact of training interventions (Mathieu, Tannenbaum, & Salas, 1992).

The rest of our paper proceeds as follows. Section 2 presents our study's theoretical and conceptual background. We review the literature on the effectiveness of decision training in Section 3, where we also develop our research hypotheses. Section 4 describes the research procedure, our quasi-experimental interventions, the dependent measures employed, and our analytical strategy. The empirical results of our hypotheses testing are summarized in Section 5, and we discuss their implications in Section 6. Section 7 outlines our study's limitations and suggests possible avenues for further research. We conclude in Section 8 with a brief summary.

2. THEORETICAL AND CONCEPTUAL BACKGROUND

2.1. EFFECTIVE DECISION MAKING AND PROACTIVE DECISION MAKING

For decades, researchers from different disciplines have studied human decision-making behavior with the aims of understanding related processes and of helping individuals, as well as organizations, make appropriate decisions (D. E. Bell, Tversky, & Raiffa, 1988; Milkman, Chugh, & Bazerman, 2009; Siebert & Keeney, 2020). The *normative* perspective of decision theory translates that appropriateness into (more or less) perfect decisions made by unbiased individuals exhibiting rational choice behavior; however, the *prescriptive* approach to decision analysis is unquestionably more realistic (Edwards, Miles, & von Winterfeldt, 2007). It evaluates decision appropriateness in terms of the normative procedural quality and effectiveness of decision making (Howard, 1980, 1988) while acknowledging the well-known limitations of human judgment (D. E. Bell et al., 1988). Decision analysis considers good decisions to be those that result from effective decision making—that is, decision making in accordance with the principles of decision quality (Spetzler et al., 2016).

According to Howard (1988), *decision quality* consists of seven elements: "proper framing", "informational excellence", "creative alternatives", "clear values", "integration and evaluation with logic", "balance of basis", and "commitment to action". Satisfying these elements requires the ability to exploit a distinctive set of different yet interrelated (cognitive) skills across all decision-making tasks; it also demands the willingness to change decision-related behavioral routines accordingly (Keeney, 2004). Finally, decision quality reflects the extent to which the decision maker systematically approaches and excels at each step of the process: recognizing, defining and structuring the problem, including the generation of alternatives;

evaluating and selecting among alternatives; and implementing and reviewing the chosen solution. Avoiding common decision biases (for an overview, see Montibeller & von Winterfeldt, 2015) is necessary but not sufficient for decision quality (Baron, 2008), contrary to what is implied by the predominant conceptualizations of decision-making competence (e.g., Bruine de Bruin, Parker, & Fischhoff, 2007; A. M. Parker, Bruin, Fischhoff, & Weller, 2018).

In his *value-focused thinking* paradigm, Keeney (1992) emphasizes clear values—and the objectives derived therefrom—as the primary source of effective decision making. If so, then there is no self-evident way in which to guide the additional cognitive efforts necessary for effective decision making when individuals are not (fully) aware of what they actually want (Locke & Latham, 2002). But instead of focusing on values first, many individuals start thinking about decisions and potential objectives only when confronted with the need to choose among alternatives that entail one or more particular courses of action (Payne, Bettman, & Schkade, 1999). This prevalent approach to decision making, which Keeney subsumes under the term *alternative-focused thinking*, leads to perceiving decisions as context-specific problems to be solved and not to their framing as general opportunities that can be seized (Ley-Borrás, 2015). Hence inherent to this approach is a basically reactive response to externally given alternatives that is based on the (usually insufficient) elicitation of short-term preferences (Fischhoff, 2008; Hsee & Hastie, 2006); this approach contrasts with proactively creating alternatives as a means to achieve long-term value (Karelaia & Reb, 2015). Truly creative alternatives, which are essential for decision quality and especially for decisions with far-reaching consequences, are seldom contemplated in a reactive regime (Keeney, 1992). Empirical support for this claim is provided Siebert and Keeney (2015) and by Siebert (2016), who show that prompting with objectives increases the number and quality of alternatives. Yet Selart and Johansen (2011) report that decision makers frequently have little or no experience with using objectives to generate alternatives, and Bond et al. (2008, p. 56) offer a possible explanation: "decision-makers are considerably deficient in utilizing personal knowledge and values to form objectives for the decisions they face."

Siebert and Kunz (2016) adopt a more holistic perspective from which to analyze the decision-making phase of problem structuring up to and including the stage where individuals generate alternatives. These authors seek to identify the traits and skills most closely associated with effective performance of the decision-making step—that is, in terms of decision quality principles (Spetzler et al., 2016). In so doing, they propose and validate a multi-dimensional model of proactive decision making, which integrates related insights into decision analysis (D.

E. Bell et al., 1988; Howard, 1988; von Winterfeldt & Edwards, 1993), research on value-focused thinking (Bond et al., 2008; Keeney, 1992; Siebert & Keeney, 2015), and previously elaborated notions that proactivity applies both to a dispositional personality trait and to actual behavior (Grant & Ashford, 2008; Greenglass, 2002; S. K. Parker, Bindl, & Strauss, 2010).

Siebert and Kunz (2016, p. 875) account for the two-dimensional nature of proactivity in defining proactive decision making as "the purposeful use of [proactive] cognitive skills and certain foresighted personality traits of the decision maker." These authors elaborate two general personality traits and four cognitive skills that distinguish proactive from reactive decision making during its phase of structuring problems (for a more detailed description, see Siebert et al., 2020). Concerning *proactive personality traits*, Siebert and Kunz distinguish between "striving for improvement" and "taking the initiative", which they regard as distinct but complementary facets of one's commitment to proactive behavior during decision processes. The authors argue that, without these traits—which VandenBos (2015, p. 784) defines more generally as "a relatively stable, consistent, and enduring internal characteristic that is inferred from a pattern of behaviors, attitudes, feelings, and habits in the individual"—there would be no reason for anyone to undertake the additional cognitive effort required for a proactive approach to problem structuring and generating alternatives.

In terms of *proactive cognitive skills*, which Siebert and Kunz (2016) view as learned behavioral manifestations of proactivity in decision processes, four interdependent cognitive abilities—based on value-oriented, analytical thinking and deliberate reasoning processes—are identified: "systematic identification of objectives", "systematic search for information", "systematic identification of alternatives", and "using a decision radar". Although by definition these four skills apply to different decision-making facets, previous research has found their effects to be barely noticeable in isolation (Siebert et al., 2020). In other words: evidence suggests that individuals, when structuring problems and generating alternatives, typically apply all four skills to a similar extent.

Tests for the possible consequences of proactive decision making indicate that it not only increases satisfaction with the decision (Siebert & Kunz, 2016) but also leads to enhanced life satisfaction and general self-efficacy (Siebert et al., 2020). In transcending the decision-analytical perspective, these findings spotlight the question of whether—and to what extent—it is possible to help individuals become more effective in the decision-making phase during which problems are structured and alternatives are generated.

2.2. IMPROVING INDIVIDUAL DECISION MAKING

The broad consensus that emerges from decision sciences is that improving individual decision making is a worthwhile goal in light of the inability of most people to avoid decision biases (Milkman et al., 2009; Morewedge et al., 2015) or to make quality decisions in complex or ill-structured situations (Thaler & Sunstein, 2009). Such improvement would be desirable also because better decision making usually increases the odds of achieving the desired decision outcomes (Hammond et al., 2007; Keren & Bruine de Bruin, 2005; Spetzler et al., 2016). The need to improve one's decision-making ability arises because few persons have ever formally learned what constitutes good decisions (Beyth-Marom, Fischhoff, Quadrel, & Furby, 1991; Hammond et al., 2007; Jacobson et al., 2012) or have much experience at being effective decision makers (Bond et al., 2008). Besides, most individuals are unaware of the degree to which they are biased (Scopelliti et al., 2015)—even though decision-making abilities naturally vary not only across individuals but also throughout each person's lifespan (Bruine de Bruin, Parker, & Fischhoff, 2012).

Over the decades, scientists and practitioners have made huge efforts to develop strategies, methods, and support tools to improve both novice and expert decision making (Morewedge et al., 2015). According to Milkman et al. (2009), most of these improvement attempts share the goal of improving the routines of human cognition (see Stanovich & West, 2000). Among the strategies considered are to leverage intuitive thinking (e.g., Thaler & Sunstein, 2009), to render intuitive thinking more conscious (e.g., Kahneman & Lovallo, 1993), and to develop conscious thinking in other ways (e.g., L. Thompson, Gentner, & Loewenstein, 2000). We can classify these attempts to improve individual decision making into two broad categories: indirect improvement and direct improvement.

The first category, *indirect* improvement, consists of approaches related to the change of motivation (cf. Morewedge et al., 2015), the optimization of choice architectures (Thaler & Sunstein, 2009), and/or the consultation of decision analysts (Keeney, 2004). Motivational strategies seek to improve decision making either by using incentives or by holding people accountable for their decisions (Larrick, 2004). Although there is some empirical support for the utility of incentives in certain situations (e.g., involving healthy behavior; Charness & Gneezy, 2009), incentives frequently fail to have their intended effect. The main reasons for their ineffectiveness are that (a) people simply do not have the (cognitive) abilities and knowledge required to make better decisions (Camerer & Hogarth, 1999; Larrick, 2004) and (b) wrongly calibrated incentives can reduce or crowd out positive intrinsic motivations for

effective decision making (Gneezy, Meier, & Rey-Biel, 2011). In a similar way, accountability—which encourages individuals to put more effort into their decision making by stimulating pre-emptive self-criticism—does not automatically result in better decisions (Larrick, 2004).

The need to justify one's decisions may have positive effects when there are capable decision makers (Lerner & Tetlock, 1999). However, it can also lead to actions that mimic the negative behavior of others by adopting decision processes that merely please the audience or to relying too heavily on the more easily justified aspects of decisions (Brown, 1999). Strategies that aim to improve decision making by optimizing choice architectures typically address how alternatives are presented and how decisions are made (Morewedge et al., 2015). Rather than relying on the conscious thinking abilities of decision makers, these improvement approaches use small "nudges" (Thaler & Sunstein, 2009) that enable individuals to make good decisions more intuitively (Milkman et al., 2009). Few doubt the positive effects of improved information presentation (Larrick & Soll, 2008; Levin & Gaeth, 1988) or the benefits of enhanced default options (Benartzi & Thaler, 2007; Johnson & Goldstein, 2003); however, such optimizing is necessarily situation specific. Moreover, it cannot resolve the underlying structural causes of biased or inferior decision making (Bhargava & Loewenstein, 2015).

The *direct* improvement of individual decision making tackles cognitive processes linked to deficient decisions (Larrick, 2004). In essence, this second category of improvement efforts amounts to guides concerning effective decision making (e.g., Baucells & Sarin, 2012; Hammond et al., 2007; Kahneman, 2013; Keeney, 1992; Spetzler et al., 2016) and the associated training interventions (i.e., operations research or general decision-making courses; for an overview, see Beyth-Marom et al., 1991). On the one hand, these efforts involve raising individuals' awareness of the benefits of good decisions and enabling them to understand how they actually make decisions and how they deviate from rational choice (Baron & Brown, 1991)—while bearing in mind that experience alone is not an efficient teacher of decision making (Hammond et al., 2007). On the other hand, direct approaches aim to demonstrate normative strategies, methods, and tools that can be used to overcome biased decision making or to achieve decision quality in specific contexts and also in general. Hence they either try to develop conscientious thinking abilities or show how one can move from intuitive to deliberate thinking processes (Beyth-Marom et al., 1991).

According to Zhang et al. (2016), there are three types of instructional decision training interventions: (i) pure decision-making courses (e.g., the GOFER course; Mann et al., 1988), (ii) issue-based (socio-science) courses with explicit decision-making content (e.g., integrating

decision making into US history instruction; Jacobson et al., 2012), and (iii) courses with embedded decision-making elements (e.g., Lee, 2007). Whereas the first two types impart knowledge on principles of improved decision making through direct teaching, the third instruction method is based on an integrated, issue-based approach that (indirectly) guides participants toward better decision making.

By definition, proactive decision making presupposes the personal traits and enhanced cognitive skills mentioned previously; hence improved individual decision making cannot rely on indirect methods alone. Instead, it requires direct improvement efforts that explicitly cover the task of problem structuring. So in line with our paper's purpose—namely, analyzing whether (and to what extent) it is possible to help individuals become more effective at structuring and generating alternatives—we assess the impact of decision training by evaluating how participation in a pure decision-making course affects individuals' decision-making proactivity. Unlike the unsupervised reading of guides (i.e., books, papers, etc.) or watching of learning videos, participation in such courses allows for at least some experimental control: there is a pre-determined time frame for everyone; all participants receive the same direct information during that time; and the experimenter can ensure that everyone gives some thought to the information provided (a requirement for passing the course).

3. LITERATURE REVIEW AND HYPOTHESES

3.1. EFFECTIVENESS OF DECISION-MAKING COURSES

Knowledge transfer and the effectiveness of training interventions (i.e., workshops, specific courses, or degree programs) are ongoing issues in many disciplines, including the decision sciences (Beyth-Marom et al., 1991) and operations research (Ackermann et al., 2019; Gault, 1984; Mingers & Rosenhead, 2011). Researchers and practitioners alike are often interested in (a) the skills or task characteristics trained, (b) the match between those skills or characteristics and the training delivery method(s) used, and (c) the evaluation of training outcomes (Arthur, Bennett, Edens, & Bell, 2003; Liebman, 1998). Although evaluating those outcomes—that is, the effectiveness of training—may be straightforward when the skills and task characteristics are delimitable (e.g., being able to solve a specific mathematical problem), it becomes increasingly difficult when those skills are mostly intangible (e.g., general problem-structuring or decision-making abilities; Ackermann, 2012; Beyth-Marom et al., 1991). It follows that measuring the effectiveness of training requires comprehensive and systematic evaluation criteria (Arthur et al., 2003).

Perhaps the most popular method is Kirkpatrick and Kirkpatrick's (2006) four-level model, which was originally developed in the 1950s (see Mathieu et al., 1992). This model distinguishes between (1) trainees' *reaction* to the training and its contents, (2) trainees' *learning* of knowledge or skills, (3) changes in trainees' *behavior*, and (4) organizational *results* in consequence of trainee's behavioral changes. According to Kirkpatrick and Kirkpatrick, these four levels build a chronological and logical sequence of training outcomes in which the participants' positive perception of a training program is the baseline condition for all other levels of effectiveness. Whereas this first level consists simply of subjective assessments of participants' feelings about the training, evaluation at the other levels is progressively more complex and time-consuming (i.e., standardized performance/ knowledge tests on Level 2, surveys/ interviews of trainees and/or other qualified, reliable, and avaliable persons on Level 3); the culmination is measuring the organizational outcomes most closely linked to training on Level 4 (i.e., changes regarding productivity, return on investment, or customer satisfaction).

We can safely assume that, from a decision-analytic perspective, this model is applicable primarily to judging the effectiveness of decision-making courses; however, the fourth level is controversial for two reasons. First, there is a broad agreement among decision scientists that the quality of decision making and the quality of (external) decision outcomes require different valuation standards—that is, because even "optimal" choices based on effective decision making can have negative consequences (and vice versa). After all, the decision maker cannot fully control all or even most external effects (Howard, 1988; von Winterfeldt & Edwards, 1993), and there is some internal uncertainty also regarding the limits of human knowledge (Larrick, 2011). Second, the effect of individual decision making on measurable organizational results necessarily depends not only on the decision maker's position within the organization but also on superordinate processes that can alter one's decision making (Huber, 1981).

With regard to the teaching of decision making in general, Beyth-Marom et al. (1991) provide a comprehensive overview of studies. In addition to reviewing the content and mode of instruction (or content delivery), these authors discuss the criteria and methodologies for evaluating courses on decision making. They find that most of the reviewed studies (i) report that training interventions were effective and (ii) rely on the evaluation criteria of Kirkpatrick and Kirkpatrick's (2006) Level 1 or Level 2 (e.g., Hernstein, Nickerson, Sánchez, & Swets, 1986; Mann et al., 1988; Ross, 1981). Other studies support these results by also finding positive response effects to decision-making courses. For instance, Pliske, McCloskey, and Klein (2001) describe military-related decision skills training that is grounded in experiential learning (e.g., G. Klein, 1997) and demonstrate the success of that approach via participants' affirmative

reactions and subjective evaluations of post-training performance. Shanteau, Grier, Johnson, and Berner (1991) and also Shamian (1991) similarly report the (learning) effectiveness of teaching decision-making skills and decision analysis to, respectively, nurses and medical students. Unlike Rogers, Swee, and Ullian (1991)—who found *no* significant differences in clinical supervisors' problem-solving ratings for students who participated in decision training versus those who did not—Shanteau et al. and Shamian observe that their decision-making course participants displayed improved abilities to choose appropriate nursing actions or (respectively) more consistently selected clinical decisions in accordance with medical experts.

More recently, Jacobson et al. (2012) use a randomized study to demonstrate the effectiveness of integrating decision-making content into existing high-school courses. Incorporating decision training into an otherwise standard history course had two effects: it increased participants' levels of self-assessed decision-making competence (Bruine de Bruin et al., 2007), and it was followed by improved academic performance in comparison with the non-treatment courses (i.e., the standard history courses). Also, Morewedge et al. (2015) analyze the effectiveness of "one-shot" training sessions dedicated to reducing decision biases (Tversky & Kahneman, 1974). The results of their longitudinal experiments—in particular, substantially reduced biases in both post-test and follow-up analyses—suggest that even a single training intervention can lead to improved individual decision making. Finally, Zhang et al. (2016) examine how contrasting instructional approaches affect children's decision-making competence. Their study highlights the value of an embedded issue-based, socio-scientific, decision-making curriculum for young students; it also confirms (cf. Lee, 2007) that collaborative interaction, rather than direct instruction, is the best way to transfer decision-making competences.

As for improving individual decision making via OR courses (in general) and soft OR–related training (in particular), much of the previous research focuses on issues (a) and (b)—that is, on skills and how they are taught. Thus O'Brien et al. (2011) describe the development of three OR courses and discuss how they teach certain tools that support strategic decision making. The authors conclude, based on increasing numbers of student enrollments and positive feedback from participants (tantamount to Level 1 in Kirkpatrick and Kirkpatrick, 2006), that their courses are successful. Ackermann (2011) and Ackermann et al. (2019) reflect more generally on the challenges of teaching soft OR or problem-structuring methods and offer some insights into how, with the aid of a pedagogically customized training program, these challenges can be addressed or even overcome. Yet a serious limitation of such research, as these authors point out, is the lack of quantitative follow-up analyses to evaluate the design effectiveness of proposed training interventions.

In contrast, Carreras and Kaur (2011) argue that courses about problem-structuring methods should (in theory) benefit from experiential and meaningful learning, and they also attempt to evaluate that effect using the example of a "causal mapping" workshop. Notwithstanding their findings' lack of (external) validity, the authors pronounce the effectiveness of their intervention based on a statistically significant difference between students' perceptions of the method's benefits before and after the workshop (this is equivalent to Level 1 or Level 2 in Kirkpatrick and Kirkpatrick, 2006). In a community OR contribution, Taylor (2018) introduces a decision-making program based on value-focused thinking (Keeney, 1992) for the chief purpose of building resilience in children and young adults. Referring to positive experiences (Level 1) and increases in the trainees' perception of decision-making skills after completing the pilot course (Level 2), Taylor infers the value of that decision training while simultaneously acknowledging the need to confirm those results with a much larger sample size. Lami and Tavella (2019) address the usefulness of soft OR models in decision making—and explore evaluating the effect of three different problem-structuring method workshops on workshop outcomes—in a quasi-experimental setting with graduate students. Overall, their results suggest that the workshops were effective in terms of positive personal reactions (Level 1) and of measurable outcomes (Level 2) as well.

Taken together, then, the works cited here provide some initial support (both qualitative and quantitative) for the assumption that decision training can be effective way to improve individual decision making in general, in particular decision-making domains, and with the assistance of specific tools or methods. At the same time, our review of the literature revealed that studies on decision training have neither systematically nor sufficiently covered the phase of structuring problems up to and including the stage of generating alternatives and its attendant skills or behavior (Level 3); this situation is in sharp contrast to other normatively prescribed steps of effective decision making, such as those related to evaluating alternatives (Beyth-Marom et al., 1991). Likewise, extant research has not properly incorporated individual differences among trainees, which could obviously influence the effectiveness of decision training interventions (Noe, 1986). More specifically, there is a lack of research that accounts for the professional pre-training decision-making experience and the responsibility to make or analyze decisions professionally—both of which are commonly viewed as indicators of increased decision-making competence (e.g., Perkins & Rao, 1990; Strough, Parker, & Bruine de Bruin, 2015). Therefore, in this study we address these two sizeable research gaps.

3.2. TRAINING PROACTIVE DECISION MAKING

At the *individual* level, proactivity and effective decision making have been linked to various positive outcomes (Bruine de Bruin et al., 2007; Fuller & Marler, 2009), including increased life satisfaction (Greguras & Diefendorff, 2010; Siebert et al., 2020) and more intact social environments (A. M. Parker & Fischhoff, 2005) as well as more rapid career progress and higher salaries (Seibert, Kraimer, & Crant, 2001). At the *organizational* level, favorable consequences include enhanced job performance (J. A. Thompson, 2005), more innovations (Kickul & Gundry, 2002), and overall organizational success (Frese & Fay, 2001). We can only conclude that firms should deliberately seek to promote the decision-making proactivity of workers. Hence there are not only theoretical but also practical reasons for examining whether—and to what extent—such proactivity can be facilitated by decision training interventions.

As discussed previously, there is some empirical support for the effectiveness of decision training. Research is more ambiguous, however, about the teaching of proactivity. Whereas earlier studies (e.g., Bateman & Crant, 1993; Seibert, Crant, & Kraimer, 1999) assume that proactivity is dispositional and persistent, the papers of Kirby, Kirby, and Lewis (2002) and Strauss and Parker (2018) hypothesize that—and test for whether—proactive thinking and behavior can be trained. We are intrigued by Kirby et al.'s conclusion that their finding of a statistically significant but fairly incremental improvement in proactive thinking—after participation in the training intervention—indicates "an individual's proactivity is probably impacted by both personality trait and trainable skills" (p. 1548). That conclusion could explain Strauss and Parker's discovery that the main effects of their training to enhance proactivity—unlike the moderating interaction effects—were not significant and that neither of their interventions had a measurable effect on proactive skill development.

After integrating these studies' insights, we expected that the "trainability" of proactivity would depend largely on the intervention approach and on whether that training delivery method matches up with either of proactivity's two facets (i.e., either proactive skills or proactive traits). Neither problem-focused nor vision-focused interventions designed to stimulate fundamental goal-setting and motivational processes (Strauss & Parker, 2018) were, in themselves, effective at increasing an individual's proactivity; neither were interventions that promoted strategic thinking toward the end of fostering cognitive abilities (Kirby et al., 2002). Hence we also anticipate differences in the effectiveness of decision training as a function of promoting either facet of proactive decision making.

Drawing on instructional theory (e.g, Gagne & Briggs, 1974; Reigeluth & Carr-Chellman, 2009) while accounting for the trainability of proactive thinking, we assume that decision training can—with proper controls—be an effective means to improve proactive cognitive skills and promote their application. Learning what constitutes decision making that accords with the principles of decision quality, and then being required to apply this knowledge repeatedly in various decision-making scenarios, raises course participants' awareness of the benefits from approaching the problem-structuring phase more systematically and with greater foresight. We therefore assume that those who participate in such a course are likely either to adjust their decision behavior (so that they adopt a more proactive approach) or, at least, to be more confident about having the set of skills necessary for becoming a proactive decision maker. Either way, we expect that such training interventions increase the level of proactive cognitive skills (Level 2 or Level 3 in Kirkpatrick and Kirkpatrick, 2006). These considerations lead to our first hypothesis.

Hypothesis 1. *Decision training has a positive effect on proactive cognitive skills.*

Following the earlier proactivity literature (Bateman & Crant, 1993; Seibert et al., 2001), we consider proactive personality traits to be relatively stable dispositions (McCrae & Costa, 1982). Thus we assume that the proclivity to engage in proactive behaviors is a manifestation of dispositional tendencies to "strive for improvement" and "take the initiative". In analogy to more general personal traits (e.g., the Big Five; Paunonen & Ashton, 2001), such dispositions—unlike their more specific behavioral consequences—are rather independent of situational influences and thus seldom change in the short-to-medium term (Judge, Higgins, Thoresen, & Barrick, 1999). There is instead some support for such traits being, at least in part, genetically determined (Digman, 1990). Hence it is all the more surprising that Frese, Hass, and Friedrich (2016) and Glaub, Frese, Fischer, and Hoppe (2014) report positive effects of their training programs designed to *enhance* personal initiative. Yet these findings probably reflect the study's participants, each of whom owned a small business whose success depended almost solely on their own efforts (Tornau & Frese, 2013). In comparison with non-entrepreneurs, these participants did not only exhibit a more impressive growth trajectory but also were clearly more motivated to alter their disposition to take the initiative. Considering the stable nature of dispositions and also that the decision-making courses cited here (unlike Frese et al.'s action training program) all address specific cognitive functioning routines, we expect that such training interventions—despite their social desirability—have no effect on the levels of the two proactive traits. Thus we have our second hypothesis, as follows.

Hypothesis 2. *Decision training has no effect on proactive personality traits.*

Given the verdict of a positive relation between proactive decision making and decision satisfaction (Siebert et al., 2020; Siebert & Kunz, 2016) and in expectation of a positive effect on proactive cognitive skills, we also anticipate that decision training has a positive effect on self-perceived satisfaction with one's decision making—a positive intrinsic result equivalent to a "subjective" form of Kirkpatrick and Kirkpatrick's (2006) Level 4. We argue that participants in such courses become more confident about their decision making, which again can be linked to decision satisfaction (Heitmann, Lehmann, & Herrmann, 2007). Moreover, the information provided in the training might well reduce the decision uncertainty of participants, which can have only a positive effect on any judgments about decision satisfaction (Venkatesh, Morris, & Ackerman, 2000). Finally, and in line with Kirkpatrick and Kirkpatrick's Level 1 evaluation criterion, we expect that increases in decision satisfaction serve as subsequent self-affirmations to make the (additional) cognitive effort required throughout decision-making courses. We can now articulate our third hypothesis.

Hypothesis 3. *Decision training has a positive effect on decision satisfaction.*

Next, we posit that the effect of decision training on proactive cognitive skills depends on the trainee's pre-course abilities and predisposition to the course content. This assumption is based on the opinion, prevalent in training and development research, that trainee characteristics have a major effect on knowledge transfer and learning (B. S. Bell et al., 2017). Besides personality and motivational processes (Colquitt, LePine, & Noe, 2000), individual abilities are oftentimes seen as critical determinants in the process of knowledge acquisition (Ackerman, 1992). In this regard, one key finding is that subjects with less cognitive ability and task familiarity make gains from training at a more rapid rate than do their more highly functioning counterparts—a generalization that holds irrespective of the level of training performance (Eyring, Johnson, & Francis, 1993). In other words, training effects are increasingly difficult to obtain once individuals close in on their maximal performance or skill levels.

In light of Siebert's (2016) result that different facets of experience have a positive effect on the task of generating quality alternatives within problem structuring, we expect differences also in (perceived) proactive cognitive skill levels as a function of whether the individual possesses relevant experience and task familiarity. We similarly account for the complexity of relationships among decision-making experience, individual skill levels (i.e., expertise), and actual task performance (Camerer & Johnson, 1991; Dane, 2010; Shanteau, 1992); thus we assume, in particular, that professional decision-making time and the specific decision-making

responsibility (e.g., as decision maker or decision analyst) are indeed relevant determinants of greater ability. In turn, these individual differences in proactive cognitive skill levels could influence the observed training effect of decision-making courses—a possibility that inspires our final hypothesis.

> ***Hypothesis 4.*** *The effect of decision training on proactive cognitive skills depends on the participants' (a) professional decision-making experience and (b) responsibility to make (or analyze) decisions professionally.*

4. METHODOLOGY

4.1. PROCEDURE AND PARTICIPANTS

We conducted quasi-experimental field studies (cf. Shadish, Cook, & Campbell, 2002) based on a repeated-measures design. By means of an online questionnaire, we asked participants in three distinct decision-making courses to answer the same set of questions about them and about their decision-making behavior before taking the course (t_1) and shortly after finishing the course (t_2). In the absence of true experimental randomization, we methodologically increased internal validity by testing a semi-equivalent external control group that received no training intervention. Additionally, we examined an internal control group by collecting data from prospective participants of the third course three months prior to that course (t_0). After that third course (t_2), we also asked participants to assess their peers' decision-making behavior, with whom they had to team up throughout the training intervention. To avoid communication and mutal agreements between participants, we collected peer-evaluations offline. Finally, we invited that third cohort to answer the same set of questions about them and their decision-making behavior approximately one year after they had completed the course (t_3).

The rationale for utilizing three independent studies was to enhance our results' external validity by replication across different contexts. This approach also allowed us to address other possible limitations, such as problems involving multiple comparisons. Our reason to incorporate both an external control group (i.e., no intervention) and an internal control group (i.e., no intervention between t_0 and t_1, intervention between t_1 and t_2) was to reduce the likelihood of plausible alternative explanations for our hypothesized intervention effects. More specifically, we aimed to rule out (among other factors) the presence of an influential test–retest effect due to asking the same questions more than once. We sought to control also for potential maturation, history, and selection effects (Cook, Campbell, & Peracchio, 1990). Although self-evaluation measures are the most suitable when studying phenomena, as in our case, of an intrinsic nature

that is not context-specific (Conway & Lance, 2010; Spector, 1994), their well-known shortcomings include the possible compromising of validity (Podsakoff & Organ, 1986). In due consideration of Kirkpatrick and Kirkpatricks' (2006) suggestion to use more than one source for assessing behavioral change where possible, that fortified our decision to examine supplementary peer-evaluations. In so doing, we intended to account for two potential biases: (1) the confounding effects of participants' overconfidence (i.e., participants may only think they are better/different decision makers after the course), and (2) their penchant for social desirability (i.e., participants may report higher skill and trait levels because they believe that higher levels are viewed favorably by others). In choosing peers as our secondary data source, we followed predominant recommendations (cf. Kirkpatrick & Kirkpatrick, 2006). Peers were not only most available but also they were best qualified because, unlike the course instructor, they had the opportunity to observe the relevant decision-making behavior more frequently. Moreover, they were sufficiently reliable because by participating in the course, unlike friends or family members, they were able to compare the observed behavior against what theoretically constitutes effective decision making. Eventually, the motive for including a second measurement point about one year after the course was to see whether any of the hypothesized intervention effects endured in the medium run or instead faded out—a phenomenon that affects most interventions designed to improve participants' cognitive, social, or emotional abilities (Bailey, Duncan, Odgers, & Yu, 2016). As a consequence of this fade-out effect, remarkable short-run training gains—in the realm of, say, mathematical abilities (see e.g. Smith et al., 2013)—can dissipate entirely over time (Clements, Sarama, Wolfe, & Spitler, 2013).

At the beginning of each questionnaire, we informed participants about our study's general purpose: analyzing decision-making behavior and personality over time. They were also told that participation was voluntary, that there were no "right" or "wrong" answers, and that their privacy would be protected. Our pre–post and self–peer matching of data relied on anonymous codes. After matching pre- and post-intervention answers and removing incomplete data sets, we were left with a total of 1,013 participants across our three studies and control groups (i.e., 921 participants in the decision-making courses, including 405 peer-ratings for 114 participants, plus 92 persons in the external control group).

The first study consisted of 578 participants (about one third female and two thirds male) who enrolled in one of NovoEd's online courses, *DQ 101: Introduction to Decision Quality* by Carl Spetzler. In this sample, the different age groups were well represented—30% were older than 40 years, 31% were between 31 and 40 years old, and 39% were younger than 31 years. The majority of these participants were from the United States, and they worked primarily in

the following sectors: banking, financial services, and insurance; education; energy, utilities, and chemical; manufacturing; technology; or transportation. Most of the participants had considerable professional experience in dealing with decision making: 35.8% more than 10 years, 18% between 5 and 10 years, 31.1% between 1 and 5 years, and only 15.1% less than 1 year. Furthermore, 51.6% were decision makers and decision analysts, 12.8% were decision makers, 23.9% were decision analysts, and 11.8% were neither a decision maker nor a decision analyst.

The second study was based on 106 industrial engineering and management students (33 females and 73 males) who attended the undergraduate course *Decision Theory* at a renowned technical university in Germany. These participants were between 18 and 29 years of age; the average age was 21.14 years with a standard deviation of 1.92 years. Most were citizens of Germany (95.3%), and a few came either from other European countries (2.8%) or from a country outside of Europe (1.9%).

The third study involved 237 students (128 females and 109 males) who attended courses in *Value-focused Thinking and Decision Quality* at a highly regarded business school in Austria. These participants were between the ages of 18 and 40; on average, they were 22.93 years old with a standard deviation of 3.87 years. Most (75.1%) originated from Austria, some (23.7%) came from other European countries, and only a few (1.2%) were citizens of a non-European country.

The internal control group consisted of 86 persons (47 females and 39 males) and the external control group of 92 persons (49 females and 43 males). All the members of these groups were business students. The internal group's participants were between 18 and 34 years of age; the average age was 21.69 years with a standard deviation of 3.03 years. The external group's participants were between 18 and 38 years old; their average age was 21.16 years with a standard deviation of 3.52 years. In both groups, the vast majority of participants (95.2% and 97.8%, resp.) came from a European country.

4.2. DECISION TRAINING INTERVENTIONS

We chose our quasi-experimental training interventions while bearing in mind the premise that, as explained in Section 2.2, our purpose is aligned only with *direct* approaches to improving individual decision making—that is, in the shape of pure decision-making courses. We selected three types of decision-making courses based on the general suitability of their content; all were designed to introduce participants to the principles of decision quality and/or the foundations of decision theory. Despite their different durations and workloads, we made sure that each

course covered the topics most relevant to the problem-structuring phase of decision-making processes: clearly expressed values, informational excellence, creative alternatives, and proper framing.

All three courses took place in the "natural" setting of a field study; that is, we did not explicitly invite individuals to participate in the respective course (i.e., as part of a controlled laboratory experiment). In taking this approach, we pursued two main goals. We first aimed to minimize the risk of a pre-selection bias toward more proactive individuals, who—by definition and as compared with their reactive counterparts—are more inclined to take part in any improvement intervention (Major, Turner, & Fletcher, 2006) and have a greater intrinsic need for personal growth (Strauss & Parker, 2018). Second, by also ensuring that the course syllabi did not provide explicit information on the different elements of proactive decision making, we sought to avoid individuals becoming biased toward our dependent measures so that they would not anticipate, and thus consciously overemphasize, the training effects (viz., observer or experimenter demand effects; Zizzo, 2010) beyond "true" developments.

Our first decision-making course, *DQ 101: Introduction to Decision Quality*, is an online course offered by the Strategic Decision Group (Carl Spetzler) via NovoEd—an online education platform collaborating with universities in the United States. During this five-week program, which was designed to help individuals improve their general decision-making skills, participants learn to understand the requirements of decision quality, to recognize the quality of decisions before actually making them, to identify gaps in decision quality, and to focus their attention where it matters in decision situations. They are also taught how to reach decision quality efficiently when making important decisions and how to improve their awareness of strategic decision making. Participants cannot complete the course without exhibiting their absorption of the course content in various homework assignments.

The second form of decision training is a large course, entitled *Decision Theory*, that is given at a technical university. During this course, which lasts four months, students learn how humans decide and how they should decide. Participants gain an awareness of the biases related to intuitive decision making and are introduced to different decision-analytical methods and tools that facilitate rational decision making. More specifically, students become acquainted with the decision support tool Entscheidungsnavi, which guides the structuring of decisions, including the systematic identification of objectives and information, and the generation of cre-

ative alternatives (Siebert & von Nitzsch, 2018; von Nitzsch & Siebert, 2018). Regular attendance at the corresponding exercise class is required to complete the course, and students also must pass a final examination.

The third intervention type, *Value-focused Thinking and Decision Quality*, consists of (identical) small-group courses. During these four-week courses, participants acquire the knowledge necessary to make good individual and group decisions. Thus they learn to frame decision problems appropriately for single and multiple decision makers, to elicit and aggregate preferences, and to deal with uncertainties. These courses also cover decision biases and methods of avoiding them as well as the effective use of decision support tools. The requirements for finishing the course include active participation, the completion of a case study using the Entscheidungsnavi support tool, and a final group report.

Table 1 summarizes each course's characteristics and outlines the course topics that match the four proactive cognitive skills. None of the courses covered any content, methods, or tools explicitly related to the two proactive personality traits, and they did not specifically mention decision satisfaction.

4.3. DEPENDENT MEASURES

Our questionnaires' latent self-evaluation measures (see the electronic appendix) had all been previously established and shown to exhibit adequate levels of reliability and validity (Siebert et al., 2020). We viewed the fulfillment of these criteria as a credible indicator of the measures' suitability for capturing the underlying theoretical constructs of interest (Kelley, Clark, Brown, & Sitzia, 2003).

Proactive decision making (PDM) was assessed using the Proactive Decision Making Scale (Siebert & Kunz, 2016). This scale comprises six dimensions: systematic identification of objectives, systematic identification of alternatives, systematic search for information, using a decision radar, taking the initiative, and striving for improvement. These dimensions are captured by 21 items that participants rated on a Likert scale that ranged from 1 ("disagree very strongly") to 7 ("agree very strongly").

Decision satisfaction (DSA) was assessed using a revised form (Siebert & Kunz, 2016) of the Fitzsimons (2000) Decision Satisfaction Scale (DSAS). This adjusted form of the DSAS is a single-factor global measure of DSA that asks respondents to indicate their satisfaction with three different aspects of decisions—final sets of alternatives, decision processes, and choice—on a scale ranging from 0 ("extremely unsatisfied") to 10 ("extremely satisfied").

Table 1
Intervention characteristics and content related to proactive decision making.

	Intervention 1: *Introduction to Decision Quality*	Intervention 2: *Decision Theory*	Intervention 3: *Value-focused Thinking and Decision Quality*
Type	Massive online course (optional)	Large university course (compulsory)	Small business school courses (compulsory)
Length	Five weeks	Four months	Four weeks
Format	Video lectures and exercises	Lectures, interactive exercises	Lectures, interactive exercises
Workload	< 30 hours	150 hours	150 hours
Target group	Professionals	Full-time students	Full-time students and part-time students
Control mechanisms/ assessment	Weekly assignments	Final examination	Case study with decision support tool, group paper
Content related to the four proactive cognitive skills			
Systematic identification of objectives	Fourth decision quality principle—*clear values and trade-offs* (Spetzler et al., 2016)—and related tools (e.g., preferences, indifference, substitution; direct/indirect values and value maps)	*Value-focused thinking* and related methods for identifying and structuring objectives (Keeney, 1992); reaching decision quality using the *Entscheidungsnavi* decision support tool (identification of fundamental objectives; von Nitzsch & Siebert, 2018)	Fourth decision quality principle (see Intervention 1) and *value-focused thinking*; related methods for identifying and structuring objectives (Keeney, 1992); using the decision support tool *Entscheidungsnavi* (see Intervention 2)
Systematic search for information	Third decision quality principle—*meaningful, reliable information* (Spetzler et al., 2016)—and related tools (e.g., scenario/ possibility trees, influence diagrams, tornado charts, assessment techniques, ranges and distributions)	Cognitive reasons for imperfect information processing and countermeasures; reaching decision quality using the support tool *Entscheidungsnavi* (dealing with uncertainties)	Third decision quality principle (see Intervention 1); using the *Entscheidungsnavi* decision support tool (see Intervention 2)
Systematic identification of alternatives	Second decision quality principle—*creative and doable alternatives* (Spetzler et al., 2016)—and related tools (e.g., right/left brain, creativity methods, systematic search, strategy tables)	Introducing methods for creating more and better alternatives (Siebert & Keeney, 2015); reaching decision quality using the decision support tool *Entscheidungsnavi* (creative alternatives)	Second decision quality principle (see Intervention 1); methods for creating more and better alternatives (Siebert & Keeney, 2015); using the decision support tool *Entscheidungsnavi* (see Intervention 2)
Use of a decision radar	First decision quality principle—*appropriate frame* (Spetzler et al., 2016)—and related tools (e.g., decision hierarchies)	Reaching decision quality using the *Entscheidungsnavi* decision support tool (identifying fundamental objectives, framing decisions appropriately)	First decision quality principle (see Intervention 1) and *value-focused thinking*; formulating decision statements and decision frames; using the decision support tool *Entscheidungsnavi* (see Intervention 2)

Peer-evaluated proactive decision making was assessed with one item for each of the six PDM dimensions. Within groups who had worked closely together on different decision-making tasks and assignments, we asked participants to evaluate each other's proactive decision-making skills and traits using a Likert scale that ranged from 1 ("disagree very strongly") to 7 ("agree very strongly"). A sample item is as follows: "My peer systematically identifies his or her objectives."

4.4. ANALYSES

We tested our hypotheses by way of a two-stage analytical procedure. In the *first* step, we conducted covariance-based confirmatory factor analyses (CFAs) to confirm the psychometric properties and dimensionalities of our constructs (viz., PDM and DSA) in each of the two main samples: the one prior to the course (t_1) and the other shortly after the courses (t_2). To ensure the comparability—in the analyses that follow—of our results across the three courses, we did not consider each study individually but rather analyzed all data simultaneously. We eliminated non-fitting items based on low factor loadings and indicated cross-loadings, and we evaluated psychometric properties by computing the composite reliability (CR ≥ .60; see Bagozzi & Yi, 1988), average variance extracted (AVE ≥ .50; Fornell & Larcker, 1981), and the Fornell and Larcker criterion that compares AVE with maximum shared variance (MSV). In addition, we determined the fit of the measurement models by employing several fit statistics: the ratio of chi-squared to degrees of freedom ($\chi 2/df \leq 3$), the root mean square error of approximation (RMSEA ≤ .10), the standardized root mean square residual (SRMR ≤ .08), the comparative fit index (CFI ≥ .90), and the Tucker–Lewis index (TLI ≥ .90). The fit statistics were gauged according to the parenthetical thresholds just given, as recommended by Browne and Cudeck (1992), Homburg and Baumgartner (1995), and Hu and Bentler (1999).

In the *second* step, we used paired-sample *t*-tests and repeated-measures ANOVAs (Field, 2013) to determine whether there were any significant changes in the levels of PDM and DSA after the participants completed their decision training. Thus we calculated—following the results obtained in our first step—unit weighted composite scores for the confirmed PDM dimensions and for decision satisfaction. To address the issue of inflated Type I errors in multiple analytical comparisons (Jaccard, Becker, & Wood, 1984), in determining the significance of *p*-values we followed conservative recommendations and used (a) the Bonferroni correction (on the *t*-tests, with $p_{crit} = .05/k$ for k the number of comparisons) and (b) Tukey's "honestly significant difference" (HSD) test for the ANOVA's post hoc comparisons (Field, 2013). Effect sizes were calculated using Cohen's d (Cohen, 1988). All analyses were conducted using IBM SPSS and AMOS 25.

5. RESULTS

5.1. MEASUREMENT MODEL AND DESCRIPTIVES

After iteratively removing three items (ALT_4, RAD_2, RAD_3) from further analyses because either their factor loadings were low (< .50) or their cross-loadings with other factors were high

(> .40), we tested two alternative measurement models for PDM and DSA. In this we followed previous work (Siebert & Kunz, 2016).

We initially ran CFAs (for the t_1 and t_2 sample) using a first-order model in which all items were constrained to load on their predicted factor. Notwithstanding the excellent fit statistics of this first-order measurement model, there were discriminant validity issues with factors related to the PDM dimensions of OBJECTIVES, INFORMATION, RADAR (t_1 and t_2 sample), and ALTERNATIVES (t_1 sample only). Next, we addressed these discriminant validity issues by testing a second-order measurement model in which the four factors related to proactive cognitive skills were constrained to load on the higher-order factor SKILLS. Our results, which confirm Siebert et al.'s (2020) findings, are reported in **Table 2**.

Table 2
Confirmatory factor analyses (second-order measurement model).

		t_1 sample (N = 921)				t_2 sample (N = 921)			
Factor	Item	SFL	CR	AVE	MSV	SFL	CR	AVE	MSV
Initiative	INI_1	.743				.779			
	INI_3	.662	.746	.496	.093	.709	.789	.555	.112
	INI_5	.705				.746			
Improvement	IMP_1	.749				.809			
	IMP_2	.864	.831	.622	.321	.872	.857	.666	.397
	IMP_3	.747				.764			
Skills	OBJECTIVES (OBJ_1, OBJ_2, OBJ_3)	.828				.878			
	INFORMATION (INF_2, INF_3, INF_4)	.875	.933	.778	.442	.855	.927	.762	.454
	ALTERNATIVES (ALT_1, ALT_2, ALT_3)	.901				.888			
	RADAR (RAD_1, RAD_4, RAD_5)	.921				.870			
Decision satisfaction	DSA_S	.727				.811			
	DSA_P	.859	.845	.647	.442	.844	.865	.682	.454
	DSA_D	.850				.822			
Overall model fit		RMSEA = .050, SRMR = .045, χ^2/df = 3.288, TLI = .940, CFI = .949				RMSEA = .051, SRMR = .043, χ^2/df = 3.438, TLI = .948, CFI = .956			

Notes: SFL = standardized factor loading.

Running confirmatory factor analyses with these second-order models yielded standardized factor loadings that were within the desired range (i.e., from .620 to .921 and from .664 to .888 for the t_1 and t_2 sample, resp.). Furthermore, all CR values were above the .60 threshold, indicating sufficient reliability of the factors. The AVE value of the second-order factor exceeded the acceptance threshold of .50, so that the factor's convergent validity was considered to be sufficient. No discriminant validity issues were observed, and each model's fit statistics met all criteria for a good fit to the data. Using the results from this second-order measurement

model (and the scale items that it represents), we computed mean composite scores for all our studies' variables; see **Table 3**.

Table 3
Mean (*M*) and standard deviation (SD) of composite scores for the study's variables.

		Study 1: United States $N = 578$		Study 2: Germany $N = 106$		Study 3: Austria $N = 237$			Control groups $N = 178$	
Factor	Time	*M*	SD	*M*	SD	*M*	SD	Time	*M*	SD
Initiative	t_1	4.65	1.16	4.56	1.14	4.71	1.10	t_0	4.62	1.15
Initiative	t_2	4.60	1.23	4.64	1.10	4.63	1.22	t_1	4.61	1.14
Improvement	t_1	5.90	.94	5.44	.95	5.48	.95	t_0	5.47	.93
Improvement	t_2	5.90	.95	5.51	.97	5.57	.91	t_1	5.41	.93
Skills	t_1	5.25	.80	5.13	.60	5.23	.68	t_0	5.33	.64
Skills	t_2	5.40	.79	5.40	.67	5.47	.68	t_1	5.30	.65
Objectives	t_1	5.49	.88	5.65	.60	5.64	.78	t_0	5.70	.78
Objectives	t_2	5.62	.84	5.81	.73	5.70	.83	t_1	5.70	.78
Information	t_1	5.41	.93	5.17	.86	5.17	.96	t_0	5.32	.89
Information	t_2	5.51	.89	5.37	.93	5.38	.93	t_1	5.26	.93
Alternatives	t_1	5.04	.99	4.82	.82	5.06	.80	t_0	5.23	.75
Alternatives	t_2	5.20	1.00	5.07	.85	5.30	.80	t_1	5.18	.79
Radar	t_1	5.07	.99	4.88	.91	5.05	.87	t_0	5.07	.92
Radar	t_2	5.28	.88	5.33	.85	5.48	.82	t_1	5.17	.89
Decision satisfaction	t_1	6.68	1.42	6.80	1.15	6.91	1.23	t_0	6.89	1.25
Decision satisfaction	t_2	6.97	1.41	7.12	1.19	7.22	1.01	t_1	6.94	1.18

Notes: The control groups ($N = 178$) consist of the external control group ($N = 92$) and the internal control group ($N = 86$). t_1 = before the course, t_2 = after the course; t_0 = first measurement point, t_1 = second measurement point.

5.2. HYPOTHESIZED EFFECTS

To investigate the effect of these decision-making courses on individuals' decision-making proactivity and decision satisfaction (Hypotheses 1–3), we performed paired-sample *t*-tests for each study and across all studies by contrasting pre-intervention (t_1) and post-intervention (t_2) scores. Due to slight deviations from the normal distribution, we followed convention (see Field, 2013) and used bootstrapping with 1,000 samples to compute 95% bias-corrected and accelerated confidence intervals; note that every confidence interval (CI) reported here will be of this same type. On the one hand, **Table 4** shows that there were, on average, no significant differences regarding INITIATIVE (avg. $\Delta M_{\text{Ini}} = .034$, CI = [−.039, .107], $t(920) = .926$, $p = .365$) or IMPROVEMENT (avg. $\Delta M_{\text{Imp}} = -.027$, CI = [−.085, .036], $t(920) = -.879$, $p = .393$) in any of and across each of the three studies. On the other hand, participants reported, on average, higher levels of SKILLS—at both the aggregate and individual levels, except for OBJECTIVES in Study 3—*after* each course (avg. $M_{\text{Skills}} = 5.42$, avg. standard error = .025) than *before* taking the course (avg. $M_{\text{Skills}} = 5.23$, avg. SE = .026). This difference (avg. $\Delta M_{\text{Skills}} = -.186$, CI = [−.230, −.142]) was significant—$t(920) = -7.828$, $p < .001$—and represented a small-sized effect: $d_{\text{Skills}} = .25$. On average, participants likewise reported higher levels of DSA

after each course (avg. M_{DSA} = 7.05, avg. SE = .043) than prior to taking the course (avg. M_{DSA} = 6.75, avg. SE = .044). The difference (avg. ΔM_{DSA} = −.30, CI = [−.381, −.220]) was significant ($t(920) = -7.031$, $p < .001$) and represented a small-sized effect: d_{DSA} = .22. Thus Hypotheses 1, 2, and 3 received equal empirical support within each study and across all three studies.

Table 4
Intervention groups: Pre–post comparison of proactive decision making and decision satisfaction.

actor	Study 1: United States N = 578				Study 2: Germany N = 106				Study 3: Austria N = 237			
	ΔMean ($t_1 - t_2$)	t	p	d	ΔMean ($t_1 - t_2$)	t	p	d	ΔMean ($t_1 - t_2$)	t	p	d
Initiative	.042	.851	.395	—	−.085	−.889	.376	—	.076	1.178	.224	—
	[−.046, .136]				[−.263, .105]				[−.058, .201]			
Improve-	.005	.129	.898	—	−.072	−.933	.353	—	−.084	−1.510	.139	—
	[−.075, .089]				[−.208, .075]				[−.197, .028]			
Proactive cognitive skills	−.150	−4.964	.000	.19	−.269	−4.235	.000	.45	−.238	−4.975	.000	.35
	[−.212, −.092]				[−.397, −.151]				[−.326, −.149]			
Objectives	−.131	−3.540	.000	.15	−.168	−2.306	.023	.29	−.060	−.969	.350	—
	[−.210, −.057]				[−.314, −.024]				[−.173, .050]			
Information	−.099	−2.616	.009	.10	−.200	−2.097	.038	.23	−.216	−3.065	.002	.22
	[−.186, −.020]				[−.373, −.028]				[−.359, −.068]			
Alternatives	−.157	−4.062	.000	.16	−.252	−2.765	.007	.30	−.248	−4.116	.000	.30
	[−.235, −.081]				[−.421, −.089]				[−.368, −.140]			
Radar	−.212	−5.976	.000	.23	−.456	−5.274	.000	.50	−.426	−7.156	.000	.51
	[−.285, −.142]				[−.623, −.266]				[−.540, −.312]			
Decision satisfaction	−.291	−5.153	.000	.21	−.318	−2.992	.000	.28	−.307	−3.968	.000	.28
	[−.402, −.184]				[−.524, −.118]				[−.466, −.150]			

Notes: Values reported in brackets are the lower (first number) and upper (second number) levels of the 95% bias-corrected accelerated confidence intervals of 1,000 bootstrap re-samples. d = Cohen's D; t_1 = before the course, t_2 = after the course.

To test for whether professional decision-making experience or having the professional responsibility to analyze or make decisions professionally influences how decision-making

courses affect SKILLS—Hypotheses 4(a) and 4(b), respectively—we used 2 × 4 repeated-measures ANOVAs. Time of testing served as the within-groups variable (before vs. after the course); the between-groups variables were experience (less than one year, between one and five years, between five and ten years, or more than ten years) and professional decision-making responsibility (decision analyst, decision maker, decision analyst and decision maker, or neither decision analyst nor decision maker). We carried out normality checks and Levene's tests, and for the most part our assumptions were verified (Field, 2013). Means and standard deviations are reported in **Table 5**.

Table 5
Mean (*M*) and standard deviation (SD) of scores on proactive cognitive skills as a function of experience and responsibility.

		Skills t_1		Skills t_2	
	N	*M*	SD	*M*	SD
Experience					
Less than one year	87	5.12	.81	5.08	.76
Between one and five years	180	5.17	.82	5.44	.72
Between five and ten years	104	5.28	.77	5.41	.80
More than ten years	207	5.36	.78	5.50	.83
Responsibility					
Neither decision analyst nor decision maker	68	4.87	.79	4.96	.74
Decision analyst	138	5.18	.78	5.36	.80
Decision maker	74	5.25	.90	5.41	.81
Decision analyst and decision maker	298	5.37	.75	5.52	.76

Notes: t_1 = before the course, t_2 = after the course.

In accord with the results obtained for Hypothesis 1, our ANOVA results revealed significant main effects of the decision-making course (time) on SKILLS: $F_{\text{time(experience)}}(1, 574) = 15.03$, $p < .001$, $\eta_p^2 = .026$; and $F_{\text{time(responsibility)}}(1, 574) = 16.43$, $p < .001$, $\eta_p^2 = .028$. The time × experience interaction was significant ($F(3, 574) = 3.71$, $p = .012$, $(\eta_p)^2 = .019$) but the time × responsibility interaction was not ($F(3, 574) = .20$, $p = .895$, $(\eta_p)^2 = .001$); see **Fig. 1**. Yet post hoc comparisons, using the Tukey HSD test, of the training effects indicated a significant difference only between participants with less than one year of experience and participants with 1–5 years of experience ($\Delta M = -.31$, CI [−.55, −.07], $p = .006$). The main effects of experience and responsibility on SKILLS were both significant: $F_{\text{experience}}(3, 574) = 4.69$, $p = .003$, $(\eta_p)^2 = .024$; and $F_{\text{responsibility}}(3, 574) = 11.38$, $p < .001$, $(\eta_p)^2 = .056$. Except for the rather small effect sizes, these results offer at least partial support for Hypothesis 4(a). Hypothesis 4(b) was not supported.

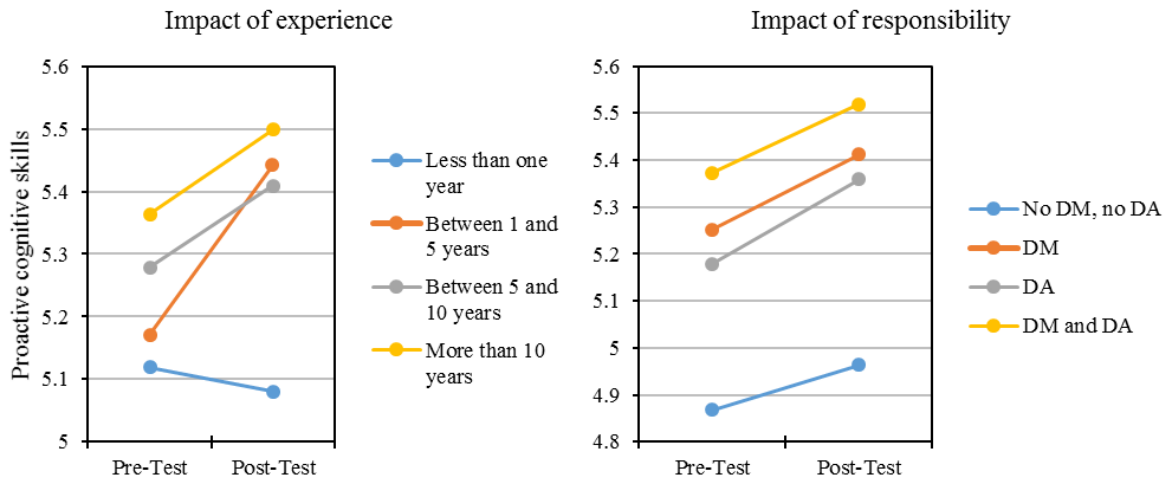

Fig. 1. Proactive cognitive skills: Time × experience interactions and time × responsibility interactions.

5.3. TESTING ALTERNATIVE EXPLANATIONS

To address possible alternative explanations for our hypothesized effects, we controlled for the influence of (1) course workload, (2) non-course participation, (3) self-evaluation measures, and (4) time of testing. At first, to test whether different total workloads/lengths of our decision training interventions had any influence on the observed effects, we performed independent-sample *t*-tests contrasting delta scores (D_{t2-t1}) of the PDM dimensions and DSA for the first course (less than 30-hour workload) with the second and third courses, which featured a higher workload (150 hours). The mean differences of delta scores between these two groups ($D_{t2-t1,30h} - D_{t2-t1,150h}$) ranged from a minimum of −.019 (CI = [−.172, .142]) for the average $\Delta D_{t2-t1,DSA}$ to a maxmimum of −.096 (CI = [−.194, −.003]) for the average $\Delta D_{t2-t1,Skills}$. The corresponding *t*-statistics ranged from $t(919) = -.221$, $p = .809$ to $t(919) = -1.964$, $p = .057$. Hence there were no statistically significant interactions between workload or length and course participation on any of the aforementioned effects on our dependent variables.

Secondly, analyzing the effect of non-course participation using two control groups, there were, on average, no significant changes in any of the proactive decision-making dimensions or in decision satisfaction between the first and second measurement points; these findings are summarized in **Table 6**. At the same time, the internal control group participants, on average, reported higher levels of SKILLS and DSA after the course ($M_{Skills} = 5.57$, SE = .070; $M_{DSA} = 7.27$, SE = .104) than before the course ($M_{Skills} = 5.37$, SE = .072; $M_{DSA} = 7.01$, SE = .122). These differences ($\Delta M_{Skills} = -.202$, CI = [−.338, −.061]; $\Delta M_{DSA} = -.260$, CI = [−.473, −.047])

were significant—$t(85) = -2.923$, $p < .01$ and $t(85) = -2.923$, $p = .012$—and represented medium-sized and small-sized effects, $d_{Skills} = .31$ and $d_{DSA} = .25$. In contrast, the corresponding (average) differences in terms of INITIATIVE ($\Delta M_{Ini} = -.005$, CI = [−.200, .170], $t(85) = -.045$, $p = .958$) and IMPROVEMENT ($\Delta M_{Imp} = -.116$, CI = [−.289, .046], $t(85) = -1.345$, $p = .174$) were not significant.

Table 6
Control groups: Pre–post comparison of proactive decision making and decision satisfaction.

	Control group: Overall $N = 178$			Control group: Internal $N = 86$			Control group: External $N = 92$		
Factor	ΔMean ($t_1 - t_2$)	t	p	ΔMean ($t_1 - t_2$)	t	p	ΔMean ($t_1 - t_2$)	t	p
Initiative	.010	.129	.887	−.061	−.490	.628	.077	.785	.418
	[−.143, .154]			[−.335, .182]			[−.091, .258]		
Improvement	.053	.847	.394	.022	.247	.805	.082	.926	.351
	[−.055, .158]			[−.149, .219]			[−.093, .254]		
Proactive cognitive skills	.004	.084	.941	.037	.475	.648	−.027	−.390	.694
	[−.111, .109]			[−.130, .209]			[−.154, .120]		
Objectives	−.005	−.068	.946	−.004	−.041	.957	−.005	−.055	.948
	[−.135, .122]			[−.196, .200]			[−.207, .210]		
Information	.063	.782	.439	−.003	−.029	.981	.124	1.099	.261
	[−.087, .205]			[−.218, .224]			[−.097, .350]		
Alternatives	.050	.699	.462	.151	1.431	.164	−.045	−.471	.639
	[−.091, .188]			[−.085, .378]			[−.216, .146]		
Radar	−.096	−1.342	.196	.006	.066	.948	−.191	−1.817	.073
	[−.246, −.052]			[−.193, .191]			[−.408, .016]		
Decision satisfaction	−.042	−.484	.593	.004	.033	.976	−.084	−.671	.512
	[−.201, .114]			[−.240, .229]			[−.328, .176]		

Notes: Values reported in brackets are the lower (first number) and upper (second number) levels of the 95% bias-corrected accelerated confidence intervals of 1,000 bootstrap re-samples. t_0 = first measurement point, t_1 = second measurement point.

Next, to control for the potential bias of self-evaluated change, we tested the relationship between participants' self- and peer-evaluations. In the first step, to justify aggregation of peer assessments and confirm their reliability, we calculated intraclass correlation coefficients (ICC(1) and ICC(2); Bliese, 2000) for each of the three PDM factors (i.e., INITIATIVE, IM-

PROVEMENT, and SKILLS). Using one-way random-effects ANOVA models, all ICC(1) values—ranging from 0.11 to 0.25—exceeded the usual cutoff at 0.10 (LeBreton & Senter, 2008). Yet, in terms of ICC(2), only the value of the SKILLS factor—$ICC_{SKILLS}(2) = 0.54$—exceeded the respective threshold of 0.50 (e.g., Cicchetti, 1994). One likely explanation in favor of the appropriateness of aggregating the peer-assessments of INITIATIVE and IMPROVEMENT, nonetheless, was the considerably small number of raters in each group (on average, 3.55 raters per participant), which tends to suppress ICC(2) estimates (Crossley, Cooper, Wernsing, 2013). In the second step, as reported in **Table 7**, we compared self-evaluations and the corresponding peer-evaluations of PDM. We found significant positive correlations between the self- and peer-ratings of IMPROVEMENT and SKILLS. Unlike INITIATIVE, there were, on average, no differences between the self-and peer-assessed levels (t_2) of these two PDM-dimensions. Moreover, comparing self-ratings before the course (t_1) and peer-ratings after the course (t_2) indicated significantly higher (average) levels of SKILLS ($\Delta M_{Skills} = -.359$, CI = [−.497, −.221], $t(113) = -5.153$, $p < .001$) and INITIATIVE ($\Delta M_{Ini} = -.945$, CI = [−1.160, −.731], $t(113) = -8.737$, $p < .001$), but no differences in terms of IMPROVEMENT ($\Delta M_{Imp} = -.012$, CI = [−.187, .211], $t(113) = .166$, $p = .908$. These results further support Hypothesis 1 and, at least, partially support Hypothesis 2, also given the weak correlations of INITIATIVE and its different scalings (i.e., reverse for self- but not for peer-evaluations).

Table 7
Comparison of self- and peer-evaluations of proactive decision making.

		Austria Self (*S*) *N* = 114		Austria Peer (*P*) *N* = 405					
Factor	Time	*M*	SD	*M*	SD	$r_{S,P}$	ΔMean ($t_{2,S} - t_{2,P}$)	*t*	*p*
Initiative	t_1	4.68	1.10				-1.028	-7.693	.000
Initiative	t_2	4.60	1.31	5.62	.81	.162	[-1.292; -.763]		
Improvement	t_1	5.44	.99				.152	1.590	.115
Improvement	t_2	5.58	.96	5.43	.69	.268**	[-.037; .341]		
Skills	t_1	5.21	.71				-.029	-.527	.599
Skills	t_2	5.54	.63	5.57	.50	.459***	[-.140; .081]		

Notes: Values reported in brackets are the lower (first number) and upper (second number) levels of the 95% bias-corrected accelerated confidence intervals of 1,000 bootstrap re-samples. *M* = Mean, *SD* = standard deviation, *r* = Pearson correlation, t_1 = before the course, t_2 = after the course, significance levels: ** < .01, *** < .001.

Finally, we accounted for the influence of time of testing. Examining the medium-term effect of the decision-making courses, we found, on average, no significant changes between the levels of INITIATIVE ($\Delta M_{Ini} = .039$, CI = [−.229, .323], $t(76) = .289$, $p = .771$), IMPROVEMENT ($\Delta M_{Imp} = .065$, CI = [−.130, .264], $t(76) = .619$, $p = .522$), SKILLS ($\Delta M_{Skills} = .013$, CI = [−.110, .137], $t(76) = .191$, $p = .848$), or DSA ($\Delta M_{DSA} = -.168$, CI = [−.355, .029], $t(76) = -1.662$, $p = .089$) directly after taking the course (t_2) and about one year after the course (t_3).

However, this third study's cohort of participants also reported, on average, higher levels of SKILLS and DSA after (t_2) the course (M_{Skills} = 5.55, SE = .067; M_{DSA} = 7.36, SE = .110) than before (t_1) the course (M_{Skills} = 5.22, SE = .082; M_{DSA} = 6.90, SE = .133). These differences ($\Delta M_{Skills} = -.331$, CI = [−.486, −.188], $\Delta M_{DSA} = -.459$, CI = [−.670, −.271]) were significant—$t(76) = -4.665$, $p < .001$ and $t(76) = -4.285$, $p < .001$—and represented large-sized and medium-sized effects: d_{Skills} = .50 and d_{DSA} = .43. Again, the corresponding (average) differences in terms of INITIATIVE (ΔM_{Ini} = .065, CI = [−.167, .289], $t(76) = -.597$, p = .556) and IMPROVEMENT ($\Delta M_{Imp} = -.190$, CI = [−.394, .014], $t(76) = -1.859$, p = .081) were not significant.

6. IMPLICATIONS

Despite nearly unanimous agreement—among OR scholars and decision analysts—on the theoretical relevance of decision-making courses (e.g., Keeney, 2004; Taylor, 2018), only a few empirical studies have considered their effectiveness and practical usefulness, and even less have systematically addressed the problem-structuring phase of decision processes or the impact of decision training on related skills and behavior. Structuring decisions, including generating alternatives, is essential for effective decision making (Gettys, Pliske, Manning, & Casey, 1987; Howard, 1988), and performing well at the structuring task, as epitomized by proactive decision making, has a positive effect on decision satisfaction and also on life satisfaction (Siebert et al., 2020). Hence the question arises: Does decision training promote (and, if so, to what extent) individuals' decision-making proactivity? This paper has systematically addressed this issue by analyzing the effect of three different decision-making courses on the various proactive decision-making facets and on decision satisfaction. Whereas the results of all three studies and four tests of alternative explanations largely support the hypothesized positive effects on proactive cognitive skills (Hypothesis 1) and DSA (Hypothesis 3) as well as the lack of any effect on proactive personality traits (Hypothesis 2), the expected influence of experience on the training effect received only partial support (Hypotheses 4). These findings bear several implications, as detailed next.

First, our study complements the literature on (soft) OR and decision analysis–related knowledge transfer (e.g., Beyth-Marom et al., 1991; Mingers & Rosenhead, 2011) by providing quantitative results on a larger scale. Regardless of the total training-related workload, these results consistently indicate the effectiveness of decision-making courses—and in excess of the theoretically expected relevance of teaching decision analysis and/or soft OR methods (e.g., Ackermann et al., 2019; Keeney, 2004; Taylor, 2018). This finding gives decision analysts and

OR lecturers a constructive starting point from which to discuss (a) the relevance of such training programs and (b) why general decision-making courses have not been adequately established in school or university curricula—and why such courses have even been eliminated (O'Brien et al., 2011). In particular, contrasting our intervention and control groups' results imply that participating in courses on decision quality and/or decision theory—unlike participating in other courses in business studies curricula, which are outside the realm of decision sciences—can have a measurable positive effect on an individual's decision-making skills and behavior related to the phase of structuring problems (Level 2 or Level 3 in Kirkpatrick and Kirkpatrick, 2006). They likewise suggest subjectively positive course outcomes (analogous to Kirkpatrick and Kirkpatrick's Level 4) such that individuals experience higher levels of DSA, not just directly through participating in the course but also indirectly as a result of their increased skill levels or altered behavior. The purpose of these courses is to improve participants' decision-making skills and promote their application, so the latter finding lends additional support to the argument (in Siebert et al., 2020) that DSA figures prominently in assessments of effective decision making.

Altogether, our studies' results provide good reasons to believe that, from an individual's perspective, participation in such courses is valuable in different echelons. The self-evaluated effect sizes of our studied interventions were definitely small (average increases between 2.9% and 5.3% in proactive cognitive skills, and between 4.3% and 4.7% in DSA). Yet this finding is neither surprising, given the complex task characteristics trained (Bakker et al., 2019), nor contextually equivocal (see e.g. Bloom, Hill, Black, & Lipsey, 2008; Lipsey et al., 2012). Apart from the comparable peer-evaluated effects, we argue instead that these self-evaluated effect sizes actually increase the credibility of our results by providing good counterarguments against any claim that the effects of decision-training interventions merely reflect participants' wishful thinking (Bastardi, Uhlmann, & Ross, 2011), which would presumably have led to even greater positive changes. Moreover, they support the argument that behavioral changes can require some time to take place (Kirkpatrick & Kirkpatrick, 2006). And with regard to the context of decision making, these comparatively small effect sizes do not seem problematic because even incremental improvements in the ability to structure problems and generate more suitable alternatives accordingly can have economically meaningful effects (Siebert, 2016; Siebert & Keeney, 2015). In other words: if the observed small enhancements in PDM lead to more structured problems, and consistently improved alternatives, then individuals will be much more likely to achieve their desired outcomes. Finally, recall that previous research has established positive relationships among PDM, general self-efficacy, and life satisfaction (Siebert et al.,

2020); it follows that observable enhancements of proactive cognitive skills and DSA might also boost other performance indicators.

Second, our results contribute more generally to proactivity-related research (e.g., Frese et al., 2016; S. K. Parker et al., 2010; Strauss & Parker, 2018). Whereas prior work has given inconsistent answers to the question of whether or not proactivity can be taught (Ashford & Black, 1996; Kirby et al., 2002), the distinction that we make—between proactive personality traits and cognitive skills—allowed us to answer this question more definitively. Thus the observed positive effects of our decision-training interventions on proactive cognitive skills and DSA, combined with the lack of an effect on proactive personality traits, underscores the multifaceted nature of PDM and thus of effective decision making in terms of the problem-structuring phase.

In support of Kirby et al.'s (2002) conclusions about the trainability of proactive thinking, our results suggest that decision-making courses can be a means to increase the level of proactive cognitive skills in the short-to-medium run. They empirically substantiate the assumption that learning about what constitutes effective decision making—as opposed to untrained decision making (Keeney, 2004)—fosters the course participant's basic understanding of the benefits from a systematic approach to the phase of structuring problems. Encouraging participants to constantly apply this new knowledge in different decision-making exercises and scenarios throughout the courses and giving learning feedback, moreover, provide the necessary basis for experientially acquiring more effective decision-making skills and developing proficiency in the use of these skills (e.g., Reigeluth & Carr-Chellman, 2009). Hence there are good reasons why most successful decision training participants either adopt a more proactive approach to decision making or believe that they possess the required tacit knowledge and cognitive skills needed to become a more effective decision maker. Both factors are indicative of training effectiveness, although on different levels (viz., Level 2 or 3 in Kirkpatrick and Kirkpatrick, 2006).

In contrast to the case of the cognitive skills, our findings about the effect of training on proactive traits support Bateman and Crant's (1993) assumption. We find no evidence for a training effect in the short-to-medium term, which is unsurprising for two reasons. First of all, we assume (after Seibert et al., 2001) that proactive traits are part of an individual's personality. Such traits are presumed to be stable dispositions (McCrae & Costa, 1982) and especially so for individuals in the middle period of their lives (Ardelt, 2000), a description that applies to all our studies' samples. It is therefore reasonable to expect that proactive traits are fairly constant

unless (i) there are significant changes in the social environment or (ii) the individual undergoes dramatic life experiences (Moen, Elder, Lüscher, & Quick, 2001). In our studies, however, neither of these change triggers is likely to occur—that is, because of the relatively short time horizons. In the second place, recall that none of the decision-making courses covered any content, methods, or tools related to the enhancement of personality traits conducive to effective decision making. Rather, these courses focused on the development of cognitive skills and conscious thinking routines. Hence it is probably safe to suppose that unobservable changes, in the levels of proactive personality traits after successful participation in decision training, reflect not so much the dynamics described here as the nature of an individual's personality.

These divergent effects of decision-making courses on proactive cognitive skills and DSA, on the one hand, and proactive personality traits, on the other hand, provide an informative basis for theory and practice. Although the PDM and DSA scales were originally intended for use by scholars of OR and decision analysis, we argue that they could serve well as indicators of the *quality* of decision-making courses dedicated to improving participants' decision-making effectiveness. Practitioners (in particular, recruiters) can similarly benefit from this finding because they increasingly seek proactive job candidates. Understanding the intricate relationship between proactive cognitive skills and traits (Kirby et al., 2002; Siebert et al., 2020)—and realizing that it is possible to promote the former in the short run whereas the latter remain constant—sheds new light on the question of what types of individuals are more likely to comply with the corporate demand for proactivity and, accordingly, are more suitable applicants.

Our results concerning the impact of pre-course decision-making experience (Hypothesis 4(a)) and responsibility (Hypothesis 4(b)) on the training effect are noteworthy. If one assumes that both experience and task familiarity have a positive effect on individual expertise, as reported by Shanteau (1992), then the internal validity of these PDM self-evaluations is increased by our finding that lower levels of decision-making experience and responsibility are associated with lower average levels of proactive skills. The insignificant interaction effect between professional decision-making responsibility and course participation, along with the rather small influence of experience on the training effects, suggest moreover that the measurable benefits from participating in courses dedicated to decision quality and/or decision theory apply to more than just a few individuals. The observable deviating result (i.e., training effect) for individuals with little professional decision-making experience, which is evidently responsible for the overall significant interaction between experience and course participation, deserves separate attention and merits a more detailed examination by interested scholars.

One possible explanation for the negative (albeit non-significant) training effect across the "little experience" cohort is that these individuals undergo a different learning experience. Thus it could be that, prior to their course participation, these individuals (unknowingly) overestimate their decision-making abilities or behavior; that is, they might well be affected by the "dual burden" metacognitive bias summarized by Kruger and Dunning (1999, p. 1121) as "unskilled and unaware of it"; Spetzler et al. (2016, p. 147) offer a more felicitous description, "the illusion of decision quality". So by learning what constitutes effective decision making within the scope of a training intervention, individuals experience two opposing effects: (1) they "debias" their initial self-evaluation, which lowers the base level of proactive cognitive skills; and (2) they accumulate task-specific abilities, which gradually increase their proactive skill level.

7. LIMITATIONS AND FUTURE RESEARCH

In comparison with the vast majority of research on decision training (see Section 3), the key strengths of our paper are the large total sample size and the replication of findings and improvement patterns across different contexts and data sources, which increases its external validity. Furthermore, our field study approach confirms the ecological validity of our results (Roe & Just, 2009); in other words, it increases the odds that the detected training effects are (a) more realistic than those obtained in laboratory experiments and (b) not likely to be influenced by pre-selection effects or experimenter demand effects.

Despite these strengths, our studies are certainly limited in some ways. The first limitation is associated with our large sample size and our training interventions' structures that precluded alternative forms of data collection other than standardized questionnaires. Direct assessments of skill transfer (e.g., utilizing simulated decision situations) could certainly be one option that might motivate future research to replicate our findings (at least concerning the second level of training effectiveness on a smaller scale). However, such alternative instruments of evaluating participants' decision-making may result in other issues (e.g., threats to external validity, inflated training effect sizes)—that is, since our aim is to study how decision training affects an individual decision maker's approach to structuring problems in general and not to analyze a course's influence on decision-specific skills at a given moment in time. Yet, we did not examine any objective results of the decision training (i.e., results in line with the fourth level of effectiveness in Kirkpatrick & Kirkpatrick, 2006). We, therefore, urge scholars to explore training outcomes of a more objective nature (e.g., organizational performance) so as to achieve a more complete grasp of how decision training affects individuals' decision-making proactivity.

Unlike some other intervention studies in the context of proactive behavior (Strauss & Parker, 2018), our study not only controls for the potential biases related to self-evaluations by its design (i.e., by divergent changes over time across desirable dependent variables, and confidential treatment of answers to avoid inflated self-evaluations) but also by the use of supplementary peer-assessments. These peer-evaluations largely support the findings for our hypothesized effects and to some extent replicate previous research which has also shown that self-ratings of proactive behavior are strongly associated with expert-ratings of that behavior (Griffin, Neal, & Parker, 2007). Even though these results seem to endorse the assumption that self-ratings of PDM are related also to actual decision-making proactivity, we stop short of unreservedly inferring the third level of training effectiveness (viz., changes in trainees' behavior) for three reasons: (i) we could not collect peer-evaluations at t1 because of most participant's inability to witness their peer's decision making up to that moment, (ii) we could not take into account peer-evaluations from non-course participants, and (iii) we measured each PDM dimension with only one item. Hence we strongly encourage future research to dedicate a study on its own to the relation between self-ratings of PDM and those obtained from other sources (e.g., peers, supervisors, subordinates, or even a triangulated mix of several perspectives).

A second limitation is related to our studies' design and associated internal validity concerns, an issue that complicates almost all experiments yet cannot be fully controlled (Shadish et al., 2002). Because our studies' participants were not *randomly* assigned to any of the training interventions and since we also lacked a fully equivalent control group, it is not possible to draw any strictly causal inferences about the relationship between the changes observed and the decision-making courses taken. Notwithstanding the theoretical soundness of this connection, which is replicable across different samples and is supported by results on our external and internal control groups, there remains a small chance that some confounding effects beyond the interventions (and the potential effects mentioned previously) might have also affected the observed changes in our dependent variables. We conclude that additional and fully controlled experimental studies should be conducted to confirm the results reported here.

The third limitation concerns the generalizability of our findings, which stems from the composition of the three studies' samples. Most participants lived either in the United States or in central Europe, which limits the possibilities for making inferences to different cultural contexts. Yet an even more important aspect of this issue is the uniformly high level of education among our three studies' participants. Our postulating a positive influence of intervention on effective decision making—vis-à-vis the phase of structuring problems—implicitly presupposes that participants have sufficient cognitive capacity to process the information presented

during these decision-making courses (cf. Kanfer & Ackerman, 1989). Conversely, we cannot rule out the possibility that our findings do not hold in samples of less educated individuals, which suggests intriguing avenues for future research. The study of cognitive functioning as it relates to knowledge acquisition during such decision training interventions could help identify the minimum mental prerequisites, if any, for benefitting from participation. Understanding the lower (and upper) boundaries of the cognitive capacity needed to realize learning effects in the PDM realm could, in turn, provide a starting point for the optimization of decision analysis and/or soft OR courses as well as useful insights into the effectiveness of training programs that cover more sophisticated (hard) OR methods.

Finally, a fourth limitation involves the time frame of our studies. Since the second and third measurement points were temporally quite proximate to the decision-making courses themselves, our results are necessarily constrained to the evaluation of short- or medium-term effectiveness. Hence we cannot rule out the possibility of observed changes in proactive cognitive skills and DSA being subject to longer-term fade-out effects (Bailey et al., 2016). Because we collected t3 data only from participants in our third course, we also could not test for whether its higher total workload (150 hours, vs. 30 hours in the first course) could help explain the *absence* of a fade-out effect in the short-to-medium term. Hence future work could employ additional measurement points with much greater time lags (say, 10 years after completion of the course) in order to assess the long-term effects of decision training on individuals' decision-making proactivity. Such research could also analyze more thoroughly the relationship between a decision-making course's characteristics (e.g., workload, instruction mode, time per subject) and the stability of PDM-related training gains.

Besides the research potential arising from these methodological limitations, there are also plenty of possibilities for studies on related issues. For example, future research could scrutinize the impact of an individual's motivation—a basic determinant of learning (Kanfer & Ackerman, 1989)—on the process of acquiring proactive cognitive skills. That research also could incorporate more general personality traits, which probably influence the effectiveness of decision training interventions (e.g., Major et al., 2006). The results of such studies would complement proactivity-related research by indicating what type of individuals are most likely to benefit from participating in related training programs. Those results would similarly provide valuable insights into effective intervention design, or how proactivity-related training programs can be designed to optimize the learning experience and to maximize training effects. Research along these lines would answer the repeated calls for operations research to (gradu-

ally) become more interdisciplinary (see e.g., Franco & Hämäläinen, 2016). That transformation would be relevant for OR and decision analysis scholars whose interests include enhancing an individual's decision-making skills in general and/or identifying the abilities required to effectively use soft (or hard) OR methods. At the same time, the results of such research would improve our understanding of the relationships among psychological and cognitive factors, personality variables, motivation, learning, and effective decision making.

8. CONCLUSION

In this paper we sought to extend the literature at the interface of behavioral OR, decision analysis, and knowledge transfer by assessing the effectiveness of decision-making courses as a means to promote effective individual decision making. Given that decision sciences have found problem structuring up to and including the stage of generating alternatives to be a crucial phase of decision processes, we focused our analysis on how decision training affects the skills and traits most relevant to the effective performance of that structuring task. In short, we examined the effect of decision training on proactive decision making.

Analyzing the data from participants of three different decision-making courses and two control groups revealed a significant positive impact of training participation on proactive cognitive skills and decision satisfaction as well as a small but non-significant effect on proactive traits. From these findings we draw three conclusions. First, our results substantiate the assumption that decision training is of practical relevance. The decision-making courses increased participants' (tacit) knowledge about effective decision making, self- and peer-reported proactive decision-making behavior, and general satisfaction with their decision making; these outcomes are equivalent to training effectiveness at Levels 2, 3, and 4 of Kirkpatrick and Kirkpatrick (2006). Moreover, the mostly non-existent interactions between professional decision-making time or responsibility and the training effect suggest that also more experienced decision makers may benefit from participating in such training interventions. In light of these two findings, we argue that it would be beneficial both for potential participants and for training providers (e.g., academic lecturers, decision analysts) to publicly deplore the dwindling number of decision-making courses being offered. Hence OR scholars in particular should be encouraged to advocate for incorporating such general decision-making courses into OR-related degree programs or into similar professional development initiatives. Of course, even the most sophisticated OR methods cannot entirely compensate for underdeveloped individual decision-making skills.

Second, our results accentuate the multi-faceted nature of proactive decision making and, accordingly, of the problem-structuring and generating-alternatives phase of effective decision making. That we find divergent intervention effects on proactive cognitive skills and proactive traits clearly answers our question about the extent of decision training's effects. We can reasonably conclude that courses on decision quality and/or decision theory may help individuals to become more effective decision makers in terms of the relevant skills or behavior. That said, such courses hardly guarantee any triggering of changes in participants' respective dipositions toward their actual decision making—especially since participants neither more actively shape their environments nor more continuously seek improvement possibilities. We therefore argue that behavioral OR, decision analysis, and the decision sciences more generally should rethink the design of their training programs in order to support effective decision making more holistically—not necessarily from a methodological point of view yet with respect to the personality-related aspects of effective decision making.

Finally, the third and foremost conclusion is that our findings showcase the value, from an individual's perspective, of participating in decision-making courses. Learning what constitutes effective decision making is almost certainly required to capitalize on the full potential of hard OR methods. Yet such learning may also have positive effects on participants' lives in general, as previous studies strongly suggest positive relationships among proactive decision making, decision satisfaction, and life satisfaction. Those connections highlight that the teaching of decision quality is theoretically relevant; perhaps more importantly, from a practical standpoint they strongly suggest that OR, decision analysis, and related decision-making courses have substantial positive effects on individuals—outcomes that, as we have shown, transcend the organizational context.

SUPPLEMENTARY MATERIALS

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.ejor.2021.01.010.

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3.4 ESSAY 3: CAREER SUCCESS AND PROACTIVE CAREER BEHAVIOR: A MATTER OF EFFECTIVE DECISION-MAKING

AUTHORS: Rolf, P., Siebert, J. U., & Kunz, R. E. (2022)

ABSTRACT[1]

In recent decades, proactivity and proactive behaviors has become a pivotal field in vocational behavior research. As an expression of the field's maturation, a consensus has emerged about the characteristics of proactivity and related stereotypical behaviors. At the same time, however, the field has somewhat lost a person-centric perspective that examines the implementation or non-implementation of these theoretically proactive behaviors against preceding decision-making processes.

Against this background, this study theorizes that (1) career success and (2) proactive career behavior are matters of effective decision-making. To test this proposition, we employ a mixed-method approach and integrate a survey into an experimental design (n = 655). Supporting the first part of our proposition, the results of our quantitative analyses, robust to our experimental manipulation based on the ease-of-recall bias, reveal substantial positive effects of proactive decision-making—that is, effective, proactivity-aligned decision-making—on several indicators of subjective and objective career success. By qualitatively analyzing and contrasting our respondents' experiences in making career decisions proactively and associated behavioral responses with common conceptualizations of career proactivity, we find initial support for the second part of our proposition. The corresponding results suggest that proactive behaviors acquire real meaning only through subjective interpretation relative to career goals or circumstances.

The findings of this study underscore the relevance of a more conscientious and person-centered view of proactive career behavior. By treating proactivity as a decision-making matter, we demonstrate a way for researchers to adopt such a view while highlighting the value of effective, proactivity-aligned decision-making for careerists and organizations.

KEYWORDS: proactive decision-making; proactive behavior; career success; mixed-method approach

[1] At the time of this thesis' publication, the third essay is a working paper to be submitted for publication in a scientific journal. Therefore, only an abstract and a summary of the essay's content are provided.

4 CONCLUSION

4.1 OVERALL SUMMARY

The rationale for this cumulative doctoral thesis was rooted in a minimum of three considerations. First and foremost, from a scientific perspective, there was an apparent contradiction between the criticality of problem-structuring and generating alternatives for effective decision-making (i.e., decisions made according to the principles of decision quality) and their numerical representations in decision-scientific research (e.g., Siebert & Keeney, 2015). Second, from a practical perspective, there has been the recognition that more than a few people in personal and professional decision situations resemble the figure of Alice (as presented at the outset) more than they probably know and lack an understanding of effective decision-making (e.g., Keeney, 2020). Finally, from a personal perspective yet uniquely consequential to the research subject, the co-occurrence of these two problems presented a decision-making opportunity to be proactively seized in this thesis.

Against this background, this doctoral thesis gratefully adopted Siebert and Kunz's (2016) recently introduced PROACTIVE DECISION-MAKING concept as a reference frame and applied it in three studies. The overarching research objectives herein have been (1) to test the measurement- and context-related applicability of this concept and (2) to add to the practical meaning of effective decision-making. To these ends, this thesis raised the question of how the application of the PROACTIVE DECISION-MAKING concept can provide insights to inform and contribute to the decision sciences and applied research on the psychology of human agency.

Having applied the PROACTIVE DECISION-MAKING concept against three distinct research settings—two of which lean more to the decision-scientific side and one closer to the side of the psychology of human agency—the answer to this research question is as straightforward as it is multifaceted. The *first study* (equivalent to the first essay) establishes a use case of PROACTIVE DECISION-MAKING at the interface of the decision sciences and happiness economics. It proposes and confirms a model of three possible consequences of effective decision-making across three samples totaling 1,300 participants. In suggesting that PROACTIVE DECISION-MAKING fosters a greater belief in one's abilities and increases satisfaction with one's decisions and life more generally, this study offers a strong baseline argument in favor of the practical relevance of Siebert and Kunz's (2016) concept. At the same time, the empirical support that PROACTIVE DECISION-MAKING indirectly positively relates to life satisfaction (via general self-efficacy and decision satisfaction) provides the decision sciences with the, so far, missing link

between effective decision-making and subjective well-being. Consequently, happiness appears not only theoretically a matter of choice (Baucells & Sarin, 2012).

The *second study* (corresponding to the second essay) validates an application scenario of PROACTIVE DECISION-MAKING at the interface of the decision sciences and education sciences. It hypothesizes and examines the effects of decision training on effective decision-making and decision satisfaction, using three intervention groups and two control groups totaling 1,013 participants. In suggesting positive training effects, robust to plausible alternative explanations, on proactive cognitive skills and decision satisfaction, and mostly non-significant interactions between training and experience, this study offers a strong argument for the trainability of PROACTIVE DECISION-MAKING. It provides the decision sciences with the, so far, insufficient empirical evidence that decision training is not only theoretically relevant; and for the individual, it highlights the merits of participating in decision-making courses. At the same time, the finding of divergent non-significant training effects on the two proactive traits (viz., taking the INITIATIVE and striving for IMPROVEMENT) adds to the psychology of human agency, which has provided inconsistent answers to the question of whether it is possible to teach proactivity.

Finally, the *third study* (analogous to the third essay) proves a use case of PROACTIVE DECISION-MAKING at the interface of decision sciences and vocational psychology. For one part, it proposes and confirms a model of seven career success consequences of PROACTIVE DECISION-MAKING across different experimental groups totaling 655 participants. For the other part, it analyzes the lived experiences of PROACTIVE DECISION-MAKING in the career context. In suggesting that PROACTIVE DECISION-MAKING promotes similarly subjective and objective career success, this study offers a strong baseline argument in favor of the practical relevance of Siebert and Kunz's (2016) concept likewise in vocational contexts. It establishes that career success, in all likelihood, is ultimately a matter of effective decision-making, thereby endorsing the value of respective decision training. At the same time, by citing the salient heterogeneity of career decisions made proactively, and associated actions, that participants recalled, this study indicates that proactive career behaviors acquire real meaning only through subjective interpretation relative to career goals or circumstances. To the extent that proactive career behaviors are thus a matter of effective decision-making, it advocates for a more conscientious and person-centered use of the proactivity term in vocational and organizational research. Yet it also offers a way for researchers to do this by embracing the concept of PROACTIVE DECISION-MAKING.

4.2 IMPLICATIONS

Overall, the findings of this doctoral thesis yield a wide range of implications for the decision sciences, the psychology of human agency, and decision-making practice, as discussed in detail in the respective essays. In principle, they organize into two categories: (1) PROACTIVE DECISION-MAKING as a measurement instrument and (2) nomological relationships of PROACTIVE DECISION-MAKING.

As to the first category, this thesis demonstrates that the PROACTIVE DECISION-MAKING scale is a *valid* and *reliable* measurement instrument, worthwhile to establish in a broader scientific context. The more than 4,000 individual data sets across the three essays (and studies) confirm Siebert and Kunz's (2016) initial scale validation by specifying equally good psychometric properties for the scale. Moreover, they repeatedly suggest that PROACTIVE DECISION-MAKING is a *three-dimensional* construct consisting of two distinct traits and four closely related cognitive skills that underlie a higher-order factor. Although these skills (viz. OBJECTIVES, INFORMATION, ALTERNATIVES, DECISION RADAR) apply to different decision-making aspects, by definition, and hence should be separable, the results indicate that they are barely noticeable in isolation. That is to say: individuals typically apply all four skills to a similar extent during the phase of problem structuring and generating alternatives—the phase that determines the effectiveness of their decision-making. Concerning the psychology of human agency, this co-occurrence suggests that the four proactive cognitive skills may well represent a crucial facilitating mechanism for the effective functioning of individuals' self-regulation (Bandura, 1991; Gollwitzer & Sheeran, 2006). After all, by demonstrating significant positive relationships between self-evaluations and peer ratings and establishing measurement invariance against the ease-of-recall bias, this doctoral thesis provides further *robustness*-related arguments for the applicability of the PROACTIVE DECISION-MAKING scale. The latter should be of particular relevance for any decision scientists interested in proposing and analyzing the effects and practical meanings of decision quality (Spetzler et al., 2016) and value-focused thinking (Keeney, 1992) on a large scale, feasibly, and economically.

Turning to the second category, nomological relationships, this doctoral thesis demonstrates that PROACTIVE DECISION-MAKING may bring about a variety of positive effects; yet it might also be trainable. As is characteristic of prescriptive contributions to the decision sciences (J. E. Smith & Winterfeldt, 2004), this should justify the *practical applicability* and *relevance* of Siebert and Kunz's (2016) concept. Concurrently, in doing so, this doctoral thesis lives up to its self-set research objective and adds to the practical meaning of effective decision-making.

In the first place, the results presented here highlight how vital the phase of problem structuring and generating alternatives is—for both positive decision outcomes and effective decision-making. For the latter, it is not sufficient to make a good choice based on appropriate evaluations of alternatives (i.e., even when suitable problem-solving methods are employed); being able to choose among good options is also mandatory. This requirement implies that decision scientists may wish to expand their definitions of decision-making competence beyond those seven skills enumerated by Bruine de Bruin et al. (2007) to problem structuring and generating alternatives. Such augmented conceptualizations (in line with the notions of decision quality and value-focused thinking) would accompany the hope that future research will pay more attention to this crucial but—even when adding this doctoral thesis—understudied decision-making phase.

Finding substantial positive relationships between PROACTIVE DECISION-MAKING, multiple indicators of career success, general self-efficacy, decision satisfaction, and, finally, life satisfaction should be of great interest to individuals, decision analysts, and organizational practice. When considering these positive effects, individuals should be encouraged to decide on a more proactive approach in their decision-making. To recall this doctoral thesis' introductory quote: that should help them render their thinking more meaningful; more importantly, it would empower them to take more deliberate control of their careers and lives more broadly. Similarly, the results herein provide decision analysts with cues that speak to the value of following the principles of decision quality (Howard, 1988; Spetzler et al., 2016) beyond the organizational business context. At last, supported by the results of this thesis, organizations are not only likely to be interested in seeking and attracting equally capable and proactive employees but also should have good arguments to help employees foster their decision-making proactivity.

In this sense, finding positive effects of decision training on the four proactive cognitive skills can only be promising. Although many people lack an understanding of effective decision-making (Keeney, 2020), this doctoral thesis, again drawing on the character of Alice, shows that there is no reason to persist in decision-making behavior such as the one depicted in the scene with the Cat (and presented in the outset). Simply participating in decision-making courses may be seen as a first step in the right direction to more effective PROACTIVE DECISION-MAKING. Against this background, educational institutions such as schools and universities should critically ask themselves whether they can impart the appropriate decision-making knowledge and skills to their students if they waive dedicated decision-making courses. The cautious answer of this doctoral thesis, supported by the second essay's findings, is: No, likely, they cannot.

Finally, the study of proactivity as a decision-making principle in this doctoral thesis provides the psychology of human agency in general with a new, but now somewhat more explored, perspective on this behavioral phenomenon. The divergent training effects on the two facets of PROACTIVE DECISION-MAKING and the usually smaller effect sizes of the two personality traits, alongside often non-significant path coefficients stemming from IMPROVEMENT, could impart a rethink of what constitutes (effective) proactivity at its core. As this thesis suggests, proactivity is likely to be less about doing something actively, self-starting, and with foresight but about effectively crafting that pursuit of change through the personally meaningful application of the four proactive cognitive skills.

In this vein, the findings presented advocate for more careful and theory-aligned usage of the term 'proactive' that thoroughly accounts for both facets of human agency (i.e., behavior and personality), as discussed in sections 2.2 and 2.3. To develop a theory of proactive goal processes in human agency and their effective regulation (e.g., S. K. Parker et al., 2010), solely relying on Bateman and Crant's (1993) most widely established *proactive personality* concept certainly is insufficient. Further, the third essay's qualitative results suggest that studies that attempt to capture (context-specific) *proactive behavior* solely through such measures as voice (van Dyne & LePine, 1998) or enacted managerial aspirations (Smale et al., 2019) may share similar limitations. Unlike PROACTIVE DECISION-MAKING, which is indeterminate to the decision content and context (including resulting actions), such research usually cannot adequately account for the subjectivity of human agency. In other words, those studies may well capture behaviors that others perceive as proactive. Yet, they cannot claim that they examine intrinsically proactive actions. Especially in light of this doctoral thesis' background, it must be all the more surprising that most research on proactivity still does not deal with decisions that lead to certain proactive behaviors (Klehe et al., 2021). That practice of taking a proactively made decision for granted once a behavior is displayed that others extrinsically deem proactive may be acceptable (albeit questionable) in applied research on the psychology of human agency. In decision-scientific terms, however, it is unquestionably not—and, with this doctoral thesis, there should be no further reason to persist in such a theoretically weak standpoint.

4.3 LIMITATIONS

Like all research, this cumulative doctoral thesis is imperfect and has several limitations beyond those already mentioned in the three constitutive essays and respective studies. The first limitation, on a meta-level, concerns the researcher's role in his studies, which seems too evident or ambiguous for many empiricists in the social sciences to contemplate. As far as this thesis is concerned, the collaboration within the three essays and the associated review processes should have mitigated some confounds (not to confuse with mistakes) attributable to the human behind the researcher. Nonetheless, the socio-cultural and scientific socialization(s) of the author(s) remain(s) a potential endogeneity constraint. Historically, the views prevalent in Western countries, in particular, have shaped the decision sciences (Tsoukiàs, 2008) and the psychological sciences (Teo, 2018). The result could be an unconsciously biased culture-centrist perception of effective decision-making, proactivity, and covariates. Regardless of its (critical) realist and empiricist approach, thus, this doctoral thesis cannot derive any claim of absolute scientific authority by itself.

The other limitations, on a less abstract level, directly concern the application of the PROACTIVE DECISION-MAKING concept. In this regard, a second constraint relates to the populations represented by the samples in this thesis. Altogether, the youngest participant was 17 years old, which precautions any inferences to children (younger than ten years). Similarly, it restricts conclusions regarding (younger) adolescents (usually including the ages ranging from 10 to 19 years), which the decision sciences generally distinguish from more senior decision-makers (cf. Bruine de Bruin et al., 2007; A. M. Parker & Fischhoff, 2005). The implicit selection of adults as the target population derives from the recognition that, contrary to René Descartes' well-known philosophical claim *cogito, ergo sum*, a strict separation (or dualism) of body and mind has not been proven neuroscientifically (Damasio, 1995). Accordingly, this doctoral thesis builds on the premise that, under typical developmental conditions, adults should hold the physical prerequisites (most likely located in their frontal lobe) for the four proactive cognitive skills constitutive of PROACTIVE DECISION-MAKING. In this respect, adults may somewhat differ from the character of Alice, commonly assumed to be a seven-year-old girl, in that they should have more likely the mental freedom (i.e., physical choice) to engage in PROACTIVE DECISION-MAKING.

A third limitation is also related to the sample selection in a broader sense yet is much more a measurement-related issue. Most participants across the three studies originated from the United States or Central Europe. Consequently, the cross-cultural validity of Siebert and

Kunz's (2016) PROACTIVE DECISION-MAKING scale remains to be determined more thoroughly. Before examining the potential moderating effects attributable to socio-cultural differences among participants (as mentioned in the three essays), future research should test for measurement invariance of the PROACTIVE DECISION-MAKING scale. To that effect, such a study should assess the measurement-related applicability of the original scale in different cultural settings (e.g., China or South America) and likewise consider language-adjusted forms in the respective contexts (e.g., in Mandarin or Spanish).

Finally, the most attentive critics may see a fourth limitation in the first-order decision regarding the choice of the nomological relationships of PROACTIVE DECISION-MAKING considered in this doctoral thesis. Although the application possibilities presented here encompass distinct contexts, various methodological approaches, and different sample characteristics, they may be inherently biased (cf. availability and representativeness biases in human judgment; e.g., Tversky & Kahneman, 1973). Not least because of their limited scopes, these application examples can naturally characterize only a small number of potential research opportunities for the PROACTIVE DECISION-MAKING concept. Hence this doctoral thesis won't cite any of its constitutive essays as fully representative of the (non-) application contexts to be determined in the future. Instead, as stated in the introduction, this thesis understands itself as the proverbial first step to fostering the (theoretical) knowledge of the PROACTIVE DECISION-MAKING concept and giving a practical meaning to effective decision-making accordingly.

4.4 FUTURE RESEARCH

In deciding what research steps to take next, four directions for further studies suggest themselves to interested researchers. The first direction concerns the PROACTIVE DECISION-MAKING scale as a measurement instrument that must inevitably defend itself against the stigma of self-evaluations as a validity threat (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff, MacKenzie, & Podsakoff, 2012). Hence, future research could address this issue holistically by systematically testing relationships between self-ratings of PROACTIVE DECISION-MAKING and those obtained from other sources (e.g., supervisors or significant others) while explicitly controlling for biases associated with third-party judgments. Similarly, such research may consider using, for example, experimental vignettes in the shape of decision-making scenarios (Aguinis & Bradley, 2014) to complement direct PROACTIVE DECISION-MAKING measurements with indirect assessments of decision-making behavior.

The second direction relates to the nomological relationships of the PROACTIVE DECISION-MAKING concept. Given the pragmatic approach to evaluating prescriptive decision-theoretic contributions outlined in Section 2.2, this thesis has focused mainly on possible consequences. Thus, future research may also wish to scrutinize potential antecedents to improve the understanding of the conditions that lead individuals to adopt and benefit from a proactive approach in their decision-making. Among those are likely to be general personality traits (e.g., Bateman & Crant, 1993), cognitive-motivational processes (e.g., S. K. Parker et al., 2010), and fluid cognitive abilities (e.g., Bruine de Bruin, Parker, & Fischhoff, 2012). Research along those lines would provide, for example, educators and human resource professionals with valuable information about the requirements under which decision training, such as that examined in essay two, helps employees to become more effective proactive decision-makers.

The third direction involves the decision context of PROACTIVE DECISION-MAKING. Beyond the studies of PROACTIVE DECISION-MAKING as a general decision-making approach in the first two essays and its adoption in vocational decision-making in the third, there are many other promising contexts to test its applicability in future research. One such area might be entrepreneurship, which inherently requires individuals to create and develop an organization in novel ways and with innovative ideas (Glaub, Frese, Fischer, & Hoppe, 2014). To the extent that this is essentially about identifying and exploiting opportunities (Shane & Venkataraman, 2000), successful entrepreneurship at the individual level should ultimately be a matter of effective decision-making in general and PROACTIVE DECISION-MAKING in particular. Another conceivable context could be consumer decision-making (Bettman, Luce, & Payne, 1998). For example,

such research could feature the question of whether—and, if so, in what way—PROACTIVE DECISION-MAKING promotes effective self-regulation of consumer behavior and ultimately leads to better consumer decisions (see also Gollwitzer & Sheeran, 2009).

Finally, the fourth direction for future research regards the unit of analysis. So far, research on PROACTIVE DECISION-MAKING has focused on individual decision-making. Yet quite a few decision-making situations involve multiple actors, both in personal (e.g., family) and professional (e.g., work unit) environments. Accordingly, once there is sufficient scientific evidence on PROACTIVE DECISION-MAKING at the individual level, prospective studies could seek to extend similar conceptualizations to the group level and, eventually, to the organizational level (e.g., Fuller & Marler, 2009). In this respect, researchers could explore, for example, whether the interaction of two or more proactive decision-makers also leads to better decision-making at the group level. Answers to this question should provide considerable implications for appropriate team compositions in organizational practice (Wang, Zhang, Thomas, Yu, & Spitzmueller, 2017).

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