Escalation of Commitment in Information Systems Projects: A Cognitive-Affective Perspective

Dissertation

zur Erlangung des akademischen Grades
„Doctor of Philosophy" (Ph.D.)
am Fachgebiet Design Thinking und Innovationsforschung

eingereicht an der
Fakultät für Digital Engineering
der Universität Potsdam

Carolin Valerie Marx
Potsdam, Germany
September 2023

Betreuer Prof. Dr. Falk Uebernickel
Fachgebiet Design Thinking und Innovationsforschung
Hasso-Plattner-Institut

Published online on the
Publication Server of the University of Potsdam:
https://doi.org/10.25932/publishup-62696
https://nbn-resolving.org/urn:nbn:de:kobv:517-opus4-626969

Dissertation Reviewers:

Prof. Dr. Falk Uebernickel, Hasso Plattner Institute, Germany

Prof. Dr. Charlotta Sirén, University of St. Gallen, Switzerland

Prof. Dr. Magnus Mähring, Stockholm School of Economics, Sweden

Examination Committee:

Prof. Dr. Tobias Friedrich (Head of Committee)

Prof. Dr. Falk Uebernickel

Prof. Dr. Charlotta Sirén

Prof. Dr. Magnus Mähring

Prof. Dr. Patrick Baudisch

Prof. Dr. Ralf Herbrich

Submission: September 2023

ACKNOWLEDGEMENTS

Completing this Ph.D. has been an incredible journey of discovery, challenge, and personal growth. I owe a debt of gratitude to many individuals who have played a crucial role in making this journey successful.

I would like to express particular gratitude to my supervisor, Professor Falk Uebernickel, and my colleagues from the Hasso Plattner Institute for their unwavering support, guidance, and encouragement throughout this research.

I am grateful to the Hasso-Plattner-Design-Thinking-Research Program for providing the financial support and resources that made my research possible. My appreciation extends to Professor Pierre Léger and his team from HEC Montreal for the equipment and know-how that enabled the physiological measurements. I also wish to acknowledge the Behavioral Lab of the University of St. Gallen for providing me with excellent research facilities and infrastructure for conducting the experiments, and to Professor Don A. Moore from the University of California Berkeley for having welcomed me as a visiting researcher.

My journey would not have been the same without the love, support, and patience of my parents, Marion and Matthias Marx, and my partner, Michel Pieper. Thank you for always believing in me and for being my pillars of strength in stressful times.

TABLE OF CONTENTS

ABSTRACT

While information systems (IS) projects are pivotal in guiding organizational strategies and sustaining competitive advantages, they frequently overrun budgets, extend beyond timelines, and experience high failure rates. This dissertation delves into the psychological micro-foundations of human behavior – specifically cognition and emotion – in relation to a prevalent issue in IS project management: the tendency to persist with failing courses of action, also called escalation of commitment (EoC).

Through a mixed-methods research approach, this study investigates the emotional and cognitive bases of decision-making during IS project escalation and its evolution over time. The results of a psychophysiological laboratory experiment provide evidence for the predictions on the role of negative and complex situational integral emotions of Cognitive Dissonance over Coping Theory and add to a better understanding of how escalation tendencies change during sequential decision-making due to cognitive learning effects. Using psychophysiological measures, including data triangulation between electrodermal and cardiovascular activity and AI-based analysis of facial micro-expressions, this research reveals physiological markers of behavioral escalation tendencies. Complementing the experiment, a qualitative analysis using free-form narration during decision-making simulations shows that decision-makers employ varied cognitive reasoning patterns to justify escalating behaviors, suggesting a sequence of four distinct cognitive phases.

By integrating both qualitative and quantitative findings, this dissertation offers a comprehensive theoretical framework of how cognition and emotion shape behavioral EoC over time. I propose that escalation is a cyclical adaptation of mental models, distinguished by shifts in cognitive reasoning patterns, temporal cognition mode variations, and interactions with situational emotions and their anticipation. The primary contribution of this dissertation lies in disentangling the emotional and cognitive mechanisms that drive IS project escalation. The findings provide the basis for developing de-escalation strategies, thereby helping to improve decision-making under uncertainty. Stakeholders involved in IS projects that get “off track” should be aware of the tendency to persist with failing courses of action and the importance of the underlying emotional and cognitive dynamics.

.

ZUSAMMENFASSUNG

Projekte im Bereich der Wirtschaftsinformatik (IS-Projekte) sind von zentraler Bedeutung für die Steuerung von Unternehmensstrategien und die Aufrechterhaltung von Wettbewerbsvorteilen, überschreiten jedoch häufig das Budget, sprengen den Zeitrahmen und weisen eine hohe Misserfolgsquote auf. Diese Dissertation befasst sich mit den psychologischen Grundlagen menschlichen Verhaltens - insbesondere Kognition und Emotion - im Zusammenhang mit einem weit verbreiteten Problem im IS-Projektmanagement: der Tendenz, an fehlgehenden Handlungssträngen festzuhalten, auch Eskalation des Commitments (Englisch: “escalation of commitment” - EoC) genannt.

Mit einem kombinierten Forschungsansatz (dem Mix von qualitativen und quantitativen Methoden) untersuche ich in meiner Dissertation die emotionalen und kognitiven Grundlagen der Entscheidungsfindung hinter eskalierendem Commitment zu scheiternden IS-Projekten und deren Entwicklung über die Zeit. Die Ergebnisse eines psychophysiologischen Laborexperiments liefern Belege auf die Vorhersagen bezüglich der Rolle von negativen und komplexen situativen Emotionen der kognitiven Dissonanz Theorie gegenüber der Coping-Theorie und trägt zu einem besseren Verständnis dafür bei, wie sich Eskalationstendenzen während sequenzieller Entscheidungsfindung aufgrund kognitiver Lerneffekte verändern. Mit Hilfe psychophysiologischer Messungen, einschließlich der Daten-Triangulation zwischen elektrodermaler und kardiovaskulärer Aktivität sowie künstliche Intelligenz-basierter Analyse von Gesichtsmikroexpressionen, enthüllt diese Forschung physiologische Marker für eskalierendes Commitment. Ergänzend zu dem Experiment zeigt eine qualitative Analyse text-basierter Reflexionen während der Eskalationssituationen, dass Entscheidungsträger verschiedene kognitive Begründungsmuster verwenden, um eskalierende Verhaltensweisen zu rechtfertigen, die auf eine Sequenz von vier unterschiedlichen kognitiven Phasen schließen lassen.

Durch die Integration von qualitativen und quantitativen Erkenntnissen entwickelt diese Dissertation ein umfassendes theoretisches Model dafür, wie Kognition und Emotion eskalierendes Commitment über die Zeit beeinflussen. Ich schlage vor, dass eskalierendes Commitment eine zyklische Anpassung von Denkmodellen ist, die sich durch Veränderungen in kognitiven Begründungsmustern, Variationen im zeitlichen Kognitionsmodus und Interaktionen mit situativen Emotionen und deren Erwartung auszeichnet. Der Hauptbeitrag dieser Arbeit liegt in der Entflechtung der emotionalen und kognitiven Mechanismen, die eskalierendes Commitment im Kontext von IS-Projekten antreiben. Die Erkenntnisse tragen dazu bei, die Qualität von Entscheidungen unter Unsicherheit zu verbessern und liefern die Grundlage für die Entwicklung von Deeskalationsstrategien. Beteiligte an „in Schieflage geratenden“ IS-Projekten sollten sich der Tendenz auf fehlgeschlagenen Aktionen zu beharren und der Bedeutung der zugrundeliegenden emotionalen und kognitiven Dynamiken bewusst sein.

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AI	artificial intelligence
ANS	autonomic nervous system
CFI	cognitive flexibility inventory
CHF	Swiss Franc (currency code)
CSV	comma- separated values
EDA	electrodermal activity
EIC	emotion-imbued choice
EKG	electrocardiogram
EoC	escalation of commitment
e.g.	for example (Latin: exempli gratia)
et al.	et alii
GSR	galvanic skin response
IS	information systems
IT	information technology
JSON	JavaScript object notation
MBA	master of business administration
NPD	new product development
OLS	ordinary least squares
PANAS	positive and negative affect schedule
PNS	peripheral nervous system
R&D	research and development
RQ	research question

1 INTRODUCTION

"The tendency to pursue a failing course of action is not a random thing. Indeed, at times, some managers, and even entire organizations, seem almost programmed to follow a dying cause" (Staw & Ross, 1987, p.86)

1.1 MOTIVATION AND RELEVANCE

In 2015, IBM launched the Watson Health unit with ambitious plans for how its artificial intelligence (AI) software could change the medical industry (Strickland, 2019; Yang et al., 2022). Despite significant setbacks and failing to live up to the hype created by its victory against top human "Jeopardy!" players in 2011 (Markoff, 2011), IBM continued to invest major resources (Yang et al., 2022). One of the projects requiring massive investments without living up to expectations was Watson's Oncology Expert Advisor - a collaboration with the MD Anderson Cancer Center, which was eventually terminated after a $62 million investment (Strickland, 2019). "IBM's artificial intelligence was supposed to transform industries and generate riches for the company. Neither has panned out" (Lohr, 2021). In 2022, parts of IBM Watson's health unit were sold for a fraction of the initial investments (Lohr, 2021).

Managing the development and implementation of information systems (IS) projects – inherently complex, dynamic, and uncertain undertakings – demands meticulous planning, management, and decision-making from a range of stakeholders. Such projects are integral to steering an organization's strategic direction, attaining a competitive edge, and fostering value creation in today's digital era (Baghizadeh et al., 2020; Keil et al., 2018; Singh & Hess, 2017).

To stay competitive and achieve digital transformation, organizations allocate vast resources to their IS projects (Käkölä & Taalas, 2008; Wallace et al., 2004). However, during IS development, it may be essential to depart significantly from the previously outlined strategies (Baghizadeh et al., 2020; Doherty et al., 2012; Wallace et al., 2004). In practice, many companies grapple with changing their habits and ways of working sufficiently to reap the maximum benefits from digital efforts (Newman & Sabherwal, 1996; Sabherwal et al., 2003; Warner & Wäger, 2019). Consequently, despite advancements in IS development methodologies and tools, a notable number of IS projects fail, exceed budgets, or overreach their timelines, undermining organizational transformation efforts (Berente et al., 2022; Doherty et al., 2012; Hughes et al., 2017; Keil & Mähring, 2010).

IBM Watson's health unit serves as a prime example of the challenging decision managers often face when overseeing troubled IS projects: whether to "stay the course" or "pull the plug" (Berente et al., 2022; Hughes et al., 2017; Keil, 1995; Keil & Mähring, 2010; Keil et al., 2000; Sabherwal et al., 2003; Staw & Ross, 1987). Due to the generativity of digital artifacts and the high level of ambiguity and complexity during IS design, development, and use, IS projects seem to serve as a "breeding ground" for the irrational tendency to hold on too long to failing courses of action (Berente et al., 2022; Keil et al., 2000; Marx & Uebernickel, 2022; Staw, 1976). Studies suggest that such escalation of commitment (EoC) to troubled IS projects is all too common in business practice: Between 30 percent and 40 percent of all organizational IS projects exhibit some degree of irrational persistence in the face of apparent setbacks (Keil et al., 2000). As Schmidt and Calantone (2002, p. 103) point out, "Projects that should have been abandoned during development often proceed through commercialization only to fail in the

market at substantially higher costs than if they had been terminated earlier". Such mismanagement can result in scenarios where "projects continue to absorb resources without ever delivering the intended benefits" leading to significant financial, temporal, and reputational losses for involved organizations and individuals (Keil et al., 2000, p. 300).

Thus, understanding the causes and mechanisms underlying the behavioral tendency of decision-makers to escalate their commitment to troubled IS projects is of paramount practical importance.

1.2 RESEARCH GAP

This dissertation integrates the psychological micro-foundations of human behavior - cognition and emotion - with one of the most challenging phenomena in IS project management - EoC to distressed IS projects.

EoC describes the tendency to persist with failing courses of action (Brockner, 1992; Staw, 1976; Staw & Ross, 1989). Since Staw's introduction to the EoC phenomenon in 1976, academic interest has surged across decades and disciplines. Especially in the IS context, EoC publications have doubled within the past 13 years (Marx & Uebernickel, 2022).

Almost five decades of EoC research scattered across application-oriented academic discourses yielded several theories proposed to explain EoC, a plethora of partially interacting decision-related, context-related, social, or individual factors reinforcing escalation tendencies, and strategies for de-escalation (Marx & Uebernickel, 2022; Sarangee et al., 2014; Sleesman et al., 2012, 2018). For instance, Self-Justification Theory posits that decision-makers continue investing resources to justify past decisions and reduce cognitive dissonance (Brockner, 1992; Pepitone & Festinger, 1959; Staw, 1976).

Despite the significant advancements in EoC research, academics agree that to deeply understand complex decision-making phenomena like EoC, the interplay of emotion and cognition requires further exploration (Fineman, 2000; Sarangee et al., 2019; Tsai & Young, 2010; Walsh, 1995; Wong et al., 2006). Yet, most research has approached EoC behaviorally, often sidelining the role of emotions in shaping escalation behaviors (Marx & Uebernickel, 2022; Sarangee et al., 2019).

Empirical studies reveal that a decision-maker's attributes play a pivotal role in the cognitive-affective dynamics of escalation behavior (Ronay et al., 2017; Sleesman et al., 2012; Yang et al., 2020). Still, the interplay between interpersonal cognitive abilities and decision-making remains under-researched (Brender-Ilan & Shertzer, 2021; Sleesman, 2019; Weeth et al., 2020; Wong et al., 2008).

Specifically, the role of individual differences in cognitive flexibility and the cognitive ability to adaptively learn from past decision outcomes remain unclear, although both could function as cognitive mechanisms counteracting escalation

tendencies (Dennis & Vander Wal, 2010; Jackson et al., 2018). Both cognitive elements are related to the adaptability function of mental models, which plays a crucial role in sequential decision-making (Diamond, 2013; van Ments & Treur, 2021). Being aware of one's dysfunctional behavior and learning adaptively based on the negative feedback that is received repeatedly could function as cognitive mechanisms counteracting escalation tendencies. Still, decision-makers escalate their commitment despite learning and being aware of their dysfunctional behavior (Betsch et al., 2001; Wong & Kwong, 2018). This poses an interesting paradox in organizational judgment and decision-making research that necessitates further investigation.

Recent research has witnessed an "emotional revolution" in decision-making, emphasizing the significance of emotions in the process (Cofrancesco & Spiker, 2019; Hodgkinson et al., 2023; Lerner et al., 2015). Given the importance of emotions and their interplay with cognition in decision-making (Hodgkinson et al., 2023; Lerner et al., 2015; Loewenstein & Lerner, 2003; Walsh, 1995), it is surprising that the micro-foundations, particularly the role of emotions, have received limited attention in escalation research (Wong et al., 2006). In comparison with the overall academic EoC discourse, and with cognition-centered studies in particular, the body of research that focuses on emotional factors of EoC is comparatively small, scattered across disciplines, and suffers from the following "blind spots".

Specifically, the role of situational emotions directly elicited by the decision context and how they interact with cognitive mechanisms is still unclear, although those emotions play a crucial role in decision-making (Lerner et al., 2015). With the exception of Wong et al. (2006), most empirical research examined carried-over, decision-unrelated, or anticipatory emotions (Dang et al., 2014; Huang et al., 2019; Sarangee et al., 2019). Within the scope of situational integral emotions, specifically, the role of negative emotions and emotional complexity remains unclear yet crucial, given their potential to test competing theories. On the one hand, Coping Theory predicts that people who experience negative emotions are less likely to escalate because they withdraw entirely to avoid an unpleasant situation (Endler & Parker, 1990). On the other hand, Cognitive Dissonance Theory argues that complex and unpleasant emotions resulting from belief-behavior discrepancy prevent people from performing against their prior beliefs, hence enforcing escalation tendencies (Brockner, 1992; Pepitone & Festinger, 1959). For both predictions, empirical support exists. For instance, Wong et. al. (2006) found that negative affect reduced EoC when being personally responsible for the failing decision, hence supporting Coping Theory. In contrast, Roeth, Spieth, and Joachim (2020) report empirical evidence for a positive effect of negative affect on EoC. Hence, examining the effect of negative and complex integral situational emotions on EoC while testing which competing predictions from the two theoretical perspectives can be confirmed is particularly promising to explain inconsistencies in previous research and advance our understanding of the role of emotions in escalation situations.

Methodologically, most existing studies investigating the role of emotions in understanding EoC rely on self-reported measures and one-time measurements of emotions without making use of technological advancement and existing tools from neuroscience. Dimoka et al. (2012, p. 700) argued that "ignoring cognitive neuroscience could be a disservice to the [IS] field". When aiming to capture the emotional factors underlying behavioral tendencies and how they change over time during sequential decision-making, psychophysiological measures pose significant advantages (Dimoka et al., 2012; Fischer et al., 2019; Riedl & Léger, 2016; vom Brocke et al., 2020). Compared to behavioral and self-reported measures, psychophysiological measures provide continuous data availability, allow dynamic stimuli and enable insights about otherwise hidden underlying processes of decision-making. Particularly for emotional states that do not reach a decision-maker's awareness, psychophysiological tools have advantages over self-report measures, which depend on conscious perception (Riedl et al., 2017). In addition to the methodological advantages, this choice of methods fits the research context as "neurophysiological tools are particularly valuable for measuring IS constructs that people are either unable, uncomfortable, or unwilling to truthfully self-report (...) [including] deep or hidden emotions (e.g., guilt, fears, and anger), (...) complex cognitive processes (...), [and] antecedents of human behaviors (e.g., beliefs, attitudes, and intentions)" (Dimoka et al., 2012, p. 680).

Additionally, the presence of several variables impacting escalation (Sleesman et al., 2012) and the reciprocal relationship between cognition and emotions (Brockner, 1992; Staw, 1976) necessitate the simultaneous investigation of behavioral, cognitive, and emotional elements to comprehend the underlying mechanisms shaping EoC. However, most existing research examined emotional factors separately from cognitive factors without acknowledging the cognitive-emotional dynamics and interrelations underlying decision-making. Contemporary discourse on decision-making contends that individuals engage both cognitive reasoning and emotional experiences when making choices (Kret & Bocanegra, 2016; Lerner et al., 2015; Loewenstein & Lerner, 2003) Abundant evidence supports the bidirectional relationship between cognition and emotions, profoundly impacting managerial judgment and decision-making processes (Barsade & Gibson, 2007; Healey & Hodgkinson, 2017; Hodgkinson et al., 2023; Lerner et al., 2015). Hence, to comprehend the dynamics behind EoC, it is imperative to recognize the distinctive yet interconnected influences of decision-makers' cognition and emotions.

Another research opportunity becomes apparent when looking at the temporal mode with which most existing research investigates cognitive and emotional factors during EoC. EoC is best understood as a process that unfolds over time, consisting of phases and phase-changing triggers (Brockner, 1992; Staw, 1976). However, the predominant form to study EoC is factor model research (Sleesman et al., 2018). Prior research has addressed this mismatch by applying a process perspective to identify phases of escalation projects (Mähring & Keil, 2008). While unpacking the behavioral stages of the escalation process greatly advances our understanding of how this phenomenon unfolds in practice, the underlying

cognitive mechanisms and their interplay with emotions over time accounting for the behavioral changes remain a "black box". Hence, to fully understand how cognitive and emotional factors shape behavioral escalation, one must additionally analyze how those elements change over time.

Table 1 summarizes the key research opportunities based on the previous problematization of the field.

Table 1 Summary of Key Research Opportunities

Area	Research Opportunity	Sources
General Research Opportunity	Despite the significant advancements in EoC research, academics agree that emotions and their interplay with cognition must be investigated further for a more **nuanced understanding of the complex decision-making phenomenon** and the underlying mechanisms.	Bazerman et al. 1998; Fineman 2000; Walsh 1995; Wong et al. 2006
	In most escalation research, academics have conceptualized EoC from a behavioral perspective, neglecting the potential role of **emotions and their interplay with cognitive mechanism**s in shaping the behavioral dimension of escalation.	Sarangee et al., 2019; Sleesman, 2012
Cognition	Despite the relevance of the decision-maker's characteristics for decision-making, specifically, the role of interpersonal differences **in cognitive abilities** lacks empirical investigation.	Lerner et al., 2015; Russel et al., 2020; Tan & Hunter, 2022
	Specifically, the role of individual differences in **cognitive flexibility** and the cognitive ability to **adaptively learn** from past decision outcomes remain unclear, although both could function as cognitive mechanisms counteracting escalation tendencies.	Dennis & Vander Wal, 2010; Jackson et al., 2018; Van Ments & Treur, 2021
Emotion	Given the importance of emotions and their interplay with cognition in decision-making, it is surprising that the micro-foundations, particularly the **role of emotions**, have been largely overlooked in escalation research.	Walsh, 1995; Loewenstein & Lerner, 2003; Huang et al., 2019;
	Specifically, the role of **situational emotions directly elicited by the decision context** and how they interact with cognitive mechanisms is still unclear, although those emotions play a crucial role in decision-making.	Wong et al., 2006; Lerner et al., 2015
	Within the scope of situational integral emotions, in particular, the role of **negative emotions and emotional complexity** remains unclear yet crucial, given their potential to test competing theories.	Endler & Parker, 1990; Pepitone & Festinger, 1959; Wong et al., 2006
	From a methodological standpoint, most existing studies investigating the role of emotions in understanding EoC rely on self-reported measures and one-time measurements of emotions without making use of **technological advancement and existing tools from neuroscience.**	Dimoka et al., 2012; Fischer et al., 2019; Leger & Riedel, 2015; Vom Brocke et al., 2020
Integrative Perspective	Most existing research examines emotional factors separately from cognitive factors without acknowledging the cognitive-emotional dynamics and interrelations underlying decision-making. Hence, to comprehend the dynamics behind EoC, it is imperative to recognize the distinctive yet **interconnected influences** of decision-maker's cognition and emotions through simultanious investigaiton.	Healy & Hodgkinson, 2017; Kret and Bocanegra, 2016; Lerner et al., 2015
Process Perspective	While EoC is best understood as a **process that unfolds over time**, consisting of phases and phase-changing triggers, the predominant form to study EoC is factor model research. Hence, to fully understand how cognitive and emotional factors shape behavioral escalation, one must additionally analyze how cognitive and emotional elements change over time.	Mähring & Keil, 2008; Staw & Ross, 1987

1.3 Research Objective and Approach

The previous problematization of the field reveals that understanding the causes and mechanisms underlying the behavioral tendency of decision-makers to escalate their commitment to troubled IS projects is of utmost practical and academic relevance. Yet, EoC research lacks an integrative cognitive-emotional perspective. It becomes apparent that examining the effect of cognition and emotions is

imperative for a more nuanced understanding of what gives rise to EoC and which underlying mechanisms account for the complex decision-making phenomenon. To achieve synthesized coherence and address the described research opportunities, bridging tools and theories from different disciplines is promising.

This dissertation aims to integrate the psychological micro-foundations of human behavior - cognition and emotion - with one of the most challenging phenomena in IS project management - EoC- to distressed IS projects. By disentangling the emotional and cognitive components underlying IS project escalation and how they change over time, this dissertation adds to an enriched and elaborated understanding of what gives rise to EoC, enabling theoretical progress. A multidimensional and more nuanced understanding of this complex psychological phenomenon is the foundation for developing de-escalation strategies that help to turn distressed IS projects around. The practical goal is to provide novel insights that can help to increase the decision quality behind deciding when to persist or withdraw from a distressed IS project by understanding how the cognitive and emotional foundations shape behavioral EoC over time.

Hence, based on the problematization of the field and the respective research opportunities and goals, the following research questions are posed:

Research Question 1: What is the effect of a decision-maker's emotional and cognitive factors on escalation of commitment?

Research Question 2: How does a decision-maker's emotion and cognition change during the process of escalation of commitment?

To answer these research questions, this dissertation adopts a mixed-methods approach (Tashakkori & Teddlie, 2009; Venkatesh et al., 2013) that combines quantitative and qualitative methods and integrates neurophysiological and behavioral measures to investigate EoC in IS projects from different angles and levels of analysis.

I draw on integrating cognitive and affective theoretical foundations of decision-making with the insights gained from existing EoC research. The interdisciplinary approach aims for synthesized coherence by bridging tools and theories from neuroscience with the behaviorism-centered EoC discourse and the IS project management field. I intentionally incorporate both, exploratory and explanatory research streams in order to maximize the overall knowledge contribution of my dissertation.

EoC is a multidimensional, highly complex phenomenon shaped by various interrelated elements. Given this complexity and the benefits of mixed-method research, using different methods to assess different facets of the phenomenon enables an enriched, elaborated understanding of the cognitive and affective dimensions underlying behavioral EoC compared to either approach alone.

The first part uses the method of a psychophysiological between-subject randomized controlled laboratory experiment, including psychophysiological, self-reported, and behavioral measures, to gain confirmatory knowledge about the effects of situational integral emotions, cognitive flexibility, and adaptive learning on behavioral EoC in a sequential decision-making simulation. Within the sequential decision-making simulation, adapted from Arkes and Blumer (1985) and Jackson et al. (2018), participants take the role of a senior manager responsible for deciding about continuing a troubled IS project for the aviation industry. Simultaneously, situational integral emotions are measured using data triangulation based on changes in the participants' electric heart activity over time using an electrocardiogram (EKG), the galvanic skin response in the form of electrodermal activity (EDA), and AI-based facial feature detection.

Complementary to the quantitative psychophysiological laboratory experiment, using qualitative research methods adds depth and potentially unearths the "cognitive black box" regarding interpreting emotions and cognitive evaluation of choices underlying behavioral tendencies. I aim to complement and extend the quantitative findings using a qualitative thematic analysis of text-based cognitive reflections of decision-makers during the same decision-making simulation. This research stream incorporates the process perspective on EoC and contributes to answering the second research question.

In the last step, the findings of the quantitative and qualitative research streams are synthesized using bridging into meta-inferences to develop an in-depth theoretical understanding of how cognition and emotion shape behavioral EoC over time.

1.4 Summary of Contributions

1.4.1 Summary of Results

The mixed-method study disentangles the emotional and cognitive factors behind behavioral EoC to distressed IS projects in sequential decision-making and shows how cognitive-emotional dynamics shape this tendency over time. The results connect the observable with the inner layer and unpack the inner layer of EoC. Both parts are consolidated into meta-inferences by developing a theoretical framework and seven propositions that describe and explain the cognitive-emotional dynamics during the phases of EoC and contribute to theoretical plurality.

The confirmatory research stream provides causal evidence that personal responsibility for initiating the project leads to higher behavioral EoC in sequential decision-making. While the overall EoC effect is supported, as the project progressed and negative feedback continued, the probability of further persisting with the failing project declined. These findings represent evidence for the de-escalating effect of the cognitive ability to adaptively learn from negative decision feedback on the individual decision level and show the complexity of counteracting cognitive forces and rationalization approaches in escalating situations. With the

differentiation into overall decision strategy and single decision level, the results contribute to solving the paradox of escalation despite learning. However, there is no support for the hypothesized de-escalating effect of individual differences in cognitive flexibility. In contrast, the results indicated a potential positive effect. In addition, the confirmatory research stream provides evidence for the escalating effect of negative and complex situational integral emotions on behavioral EoC. Specifically, feeling sad can be related to escalation tendencies, while feeling surprised indicates subsequent behavioral de-escalation. The results can be interpreted as support for the effect predictions of Cognitive Dissonance aligned with the Self-Justification explanation of escalation over Coping Theory. However, the findings indicate no support for the hypothesized interaction between emotional factors and personal responsibility. Beyond theoretical progress and empirical evidence for the role of specific emotional and cognitive elements, applying psychophysiological tools and AI-based emotional detection software uncovers a psychophysiological link between behavioral EoC and physiological correlates.

After showing the psychophysiological connection between the observable and the inner layer, the complementary qualitative investigation unpacks the inner layer further, in particular with regard to cognitive appraisal, evaluation, and behavioral tendencies. The findings of the qualitative research stream show that decision-makers use different cognitive reasoning patterns to justify escalating behavior. Those reasoning patterns change over time during the process of escalation, indicating a typical sequence of four different cognitive phases: Honeymoon Phase, Hangover Phase, Denial Phase, and Goal Fever Phase. Decision-makers' cognition differs between those phases regarding its temporal focus (retrospective, introspective, or prospective thinking), dominant mechanisms (starting momentum, path dependency, denial, or perceived proximity of completion), and the combination of cognitive reasoning patterns. The transition between phases is triggered by changes in the problem assessment, the degree of realizing irrational behavior, and the misperception of the goal completion proximity.

Based on the development of meta-inferences from bridging both qualitative and quantitative research streams, I develop an in-depth theoretical understanding of how cognition and emotion shape behavioral EoC over time. Specifically, I theorize that escalation manifests as a constant loop of mental model adaptation. This process of mental model shifts is characterized by different combinations of cognitive reasoning patterns, shifts in temporal cognition mode, and the reciprocal interaction with situational emotions and their anticipation. The repeated loop consists of initial mental model building, followed by realizations based on adaptive learning that create tensions in the form of contradictions and interdependencies with those mental models and, as a result, trigger cognitive-emotional dynamics, producing a new mental model that resolves the tensions until the next stage of realization. Based on the theoretical model, I formulate seven theoretical propositions about the nature of cognition and emotion during EoC and develop an argument for theoretical plurality.

In a last step, I integrate existing managerial de-escalation strategies with the developed theoretical framework modeling the loops of mental model adaptation

behind the phase transitions during EoC, and propose a set of phase- and cognitive-emotional dynamics-specific de-escalation strategies.

1.4.2 Contribution to Academia

This dissertation integrates the psychological micro-foundations of human behavior - cognition and emotion - with one of the most challenging phenomena in IS project management - EoC to distressed IS projects. The main academic contribution of this dissertation lies in disentangling the emotional and cognitive components and processes underlying IS project escalation.

Despite the relevance of understanding the causes and mechanisms underlying EoC in troubled IS projects, previous academic literature had not integrated cognitive and emotional dimensions. This dissertation effectively bridges this gap by offering a comprehensive perspective on how cognitive and emotional factors interplay to shape EoC dynamics. In particular, I contribute to advancing the nascent and fragmented field of affective EoC research. By providing empirical evidence for the effect predictions of Cognitive Dissonance over Coping Theory, I add to consensus creation in the academic debate about competing theories on the role of emotions in shaping EoC. Opening the cognitive "black box" and further breaking down the escalation process into different phases based on a process perspective allowed for a more nuanced understanding of how cognitive-emotional dynamics shape behavioral tendencies over time.

In addition to testing theories, the study pioneers a layered understanding of EoC as loops of mental model adaptation by bridging the qualitative and quantitative streams into meta-inferences. The theoretical framework and the developed propositions provide an in-depth understanding of how cognition and emotion shape behavioral EoC over time, which can be applied beyond the study context. Recognizing the complexity and interrelatedness of emotional and cognitive factors promotes diverse approaches and perspectives in academia. Hence, this dissertation advocates for theoretical plurality through a detailed exploration of the cognitive-emotional dynamics and their manifestations in decision-making.

In addition, the findings contribute to current research on managing and governing complex IS projects in organizations. With the phenomenon of EoC, I introduce a novel theoretical perspective built on interdisciplinary research to the field of IS design, development, and project management that questions the current understanding of IS project failure as a static end. In the context of IS project distress and failure, a better understanding of the decision-making phenomenon that can determine whether distress turns into failure may generate more effective strategies for reducing destructive personal and organizational consequences.

The methodological contribution of this dissertation is two-fold. First, this research goes beyond traditional paradigms by merging tools and theories from neuroscience, the behaviorism-centered EoC discourse, and IS project management. The use of AI-based emotional detection software and psychophysiological tools not only reveals the underlying emotional and cognitive mechanisms of behavioral EoC but also provides an innovative methodological

contribution. With the application of neurophysiological tools, I was able to uncover a link between behavioral EoC and physiological correlates, thereby "enhancing [...] decision-making in uncertain environments by using both cognitive and emotional markers" (Dimoka et al., 2012, p. 689). Second, by complementing the psychophysiological laboratory experiment with a qualitative research stream, this dissertation contributes to the growing field of mixed-method research, underlining the methodological advantages of mixing methods for examining multifaceted phenomena like EoC.

1.4.3 Contribution to Managerial Practice

From a practical perspective, EoC is highly relevant in transforming processes, managing IS projects, managerial decision-making, and strategy formulation. Hence, unpacking the cognitive-emotional dynamics behind that phenomenon helps distinguish between healthy entrepreneurial persistence and irrational EoC potentially harming the entire organization. By disentangling the emotional and cognitive components underlying project escalation, this dissertation better explains what gives rise to EoC. A complete and nuanced understanding of this complex psychological phenomenon is the foundation for developing de-escalation strategies that help to turn distressed IS projects around.

The cognitive reasoning patterns and the process model can help IS project managers identify the current escalation phase and choose the appropriate countermeasures that increase decision quality and help turn distressed projects around. Specifically, the developed phase-specific de-escalation model contributes to managerial practice and the de-escalation discourse. Stakeholders involved in troubled IS projects should be aware of potential EoC, the relevance of emotional and cognitive dynamics underlying this phenomenon, and the fallacy of underestimating unconscious forces driving towards persisting with failing courses of action.

1.5 Structure of this Dissertation

This dissertation is structured as follows:

Chapter 2 is organized into three parts: First, the conceptual foundations from cognition and emotional research are reviewed. This part introduces the lens applied in my dissertation. In this part, I provide working definitions of key terms and discuss existing theoretical positions on elucidation, the interplay, and the effect of emotions and cognition in general, and, more specifically, in the context of managerial decision-making. In the second part of this chapter, I summarize the current state of research on the phenomenon of interest - EoC. This part consists of a conceptualization of EoC, an overview of theoretical explanations, and a discussion of empirical studies synthesized within a nomological net with an emphasis on existing research on the cognitive and emotional factors of EoC. The third part of this chapter refers to the application or the context of the phenomenon

of interest I chose for my dissertation. In this part, I discuss the managerial manifestation of EoC in general and the application of EoC to decision-making about distressed IS projects, in particular.

Chapter 3 introduces the research framework developed for studying the research questions of this dissertation and consists of three parts. The first part summarizes the assumptions and theoretical foundations derived from discussing existing literature. The second part describes the research framework consisting of two complementary research streams and an integration of elements on the behavioral, cognitive, and emotional dimensions of EoC. In the third part, following the structure of the research framework, I develop the hypotheses relevant to the confirmatory research stream.

Chapter 4 describes this dissertation's research strategy, i.e., the methodological approach. In the first part of this chapter, I lay out the overall mixed-method research strategy and provide arguments for the choice of methods. Building on the overall research strategy, I describe the specific methodological approaches (e.g., procedure, sample, data gathering and processing, quantitative and qualitative data analysis) for both research streams - the psychophysiological laboratory experiment and the complementary exploratory approach.

Chapter 5 presents the results of the empirical part of this dissertation and is organized into two subchapters. First, I report on the results of the quantitative analysis, including the testing of the hypotheses. In the second part, I present the results of the complementary qualitative analysis based on the free-form narrating of decision-makers during the decision simulation, consisting of a description of the cognitive reasoning patterns and the developed cognitive process model.

Chapter 6 discusses the results presented in Chapter 5 and consists of three parts. First, I discuss the empirical results following the multilayered conceptualization of EoC. For this, I discuss how the results (1) connect the observable with the inner layer and (2) unpack the inner layer of EoC. Second, the insights gained from both research streams are consolidated into meta-inferences by developing a theoretical framework and propositions that describe and explain the cognitive-emotional dynamics during the phases of EoC and contribute to theoretical plurality. The third part of the discussion chapter discusses the implications of this dissertation for de-escalating commitment from a managerial and technological perspective.

Chapter 7 concludes this dissertation by summarizing key insights, describing the contributions to academia and practice, and analyzing limitations and avenues for future research.

1.6 Overview of Publications

Elements of this dissertation have been published. Table 2 provides an overview of the author’s publications related to this dissertation’s research context and which chapters they influence. In addition, references to the respective publications are

made in the chapter introductions. A full list of publications can be assessed in the Appendix.

Table 2 Core Publications for this Dissertation

Dissertation Area	Selected Publications	Short Description	Chapter Reference
Foundations for Answering the Research Questions	Marx, C.; de Paula, D.; Haskamp, T.; Uebernickel, F. (2023) **"A Cognitive Perspective on Digital Transformation: Literature Review and Research Framework"** Hawaii International Conference on System Sciences (HICSS).	Systematic Literature Review of Cognition in the Context of Digital Transformation	**Literature Review** (Relevance & Research Context, Theoretical Foundation of Cognition Research)
	Marx, C.; Uebernickel, F. (2022) **"How to Turn Around: Escalation of Commitment in the Context of ISD Project Distress"** International Conference on Information Systems (ICIS). Best Paper in Track Award.	Systematic Literature Review of EoC in the Context of IS Project Distress	**Literature Review** (Conceptualization & Literature Review of EoC, Research Context)
Answering the Research Questions	Marx, C.; Uebernickel F. (2023a**) "Disentangling emotional and cognitive factors of escalation of commitment: Evidence for a physiological link"** European Conference on Information Systems (ECIS).	Psychophysiological Laboratory Experiment on the effect of emotion and cognition on EoC	**Results** (Confirmatory Research Stream)
	Marx, C.; Uebernickel F. (2023b) **"Unpacking the Black Box: A Cognitive Process Model of Escalation of Commitment in IS Project Management"** International Conference on Wirtschaftsinformatik (WI).	Cognitive process model development based on free-form narrating during EoC	**Results** (Exploratory Research Stream)
Further publications related to the research context	Marx, C.; Ampel, B.; Lazarine, B. (2021) **"The Role of AI Agents for De-Escalating Commitment in Digital Innovation Projects"** International Conference on Information Systems (ICIS).	Online Experiment on the de-escalating effect of AI-based Advice (Research in Progress Paper)	**No direct Chapter Reference** (Implications – De-Escalation Strategies, Future Research)
	Marx, C.; Haskamp, T.; Uebernickel, F. (2023) **"Designing Innovation in the Digital Age: How to Maneuver Around Digital Transformation Traps"** Meinel C., Leifer L. (eds). Design Thinking Research. Understanding Innovation. Springer, Cham.	Summary of Key Digital Transformation Traps based on a Systematic Literature Review and Case Study Results	**No direct Chapter Reference** (Role of EoC for Digital Transformation in Research Motivation, Practical Implications)

2 CONCEPTUAL BACKGROUND

Marx, C.; de Paula, D.; Haskamp, T.; Uebernickel, F. (2023) "A Cognitive Perspective on Digital Transformation: Literature Review and Research Framework" Hawaii International Conference on System Sciences (HICSS).

Marx, C.; Uebernickel, F. (2022) "How to Turn Around: Escalation of Commitment in the Context of ISD Project Distress" International Conference on Information Systems (ICIS).

This chapter is organized into three parts: First, the conceptual foundations from cognition and emotional research relevant for the study of cognitive and emotional factors of EoC are reviewed. This part introduces the lens applied in my dissertation. In this part, I provide working definitions of key terms and discuss existing theoretical positions on elucidation, the interplay, and the effect of emotions and cognition in general, and more specifically in the context of managerial decision-making. In the second part of this chapter, I summarize the current state of research on the phenomenon of interest - EoC. This part consists of a conceptualization of EoC, an overview of theoretical explanations, and a discussion of empirical studies synthesized within a nomological net. The nomological net is analyzed with an emphasis on existing research on cognitive and emotional factors of EoC. The third part of this chapter refers to the application or the context of the phenomenon of interest I chose for my dissertation. In this part, I discuss the managerial manifestation of EoC in general, and the application of EoC to decision-making about distressed technology projects, in particular.

2.1 Foundations from Cognition and Emotion Research

In order to untangle the emotional and cognitive factors and processes behind EoC, I will make use of the conceptualizations and theories presented in this subchapter.

In the following, I will outline key foundations and concepts from related cognition and emotion research relevant to studying EoC and elaborate on how cognitive-emotional interactions shape behavior based on a scoping review.

2.1.1 Cognition

2.1.1.1 Key terms: Concepts and Processes

In contrast to behaviorism and related perspectives, which argue that mental states are nothing more than unobservable, intervening variables (Fiske & Taylor, 2020), the cognitive perspective assumes that attitudes, motivations, and other mental states can be treated as constructs that exist in the mind (Sternberg & Ben-Zeev, 2001). Hence, a critical assumption of the cognitive perspective is that the environment is enacted and represented through cognitions.

Cognition refers to the mental processes that involve "using, modifying, enacting, recalling, storing, sensing, and transforming knowledge in a dynamic and recursive manner" (Brymer et al., 2011, p. 121). Theoretical positions on cognition converge on the idea that understanding human behavior necessitates the consideration of mental representations and processes that involve thoughts, beliefs, and emotions (Russell et al., 2020). During cognitive processes, decision-makers' personal beliefs and mental models incorporate knowledge and an understanding of current events and predictions of future developments (Russell et al., 2020).

Managerial and organizational cognition refers to applying cognition to a managerial context (Walsh, 1995). Managers' personal beliefs and mental models underlying their decision-making include knowledge and the understanding of current events and predictions of future developments (Stubbart, 1989). The organizational and environmental context function as information sources that affect the cognition's content and structure of organizational actors. *Strategic cognition* involves "the linkages between cognitive structures and decision processes in strategic management" (Thomas & Porac, 2002, p. 165). This research field investigates how cognitive structures and processes develop in an organizational context and how these structures and processes relate to decision-making, strategies, and intra-organizational dynamics like strategic change, the need for, and the resistance to it (Kaplan, 2011).

Based on the foundations of cognition, managerial cognition, and strategic cognition research, I identified the cognitive processes and concepts relevant to understanding EoC. *Relevant cognitive processes* include decision-making, scanning, sensemaking, issue-selling, sense-giving, and problem-solving (Dutton

& Ashford, 1993; Narayanan et al., 2011). *Decision-making* is the process of choosing a preferred option or a course of action from a set of alternatives based on given criteria or strategies (Wang & Ruhe, 2011). *Scanning* processes are forward-looking, based on actors' cognitive maps of action-outcome linkages, and those that are backward-looking or experience-based (Gavetti & Levinthal, 2000). *Sensemaking* is a cognitive process described by the reciprocal interaction of information seeking, meaning ascription, and action (Narayanan et al., 2011). Together with sensemaking, the cognitive process of *sense-giving* shapes meaning and leads to a collective interpretation of decisions through symbols and labels and then to action (Narayanan et al., 2011). Another relevant cognitive process is *issue-selling* - the notion that individuals affect others' attention to and understanding of the events, developments, and trends that affect organizational performance (Dutton & Ashford, 1993). Further, *problem-solving* - a process at the higher cognitive layer that searches for solutions or finds a path to reach a given goal - is a key cognitive process (Wang & Chiew, 2010).

Two groups of cognitive concepts are relevant in a decision-making context: Concepts related to heuristics and cognitive biases and concepts related to schemata and beliefs (Kaplan, 2011).

Heuristics and cognitive biases are cognitive concepts rooted in Simon's (1990) work on bounded rationality - the idea that decision-makers are bounded in their strive for rationality by their finite cognitive capabilities and information availability. In their recent introductory article to the Journal of Management special issue "the heuristics and biases of top managers" Hodgkinson et al. (2023, p. 1034) stated that heuristics and cognitive biases (Tversky & Kahneman, 1974) are "one of the most important psychological phenomena that influence the judgment and decision making of actors at all levels of seniority, throughout the organizational hierarchy".

Heuristics "serve as potential aids to decision making by focusing decision makers' attention on particular aspects of information" (Hodgkinson et al., 2023, p. 1034). Specifically, heuristics aid the decision-maker in arriving at "satisfactory solutions with modest amounts of computation" (Simon, 1990, p. 11). Hence, the element of effort reduction is core to the concept of heuristics (Shah & Oppenheimer, 2008). Given this function, heuristics are sometimes called rules of thumb or mental shortcuts (Fleischmann et al., 2014).

Grounded in bounded rationality, Tversky and Kahneman (1974) led and advanced the *heuristics and biases program* - a research stream emphasizing a skeptical attitude towards heuristics that reduce effort but simultaneously result in systematic deviations from rationality. Common types of heuristics falling into this category are *cognitive biases*. Based on Tversky and Kahneman (1974) and Gigerenzer et al. (2022), Hodgkinson et al. (2023, p. 1034) defined cognitive biases "as systematic deviations from rational judgment and thinking that can, and sometimes do, result from the adoption of heuristics". Those systematic deviations from rational judgment and thinking often lead to suboptimal outcomes for the decision-maker or other individuals affected by the particular decision (Wilkinson & Klaes,

2012). Fleischmann et al. (2014) grouped cognitive biases by synthesizing existing categorizations into perception biases (e.g., framing (Tversky & Kahneman, 1981)) pattern recognition biases (e.g., availability bias (Tversky & Kahneman, 1973)), memory biases (e.g., reference point dependency (McFarland & Ross, 1987)) decision biases (e.g., illusion of control (Langer, 1975)), stability biases (e.g., status quo bias (Fleischmann et al., 2014; Staw, 1976)), social biases (e.g., herd behavior (Scharfstein & Stein, 1990)), and interest biases (e.g., self-serving bias; (Babcock et al., 1996)) EoC can be categorized as a cognitive decision bias as it occurs during the process of decision-making and reduces the quality of decision outcomes (Fleischmann et al., 2014; Staw, 1976).

Schemata and beliefs mark the second group of cognitive concepts relevant in a managerial context. Schemata are cognitive structures that represent knowledge about a concept or type of stimulus, including its attributes and the relations among those attributes (Fiske & Taylor, 2020). Schemata can be seen as an umbrella term, including concepts like *cognitive frames, mental models, belief structures, and mindsets* (Kaplan, 2011) While these concepts closely relate and the terms have been used interchangeably, conceptual differences exist, which I will address in the following descriptions of each sub-concept.

Referring to the knowledge structure that informs decision-making, *cognitive frames* act as filters individuals apply. They can be understood as a cognitive template that individuals impose on the information environment to give it form and meaning (Walsh, 1995). Functioning as means by which individuals make sense of their environment (Daft & Weick, 1984), cognitive frames influence what people pay attention to and consider relevant during decision-making (Walsh, 1995). With increasing complexity and uncertainty in organizational environments, adopting simplified mental representations of the internal and external environment of the organization allows firms and decision-makers to reduce their real-world problems to more manageable representations (Levinthal, 2011). Cognitive frames have been labeled a core element of structure-related cognition alongside organizational identity and routines (Narayanan et al., 2011).

Similarly rooted in cognitive representations, *mental models* are general beliefs built on organizing knowledge into structured and meaningful patterns stored in memory (van Ments & Treur, 2021). Underlying mental models are *belief structures* (or assumptions) that can be classified into phenomenological, causal, and normative beliefs (Sproull, 1981). Mental models are cognitive representations of the external world or internal mental states, crucial in human perception, reasoning, and decision-making. They can be classified considering their dynamism (static or dynamic) and their focus (on the world or the mind) (van Ments & Treur, 2021). Static world-focused mental models represent static states in the external world, helping individuals understand the layout of physical spaces or the structure of complex systems. Static mind-focused mental models, on the other hand, represent static mental states, such as beliefs and self-perceptions, that shape how individuals perceive themselves and others. In addition to those static mental models, van Ments and Treur (2021) identified two types of dynamic mental models: Dynamic world-focused mental models and dynamic mind-focused mental

models. While the former describes dynamic processes and changes in the external world, enabling individuals to comprehend how systems and events evolve, the latter represents dynamic mental processes such as thought patterns and decision-making strategies aiding individuals in understanding their own cognitive processes and adapting their thinking.

Given this categorization, mental models serve three main functions: Internal simulation, adaptation, and control (van Ments & Treur, 2021). Internal *simulations* allow individuals to explore hypothetical scenarios and potential outcomes without direct external interaction. This capability supports effective planning, strategizing, and decision-making (van Ments & Treur, 2021). Providing a heuristic function, mental models enable people to process information rapidly and flexibly by allowing information to be classified and retrieved in terms of its most salient features. However, the impact of specific mental models reaches beyond individual consequences: Mental models of individuals can impact strategic decision-making (Eggers & Kaplan, 2009), organizational change processes (Russell et al., 2020; Tripsas & Gavetti, 2000), and firm performance (Osborne et al., 2001) in both positive and negative ways. Along those lines, existing research has emphasized the positive role of mutual or shared mental models in collective performance (Burtscher et al., 2011; Lim & Klein, 2006).
A second function is that mental models are *adapted* or updated in response to new information or environmental changes. While "mental models can impede learning, freezing companies and industries in outmoded practices," they might also "help accelerate learning" (Senge, 1992, p. 167). While the outcome of learning when enabling mental model adaptation is a cognitive one, the basic concept of learning goes back to the very foundations of behaviorism and conditioning, with early theories like the law of effect stating that any behavior that is followed by pleasant consequences is likely to be repeated, and any behavior followed by unpleasant consequences is likely to be stopped (Thorndike, 1898). The adaptability function of mental models is not only crucial for enabling learning but also for problem-solving and resilience in dynamic and uncertain situations (van Ments & Treur, 2021).

Besides adaptive learning, the concept of cognitive flexibility can be related to the adaptability of mental models. *Cognitive flexibility* has been defined as the ability to switch cognitive sets to adapt to changing environmental stimuli (Dennis & Vander Wal, 2010). Other definitions of cognitive flexibility have used the term "processing strategies" instead of "sets" (Cañas et al., 2003), emphasizing that such a strategy is a sequence of operations that search through a problem space (Payne, 1991). Cognitive flexibility is essential for tasks requiring simultaneous consideration of multiple concepts, switching between tasks, or adapting to changing environments. As per research, cognitive flexibility is an integral component of executive functions and is closely tied to the prefrontal cortex's operations. Diamond (2013) emphasized its role not only in adjusting to new rules or environments but also in facilitating problem-solving, creativity, and adaptive behavior. The development of cognitive flexibility begins in early childhood and can be influenced by various factors, including genetics, environment, and educational interventions. Its impairment is observed in certain neuropsychological

disorders, emphasizing its critical role in daily functioning and adaptive decision-making (Diamond, 2013).

The third function of mental models - *control* - states that individuals can actively control and manipulate their mental models to regulate cognitive processes and achieve desired outcomes. This control enables them to optimize decision-making strategies and manage emotions effectively (van Ments & Treur, 2021). To manipulate their or others' mental models, individuals must first be aware of and recognize existing mental models and underlying beliefs (Senge, 1992; Solberg et al., 2020). This active regulation of cognitive processes is challenging, as mental models are hard to detect and require high effort to change given their "stickiness" to underlying belief structures (de Paula et al., 2022; Gurtner et al., 2007).

While mental models and mindsets both consist of beliefs, a *mindset* can be seen as an established set of multiple mental models that influence human behavior more generally. The most prominent types of mindsets are growth and fixed mindsets rooted in the implicit theories of intelligence (Dweck & Yeager, 2019; Yeager & Dweck, 2020). Implicit theories are the lay beliefs that individuals hold about the malleability of a given attribute, such as intelligence, various forms of ability, and personality (Dweck & Leggett, 1988). With a prototypical entity implicit theory (later termed "fixed mindset"), one believes that a given personal attribute is largely a fixed entity that is difficult to change or develop. In contrast, with a prototypical incremental implicit theory (later termed "growth mindset"), one believes that personal attributes are relatively malleable and thus amenable to change and development (Dweck & Leggett, 1988). Mindsets create and are at the core of so-called *meaning systems:* When mindsets serve an organizing function, they bring together goals, beliefs, and behaviors into a system (Molden & Dweck, 2006). Those systems make predictions, for instance, about how mindsets affect challenge-seeking and resilience and influence the formation of judgments and stereotypes (Dweck & Yeager, 2019).

Table 3 summarizes the working definitions of the terms related to cognition that have been selected based on their relevance in the context of understanding the cognition behind EoC.

Table 3 Working Definitions of Selected Terms Related to Cognition

Area	Term	Working Definitions	Source(s)
Cognitive Processes	Decision-making	Decision-making is the cognitive process that chooses a preferred option or a course of actions from among a set of alternatives on the basis of given criteria or strategies.	Wang & Ruhe, 2011
	Scanning	Scanning processes are forward-looking, based on actors' cognitive maps of action-outcome linkages, and those that are backward-looking or experience-based.	Gavetti & Levinthal 2000
	Sensemaking	Sensemaking is a cognitive process described by the reciprocal interaction of information seeking, meaning ascription, and action.	Narayanan et al., 2011
	Sensegiving	The cognitive process of sense-giving shapes meaning and leads to a collective interpretation of decisions through symbols and labels and then to action.	Narayanan et al., 2011
	Issue-selling	Issue-selling is the notion that individuals affect others' attention to and understanding of the events, developments, and trends that affect organizational performance.	Dutton & Ashford, 1993
	Problem-solving	Problem-solving is a process at the higher cognitive layer that searches for solutions or finds a path to reach a given goal.	Wang & Chiew, 2010
Cognitive Concepts	Heuristics	Heuristics aid the decision-maker in arriving at "satisfactory solutions with modest amounts of computation".	Simon, 1990, p.11
	Cognitive biases	Cognitive biases are "systematic deviations from rational judgment and thinking that can, and sometimes do, result from the adoption of heuristics".	Hodgkinson et al. 2023, p. 1034
	Schemata	Schemata are cognitive structures that represent knowledge about a concept or type of stimulus, including its attributes and the relations among those attributes. It is an umbrella term including concepts like cognitive frames, mental models, belief structures, and mindsets.	Fiske & Taylor, 2020; Kaplan, 2011
	Cognitive Frames	Cognitive frames can be understood as a cognitive template that individuals impose on the information environment to give it form and meaning.	Walsh, 1995
	Mental Models	Mental models can be described as general beliefs built on the organization of knowledge into structured and meaningful patterns stored in memory. They can be classified considering their dynamism and focus and serve the function of internal simulation, adaptation, and control.	Sproull, 1981; Van Ments & Treur, 2021
	Cognitive Dissonance	Cognitive dissonance refers to the psychological discomfort experienced when an individual holds two or more contradictory beliefs, attitudes, or values simultaneously.	Festinger, 1957
	Cognitive Flexibility	Cognitive flexibility is the ability to switch cognitive sets to adapt to changing environmental stimuli.	Dennis & Vander Wal, 2010
	Mindset	Mindsets are established sets of general beliefs that influence human behavior more generally than mental models. The most prominent types of mindsets are growth and fixed mindsets rooted in the implicit theories of intelligence.	Dweck & Yeager, 2020; Dweck, 2006

2.1.2 Emotion

2.1.2.1 Key Terms: Concepts and Dimensions

Affect is an umbrella term that encompasses a broad spectrum of experiential states, including mood, discrete emotions, and trait affectivity (Barsade & Gibson, 2007; Brief & Weiss, 2002; Forgas, 1995).This state of feeling varies along dimensions such as duration, intensity, specificity, pleasantness, and level of arousal. Moreover, affect plays a pivotal role in modulating cognition, behavior, and social interactions (Abrams et al., 2013).

Scholars predominantly distinguish between two facets of affect: trait and state (Barsade & Gibson, 2007). Trait affect represents relatively stable individual differences (Barsade & Gibson, 2007; Watson & Walker, 1996). In contrast, state affect captures the transient feelings of an individual at a particular moment, further categorized into moods and emotions. State affect can be categorized based on its source: integral, wherein the affective experience arises directly from the event under investigation, and incidental, which is elicited by external stimuli unrelated to the focal event (Andrade & Ariely, 2009; Bodenhausen, 1993). Notably, while emotions can be both integral and incidental, moods are primarily incidental due to the absence of a direct eliciting stimulus.

Discrete emotions are complex psychological constructs that describe a type of affective state encompassing subjective feelings, physiological responses, cognitive appraisals, expressive behaviors, and motivational tendencies (Ekman, 1992; Frijda, 1993). Emotions are integral to human adaptation, social interaction, and overall well-being. Psychologists argue that emotions tend to be adaptive rather than maladaptive (Frijda, 1993). In this context, emotions serve as significant indicators of the alignment between individuals and their surroundings, directing their focus and facilitating prompt responses to the immediate situation (Gross, 1998). Emotions (intense yet transient affective states) emerge in response to specific external stimuli such as objects or events. The onset of emotion can be relatively automatic or contingent upon a cognitive evaluation of its relevance or alignment with personal goals. Examples of discrete emotions are anger, sadness, fear, disgust, guilt, embarrassment, uneasiness, pride, gratitude, happiness, and love.

Emotions can also be categorized based on their temporal focus. Emotions elicited by a current emotional experience can be labeled situational. However, emotions can also be carried-over into the present situation from emotional experiences that lie in the past. Another form of temporal focus that helps to classify emotions is anticipation. Here, it is important to distinguish between anticipated and anticipatory emotions. Anticipated emotions in a particular future state are a person's affective forecast about future affective experience. They are not felt emotions but the person's prediction of their emotions after a certain future state has happened. On the contrary, anticipatory emotions are felt emotions that reflect future value expectancy (Frijda, 2004). Hope, for instance, represents an anticipatory emotion characterized by positive expectations about the future and is often accompanied by sensations of enthusiasm and confidence (Snyder, 1994). On the other end of the spectrum, fear, sometimes described as anxiety, unease, or apprehension, manifests as a negative response to anticipated unfavorable outcomes (Tsai & Young, 2010).

In the context of decision-making, scholars have further used aggregated terms of discrete emotions like negative emotions (including discrete emotions with negative valence like anger, sadness, and fear) or concepts like *emotional complexity*. Rothman and Melwani (2017, p. 259) characterize emotional complexity as "the simultaneous or sequential elicitation and experience of at least two different emotions during the same emotional episode." It is crucial to

understand that individuals often grapple with more than one integral emotion during decision-making. In many cases, they navigate through a spectrum of emotional responses, each potentially steering their decisions in conflicting directions. Recognizing that emotional states frequently encompass multiple distinct affective experiences (Filipowicz et al., 2011), a singular focus on valence or discrete emotions can be limiting. Instead, the concept of emotional complexity, which captures the simultaneous or sequential experience of various emotions within a single episode, provides a more encompassing understanding.

Mood is another type of affective state that differs from emotion in its longevity and specificity. While both are affective experiences, moods persist for longer durations and are more generalized, often without the individual's conscious recognition of the triggering event (Schwarz & Clore, 1983). Such states might emerge from the gradual dissipation of emotion until its original cause becomes apparent (Schwarz & Clore, 1983; Watson & Tellegen, 1985). This means moods are not typically tied to a particular cause but manifest as overarching sentiments of positivity or negativity. Moods can shape how an individual perceives and interprets external stimuli, potentially influencing the likelihood experiencing specific emotions (Abrams et al., 2013).

Table 4 summarizes the working definitions of the terms related to emotions that have been selected based on their relevance for unpacking the emotional aspects of EoC.

Table 4 Working Definitions of Selected Terms Related to Emotions

Area	Term	Working Definition	Source(s)
Affective Concepts	Affect	Affect can be described as unspecified feelings It is the "superordinate umbrella of constructs involving emotion, mood, and emotion-related traits.	Barsade & Gibson, 2007; Lerner et al., 2015
	Trait Affect	Trait affect is defined as an individual difference that is relatively stable within a person. An example is negative trait affect which is related to depression.	Barsade & Gibson, 2007
	State Affect	State affect refers to how an individual feels at a specific moment and can be divided into moods and emotions. State affect can be integral or incidental.	Barsade & Gibson, 2007
	Negative/ Positive State Affect	Negative state affect describes an unpleasant affective experience. Positive state affect describes a pleasant affective experience.	Barsade & Gibson, 2007
	Discrete Emotions	Emotions are complex psychological phenomena that involve subjective feelings, physiological responses, cognitive appraisals, expressive behaviors, and motivational tendencies. Emotions are multifaceted, biologically mediated, concomitant reactions (experiential, cognitive, behavioral, expressive) regarding survival-relevant events. Emotions can be situational, carried over, or anticipatory and integral or incidental. Examples are anger, sadness, gratitude, and happiness.	Barsade & Gibson, 2007; Lerner et al. 2015
	Emotional Complexity	Emotional complexity can be created by combining opposing pairs of emotions. It has been defined as a state involving "the simultaneous or sequential elicitation and experience of at least two different emotions during the same emotional episode". An example is the combination of happiness and sadness.	Rothman & Melwani, 2017, p.259
	Negative/ Positive Emotions	Negative emotions are those emotions with negative valence. Examples are sadness and anger. Positive emotions are those discrete emotions with positive valence. Examples are happiness and gratitude. The terms can be used to aggregate or classify discrete emotions.	Barsade & Gibson, 2007; Lerner et al., 2015; Posner et al., 2005
	Moods	Moods are affective experiences that are longer, more diffuse, and lack awareness of the eliciting stimulus; they can be caused by emotions that fade so that initial cause is no longer salient. Moods are always incidental.	Schwarz & Clore, 1983; Watson & Tellegen, 1985
Affective Dimensions	Valence	Valence is the positive to negative evaluation of the subjectively experienced affective state.	Russell & Barrett, 1999
	Arousal	Arousal levels describe the intensity of the subjectively experienced affective state.	Russell & Barrett, 1999
	Cognitive Appraisal	A cognitive appraisal is an assessment of an emotional situation wherein a person evaluates how the event will affect them, interprets the various aspects of the event, and arrives at a response based on that interpretation This cognitive meaning -making elicits emotions, usually along dimensions of certainty, pleasantness, attentional activity, control, anticipated effort, and self-other responsibility.	Lerner et al., 2015; Moors et al. 2013

2.1.3 The Interaction of Emotion and Cognition

2.1.3.1 The Elicitation of Emotions

Circumplex Model of Affect

In the realm of emotion and decision-making, there is a divergence in theories that underscores the importance of understanding the various dimensions of emotion. These theories can largely be grouped into those emphasizing valence (or the positive-negative dimension) and those focusing on specific emotions (Lerner et al., 2015). One of the most salient discussions in the domain of affective

psychology is the distinction between basic emotions and dimensional models of affective states. While the theory of basic emotions asserts that each emotion, such as anger, disgust, fear, happiness, sadness, and surprise, originates from a distinct and autonomous neural system and is universally recognized (Ekman, 1992), dimensional models conceptualize affective experiences as a continuum of intricately related and often ambiguous states (Posner et al., 2005). In this light, dimensional models such as the circumplex model of affect marked a paradigmatic shift, moving away from the basic emotion model and towards an understanding where all affective states emerge from shared, overlapping neurophysiological systems.

The circumplex model of affect offers an integrative perspective, emphasizing the interconnectedness of cognitive processes and neurophysiological systems in the orchestration and experience of emotions. Central to the circumplex model of affect is the assumption that "all affective states arise from cognitive interpretations of core neural sensations that are the product of two independent neurophysiological systems": valence and arousal (Posner et al., 2005, p. 715; Russell, 1980). These two dimensions function as foundational axes, with valence denoting the positive to negative evaluation of a subjectively experienced state, ranging from unpleasant to pleasant, and arousal indicating the intensity of that emotional experience, which is related to the activation of the sympathetic nervous system (Russell & Barrett, 1999). Each emotion can be understood as a linear combination of these two dimensions or as varying degrees of valence and arousal. Both dimensions can be quantified through self-report or physiological indicators such as brain activity or heart rate variability (Russell & Barrett, 1999).

Cognitive Appraisals

Cognitive appraisal theories further enrich dimensional perspectives on emotions, like the circumplex model of affect, highlighting the role of individual and contextual interpretations in shaping affective experiences (Frijda, 1993). According to this view, the interpretation of sensory input, alongside past experiences and situational context, determines the precise nature of the emotional response. The appraisal theory posits that emotions are not mere reflexive reactions to stimuli but emerge from individuals' cognitive evaluations, or *appraisals* of events and situations (Moors et al., 2013). A cognitive appraisal is an assessment of an emotional situation wherein a person evaluates how the event will affect them, interprets the various aspects of the event, and arrives at a response based on that interpretation (Lerner et al., 2015; Moors et al., 2013). Appraisal determines the intensity and quality of action tendencies, physiological responses, behavior, and emotions. Appraisal processes do so by using information from events in their context, the individual's concerns, history, and other sensitivities. In other words, according to appraisal theory, during the elicitation of emotions, changes in the core affect in terms of valence and arousal that are based on emotional experiences (cause of emotion) influence the appraisal (meaning making) of the emotional experience (Lerner et al., 2015). Appraisal dimensions include responsibility (self vs. other), certainty (certain vs. uncertain), legitimacy (morally right vs. morally wrong), and control (entity vs. circumstances). The appraisal dimensions are

related to different discrete emotions (e.g., sadness is related to uncertainty and circumstances, while anger is related to certainty and control) (Lerner et al., 2015). Hence, two emotions with the same valence (like sadness and anger) can contrast in their underlying appraisal dimension. The combination of appraisal dimension and discrete emotion can explain different appraisal tendencies (e.g., approach/avoidance, attention, rejection, reactance) and differences in judgments (e.g., depth of thought, content of thought).

In essence, the blend of the circumplex model of affect as a dimensional approach to conceptualizing emotions with appraisal theory provides a deep and well-rounded foundation to unravel the complex interplay of emotional and cognitive factors that underlie decision-making. The circumplex view on affect can model emotional states individuals find themselves in as they face decisions to continue or abort a chosen course. Concurrently, the appraisal theory helps to understand how cognitive processes drive these emotions.

2.1.3.2 The Effects of Emotion-Cognition Interactions

Coping Theory

Cognitive Appraisal Theory is often linked to the concept of coping, thereby showing how cognition can mediate the relationship between emotions and behavior. Coping consists of cognitive and behavioral efforts to manage specific external or internal demands that are appraised as taxing or exceeding the person's resources (Folkman & Lazarus, 1988). These cognitive and behavioral efforts are constantly changing as a function of continuous appraisals and reappraisals of the person-environment relationship, which is also changing. Some of the changes in the relationship result, in part, from coping processes directed at altering the situation that is causing distress (problem-focused coping) or regulating distress (emotion-focused coping), from changes in the person that are a result of feedback about what has happened, and from changes in the environment that are independent of the person (Folkman & Lazarus, 1988). Coping relates to avoidance mechanisms and predicts withdrawal strategies in stressful or negative situations. Hence, according to Coping Theory, the likelihood of applying an avoidance strategy increases with the strength of a person's negative emotional state (Endler & Parker, 1990; Wong et al., 2006).

Cognitive Dissonance Theory

Another perspective illustrating the effects of emotion-cognition interaction is Cognitive Dissonance Theory, first introduced by Festinger in (1957). Following the action-based model, which accounts for the adaptive function of dissonance, cognitive dissonance refers to the unpleasant emotional state produced by cognitive discrepancy - the inconsistency of cognitions (Harmon-Jones, 2000; Pepitone & Festinger, 1959). The psychological discomfort experienced when an individual holds two or more contradictory beliefs, attitudes, or values simultaneously motivates people to reduce or eliminate the dissonance. Specifically, according to Festinger's theory, this discomfort, akin to a state of tension, motivates individuals to reconcile conflicting cognitions, often through changing one's beliefs, acquiring new information, or minimizing the importance of the discrepancy. Empirical

studies have demonstrated the impact of cognitive dissonance on mental model or attitude change, and behavior (Harmon-Jones, 2000; Hinojosa et al., 2017; Stone & Cooper, 2001).

In essence, the Cognitive Dissonance perspective emphasizes the inherent human motivation for consistency in beliefs and actions (Festinger, 1957). The example of unpleasant emotions shows that while Cognitive Dissonance Theory and Coping Theory both rely on the underlying assumption that emotions and cognition shape behavior in a reciprocal way, the perspectives predict different behavioral consequences in the context of decision-making (Wong et al., 2006).

Emotion-Cognition Interactions in Managerial Decision-Making

After decades of predominantly following the "cognitive route," a recent paradigm shift has ushered in an emotional revolution that has reshaped the landscape of decision-making (Healey & Hodgkinson, 2017; Lerner et al., 2015). Contemporary discourse on decision-making contends that individuals engage both cognitive reasoning and emotional experiences when making choices (Forgas, 1995; Healey & Hodgkinson, 2017; Loewenstein & Lerner, 2003; Wagar & Thagard, 2004). To comprehend this dynamic, it is imperative to recognize the distinctive yet interconnected influences of both components (Hodgkinson et al., 2023), aligning well with the cognitive appraisal theory of emotions introduced earlier.

Abundant evidence underlines the bidirectional relationship between cognition and emotion: emotions can shape cognitive processes, while cognition can shape emotional responses, both of which significantly impact attitudes and consequently influence behavior (Brockner, 1992; Staw, 1976). More specifically, researchers have shown that emotions drive information processing and cognition steers affective processing (Loewenstein & Lerner, 2003). The interplay of cognition and emotion has significant implications for managerial judgment and decision-making processes. For instance, the interplay of cognition and emotion shapes what information decision makers attend to and how they use it (Barsade & Gibson, 2007). Beyond shifting attentional focus, emotions and their cognitive appraisal can alter the depth of thought and activate specific goals. Regarding the latter, empirical investigations have revealed that distinct emotions can trigger implicit goals. For instance, when sadness is prevalent, individuals might be inclined to opt for high-reward, high-risk alternatives to counteract sentiments of loss, whereas feelings of anxiety may prompt a preference for low-reward, low-risk choices as a strategy to mitigate uncertainty (Lerner et al., 2015).

In an endeavor to combine traditional decision-making models with the understanding of emotional and cognitive influences, Lerner et al. (2015) proposed the emotion-imbued choice (EIC) model. In addition to processes such as evaluating the expected utility of decision outcomes, which is influenced by the characteristics of the decision maker and the options, the EIC incorporates emotional influences on decision-making. Emotions arising from various sources, such as personal characteristics, attributes of options, expected outcomes, and the evaluation of options, can influence cognitive processing by altering the content considered, the level of processing utilized, and the implicit goals pursued. On the

other hand, cognitive processes, such as reasoning and evaluation, can impact emotional responses by either mitigating or intensifying them.

Figure 1 Extended Cognitive-Affective Decision-Making Model

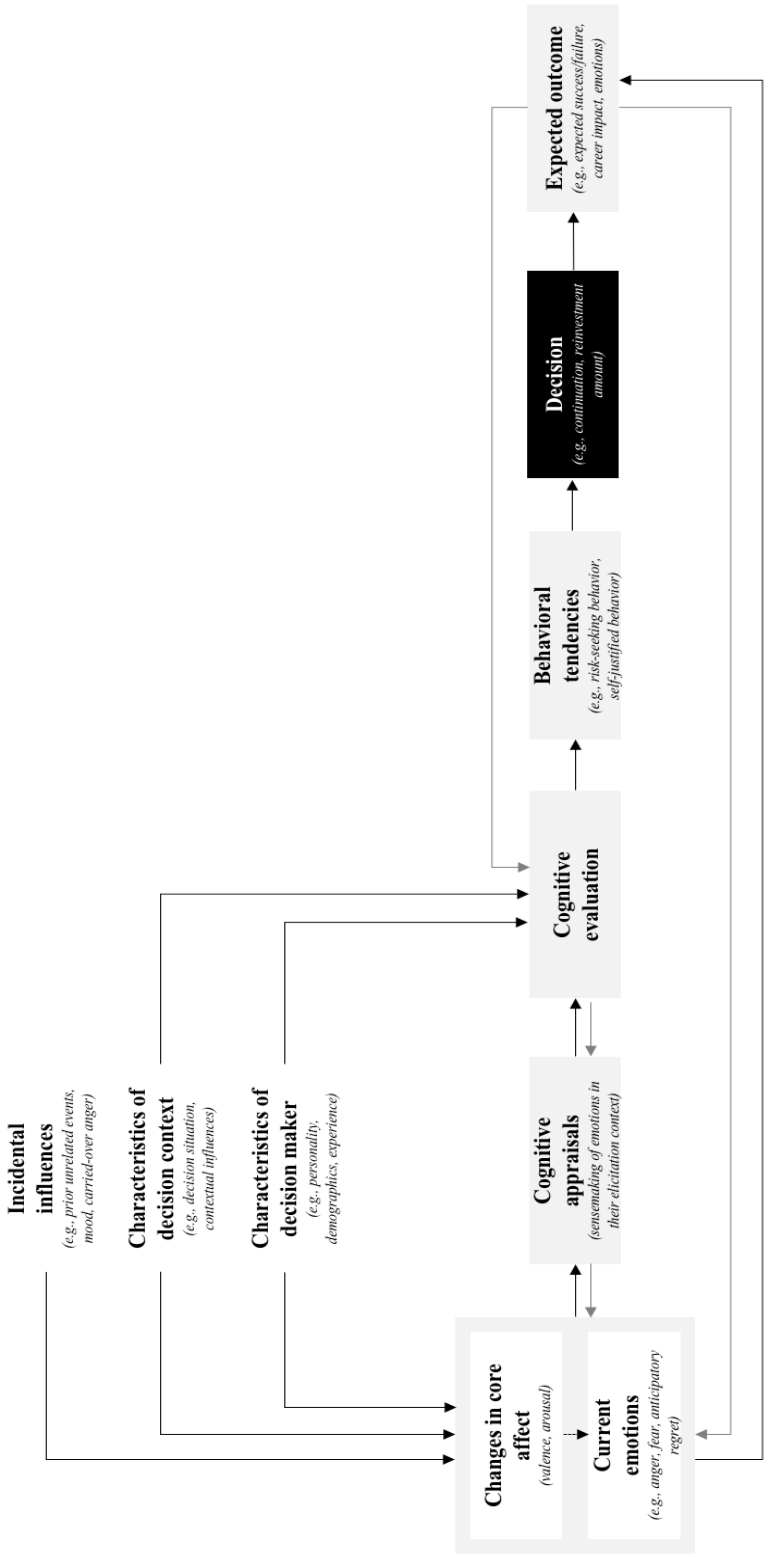


Figure 1 shows the cognitive-affective decision-making model I developed that is based on a synthesis of the EIC model from Lerner et al. (2015), key elements from

cognitive appraisal theory (cognitive appraisals, behavioral tendencies), and the circumplex model of affect (changes in core affect). The model is an extension of rational choice models, showing that multiple paths influence the conscious or unconscious evaluation of options that lead to a decision. It thereby provides details about the reciprocal relationship between emotional and cognitive influences underlying decision-making.

Before applying the foundations from cognition and emotion research in general, and the integrated cognitive-affective decision-making model in particular to the EoC phenomenon, it is necessary to conceptualize EoC and synthesize existing knowledge thoroughly.

2.2 ESCALATION OF COMMITMENT

This subchapter reports on and extends the results from a systematic review of existing literature from IS, management, and psychology outlets with the aim to conceptualize EoC give an overview of the current state of academic research (Marx & Uebernickel, 2022).

I will first provide a conceptualization of EoC consisting of key attributes, dimensions, and temporal perspectives. In the second part, I discuss theories explaining why individuals tend to escalate their commitment to a failing course of action. I conclude the review with describing and discussing the nomological net around EoC with a particular emphasis on how antecedents, moderators, and mediators relate to the cognition and emotion of the decision-maker who is escalating.

2.2.1 Conceptualizing EoC

The review of existing conceptual literature reveals a more nuanced conceptualization of EoC as the phenomenon of interest consisting of key attributes, dimensions, and temporal perspectives.

2.2.1.1 Attributes

EoC has been defined as continued commitment in the face of negative information about prior resource allocations (Brockner, 1992; Staw, 1976). In line with this early definition and following Staw and Ross (1987), Barton, Duchon, and Dunegan (1989), and Staw (1997), there exist four attributes characterizing an EoC situation.

(1) Continuation
(2) Negative information or feedback
(3) Uncertainty
(4) Real choice

The first core attribute of EoC is the element of continuation. Here, escalation does not necessarily imply an increasing rate of investment over time, but rather, refers

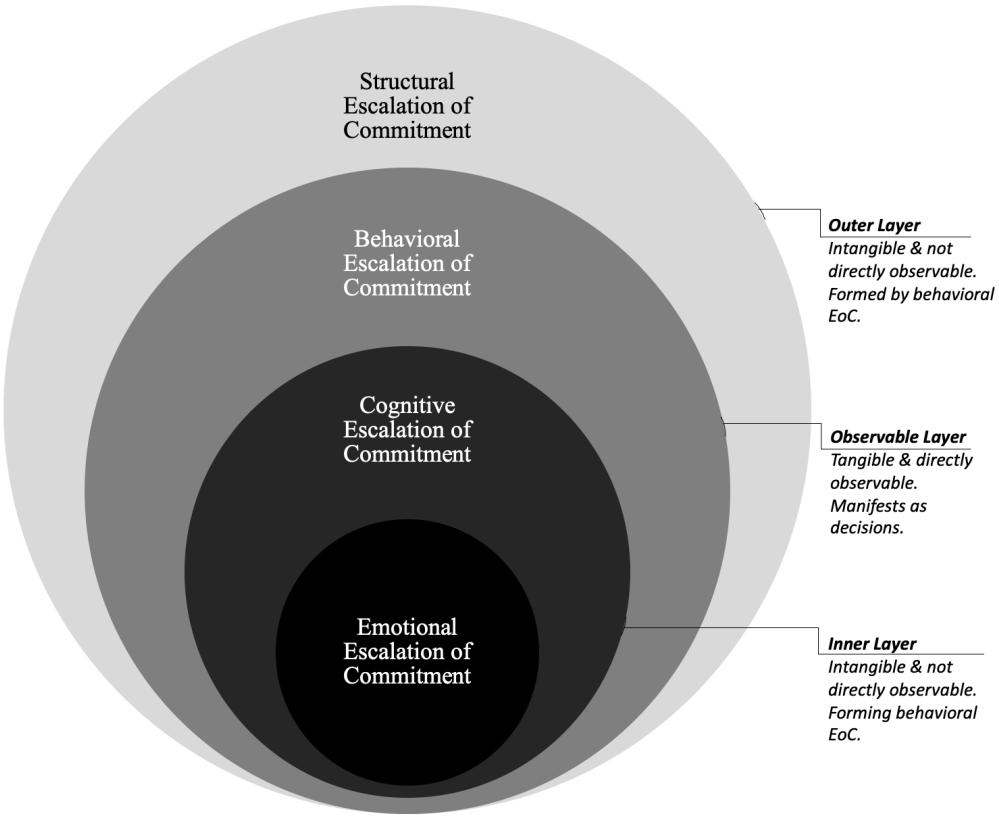
to a growth in the cumulative amount of resources invested over time (Brockner, 1992). Thus, escalation can be thought of as continued commitment. The second attribute of EoC is the presence of negative information or feedback. Thirdly, those attributes are paired with the element of uncertainty surrounding the likelihood of goal attainment (Brockner, 1992). That is, decision-makers are not certain that additional investments will be sufficient to bring about goal attainment. Additionally, decision-makers must have a real choice in their decision-making about whether to continue. In essence, escalation situations include continuation during decision-making in the face of negative feedback about prior resource allocations, uncertainty surrounding the likelihood of goal attainment, and choice about whether to continue.

It should be noted that there exists a difference between EoC behavior and EoC situations. EoC situations could be defined as a course of action where negative feedback has been received, costs have been incurred, where one can withdraw or persist in the course of action; and where the consequences of both are uncertain.

2.2.1.2 Dimensions

I conceptualize EoC as a multidimensional phenomenon consisting of four dimensions that can be located on the observable, outer, and inner layers. In most previous research, academics have not differentiated between different layers and have typically conceptualized EoC from a behavioral perspective only.

Figure 2 Escalation of Commitment as a Multidimensional Phenomenon



Behavioral commitment escalation describes the classical view of EoC as the behavioral tendency of decision-makers or groups of decision-makers to commit to failing courses of action. Behavioral commitment is directly observable and manifests as decisions, judgments, or recommendations. An example of behavioral commitment escalation is the funding recommendation to invest additional resources in a failing project (Eliëns et al., 2018).

Building on Binder (1985) who defined commitment from both behavioral and cognitive perspectives, I conceptualized escalation as having a cognitive dimension (mental or attitudinal escalation) in addition to the behavioral component. Cognitive EoC is the establishment of favorable attitudes in the decision-maker's mind towards the failing course of action. Those attitudes develop into cognitive patterns (mindsets and mental models) that produce behavioral commitment escalation. For instance, Weeth et al. (2020) found that departmental thought worlds determine escalating tendencies. Similarly, Lee et al. (2021) found evidence for the relationship between mindset types and EoC.

Besides behavioral and mental representations of EoC, previous research has pointed out the role of emotions in the context of EoC (Huang et al., 2019; Sarangee et al., 2019; Wong et al., 2006). Emotional commitment escalation describes the emotional factors and dynamics underlying behavioral commitment escalation. Similar to the cognition dimension, and given the reciprocal relationship between cognition and emotion, this dimension is not directly observable and was therefore located within the inner layer.

While rooted in individual and group decision-making processes, EoC can exist as relational and organizational structures reinforcing persistence (Sinha et al., 2012; Tang, 1988). Structural commitment escalation describes the structural manifestation of EoC, such as organizational processes that evolve into hard-to-change routines or organizational patterns of action with high levels of legitimacy. This form of commitment escalation can create structural path dependencies and inertial forces, reinforcing behavioral escalation. Hence, structural escalation commitment evolves passively on an organizational or environmental level as a function of repetitive behavioral commitment escalation.

2.2.1.3 Process Perspectives

For conceptualizing EoC, approaching the phenomenon through a process lens offers additional insights into its evolution and multifaceted nature. The lifecycle nature of EoC, which captures its inception, temporal progression, and eventual outcomes, is consistently emphasized in seminal works, particularly those of Brockner (1992) and Montealegre and Keil (2000). Hence, embracing frameworks that acknowledge this lifecycle view is crucial. For instance, through a detailed examination of an IT project, Mähring and Keil (2008) illustrated EoC as a phased evolution. Their findings show that EoC consists of a trajectory beginning with a drifting phase, transitioning through an incremental adaptation phase, and culminating in a rationalized continuation.

EoC's complexity may be best understood when examining the differential impact of determinants across various escalation stages. McCain (1986) underlined this

argument with a staged perspective, suggesting that factors like opportunity costs might hold prominence in the early stages, while psychological facets such as felt responsibility or project progression might gain traction as escalation advances. Similarly, Staw and Ross (1987) proposed that determinants, whether decision-centric, external, or individual, might exhibit variable relevance depending on the escalation stage. Supporting this, Sleesman et al. (2012) encompassed various determinants ranging from personal responsibility and market conditions to dispositions like optimism that may differ in their impact depending on the escalation stage.

Challenging conventional wisdom, McCain (1986) also posited that the much-emphasized sunk costs might not consistently influence escalation decisions. Further nuances emerge when considering the decision-making mode, with the voluntary selection of a faltering course differing in impact from assigned responsibilities. The "embedded rationality" concept further illuminates this, suggesting context-bounded rationality that varies with circumstances and escalation stages.

A comprehensive understanding of EoC demands consideration of myriad, sometimes conflicting processes. As shown by He and Mittal (2007), the factors influencing EoC dynamically shift based on project completion stages: initial stages emphasize project information, the intermediate phase accentuates decision risk, and the concluding stages foreground project completion. Brockner (1992) captured this dynamism, stressing the need to integrate diverse theoretical perspectives to grasp the nature of escalation behaviors across its stages fully.

2.2.2 Theories Explaining EoC

Several theories have been developed that explain the phenomenon of persistence with a failing course of action. The following table provides an overview of the most dominant theories associated with EoC, key constructs related to those theories, a description of how each theory explains EoC, and the resulting behavior that underlies this explanation.

Table 5 Theories Explaining Escalation of Commitment

Theory	Key Constructs	Explanation of EoC	Resulting Behavior
Self-Justification Theory	• Cognitive dissonance *(Festinger, 1957)* • Personal responsibility *(Staw, 1976)* • Internal & external self-justification *(Staw & Ross, 1987)*	Decision-makers commit resources to a failing course of action "because of their unwillingness to admit - to themselves and/or others - that the prior resources were allocated in vain." *(Brockner, 1992, p. 40).*	Self-justified behavior
Norms of Consistency	• Socialization *(Bandura, 1971)* • Modeling *(Bandura, 1977)*	Decision-makers commit resources to a failing course of action due to their perception that adhering to consistent behavior is socially desirable *(Staw & Ross, 1980).*	Behavior aligned with social norms
Prospect Theory	• Cognitive framing *(Kahneman & Tversky, 1979)* • Sunk costs effect *(Arkes and Blumer, 1985; Kahneman & Tversky, 1979)*	Decision-makers commit resources to a failing course of action because sunk costs and the framing of the decision leads to the perception of a choice between losses which evokes risk seeking (escalating) behavior *(Bazerman, 1984; Whyte, 1986).*	Risk-seeking behavior
Agency Theory	• Goal incongruency *(Jensen & Meckling, 1976)* • Information asymmetry *(Bauman, 1990)*	Decision-makers commit resources to a failing course of action because it is in their best self-interest due to goal incongruency and a condition of information asymmetry between them (agents) and their superiors / the organization (principles). *(Harrison and Harrell, 1993).*	Self-interested behavior
Approach Avoidance Theory	• Driving & restraining forces *(Brockner & Rubin 1985)* • Completion Effect *(Conlon & Garland, 1993)*	Decision-makers commit resources to a failing course of action when driving forces that encourage persistence (e.g. completion effect) outweigh restraining forces that encourage withdrawal *(Brockner and Rubin 1985).*	Behavior aligned with weighted forces
Expectancy Theory	• Valence, instrumentality, & expectancy *(Vroom, 1964)* • Subjective expected utility *(Vroom, 1964)*	Decision-makers commit resources to a failing course of action when this course of action is expected to carry the greater subjective expected utility based on the expectations about probability and value of potential goal attainment *(Vroom, 1964).*	Utility-motivated behavior
Decision Dilemma Theory	• Decision dilemmas *(Bowen, 1987)* • Equivocality *(Bowen, 1987)*	An escalation situation is a decision dilemma (not a decision error) in which decision-makers commit resources to a failing course of action to clarify equivocal information *(Bowen, 1987).*	Equivocality reducing behavior

2.2.2.1 Self-Justification Theory

Self-Justification Theory, grounded in Festinger's (1957) theory of cognitive dissonance, suggests that individuals naturally tend to rationalize and justify their decisions and behaviors (Staw & Fox, 1977). A decision-maker's goal under self-justification theory is not to achieve optimal economic outcomes but to "save face" and maintain a positive self-image. As outlined before, the notion of cognitive dissonance suggests that when an individual holds two or more cognitions that are contradictory, they will feel an unpleasant state (Festinger, 1957). In the context of EoC, choosing to withdraw forces individuals to admit that past decisions were incorrect, which induces cognitive dissonance. Hence, individuals may escalate their commitment to a failing project to resolve this state of cognitive dissonance created by conflicting beliefs or actions. Underlying this view is the assumption that decision-making itself can be seen as a psychologically binding act that shapes people's attitudes and beliefs. Festinger (1957) described this binding act as motivated states created by the act of decision-making that must be resolved or

justified through changes in attitudes and beliefs (Festinger, 1957). During the process of decision-making, individuals take on attitudes or beliefs that are consistent with their behavior. In the context of EoC, individuals commit more resources to a losing project when they are personally responsible for it because they "seek to rationalize their previous behavior (...) against a perceived error in judgement" (Staw & Fox, 1977, p. 432).

The assumption underlying Self-Justification Theory is that individuals may go "beyond the passive distortion of adverse consequences in an effort to rationalize a behavioral error." (Staw, 1981, p. 579). By committing new and additional resources, an individual who has suffered a setback could demonstrate the ultimate rationality of their original course of action. This focus on rectifying past behavior underlines that forces for justification can lead to a form of "retrospective rationality" meaning that costs or losses that have been incurred as decisions in the past are considered relevant to present decision-making. Empirical research supports the notion of retrospective rationality, showing that decision makers with higher justification needs seek (E. J. Conlon & Parks, 1987) and present (Caldwell & O'Reilly, 1982) more retrospective information that helps to justify their prior investment compared to prospective information about decision outcomes.

Within the theory of self-justification, one can further differentiate between internal (also called psychological) and external (also called social) self-justification. Decision makers may escalate their commitment to a failing course of action "not only because they do not want to admit to themselves that they made a mistake, but also because they may be especially hesitant to expose their errors to others" (Staw & Ross, 1987, p. 55). When faced with an external threat or evaluation, individuals are motivated to prove to others that they were not wrong in an earlier decision. Unlike the notion of self-justification as a primary intra-individual process (Blanton et al., 1997), this form of justification is directed externally. While internal self-justification is based on the need to be consistent and correct, driving self-esteem (Festinger, 1957), the external form relates to individual desires for social approval (Grimm, 2010).

A key concept under Self-Justification Theory is personal responsibility. Individuals with a high degree of personal responsibility for a previously chosen course of action (based on high psychological or economic investments) feel a greater need to justify the initial decision (Brockner, 1992; Staw, 1976). Since Staw's role-playing study in 1976, a plethora of empirical support for the effect of personal responsibility on escalating behavior has been accumulated (Sleesman et al., 2012, 2018).

Research has further shown the interaction of the sunk cost and the completion effect under Self-Justification Theory: The need to self-justify increase with the level of sunk costs and completion because individuals tend not to seem wasteful (Arkes & Blumer, 1985) and believe that it is socially desirable to finish what was started (H. Moon, 2001; Barry M. Staw & Ross, 1980).

In essence, when critically evaluating the status of the self-justification explanation, both Brockner (1992) and Sleesman et al. (2012) came to the

conclusion that Self-Justification Theory has merit as a central theory for explaining the escalation phenomenon.

2.2.2.2 Norms for Consistency

Norms for consistency refer to the social and cultural norms that influence individuals to maintain consistency in their decisions and actions (Staw & Ross, 1980). Individuals aim to align their behavior with prior commitments to avoid appearing indecisive or unreliable. Underlying is the lay theory that consistent actions signify effective leadership, particularly within business and government settings. For instance, Staw (1981) showed that consistent administrators are viewed as better leaders. This perception is acquired through socialization and modeling in business and governmental roles. Modeling describes a process where individuals imitate the behavior of others (Bandura, 1977). Individuals unconsciously model their behavior on successful peers, influenced by cultural and societal norms (Bandura, 1977). This effect may be time-dependent, as decision-makers model their behavior on prevalent leadership stereotypes (Gergen, 1976). Hence, following norms for consistency, in the context of EoC, individuals continue investing in failing projects because they believe consistency in action is an appropriate (socially desirable) form of behavior (Staw & Ross, 1980).

2.2.2.3 Prospect Theory

Prospect Theory, developed by Kahneman and Tversky in 1979, is a behavioral economics theory that explains how individuals make decisions under risk and uncertainty. According to this view, cognitive framing (Kahneman & Tversky, 1979) - the notion that people have different risk preferences for positive and negative outcomes - can explain escalation tendencies. Given loss aversion and the convex value function in the domain of losses, people are risk-averse when facing potential gains but risk-seeking when faced with potential losses. Hence, decision-makers allocate more resources to a failing course of action rather than accept a certain loss, thereby subjecting themselves to the risk of even greater negative consequences. Closely related to this perspective is the sunk cost effect. Sunk costs are costs (prior investments of money, effort, or time) that have already been incurred and cannot be recovered regardless of the final investment outcome. Although economists universally agree that sunk costs should be ignored, they continue to influence people's decision-making behavior over time, including decisions in escalation situations (Arkes & Blumer, 1985; Teger, 1980). In escalation situations, sunk costs influence present decision-making by invoking a choice between losses, which induces escalation tendencies.

Early on, some authors (Bazerman et al., 1984; Whyte, 1986) have argued that elements of the Prospect Theory like framing effects and the sunk cost effect might substitute the importance of personal responsibility as part of the self-justification explanation. According to Whyte (1986), the critical distinction between Self-Justification Theory and Prospect Theory is the role ascribed to personal responsibility in fostering commitment. Given the strong empirical evidence for the effect of personal responsibility, and given the results of the Davis and Bobko (1986) study, Brockner (1992) evaluated existing research as more supportive of

responsibility effects as part of self-justification theory compared to Prospect Theory. In his 1997 update on EoC, Staw concluded, based on competing empirical evidence regarding the sunk cost and the personal responsibility effect, that in the context of EoC, sunk costs may influence project decisions only when linked to the perception of progress on a course of action. It is also important to note that most empirical research finding the sunk cost effect responsible for escalation behavior deals with decision-making in single-choice scenarios. The sunk cost effect as part of Prospect Theory has further been discussed as a substitute for completion effects in explaining EoC. Garland (1990), for instance, showed that subjects' willingness to authorize additional resources for a threatened research and development project was both positively and linearly related to the proportion of the budget that had already been expended. More recent studies (e.g., Moon, 2000) converge on a complementary perspective of the sunk cost and the completion effect emphasizing the curvilinear influence on commitment.

2.2.2.4 Agency Theory

Agency Theory, introduced by Jensen and Meckling in 1976, explores the relationship between principals (e.g., shareholders) and agents (e.g., managers) and the potential conflicts of interest between them. Agency relationships have been defined as "a contract under which one or more persons engage another person to perform some service on their behalf which involves delegating some decision making authority to the agent" (Jensen & Meckling, 1976, p. 308). The theory emphasizes the separation of ownership and control in organizations and how agents might prioritize their self-interest over the best interests of the principals they represent in the presence of goal incongruence between principal and agent. Another key concept to self-interested behavior according to Agency Theory is information asymmetry: "The agent is assumed to have private information to which the principal cannot costlessly gain access" (Baiman, 1990, p. 343).

Applied to the context of EoC, agents (decision-makers) may escalate their commitment to a failing project to protect their reputation or career, even when it may not be in the best interest of the principles (shareholders or the organization as a whole) (Harrison & Harrell, 1993). This process arises when the decision-maker has or believes to have private information about the project's future performance and the principle is unable to thoroughly monitor the situation. Harrison and Harrell (1993) showed that those situations hold the potential for arising conflicting goals, as discontinuing the project might negatively affect the agent's future career opportunities. Consequently, decision-makers escalate their commitment to a failing project because they believe to possess private information about the project and that discontinuing would not be in their best self-interest as it might harm their career (Harrison & Harrell, 1993).

2.2.2.5 Approach Avoidance Theory

Approach-Avoidance Theory explains the conflict that arises when individuals are simultaneously attracted to and repelled by the same goal or decision (Rubin & Brockner, 1975). In an approach-avoidance conflict, the decision maker has to weigh the positive and negative attributes in order to decide which is stronger—the

need to approach or the need to avoid (Rubin & Brockner, 1975). Applied to the context of EoC, individuals may be attracted to the potential success of a project but also repelled by the idea of accepting failure. Within this internal conflict individuals oscillate between the desire for success and the aversion to failure. Persisting with failing courses of action results when driving forces that encourage persistence outweigh restraining forces that encourage withdrawal (Brockner & Rubin, 1985).

While compared to Self-Justification and Prospect Theory, the approach-avoidance perspective received limited academic attention in the context of EoC, some researchers argue that it may act as a foundation to consolidate different escalation theories into one model (Keil et al., 2000; Pan et al., 2006). One example of this integration is the relation of the Approach-Avoidance Theory with the completion effect: Key driving forces that can overshadow restraining forces in an approach-avoidance conflict are the cost of withdrawal, ambiguity, the size of the reward of goal attainment, and the proximity for goal attainment (also labeled completion effect) (Pan et al., 2006).

Given that achieving a task closure or completion influences human behavior, the completion effect predicts that the "motivation to achieve a goal increases as an individual gets closer to that goal" (Conlon & Garland, 1993, p. 403). Hence, following the goal completion effect, EoC can be explained by the motivation to complete a task that has already been started and is perceived to be near completion. The "pull on the individual (...) relates to benefits to be received in the future" (Mann, 1996, p. 46) and can therefore take the form of prospective rationality. The academic discourse about the potentially conflicting frameworks of sunk costs and the completion effect for explaining EoC were integrated by Moon (2001), emphasizing their interaction.

2.2.2.6 Expectancy Theory

Expectancy Theory, developed by Vroom (1964) explains motivation in decision-making based on the belief that people are driven by the expectation that their efforts will lead to desired outcomes. According to this view, the intensity of a tendency to behave in a particular manner is dependent on the intensity of an expectation that the behavior will be followed by a definite outcome and on the appeal of the outcome to the individual (Vroom, 1964). Hence, this view models behavioral motivation as a function of valence, instrumentality, and expectancy. Valence summarizes all possible affective orientations toward outcomes and can be interpreted as "the importance, attractiveness, desirability, or anticipated satisfaction with outcomes" (Van Eerde & Thierry, 1996, p. 576). Instrumentality consisting of the relationship between outcomes and the probability of obtaining an outcome and expectancy is defined as a subjective probability of an action or effort leading to an outcome or performance (Vroom, 1964).

In the context of EoC, individuals may persist in a failing project because they hold a high expectation that their continued efforts will eventually lead to the desired goal or successful completion. Hence, by assessing the probability as well as the value of potential goal attainment, the decision-maker chooses to increase

commitment as this course of action is expected to carry the greater subjective expected utility. The underlying theory of subjective expected utility posits that individuals make decisions based on their subjective assessment of the probabilities of various outcomes and the utility or value they place on those outcomes. Similar to the Approach Avoidance Theory, subjective expected utility models of behavior posit that the individual is prospectively rational, seeking to maximize future utility. The expectancy explanation is in line with empirical research showing that escalating behavior is particularly high when the cause for the current negative feedback is non-recurring (Staw & Ross, 1978) and when decision makers with high rather than low self-efficacy (Whyte et al., 1997) have a prior history of success (Bragger, 2003; Wong et al., 2005) and internal rather than external locus of control (Singer & Singer, 1986).

2.2.2.7 Decision Dilemma Theory

According to the Decision Dilemma Theory, initially discussed by Bowen (1987), decision-makers escalate their commitment not necessarily in failing conditions but under conditions of equivocality. Equivocality refers to the uncertainty of information where feedback high in equivocality provides ambiguous information and feedback low in equivocality provides clear information.

Instead of seeing EoC as a decision-making error, the equivocality explanation as part of the Decision Dilemma Theory views an escalation situation as a decision dilemma in which escalation is a means to clarify equivocal information. Accordingly, decision-makers persist with a failing course of action in the face of uncertainty because they seek more information to make sense of the highly uncertain situation. By persisting, the decision-makers can gather this type of information and use it in future decision-making.

Brockner (1992, p.52) summarized those explanations in contrast to the Self-Justification explanation: “The tendency to persist with the previous course of action may stem not from the need to justify the correctness of previous decisions, but rather from any or all of the following motives: (a) economic considerations, (...) (b) curiosity (...), (c) the need to make a greater effort to see if it will bring the project to fruition, or (d) to learn about the phenomenon.”

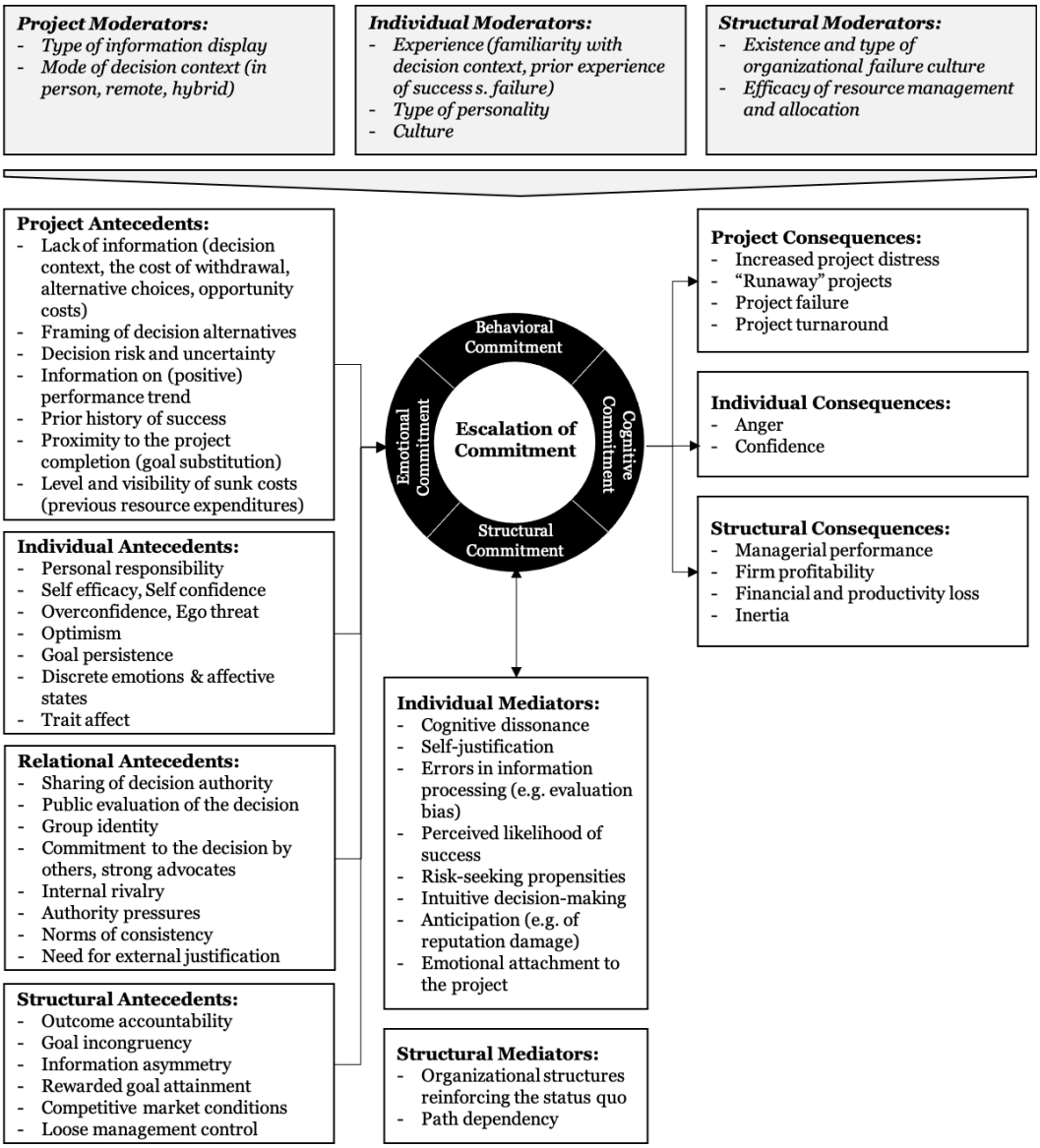
Empirical research in support of this rational view on EoC showed that when manipulating equivocality of feedback in escalation situations, decision-makers who received low equivocality feedback did not escalate allocations, while decision-makers who received high equivocal feedback escalated allocations (Brecher & Hantula, 2005). However, conflicting evidence points towards Brockner’s (1992) counterargument that persistence is not based on economic considerations (Brockner & Rubin, 1985; Garland, 1990) and that in an escalation situation, the feedback is usually experienced as negative, hence unequivocal (Conlon & Parks, 1987).

2.2.3 Nomological Net of EoC

In this section, I provide an overview of antecedents, moderators, and mediators of EoC based on a systematic review of existing empirical literature in psychology, management, and IS outlets with a focus on cognitive and emotional factors.

Staw and Ross (1987) discussed project, psychological, social, and structural (later termed organizational) determinants that could trigger EoC. Based on the same categories, Sleesman et al. (2012) evaluated the plethora of existing antecedent factors in their meta-analytic review and later added a synthesis of contextual factors (Sleesman, 2018). Building on those insights and categories, I integrated the rich but highly fragmented body of EoC research using 230 papers related to EoC in the context of project distress from IS, business psychology, psychology, and management outlets into a nomological net that exceeds the prior focus on determining factors (Marx & Uebernickel, 2022). Figure 3 shows the nomological net based on an updated analysis, including studies from 2022 and 2023. In the following, I will briefly introduce elements of the nomological net which are not directly related to cognitive or emotional dimensions. Given the scope and purpose of this dissertation, I will then discuss in more detail the relevant elements within the nomological net related to cognition or emotion.

Figure 3 Nomological Net - Escalation of Commitment



Elements within the nomological net, unrelated to cognitive or affective dimensions, are observable in antecedents and moderators, mainly in the structural categories. These elements are influenced by the organization's characteristics and its external environment, often amplifying or moderating tendencies toward persistence. Examples include structural antecedents like organizational reward systems centered around outcome instead of process accountability (Booth & Schulz, 2004), information asymmetries across stakeholders related to organizational structures (Berg et al., 2009), and competitive market conditions (Hsieh et al., 2015). Structural elements have further been investigated as mediators, explaining the underlying organizational mechanisms that result in structural EoC. For instance, organizational structures reinforcing the status quo and general path dependency have been identified as mechanisms through which EoC unfolds in organizations (Sydow, 2009).

2.2.3.1 Cognitive Elements within the Nomological Net

Given that EoC can be labeled a cognitive bias and most theories used to explain EoC are based on concepts from cognition research like cognitive framing or cognitive dissonance (see Chapter 2.1), it is not surprising that most elements within the nomological net indirectly or directly relate to the cognition of the decision-maker.

Indirect Links to Cognition

While *project antecedents and moderators* are not, per se, cognitive elements but rather relate to decision characteristics, they determine escalation behavior mainly through cognitive mechanisms like rationalization or biased information processing. Project antecedents are situational and incorporate components or characteristics of the decision situation and the way those particularities are displayed. Related to errors in information processing, research consistently shows that the availability of information, whether it's related to decision-making contexts (Moon et al., 2003), implications of withdrawal (Schultze et al., 2012), or opportunity costs (Northcraft & Neale, 1986), can amplify EoC. In particular, information on positive performance trends (Brockner et al. 1986) and a prior history of success (Bragger, 2003) can lead to behavioral EoC. The type and form of information display and the framing of the decision alternatives can further moderate the effects of antecedent factors on EoC (Davis & Bobko, 1986; Schoorman & Champagne, 1994). For instance, Behrens and Ernst (2014) found that the personal responsibility effect is accelerated when the information about the project is based on text compared to when it's visualized with graphs. Two other examples with temporal relevance are the moderating effects of project management methodology, for instance, studied by Klingebiel and Esser (2020), who showed the escalation effect of employing a stage-gate-process, and face-to-face versus virtual communication mode (Schmidt et al., 2001).

Another theme in empirical EoC research indirectly related to the cognition of the decision-maker addresses the characteristics of the *decision situation.* For instance, high decision risk and uncertainty have been found to accelerate EoC (John Schaubroeck & Davis, 1994). Most prominent in this category is the amount of previous resources invested in the course of action, which has been found to increase escalation tendencies, particularly at the beginning of escalation processes (Arkes & Blumer, 1985; Conlon & Garland, 1993; Fukofuka et al., 2014). Besides the level of sunk costs, also the degree of completion influences EoC, most probably while interacting with the effects of sunk costs (Conlon & Garland, 1993; Moon, 2000).

Direct Links to Cognition

More closely linked to cognition are several antecedents and moderators based on relational or individual factors. Centered around the decision-maker, the category of *relational antecedents* summarizes group-level and relationship-oriented determinants that acknowledge the role of social factors. Evidently, both the interpersonal level and the broader socio-cultural environment significantly shape escalation tendencies. For instance, the sharing of decision authority has been

shown to boost escalating tendencies, as indicated by McNamara et al. (2002). Moreover, when individuals publicly commit to an initial decision or when there is a need for external justification, the tendency to escalate becomes stronger, as suggested by studies from Bobocel and Meyer (1994) and Steinkühler et al.(2014). Social pressures, whether they originate from social norms, authority figures, internal rivalries, group identity, or strong project advocates, can heighten commitment to projects that may be seen as questionable from an external viewpoint (Chong & Syarifuddin, 2010; Huang et al., 2019). Cognition-related interpersonal effects can even amplify EoC when aiming to de-escalate commitment: In four experiments, Gunia et al. (2009) showed that given a division of responsibility (the most suggested de-escalation strategy based on the personal responsibility effect), escalation tendencies can "spill over" from the one responsible for the sunk costs to the one deciding about further committing to the failing course of action through psychological connectedness (perspective-taking, shared attributes, and interdependent mindsets).

On the *individual level*, personal attributes, interpersonal differences, and motivational tendencies of the decision-maker emerge as escalation antecedents linked to cognition. Within this category, accountability, or the sense of personal responsibility for an initial course of action, is often considered the strongest influencer of intensified commitment (Arkes & Blumer, 1985; Sleesman et al., 2012) that has been directly linked to the cognition of the decision-maker.

Another factor within the domain of personal differences is the effect of extrinsic in comparison to intrinsic motivation on escalation tendencies. While Gimeno et al. (1997) found that intrinsic motivation altered the willingness of entrepreneurs to persist with a failing business, DeTienne et al. (2008) found a relationship between extrinsic motivation and EoC.

Moreover, attributes of the decision-maker such as self-efficacy, as explored by Liang (2019), confidence, highlighted by Jackson et al. in 2018, and overconfidence, studied by Ronay et al. in 2017, significantly influence EoC. For instance, Yang et al. (2023) found in a mixed-method study that the de-escalating effect of open innovation on manager's EoC to NPD projects is mediated by managerial efficacy. Similarly, Sivanathan et al. (2008) found that individuals with few affirmational resources (low self-esteem) tend to escalate commitment more than individuals with high self-esteem. In addition, individuals with a higher level of creativity are more likely to escalate their commitment than those with lower levels of creativity (Roetzel, 2015).

In general, personality characteristics have been marginally addressed in the extant EoC literature (Wong et al., 2006). One exception is the study by Schaubroeck and Williams (1993), who found that individuals with a type A personality are more likely to escalate commitment than those with a type B personality. Another exception is a recent study by Shertzer and Brender-Ilan (2023, p. 4), who showed how extraversion affects EoC through the mediation of sensation-seeking and how hubris - "describing individuals who display arrogance and impudence stemming

from pride and excessive self-confidence" moderates the effect of sensation-seeking on EoC.

Along the same lines, researchers investigating personal dispositions and traits related to escalation tendencies found significant influences of general optimism, strong goal persistence, and a drive for achievement (Aspinwall & Richter, 1999). Further, efforts to uphold one's reputation and image in difficult situations can amplify EoC (Shi et al., 2021; Zhang & Baumeister, 2006). Attributes of the decision-maker, like personal experiences, professional ability, and cultural background, have also been investigated as moderators related to the cognitive dimension of EoC (e.g., Gomez et al., 2013; Schaubroeck & Williams, 1993).

Cognition

While most elements within the nomological net either indirectly or directly *relate* to the cognition of the decision-maker, there exists a third category that incorporates studies explicitly investigating cognitive concepts or processes in the context of EoC, either as determining factors or as underlying mechanisms explaining behavioral effects.

Particularly when it comes to understanding the mechanisms that *mediate* the effects of antecedent factors on behavioral commitment escalation, cognitive concepts and processes lie at the center of the empirical investigation. Mediators include attribution errors and errors in information processing (Staw & Ross, 1978), general evaluation bias (Schultze & Schulz-Hardt, 2021), biased risk assessments (He & Mittal, 2007; Wong et al., 2005), cognitive dissonance and related justification (Beauvois & Joule, 1982; Bobocel & Meyer, 1994), retrospective cognition (E. J. Conlon & Parks, 1987; Staw, 1981), mindsets or belief structures (Lee et al., 2021; McMullen & Kier, 2016; Sleesman, 2019; Weeth et al., 2020), and thinking styles (Eliëns et al., 2018; Wong et al., 2008).

For instance, Schultze et al. (2012) showed that the evaluation of the previously sought information is biased among participants responsible for initiating the course of action. This evaluation bias in favor of reinvestment partially mediates the responsibility effect on escalation and can be categorized within general errors in information processing. In line with this view, Bonney et al. (2014) found that the escalating triggers increase the perceived likelihood of success and thereby encourage EoC to the failing course of action. In another study on errors in information processing, Van Oorschot et al. (2011) found that different types of information filters enabled EoC in group settings. Amplified in group settings, the failure to take perspective given different opinions in decision-making groups can lead to "pluralistic ignorance" as a cognitive mechanism underlying escalation behavior (Moon et al., 2003; Westphal & Bednar, 2005).

When studying factors contributing to or explaining EoC, empirical research has also investigated the importance of cognitive constructs related to belief structures, mindsets, and thinking styles. McMullen and Kier (2016), for instance, researched the impact of specific mindset types on EoC, arguing that opportunity-seeking in a promotion-focused state of goal striving prevents the formation of an exit strategy and delays the detection of an action crisis, making disengagement in an escalation

situation particularly difficult. Similarly, Weeth et al. (2020) uncovered the different effects of managers' belief structures in the form of departmental thought worlds on EoC. Delving more deeply into the underlying individual cognitions, empirical research has shown that overall, a growth compared to a fixed mindset affects anticipated regret about project failure and anticipated likelihood of project success in a way that behavioral escalation tendencies are increased (Lee et al. 2021). Moreover, "the extent to which [individuals] accept and are energized by tensions" produced by an escalation situation - a paradox mindset - has been found to alter escalation tendencies through the association with optimism (Sleesman, 2019, p. 83). While the general influence of thinking styles in escalation situations is evident, the effect directions of rational thinking in comparison with intuitive thinking styles have been debated: Wong et al. (2008) showed that a rational (compared to an intuitive) thinking style ability increases beliefs in prior decisions, which in turn amplify escalation. Eliens (2018), on the other hand, provided empirical evidence for the opposite effect, showing how rational thinking can decrease escalation tendencies.

Besides the body of research related to the cognitive mechanisms behind the personal responsibility effect, researchers have analyzed cognitive biases such as framing as a mechanism or moderator underlying EoC (Bazerman, 1986; Whyte, 1986). Heng et al. (2003), for instance, looked at optimistic frames of feedback in combination with the effects of accountability stemming from personal responsibility from a motivational perspective. Based on action-inaction framing, Feldman and Wong (2018, p. 537) offered a new perspective on EoC, showing that "negative feedback results in the tendency to take action, regardless of what that action may be". Besides cognitive framing, key cognitive biases that can promote escalation behavior directly and through the failure to recognize the significance of the problem are selective perception and illusion of control (Keil et al., 2007).

2.2.3.2 Affective Elements Within the Nomological Net

Given the importance of emotions to the decision-making process, it is surprising that the emotional component of EoC has been largely overlooked in escalation research. In comparison with the overall academic EoC discourse in general, and with cognition-centered studies in particular, the body of research that focuses on emotional factors is comparatively small, scattered across disciplines, and in parts contradictory.

Links to Emotions

Several studies explored the role of emotions for EoC in an indirect way, making use of broader concepts entailing emotional elements. In the context of family businesses, for instance, Chirico et al. (2018) identified *emotional ownership* - the strong attachment and identification with the business - as a key determinant for escalating behavior. Related to anticipated emotional responses, Shepherd et al. (2009) developed propositions about the effect of *emotional costs of failure* on persistence in the context of business failure, arguing that by occurring before and after a failure event, emotions significantly impact the emotional recovery after failure. Other research streams have looked at emotional intelligence and the role

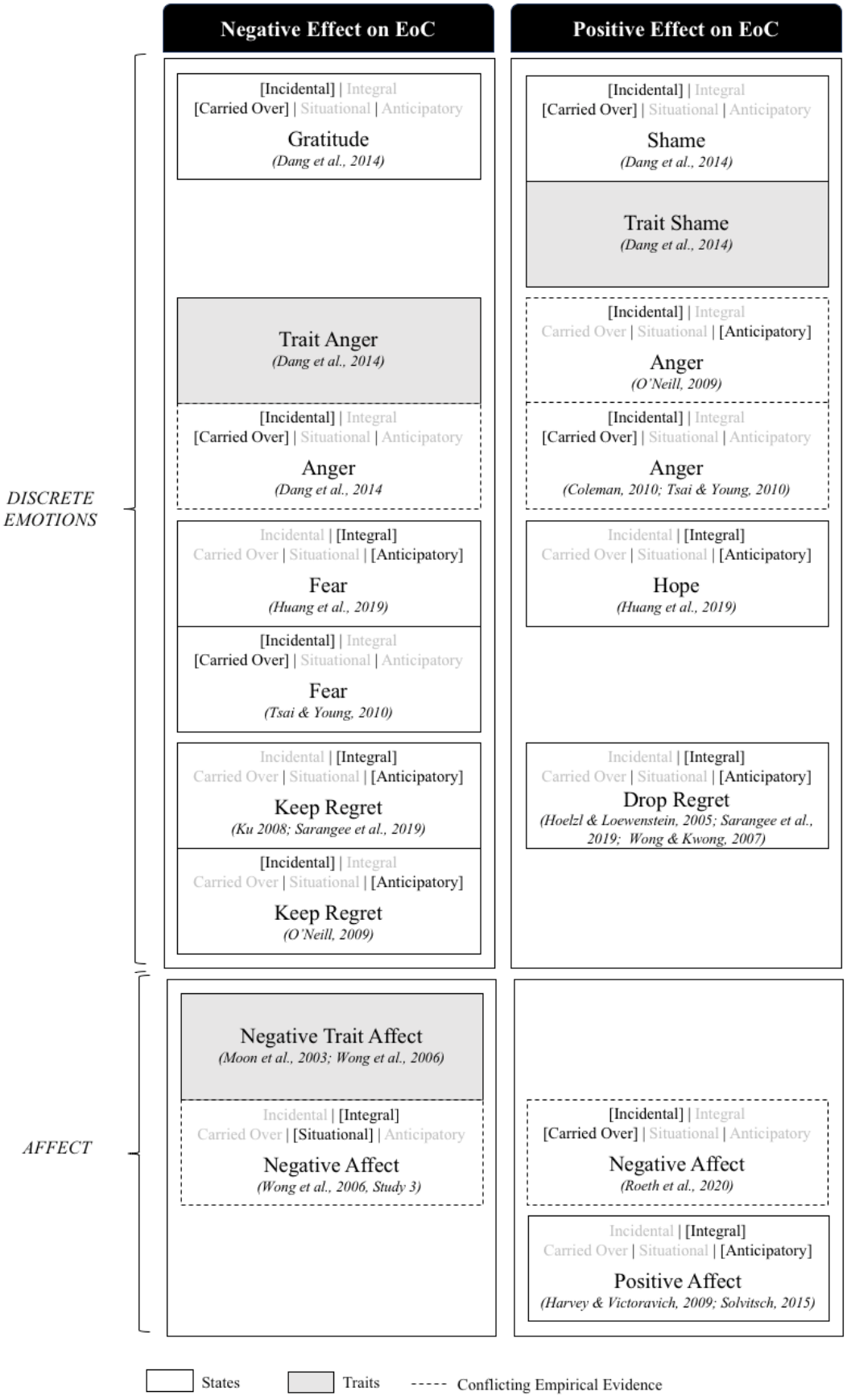
of emotion regulation during escalation situations (Boland & Ross, 2010; Rekar et al., 2023).

Emotions

Compared to individual or relational cognitive processes and characteristics of the decision-maker, a relatively small discourse has directly investigated the escalating or de-escalating effects of affective constructs like discrete emotions. As untangling the emotional factors of EoC is key to this dissertation, and the current research on the emotional aspects is both sparse and scattered, I will discuss and interpret the results from this research field in more depth.

Figure 4 visualizes the synthesis of existing empirical studies investigating affective effects on EoC behavior. I have grouped the studies in columns according to the effect direction of behavioral escalation tendencies: Positive (escalating) effect and negative (de-escalating effect). The figure further uses the affective concept differentiations (trait vs. state; integral vs. incidental; carried-over vs. situational vs. anticipatory) introduced in Chapter 2.1.2 to organize the literature. The categorization and detailed breakdown is imperative for advancing the current academic state for the following reasons. Firstly, it helps disentangle seemingly contracting findings and reveals empirical contradictions and blind spots. For instance, as a basis for modeling their hypotheses on escalation over time, Jackson et al. (2018, p.4) claimed that "Strough et al. (2016) found that negative affect is positively related to willingness to cancel a failing plan". However, while Strough et al.'s (2016) study gained novel insights about age differences in escalation situations in general, and the de-escalating effect of the "thoughts and feelings intervention" in particular, the indirect pathway through negative affect was not significant. Second, the detailed categorization naturally evolves from the complex nature of emotions and the conceptual as well as consequential differences different types of emotions yield (see Chapter 2.1.2). It is necessary, for instance, to differentiate the results of studies on negative affect and those that investigate discrete emotional states. The conceptualization further requires a differentiated view on studies that look at integral in comparison to incidental emotions, or studies that investigate anticipatory emotions in comparison to situational or carried-over emotions. Careful differentiation is further needed when interpreting results from studies examining trait affect, which differs significantly from affective states. And thirdly, taking the example of regret, even between studies seemingly investigating the same higher-lever emotion, further differentiation - in this case into "keep-regret" and "drop-regret" - fundamentally changes the interpretation of the effect direction on escalating behavior.

Figure 4 The Effect of Discrete Emotions and Affect on EoC



The effects of discrete emotional states, affective states, and trait affect on escalation or de-escalation tendencies are both complex and under-researched. However, based on a systematic literature search, I could identify 14 studies published between 2003 and 2020 that found significant effects of one or more affective constructs on escalation or de-escalation behavior in different contexts (Coleman, 2010; Dang et al., 2014; Harvey & Victoravich, 2009; Hoelzl & Loewenstein, 2005; Huang et al., 2019; Ku, 2008; Moon et al., 2003; O'Neill, 2009; Roeth et al., 2020; Sarangee et al., 2019; Tsai & Young, 2010; Wong & Kwong, 2007; Wong et al., 2006). Studies like Strough et al. (2016), and Jackson et al. (2018) that investigated affect but did not find a significant effect on EoC were not included in the overview.

Three studies showed significant effects of *trait affect* on EoC: While trait shame increases escalation tendencies (Dang et al., 2014, Study 1), trait anger (Dang et al., 2014, Study 1) and negative trait affect (Moon et al., 2003; Wong et al., 2006, Study 1 and 2) have a de-escalating effect.

When looking at the influence of *affective states* (negative affect and positive affect), empirical findings yield mixed results. Here, it is particularly important to identify the classification categories for each study to interpret the findings adequately.

One of the first exceptions acknowledging the role of affective states in EoC research was a study by Wong et al. in 2006. While in the first experiments within this study, the authors showed the effects of negative trait affect, in the third experiment, Wong et al. (2006) found that negative situational affect stemming from the decision situation itself discourages individuals from further investing in the troubled project, hence showing that negative affect triggers de-escalating coping mechanisms.

In 2009, Harvey and Victoravich made two valuable extensions to Wong et al. (2006). First, using the positive affect negative affect scale (PANAS) measure (Watson & Clark, 1994), they investigated both negative and positive affect within the same study. And second, they shifted their focus from situational to anticipatory affect regarding the success of the existing project. Harvey and Victoravich (2009) were able to provide empirical evidence for the mediating effect of anticipatory affect between uncertainty and EoC. They found that uncertainty concerning an ongoing course of action promotes negative anticipatory emotions discouraging further investment in the existing project. On the other hand, a low level of uncertainty promotes positive anticipatory emotions that strengthen a decision maker's commitment in the hopes of realizing these anticipated emotions. Building on these findings, Solvitsch (2015, p.106) found additional empirical evidence for the escalating effect of positive anticipatory emotions, showing that "participants who anticipated more positive emotions about completing the investment were significantly more likely to allocate additional funds toward finishing the project".

Contrary to the notion that positive anticipatory affect encourages further escalation (Harvey & Victoravich, 2009; Solvitsch, 2015), while situational negative affect produces de-escalation tendencies (Wong et al., 2006, Study 3), a

recent study found evidence for escalation promoting effects of negative affect. In 2020, Roeth et al. showed that carried-over decision-unrelated negative affect induced by a writing exercise strongly influences the decision to escalate commitment further when using a rational decision-making style. In the same vein, positive carried-over affect, when paired with an intuitive decision-making style, can reduce a decision-maker's EoC. Those findings are surprising given that intuition is often associated with decision-making biases like EoC and that previous research generally supported the opposite effect of affect on EoC. Notably, Roeth et al. (2020) investigated carried-over, incidental affect, whereas prior research has looked at situational (Wong et al., 2006, Study 3) and anticipatory (Harvey & Victoravich, 2009; Solvitsch, 2015), integral affect.

Another stream of affective EoC research has shifted from a valence-based approach to investigating the effects of the discrete emotions anger (Coleman, 2019; O'Neill, 2009; Tsai & Young, 2010), fear (Huang et al., 2019; Tsai & Young, 2010), hope (Huang et al., 2019), shame (Dang et al., 2014), gratitude (Dang et al., 2014), and regret (Hoelzl & Loewenstein, 2005; Ku, 2008; O'Neill, 2009; Sarangee et al., 2019; Wong & Kwong, 2007). Here, one can again differentiate between carried-over or anticipatory and between integral or incidental emotions.

Carried-over emotions are, in most cases, unrelated to the current decision scenario and stem from a past event; hence, they have been carried-over to the current situation. Several studies have shown how such incidental emotions influence escalation behavior. For instance, while carried-over incidental shame (Dang et al., 2014) has been found to increase subsequent escalation tendencies, carried-over incidental gratitude (Dang et al., 2014) and fear (Tsai & Young, 2010) have the opposite effect and decrease escalation tendencies. Tsai and Young (2010) not only investigated the role of fear but were primarily interested in comparing fear with anger. They found that while anger and fear both have negative valence levels, they differ in their effect direction and strength given their different appraisals: The escalating effect of carried-over incidental anger is stronger than the de-escalation effect of carried-over incidental fear. The escalating effect of carried-over anger was further supported by Coleman in 2010, who revealed that anger increased the magnitude of the sunk cost effect on escalating commitment in the context of education. However, the results did not reveal any effect of carried-over fear. Contradicting the results of Coleman (2010) and Tsai and Young (2010) regarding the role of carried-over, unrelated anger, Dang et al. (2014, Study 2 and 3) found that carried-over incidental anger decreases escalation tendencies. Anger was induced similarly in both studies by asking participants before the decision task to describe past events that made them feel angry. However, Dang et al. (2014) point out in their discussion that given the different experimental procedures, participants in Tsai and Young's (2010) study might have had a weaker sense of personal responsibility. Consequently, in the studies that showed an escalating effect of carried-over anger, the "relevance of the responsibility dimension to escalation situations is blocked, and the appraisal dimensions related to risk perception will most directly influence escalation of commitment" (Dang et al., 2014, p. 386).

Besides trait affect, affective states, and carried-over emotions, also *anticipatory emotions* influence behavioral escalation tendencies. Anticipatory emotions are emotional responses to the possible outcomes of prospective events (Ortony et al., 1988). The influence of anticipatory emotions shows that decision-makers consider not only retrospective and situational factors but also prospective factors like the anticipation of emotions when making EoC decisions. Greitemeyer et al. (2011) underline the general relevance of anticipatory emotions for decision-making, showing that in unchangeable situations (like EoC scenarios), people have more extreme anticipatory emotions, which partially explains why they try to actively change those situations instead of withdrawing. The review of existing literature revealed six empirical studies that reported significant results of anticipatory emotions on escalation or de-escalation tendencies. Also here, I differentiate between incidental and integral emotions for an adequate interpretation of results. Investigating anticipatory emotions that stem from anticipating a future event unrelated to the decision context (i.e., incidental), O'Neill (2009) found that anticipatory anger increases escalation tendencies, while anticipatory keep-regret de-escalates commitment. Regret "is a negative, cognitively based emotion we experience when realizing or imagining that our present situation would have been better, had we decided differently" (Zeelenberg, 1999, p. 93). Given the number of empirical studies and the consistency of findings, the effect of regret as an anticipatory emotion on EoC is relatively well-researched within the overall small affective EoC discourse. Anticipatory regret also affects escalation tendencies when the emotion is directly related to anticipating a decision outcome (i.e., integral regret). Anticipatory regret in anticipation of persistence with the current course of action (integral anticipatory keep-regret) reduces escalation tendencies (Ku 2008; Sarangee et al., 2019). On the other hand, multiple empirical studies have shown that anticipatory integral drop-regret - the anticipatory feeling of regret as an emotional response to the prospective withdrawal from the current course of action - propels escalation tendencies (Hoelzl & Loewenstein, 2005; Sarangee et al., 2019; Wong & Kwong, 2007). Besides anticipatory anger and regret, hope and fear as emotional responses to the anticipation of decision outcomes significantly influence the behavioral tendency to persist with failing courses of action. In a study about EoC to a failing venture, Huang et al. (2019) compared the effects of hope and fear on escalation tendencies in a group setting. The results not only confirm that hope is associated with escalation and fear is associated with de-escalation but further show that "the relationship between group hope and escalating commitment to a failing venture is stronger than the relationship between group fear and terminating that venture" (Huang et al., 2019, p. 1852).

In general, the in-depth discussion of existing empirical findings shows that the role of affect in EoC is more *relevant* and more *complex* than assumed.

There is consensus in the presented studies that emotions play a key role in EoC. Investigating the decision-maker's state affect and discrete emotions is particularly suited to answer the academic quest to understand the mechanisms behind behavioral theories of EoC and the plethora of antecedent factors that have been found to accelerate behavioral escalation. However, despite its theoretical potential

and relevance-related consensus among affective EoC researchers, the role of emotions is still overlooked outside psychological outlets.

Despite the long history of EoC research, the subfield investigating the role of affect in the context of EoC is still in its infancy. With a total of 14 academic, peer-reviewed journal papers showing a significant effect of affective constructs on EoC, the subfield of affective EoC research is relatively small compared to the number of studies investigating behavioral or cognitive elements of EoC. Still, this small number of studies has made significant contributions to EoC research. Most empirical support (measured in the number of supporting studies) exists for the de-escalating effect of drop regret, further supported by Sleesman's (2012) meta-analytic review.

However, there are still inconsistencies and blank spaces to be explored. For instance, with one exception (Wong et al., 2006, Study 3), all studies look at carried-over or anticipatory emotions. Hence, there is a lack of insights regarding situational emotions that arise from the decision situation itself, and several discrete emotions like happiness, sadness, or surprise are not researched at all. Moreover, the insights are skewed toward negative affect and negative discrete emotions compared to positive affective states.

In addition, the analysis clearly shows that the effect of emotions of EoC is not an isolated one. Emotions interact with antecedent factors like uncertainty, personal responsibility, the amount of sunk costs, experience, or age and are related to EoC mediators like risk perception, retrospective or prospective cognition, selective attention, or decision-making style. The analysis further demonstrates the limitations of the valence-based approach supported as both positive and negative emotions can lead to escalation and de-escalation. However, despite this complexity and the apparent interrelatedness of emotional elements within the nomological net around EoC, most analyzed studies look at one affective construct or compare two constructs in isolation (Dang et al., 2014 is one of the few exceptions).

Additional blank spots arise, given the different decision scenarios, experiment procedures, and measurement techniques employed in the existing studies. This makes it challenging to compare across studies, making additional research investigating multiple affective constructs within one study essential. Further, all studies rely on variations of self-report scales of affective states, which may be subject to subjective biases and hardly capture underlying, unconscious emotional states and their changes over time. Given the inconsistencies in empirical findings, the outlined blank spots, and the difficulties of comparing the empirical studies, it is surprising that none of the studies uses physiological measures of affective constructs or employs other technological advancements that help improve the internal validity and reliability of capturing emotions.

Moreover, with few exceptions (e.g., Huang et al. 2019), the research discussion is so far limited to psychology and managerial psychology outlets. The overall trend that EoC is increasingly studied in management and IS outlets (Marx & Uebernickel, 2022) has not reached the affective EoC discourse (yet). Given the

blank spaces and the inconsistencies yielded by empirical research, there seems to be a mismatch in maturity between the subfield of affective EoC research and general EoC research.

The previous analysis of existing research further yields insights regarding the temporal development of the described subfield. Wong et al. (2006) were the first to investigate affective states in the context of EoC in an experimental setting after Moon et al. provided evidence about trait affect in 2003. This is surprisingly late, given that the study of EoC looks back to decades of research in psychology and management with a starting momentum in the 1970s. Even with the following shift from the valence-based approach toward discrete emotions, all following papers in the analyzed sample reference Wong et al. (2006) as a basis for their study. Most recently, the increasing incorporation of cognitive appraisal theory within the hypothesis development and the discussion of results might mark another shift in this subfield. Following this trend, the next step would be an even more integrative approach acknowledging the reciprocal relationship between affect and cognition.

2.3 EoC in Managerial Practice

2.3.1 EoC & IS Project Distress

The consequences of escalating commitment to a failing course of action not only depend on the characteristics of the decision-maker and the outlined antecedent factors but also on the general context of the escalation situation. Hence, it is crucial to define what it is that the decision-maker is escalating their commitment to (e.g., people, projects, products, or strategies) and what type of choice they are facing (e.g., continuation, allocation, or evaluation) within the given decision environment (e.g., relationships, sports, military operations, politics, or corporate organizations).

As outlined by Berente et al. (2022, p. 640), the "persistent commitment to troubled projects is evident across the globe". For instance, EoC is an ongoing problem in public and private projects ranging from smaller-scale to large-scale - so-called "mega" - projects that require significant infrastructure components. Mega projects are often considered "too big to fail and too costly to stop" making them particularly prone to EoC (Cornelio et al., 2021, p. 774). The German Berlin-Brandenburg Willy Brandt Airport which opened in 2020 being $4.5 billion over budget and 10 years behind schedule shows how EoC contributes to entrapping decision-makers in mega projects that are considered too big and too costly to fail (Chazan, 2020). One of the largest application areas of EoC can be found in innovation research. Examples include Yang et al. (2020), Oorschot et al. (2011), Lee et al. (2018), Weeth et al. (2020), and Klingebiel and Esser (2020) who analyzed EoC to troubled new product development (NPD) projects. Besides EoC to projects or new products, researchers have also investigated EoC to failing organizational strategies (Matthyssens & Pauwels, 2000; Sinha et al., 2012), ventures (Devigne et al., 2016; McCarthy et al., 1993; Nouri, 2020; Yamakawa &

Cardon, 2017), financial investments (Beshears & Milkman, 2011; Elfenbein et al., 2017), and personnel (Coppens & Knockaert, 2021; Zorn et al., 2020).

When looking at how EoC has been studied in management and IS outlets, besides EoC to NPD projects, EoC to IS projects is the most dominant theme. Here, "EoC manifests as the commitment to failing, troubled, runaway, or unprofitable projects in general, and to distressed IT, IS, and software development projects, in particular" (Marx & Uebernickel, 2022, p. 2424). Given the scope of this dissertation, in the following, I will analyze existing studies on EoC to distressed IS projects in an organizational context in more depth.

Prominent examples of troubled large-scale IS projects from the public sector include the Canadian "Phoenix Pay" system (Cooper & Turgeon, 2021) or England's NHS paperless system (Armstrong, 2017). One of the first and most cited examples in this context is the $500 million "Taurus" IT project initially aiming to transfer settlements from the London Stock Exchange to an automated system that collapsed in 1993 (Drummond, 1996).

Also in an organizational context, EoC to distressed IS projects is a persistent problem. A recent example is IBM's Watson Health unit, which developed AI medical systems (Strickland, 2019; Yang et al., 2022). Even though Watson suffered significant setbacks not living up to the hype and expectations generated after the victory against the best human "Jeopardy!" players in 2011 (Markoff, 2011), IBM continued to invest major resources in the troubled projects (Yang et al., 2022). One of the projects requiring massive investments without living up to expectations was Watson's Oncology Expert Advisor - a collaboration with the MD Anderson Cancer Center, which was eventually terminated $62 million later in 2015 (Strickland, 2019). "IBM's artificial intelligence was supposed to transform industries and generate riches for the company. Neither has panned out" (Lohr, 2021, p. 1), and in 2022, IBM Watson was sold for a fraction of the investments made (Yang et al., 2022). Berente et al. (2022)further reference the cases of LeasePlan's expensive acquisition of an enterprise system that never came into use and MillerCoors lawsuit against HCL Technologies over the failed implementation of a SAP enterprise resource system as examples of EoC to corporate IS projects. The plethora of academic case studies on EoC to troubled corporate IS projects shows that those examples are no exceptions (Berente et al., 2022). Case studies document EoC to IS projects across industries, including manufacturing, services, technology, electronics, insurance, finance, and logistics (Berente et al., 2022).

The examples have shown that to maintain their competitive advantage and digitally transform, organizations invest substantial resources and efforts in their IS projects (Wallace et al., 2004). However, most organizations are too persistent in their IS development processes and escalate their commitment to IS projects under distress as the case studies indicated.

EoC is particularly relevant in managing IS projects due to their inherent complexity, uncertainty, and dynamic nature. The unique attributes of technology, such as generativity and the granular recombination of characteristics, further

contribute to shifts in the decision trajectory that can lead to escalation. Acknowledging this "proneness" is pivotal for project managers to effectively navigate distressed projects and enhance the overall success rate of technology endeavors. In the following, I will analyze the particularities associated with managing IS projects and how those attributes relate to shifts in the decision trajectory that produce escalation.

Project Characteristics: One of the key attributes of IS projects that make them prone to EoC is the inherent complexity involved (Maylor et al., 2013). IS projects frequently exhibit high levels of structural, socio-political, and emergent complexity (Morcov et al., 2021). The interrelationships between various components within a IS project can be intricate and surpass the scope of traditional project management techniques. For instance, the integration of different systems, technologies, and projects creates interdependencies that impede prompt decisions about persisting or withdrawing from troubled projects (Bathallath et al., 2016). Additionally, the diverse array of stakeholders involved in IS projects enhances the potential for information asymmetry and misunderstandings, thus creating structural complexity. This overarching complexity poses challenges in accurately forecasting outcomes and managing uncertainties, thereby increasing the likelihood of decisions culminating in EoC.

Furthermore, IS projects invariably occupy a central role in digital transformation and innovation initiatives (Baghizadeh et al., 2020; Wessel et al., 2021). Given the multitude of areas that may be affected by the consequences of holding on too long to a failing course of action and the central role that IS projects play in the implementation of digital transformation strategies, it is no surprise that an escalated IS project, if unnoticed or unaddressed, may jeopardize financial performance and a company's efforts to gain a competitive advantage by digitally transforming (Fox & Hoffman, 2002; Hsieh et al., 2015; Marx & Uebernickel, 2022). Digital transformation has been described as "a continuous complex undertaking that can substantially shape a company and its operations" (Matt et al., 2015, p. 341). Along the same lines, Wessel et al. (2021) pointed out that digital transformation is a process of deep, structural change that occurs through the integration of multiple technologies and fundamentally redefines organizational value and identity. As digital transformation endeavors are usually complex, uncertain, and highly dynamic, many initiatives continue to run over budget, extend past schedule, and deliver less than or different outcomes than anticipated (Forth et al., 2020). In an analysis of the most common digital transformation "traps" organizations currently face, my colleagues and I pointed toward EoC, arguing that "while persistence is intuitively associated with success, in the context of distressed or generally troubled specific digital transformation initiatives, becoming overly persistent and committed without recognizing negative signs can become a severe trap" (Marx et al., 2023, p. 8).

Further, IS projects are especially vulnerable to EoC due to their explorative nature, far-reaching organizational impact, and resource-intensive nature. Extant research suggests a heightened likelihood of IS project escalation when projects are perceived as research and development (R&D) endeavors. Decision-makers often

exhibit higher patience in the management of R&D projects, potentially fostering more significant commitment even in the face of setbacks. Given the frequent endorsement of technology-related projects by C-level executives within organizational digital transformation endeavors and the consequential influence on organizational change and operational paradigms, the management of IS projects is associated with elevated external expectations. Coupled with high failure costs due to the comparatively high amount of resource expenditures required, those particularities give rise to factors like anticipated reputation damage, strong advocates and commitment to the project by others, reliance on routines, and an increased need for external justification. As outlined before, these factors are recognized catalysts for EoC.

Furthermore, it is essential to recognize that IS projects have high internal and external risks. These risks make it more likely for decision-makers to face challenges when trying to adapt to difficult situations. On an internal level, IS projects often encounter resistance to change, especially because they can significantly impact the entire organization. Additionally, accurately estimating the necessary resources can be challenging due to the unpredictable nature of the project trajectory. External risk can be assessed as high as IS projects greatly rely on external contractors and might also be influenced by competitors, mainly due to the complex nature of technology initiatives. These combined factors contribute to the complexity of IS projects and the difficulties in managing them effectively by adjusting to unforeseen circumstances.

Another attribute of IS projects that can be linked to factors conducive to escalating behavior is their heightened likelihood of encountering a state of project distress. IS project distress represents a critical state of disturbances that, if not adequately addressed, can lead to project failure (Baghizadeh et al., 2020). The notion of distress refers to a situated, dynamic, and fluid constellation of critical problems that are not easily detected, understood, and addressed (Baghizadeh et al., 2020). Montealegre and Keil (2000) argue that in the context of IT, "projects seem to take on a life of their own, continuing to absorb valuable resources, while failing to deliver any real business value" (p. 417). The dynamic, situated, and complex nature of the problems contributing to distress shows the challenge of effecting a turnaround in distressed technology projects (Baghizadeh et al., 2020; Keil et al., 1994), hence likely triggering further escalation tendencies and reinforcing initial routines.

Management Characteristics: IS projects are notoriously difficult to monitor and control. Hence, goal incongruences and information asymmetries are likely to accelerate self-interested behavior that may lead to escalation, as predicted by Agency Theory. Additionally, the transition from plan-based to agile and product-centered management in IS development inadvertently heightens the propensity for escalation behavior. This phenomenon can be attributed to frequent shifts in requirements, diminished predefined evaluation criteria, and loose management controls (Keil, 1995). Klingebiel and Esser (2020), for instance, illustrate how innovation projects at Sony Ericson escalated despite the employment of a stage-gate process designed to mitigate initial commitment. Similarly, evidence

underscores that self-organized agile teams exhibit an even greater tendency to escalate compared to individual decision-makers (Whyte, 1993). Moreover, the overall technology-centered environment of IS projects fosters a growth mindset particularly relevant for project managers operating within dynamic and evolving environments, which has been linked to increased escalation tendencies (Lee et al., 2021). The need to acquire new management and technical skills that comes along with the project management role in IS projects may further foster optimism, which, when coupled with unfamiliar technology, can catalyze EoC (e.g., Sleesman, 2019). Another management-related characteristic of IS projects that makes them particularly prone to escalation is the so-called "90% complete syndrome" frequently exhibited in IS projects that incorporate software components (Abdel-Hamid, 1988). This tendency of developers to inaccurately perceive project completion as close to 90% complete for most of the time of the project is closely related to the completion effect accelerating escalation tendencies (Conlon & Garland, 1993).

Environmental Characteristics: The dynamic and unstable nature of IS project environments further enhances the potential for escalation. Unlike linear and predictable systems, IS projects frequently encounter random and unforeseen changes, causing uncertainty and ambiguity (San Cristóbal et al., 2018). The difficulty in predicting project trajectories and the presence of frequent shifts in requirements contribute to the inclination towards escalating commitment. The IT industry, in particular, is known for its high uncertainty and dynamic nature, making projects in this domain particularly susceptible to escalation. Specifically, studies have shown that software companies, dealing with intangible products and volatile requirements are more likely to fall into the trap of escalation, as their project scopes tend to change frequently (Keil et al., 2000). Additionally, the rapid pace of technological advancement adds to volatile requirements and environmental uncertainty, rendering precise success prognostication arduous.

Technology Characteristics: The rapid progression of new technologies has drastically changed how IS are developed and managed in organizations. At the center of most IS projects lies the digital artifact, which is designed, used, or developed. A digital artifact is an object created by and composed of digital technology and the outcome of coordinated human action (Kallinikos et al., 2013). The capacity to be malleable by diverse groups of actors in unanticipated ways, termed generative capacity, constitutes a distinctive attribute of digital artifacts that can accelerate escalation tendencies (Kallinikos et al., 2013). Given their generative capacity and their interactive, editable, reprogrammable, distributed, modular, granular, and reflexive nature, digital artifacts stand apart from their tangible counterparts (Kallinikos et al., 2013; Orlikowski, 1992). What is more, the intangible, or invisible, nature of the digital artifact itself, for instance software being developed, contributes to difficulties in control and monitoring, hence giving rise to the agency problem fostering escalation behavior (Abdel-Hamid, 1988). This distinctiveness of technological characteristics engenders novel and unforeseen challenges during project implementation, rendering the management,

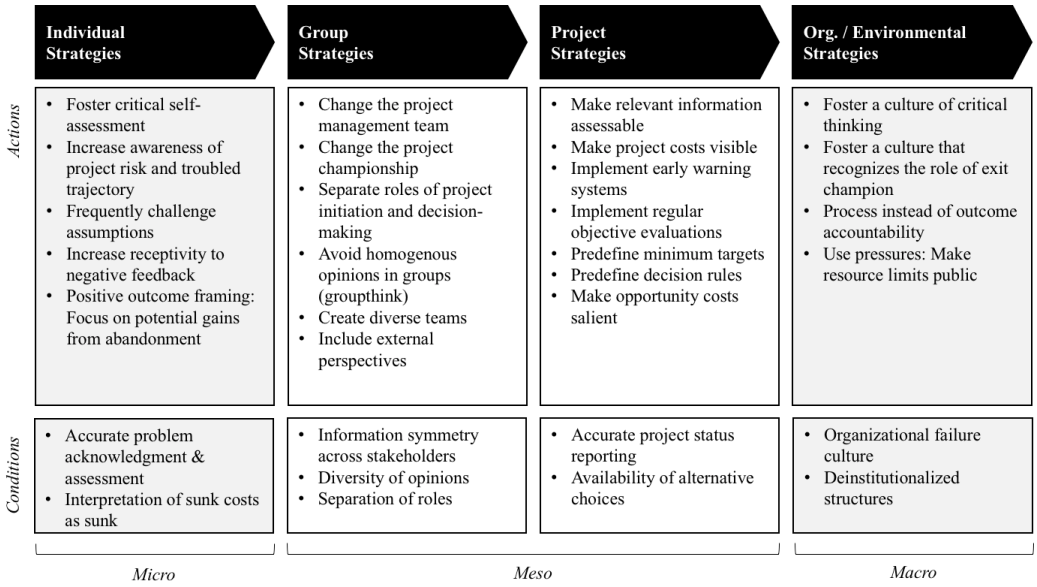
prediction, and steering of projects involving digital artifacts inherently challenging and, consequently, fosters escalation tendencies.

2.3.2 De-Escalation of Commitment

EoC, when addressed and de-escalated, can eventually lead to project turnaround (Mähring et al., 2008). Based on existing research, I summarized de-escalation strategies into a model of project de-escalation. Figure 5 overviews the actions and conditions that can turn project distress into success. I grouped the de-escalating strategies by type (action, condition), focus (individual, group, project, organizational/environmental), and their level into micro, meso, and macro.

On the micro level, EoC can be de-escalated when the decision-maker accurately acknowledges and assesses the project's risks and troubled status while interpreting previous resource expenditures as sunk costs, hence disregarding them for the present decision (Marx & Uebernickel, 2022). Those conditions can be achieved by specific managerial actions that foster critical self-assessment, frequently challenge assumptions, and generally increase the receptivity to negative feedback (Pan et al., 2004). Positive outcome framing is another area of managerial action that can be implemented on the micro level to achieve de-escalating conditions. Here, shifting the focus from abandonment costs to potential gains from alternative investments with freed-up resources can help improve the decision quality (Feldman & Wong, 2018; Liang, 2021). Research has further shown that altering the broad motivational context (the regulatory focus) within which people make decisions can help to de-escalate commitment (Molden & Hui, 2011). Contrary to the fundamental assumption of bounded rationality, Lee et al. (2018, p. 171) found that ego depletion - "a tired mind" - can help reduce the escalation bias. Similarly counterintuitive, a fixed compared to growth mindset has been related to behavioral de-escalation tendencies (Lee et al., 2021). Besides behavioral and cognitive strategies to de-escalate on the micro level, recognizing and regulating escalation-triggering emotions has been proposed as a de-escalation strategy for managers to imply (Rekar et al., 2023).

Figure 5 De-Escalation Strategies



While individual strategies constitute the micro level, group-based and project-related de-escalation strategies can be located on the meso level (Marx & Uebernickel, 2022). Favorable conditions that foster de-escalation in group-based strategies include information symmetries across stakeholders, diversity of opinions, and separation of roles (Sleesman et al., 2018). Information symmetry mitigates misperceptions and conflicting interests among stakeholders, favoring an unbiased assessment of the troubled trajectory and resulting choice alternatives. However, excessive homogeneity, particularly regarding opinions within the project team, should be avoided and replaced by diverse groups frequently challenging each other's opinions. Otherwise, groupthink mechanisms could threaten objective problem assessments and foster the development of critical "blind spots" (Sleesman et al., 2018). Another managerial action that can counteract escalation triggering groupthink mechanisms and the development of blind spots is the systematic inclusion of external perspectives throughout the project phases. Along this vein, Staw (1981, p. 585) suggested that "individuals should seek and follow the advice of outsiders who can assess the relevant issues of a decision situation without being responsible for previous losses or subject to internal or external needs to justify past actions". Further, given that personal responsibility for initiating the project is a crucial trigger for EoC, changes in the top management team or changes in the project championship are actions that can help to de-escalate upcoming commitment due to the separation of responsibility (Chulkov & Barron, 2021). The project conditions should include separating roles regarding project initiation and evaluation to weaken responsibility effects and further de-escalate commitment. Regarding project-related strategies, the availability of alternative choices is a favorable condition that may de-escalate commitment to failing projects (Sleesman et al., 2012). Moreover, increasing the accessibility to information in general and about project costs and risks, in particular, can help the decision-maker to recognize the easily omitted future downsides of continuing a distressed project. Another de-escalating condition in

the project area is the accuracy of evaluating the project's status (Ohlert & Weißenberger, 2020). This condition is related to the importance of project-related triggering factors and resulting errors in information processing that can lead to EoC. Implementing an early warning system and increasing awareness of project risks are de-escalating actions. Managers should implement regular reviews and feedback mechanisms to assess the project's performance and make data-driven decisions based on objective information. De-escalating management actions include setting minimum target levels and making opportunity costs salient. When paired with effective managerial action, for instance, in the form of establishing clear decision criteria to guide the decision-making process, those managerial actions and conditions can significantly increase the decision quality and foster de-EoC.

The macro level includes organizational and environmental conditions and actions favoring de-escalation. Managerial actions range from appealing to stakeholders to making resource limits public and using social pressure effects in favor of de-escalation (Marx & Uebernickel, 2022). Moreover, deinstitutionalized structures that decouple the project from the organization can help to de-escalate commitment (Montealegre & Keil, 2000). Related to the presented structural triggering and moderating influences on EoC, a de-escalating organizational culture can greatly impact the direction an EoC situation may take (Sleesman et al., 2012). Actions include acknowledging the role of the "exit champion," thereby incentivizing process over outcome achievements. Managers should build incentive structures that reward adaptive decision-making and learning from failure rather than celebrating success. Here, a general condition for managers seeking de-escalation is improving organizational tolerance for failure and a general culture that fosters learning. A supportive corporate culture that encourages open discussions and learning from failure, ensuring psychological safety for team members to voice concerns, can change how decision-makers anticipate the consequences of stopping or changing distressed projects.

3 RESEARCH FRAMEWORK

Marx, C.; Uebernickel F. (2023a) "Disentangling emotional and cognitive factors of escalation of commitment: Evidence for a physiological link" European Conference on Information Systems (ECIS).

Marx, C.; Uebernickel F. (2023b) "Unpacking the Black Box: A Cognitive Process Model of Escalation of Commitment in IS Project Management" International Conference on Wirtschaftsinformatik (WI).

This chapter introduces the research framework developed for studying the research questions of this dissertation and consists of three parts. The first part summarizes the assumptions and theoretical foundations derived from discussing existing literature. The second part describes the research framework consisting of two complementary research streams and an integration of elements on the behavioral, cognitive, and emotional dimensions of EoC. In the third part, following the structure of the research framework, I develop the hypotheses relevant to the confirmatory research stream.

3.1 ASSUMPTIONS & THEORETICAL FOUNDATIONS

3.1.1 Key Assumptions

This dissertation aims to uncover the cognitive and affective dimensions underlying behavioral EoC. The previous chapter introduced, discussed and problematized relevant concepts, perspectives, and theories related to this research goal. In the following, I will briefly summarize selected insights from the previous chapter that are key assumptions underlying this research endeavor.

[1] *"EoC has a cognitive and an affective dimension":* A key insight derived from the literature-based conceptualization of EoC that guides this dissertation is the phenomenon's multidimensionality. Underlying behavioral escalation are the cognitive and affective layers. Those layers are not directly observable but play a key role in shaping behavioral escalation. Despite the relevance of cognition and affect for decision-making in general, and during escalation situations in particular, past research has primarily focused on the behavioral layer. Based on the discussion of prior research (Chapter 2.2) and the foundations from cognition and emotion research (Chapter 2.1), two shortcomings become apparent: First, there is a disconnection between behavioral EoC and the not directly observable inner layers. Second, within the underlying layers, particularly emotional elements are underresearched.

[2] *"Multiple interacting factors influence the decision-making behind EoC":* The decision to persist with failing courses of action is influenced by the complex interplay of rational, non-rational, affective, and cognitive factors. The theoretical framework best fitted to model the decision-making behind EoC while incorporating both the cognitive-affective interplays and other determinants of EoC is the integrated cognitive-affective decision-making model developed and presented in Chapter 2 (Figure 1).

[3] *"EoC is a process":* Another insight is that EoC is best understood as a process that unfolds over time and consists of phases and phase-changing triggers. One must analyze how the inner layers' elements change over time to understand how cognitive and emotional factors shape behavioral escalation fully. As outlined in Chapter 2, acknowledging the myriad, sometimes conflicting processes behind EoC also stresses the need to integrate diverse theoretical perspectives.

[4] *"Distressed IS projects are prone to EoC":* EoC is a situational phenomenon that requires context to unfold. To investigate the inner layers and how they connect to behavioral EoC, the context chosen is managerial decision-making in the face of IS project distress. EoC is one of the main challenges in managing corporate IS projects. The analysis in Chapter 2 underlines this "proneness" of IS projects to EoC, given their unique project-related attributes, environment, management, and technology-related characteristics. Simultaneously, IS projects become increasingly relevant in the digital era, as it is pivotal for project managers to effectively navigate distressed projects and prevent them from jeopardizing the overall success rate of technology endeavors. This tension presents an ideal

research context to explore the EoC phenomenon in depth and with high practical relevance.

3.1.2 Integrating Key Theoretical Foundations

This dissertation integrates the psychological micro-foundations of human behavior - cognition and affect - with one of the most challenging phenomena in IS project management - EoC to distress IS projects. Given the complex nature of this research endeavor, building on existing knowledge from different disciplines and research discourses is inevitable. The following presents a brief overview of the interdisciplinary "input knowledge" presented in the previous chapter mapped to the goals of this dissertation.

To create the overall research framework, I draw on integrating cognitive and affective theoretical foundations of decision-making (particularly the EIC choice model, dimensional models of affect elicitation, and cognitive appraisal theory) with the insights gained from EoC research (mainly cognitive and affective elements within the nomological net).

To evoke the EoC phenomenon on the behavioral layer, I build on the conceptualization of EoC, including the central role of personal responsibility and the characteristics of the decision context - IS project management.

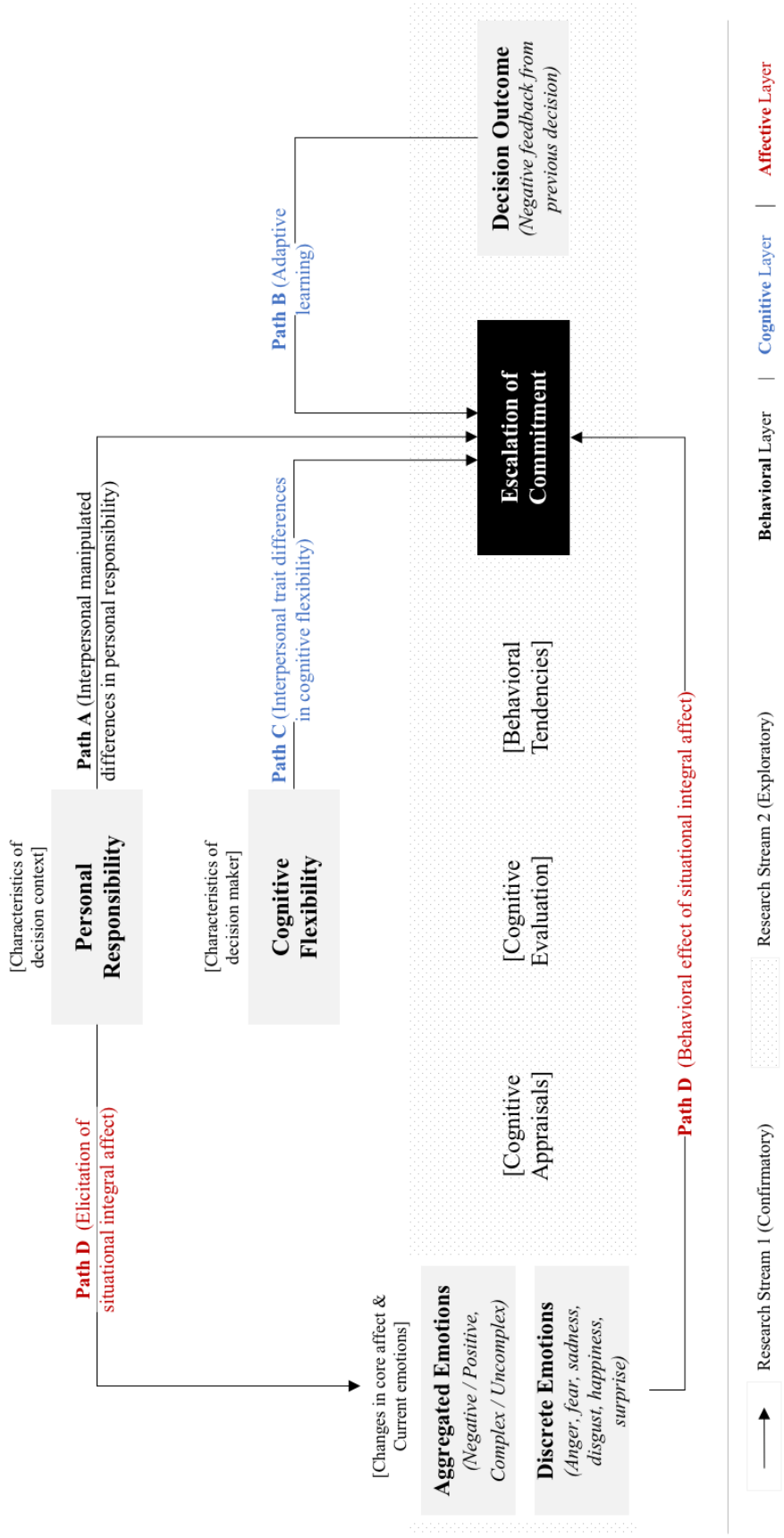
For connecting the behavioral with the cognitive layer and delving into changes over time, particularly to investigate the relationship between cognitive flexibility, adaptive learning, and EoC, I draw on the outlined foundations of cognition research with particular emphasis on mental model adaptation.

To connect the behavioral with the affective layer, more specifically to investigate the relationship between situational integral negative emotions, emotional complexity, and discrete emotional states, I mainly draw on two competing theories on the effects of emotion-cognition interaction: coping theory and cognitive dissonance theory.

3.2 RESEARCH FRAMEWORK

Given those key assumptions and theoretical foundations, I developed a research framework guiding my dissertation's two complementary research streams (Figure 6). The research framework is based on the insights gained from discussing and synthesizing existing literature in Chapter 2. It follows the schematic representation of the cognitive-affective decision-making model adapted from Lerner et al. (2015), Moors et al. (2013), and Posner et al. (2005) (Figure 1).

Figure 6 Research Framework



Given the complexity of effect interactions during escalation situations and the different maturity stages of affective, cognitive, and behavioral EoC research identified in Chapter 2, the research framework incorporates two complementary research streams to answer the research questions.

For the first research stream, I chose specific cognitive and affective constructs with testable effect paths on behavioral escalation. This confirmatory approach is suitable given the contradicting empirical findings regarding the role of emotions and allows testing different effect predictions based on two competing theories. Applied to the phenomenon of EoC and informed by the review of related empirical and theoretical work (Chapter 2), the research framework incorporates the chosen concepts of interest, shows how they relate to the different EoC layers, and models specific effect directions as paths that can be translated into testable hypotheses.

For the second research stream, besides testing the influences of specific constructs as deduced from theory, the research framework acknowledges the advantages of complementary inductive reasoning to account for the multiple interrelated mental processing steps that lie between influential factors and the decision to persist with the failing course. Affective reactions, characteristics of the decision-maker, and the decision context are interpreted, evaluated, and translated into behavioral tendencies before a decision is made. The cognitive evaluation of the decision is shaped by the interpretation of affective and decision-specific stimuli as well as characteristics of the decision context. Given the complexity of those elements and their intertwined nature, they have to be investigated from a different, more explorative angle: To complement the effect relations modeled by the paths in the first research stream, in this second research stream, I aim to unpack the underlying "black box" indicated by the dotted area in the research framework using inductive reasoning. While the element of time is incorporated indirectly in the first research stream by investigating how behavioral EoC changes over multiple decisions during sequential decision-making, the second research stream allows for a more direct investigation of potential changes of cognitive and emotional influences during the process of escalation.

3.3 HYPOTHESES DEVELOPMENT

3.3.1 Behavioral Layer

At the center of the behavioral layer lies the repeated decision to persist with the failing course of action despite negative feedback on its trajectory. One of the key assumptions introduced earlier was that EoC is a process that unfolds over time. Hence, the box "Escalation of Commitment" can be understood as the overall behavioral phenomenon observable in sequential decision-making on the decision strategy level. Given its multidimensional nature and the complex interaction of determining factors, behavioral EoC is connected to every other element in the research framework via behavioral, cognitive, and affective paths.

3.3.1.1 Path A: Personal Responsibility

Characteristics of the decision context introduced by Lerner et al. (2015) for general decision-making and applied to the particularities of studying the decision-making behind EoC in Figure 1 relate to the characteristics of the escalation situation and contextual influences. As outlined in Chapter 2, an escalation situation is characterized by continuity, uncertainty about the decision outcome, negative information or feedback on the chosen trajectory, and a real choice available for the decision-maker. Applied to EoC, this area further includes the structural, project-related, and relational antecedents of escalation tendencies not or only indirectly related to cognition or emotion summarized in the nomological net presented in Chapter 2. Examples include the availability of information, competitive market conditions, responsibility distributions across actors, the level of decision risk, or the amount of previous resources invested. The analysis of the last chapter has further shown that characteristics of the decision context can influence both the cognitive evaluation and the emotional elements of the decision-making model, which aligns with how Lerner et al. (2015) described and visualized this area.

Given that being *personally responsible* for having initiated the course of action that is now in distress is regarded as the most robust determinant of behavioral escalation tendencies (Sleesman et al., 2012; Staw, 1976) and influences both affect and cognitive evaluation of the decision situation as part of the characteristics of the decision context, I chose personal responsibility as one of the elements to incorporate in the research framework. Since Staw's landmark article in 1976, the personal responsibility effect has been replicated multiple times and is nowadays used as manipulation in almost every EoC study design. With the exception of a small academic substream suggesting that elements of prospect theory might substitute the effect of personal responsibility related to self-justification theory (see the discussion of EoC theories in Chapter 2), there is academic consensus about the key role of personal responsibility for understanding EoC. In their meta-analytic review of EoC determinants, Sleesman et al. (2012, Hypothesis 8a) supported this view by finding a significant effect of personal responsibility on behavioral escalation across all empirical studies.

The feeling of personal responsibility makes it more challenging for the decision-maker to abandon the course of action as this would contradict their prior decision to initiate the endeavor and belief in its success. When facing negative feedback, the notion of personal responsibility enhances the threat associated with decision failure and increases the need to justify those past decisions or attitudes in front of themselves or others when social pressures are present. On the other hand, with low levels of personal responsibility for the previous course of action, for instance, because the decision-maker just took over the project from the person who initiated it, it should be easier to correctly identify and interpret the negative feedback as a sign to change courses and de-escalate. Hence, decision-makers should show significantly higher behavioral tendencies to commit additional resources to a failing course of action when they have initiated it themselves. In other words, people who are personally responsible for initiating the project are more likely to

escalate their commitment than people who are not personally responsible. The effect of personal responsibility on behavioral EoC is visualized as "Path A" in the research framework (Figure 6).

Hypothesis 1: Individuals who are personally responsible for initiating the troubled project are more likely to escalate their commitment than individuals who are not personally responsible.

3.3.2 Cognitive Layer

The conceptualization of cognition in Chapter 2.1 revealed the plethora of cognitive concepts and processes relevant during decision-making. Insights from Chapter 2.2.2 suggest that most elements within the nomological net of EoC indirectly or directly relate to the cognition of the decision-maker. I decided to investigate two specific cognitive determinants of EoC related to interpersonal differences in cognitive flexibility (the ability to switch cognitive sets dynamically) and the cognitive ability to learn from past decision outcomes adaptively. Both cognitive elements are related to the adaptability function of mental models, which plays a crucial role in sequential decision-making (Chapter 2.1.1). Further, I chose those specific cognitive concepts as their investigation contributes to solving two paradoxes in organizational judgment and decision-making research.

The blue-colored paths in the research framework indicate the relationship between the former cognitive factors (cognitive flexibility and adaptive learning) and behavioral escalation.

3.3.2.1 Path B: Adaptive Learning

Path B in the research framework - the effect of the previous decision outcome on the current decision - aims to solve the paradox of escalation despite the cognitive ability to adaptively learn from past decision outcomes. It incorporates the notion that EoC is a sequential decision-making process that unfolds gradually over time and that the consequences of the previous decision influence the expected outcome of the current decision.

Learning is a natural consequence when making several decisions over time and receiving feedback in the form of decision consequences. According to the law of effect, individuals should stop behavior followed by unpleasant consequences and reinforce behavior yielding pleasant outcomes (Thorndike, 1898). In line with the law of effect, a prior history of success - an escalating determinant I classified as having indirect links to cognition in Chapter 2.2.2 - increases following escalation tendencies (Bragger, 2003). Studies have also shown that decision-makers learn from one escalation situation to another, significantly reducing their tendency to escalate as they anticipate regretting their commitment (Ku, 2008).

Following this line of thought, decision-makers should also learn from adverse decision outcomes within one escalation situation and withdraw from the failing project. However, individuals still escalate their commitment to failing courses of action, even when they repeatedly receive negative feedback following their decision to persist (Staw, 1976). As introduced in the review of EoC theories,

multiple forces drive individuals to deviate from the law of effect on the individual decision level (e.g., persisting to self-justify past beliefs or behavior).

To solve the paradox of escalation despite learning, I draw on prior empirical research showing a decrease in escalation tendencies over time (Jackson et al., 2018) and on Wong and Kwong's (2018) differentiation into the individual decision level and the decision strategy level. When looking at the individual decision level - where learning is based on the association of single decision-outcome pairs - adaptive learning from adverse decision outcomes is expected to counteract the escalation effect over time. On the overall decision strategy level - where learning is based on the association of multiple decisions with one consequence of that strategy - repeatedly persisting with the failing course in anticipation of an overall successful outcome is the reinforced decision strategy (Wong & Kwong, 2018). Applying this differentiated view of adaptive learning, it becomes apparent that EoC is consistent with the law of effect on the decision strategy level, thus explaining the overall EoC effect. Within this dominant decision strategy of EoC, escalation tendencies are expected to decrease over time due to the effects of adaptive learning at the single decision level.

Hypothesis 2: Escalation of commitment decreases over multiple decisions.

3.3.2.2 Path C: Cognitive Flexibility

Besides incidental influences, particularities of the decision context, and influences from previous decisions, the characteristics of the decision-maker herself affect the behavioral tendency to persist with failing courses of action. Examples of elements within the nomological net of EoC that are based on the characteristics of the decision-maker include individual differences in self-efficacy, self-esteem, overconfidence, creativity, personality, trait affect, optimism, goal persistence, personal experiences, professional ability, age, and cultural background (see Chapter 2.2.3 for details). The previous analysis of those individual elements found in empirical research showed that attributes of the decision-maker significantly influence the cognitive-affective dynamics shaping escalation behavior. However, the literature review showed that research on dispositional differences is still sparse, particularly when considering differences in cognitive abilities.

Cognitive flexibility, the ability to switch cognitive sets to adapt dynamically to changing environments (Dennis & Vander Wal, 2010), can be categorized as a characteristic of the decision-maker within the research framework. Path C in the research framework models the effect of interpersonal differences in the ability to dynamically switch cognitive sets to adapt to changing environmental stimuli on behavioral EoC. While my systematic review of existing literature did not yield a single study that empirically investigated the effect of individual differences in cognitive flexibility on EoC, strong theoretical arguments support a connection between cognitive ability and behavioral phenomenon.

First, as outlined in the conceptualization of cognitive concepts and processes in Chapter 2.1.1, cognitive flexibility plays a critical role in cognitive functioning, particularly in problem-solving, creativity, and adaptive behavior (Diamond, 2013). As cognitive flexibility is essential for tasks requiring simultaneous

consideration of multiple concepts, switching between tasks, or adapting to changing environments, differences in cognitive flexibility are likely to shape the behavioral reactions to failing courses of action in escalation situations.

Second, investigating this path contributes to solving the paradox of escalation despite being aware of dysfunctional decision-making. Even when decision-makers assess the escalation situation and their previous persistence as dysfunctional, translating this realization into behavioral change is unlikely when they fail to adjust their cognitive sets accordingly (Betsch et al., 2001; Dane, 2010). High levels of cognitive flexibility should make decision-makers less prone to EoC by allowing them to adjust their mental models and underlying processing modes to facilitate behavioral change (Laureiro-Martínez & Brusoni, 2018; Rothman & Melwani, 2017). Hence, individuals with high cognitive flexibility are expected to be less likely to escalate their commitment than those with low cognitive flexibility. Given the hypothesized effect of cognitive flexibility and that educational interventions can partially influence this innate cognitive ability, its investigation in the context of EoC further yields practical potential for educational interventions.

Hypothesis 3: Individuals with high cognitive flexibility are less likely to escalate their commitment than individuals with low cognitive flexibility.

3.3.3 Affective Layer

Rich empirical support exists for the escalating or de-escalating effect of carried-over incidental affect and discrete emotions (Chapter 2.2.3, Figure 4). Incidental influences on emotions relevant during decision-making are part of Lerner et al.'s (2015) original model. Incidental influences can be internal, like carried-over emotions elicited from unrelated events, and general moods, or external, stemming from prior events the decision-maker experienced unrelated to the current decision-context. Carried-over to the present decision context, those originally incidental factors become relevant by influencing current emotions and their interaction with cognitive interpretations and changes in the core affect underlying behavioral decision tendencies.

However, given the finding of my literature review that within affective EoC research, insights on situational affect directly elicited by the decision context are particularly sparse yet relevant (Chapter 2.2.3), I will not focus on incidental influences on affect during escalation situations. Hence, incidental influences are not included in the research framework.

3.3.3.1 Path D: Situational Integral Emotions

Within the integrated model of cognitive-affective decision-making during EoC, the characteristics of the decision context and the decision-maker, incidental influences, expected decision outcomes, and the cognitive evaluation of the decision situation are all linked to the elicitation and the consequences of current emotions. The behavioral consequences of integral situational state affect have been demonstrated in various contexts. Hence, conceptualizing affect as momentary emotions arising from the decision situation is advantageous in

capturing the instant emotional reactions of the specific escalation situation in which the affective experience occurs compared to trait affect or anticipatory and carried-over state affect conceptualizations. However, as shown in the discussion of existing affective EoC research, only Wong et al. (2006, Study 3) explicitly examined the effect of integral *situational* state affect on EoC. While their study significantly contributed to a better understanding of the role of emotions in EoC, there are still inconsistencies and severe blank spots that must be filled to complete the picture. Additionally, my review yielded systematic limitations within the affective EoC discourse, for instance, the reliance on self-report for measuring emotions, one-time measurement of emotions without acknowledging potential changes over time, and the lack of simultaneously investigating multiple emotional elements while acknowledging their reciprocal relationship with cognition. Given this crucial role and the blank spots outlined in Chapter 2.2.3, I decided to include situational integral emotions as a central element in my research framework and examine the effects of the current emotional experience on EoC.

Negative Emotions

Within this scope, I decided to specifically investigate the effects of *negative* situational emotions elicited directly by the decision context (those emotions with negative valence) for the following reasons. First, given the particularities of the decision context in escalation situations, the momentary emotional response to receiving negative feedback is expected to involve more negative than positive emotions. Second, there is conflicting empirical evidence regarding the role of negative affect (Harvey & Victoravich, 2009; Roeth et al., 2020; Solwitsch, 2015; Wong et al., 2006) and anger (Dang et al., 2014; O'Neill, 2009), both related to negative valence. Third, the two perspectives outlined in Chapter 2.1.2 for explaining the effects of emotion-cognition interactions, namely Coping Theory and Cognitive Dissonance Theory, yield conflicting hypotheses regarding the role of negative emotional states. Hence, examining the effect of integral situational emotions with negative valence on EoC while testing which competing predictions from the two theoretical perspectives can be confirmed is particularly promising to explain inconsistencies and advance our understanding of the role of affect in escalation situations.

In the following, I will outline the predicted effect patterns of negative integral situational emotions on EoC, drawing from Coping Theory and Cognitive Dissonance Theory.

In an escalation situation, the decision-maker repeatedly receives negative feedback on the chosen course of action, indicating that prior beliefs and behavior may have been dysfunctional. This situation causes distress and is perceived as emotionally unpleasant, threatening the decision-maker's self-image and the project's successful termination (Baumeister, 1993). Past research has indicated that in escalation situations, particularly adverse emotional reactions such as fear, anger, or generally decreased psychological well-being influence the behavioral tendency to persist or withdraw (e.g., O'Neill, 2009; Roeth et al., 2020; Sarangee et al., 2019; Wong et al., 2006).

As outlined in Chapter 2.1.2, coping consists of cognitive and behavioral efforts to manage specific external or internal demands appraised as taxing or exceeding the person's resources (Folkman & Lazarus, 1988). Those efforts are directed at altering the situation that is causing distress (problem-focused coping) and/or regulating distress (emotion-focused coping). According to problem-focused coping, those adverse emotional reactions trigger processes to eliminate the source of discomfort, which increases the likelihood of an avoidance strategy by withdrawing entirely from the escalation situation (i.e., de-escalating commitment). In other words, following the coping perspective, an increase in negative situational affect elicited by the decision situation is expected to increase the likelihood of coping by withdrawing from the situation that causes distress. This effect of negative situational affect on the application of withdrawal strategies has been empirically supported (Endler & Parker, 1990) and applied to the EoC context (Wong et al., 2006).

While cognitive dissonance theory and coping theory both assume that emotions and cognition reciprocally shape behavior, the perspectives predict different behavioral consequences in the context of escalation decisions (Wong et al., 2006). As outlined in more detail in Chapter 2.1.2, dissonance refers to the unpleasant emotional state produced by cognitive discrepancy - the inconsistency of cognitions (Harmon-Jones, 2000). During the process of decision-making, individuals take on attitudes or beliefs that are consistent with their behavior. When holding two or more contradicting beliefs, attitudes, or values simultaneously, individuals experience emotional discomfort (Festinger, 1957). To minimize this tension-based discomfort and maintain consistency in beliefs and actions, individuals reconcile conflicting cognitions by changing their mental models, acquiring new information, or minimizing the importance of the discrepancy. When receiving negative feedback on a previously made decision in an escalation situation, choosing to withdraw from the situation would force individuals to admit that past decisions were incorrect, which induces cognitive dissonance. This dissonance leads individuals to experience psychological discomfort (Pepitone & Festinger, 1959), negative affect (Harmon-Jones, 2000), and increases physiological arousal (Elkin & Leippe, 1986). According to the cognitive dissonance perspective, individuals strive to resolve the unpleasant emotional experience arising from the inconsistency with one’s beliefs or past decisions and the escalation situation by maintaining consistency in beliefs and actions (Harmon-Jones, 2000). In an escalation situation, this motivational tendency to reduce cognitive dissonance would lead to self-justification processes and persistence with previously made decisions, hence EoC. Instead of engaging with the possibility of a wrong previous decision and its consequences, individuals might de-emphasize the importance of negative feedback and instead strive for consistency within their overall decision strategy to commit to the course of action. Hence, contrary to the coping theory predictions, cognitive dissonance theory predicts that increases in negative situational integral affect elicited by cognitive discrepancies when faced with negative project feedback would further intensify the strive for consistency, thereby increasing behavioral escalation.

Hypothesis 4a: Individuals who experience negative integral situational emotions are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment than individuals who experience less negative integral situational emotions.

As outlined in Chapter 2.1.2, cognitive appraisals play a crucial role in decision-making as they determine the intensity and quality of action tendencies, physiological responses, behavior, and emotions (Frijda, 1993; Moors et al., 2013). The assessment of an emotional situation includes evaluating how the event will affect the individual, interpreting the various aspects of the event, and arriving at a response based on that interpretation (Lerner et al., 2015; Moors et al. 2013). Being personally responsible for the initial path of action may change those cognitive interpretations of the same unpleasant feeling elicited by the escalation situation. With greater personal responsibility, the affective experience resulting from the escalation situation is more likely interpreted as self-relevant on the responsibility dimension of appraisal, intensifying the emotional reaction and increasing the threat to the decision-maker's self. Consequently, differences in personal responsibility may also affect appraisal tendencies (e.g., approach/avoidance, attention, rejection, reactance) and judgments (e.g., depth of thought, content of thought), ultimately shaping behavior (Lerner et al., 2015).

I previously argued that decision-makers responsible for initiating a path of action tend to escalate their commitment to it (see Hypothesis 1). Given the changes in cognitive appraisals based on differences in personal responsibility, in addition to the direct effect of negative integral situation emotions and personal responsibility, an interaction of both variables in shaping behavioral EoC is likely.

Coping Theory predicts a distinct interaction pattern of negative integral situation emotions and personal responsibility in shaping behavioral EoC that differs from the predictions of Cognitive Dissonance Theory. When responsible for the initial path of action, the intensified adverse emotional reactions resulting from the changes in interpreting the negative project feedback are expected to increase the likelihood of coping by withdrawing. On the other hand, when not personally responsible for initiating the course of action, the correlates between negative integral situational emotions are expected to disappear as *t*he threat to the decision-maker's self should be minimal. Given that potential adverse emotional reactions to receiving negative feedback should not threaten the decision-maker self in this condition, applying coping strategies would not be necessary.

When applying Cognitive Dissonance Theory, the intensified adverse emotional reactions resulting from the changes in interpreting the negative project feedback are expected to intensify the need to resolve cognitive dissonance by maintaining consistency and persistence with the failing course of action. In contrast, when not being responsible, the threat to the decision-maker's self (reflected in cognitive dissonance) should be minimal, likewise, the effect of negative integral situational emotions on the behavioral tendency to persist.

Hypothesis 4b: Individuals who experience negative integral situational emotions are less [Coping Theory]/ more [Cognitive Dissonance Theory] likely to escalate

their commitment when personally responsible for the initial path of action than individuals who experience less negative integral situational emotions.

Emotional Complexity

Besides integral situational state affect, specifically negative emotions, I decided to examine the effect of another aggregated affective concept - emotional complexity. Emotional complexity is "the simultaneous or sequential elicitation and experience of at least two different emotions during the same emotional episode" (Rothman & Melwani, 2017, p.259). Given that in complex decision situations like escalations scenarios, individuals frequently encompass multiple distinct affective experiences, each potentially steering their decision in conflicting directions, solely examining the effect of negative situational integral emotions or single discrete emotions would be limiting (Filipowicz et al., 2011). Instead, the concept of emotional complexity provides a more encompassing understanding. As outlined in Chapter 2.2.1, such a multifaceted emotional experience capturing the simultaneous or sequential experience of various emotions within a single episode is representative of real-life emotional reactions in managerial decision-making.

While overall, negative emotions seem to dominate in escalation situations, the review of existing empirical evidence in Chapter 2.2.3 showed that also positive emotions like gratitude, hope, and general positive affect play a role in determining escalation behavior (e.g., Dang et al., 2014; Huang et al., 2019). As pointed out while discussing the literature, despite apparent interrelations between emotional elements and high conceptual complexity, only a few studies examine the effect of multiple emotions within one study (Dang et al., 2014). So far, no empirical study has examined the effect of multiple emotions experienced simultaneously by the same individual.

Given that emotional complexity is associated with a sense of conflict within the individual experiencing the emotions simultaneously (Filipowicz et al., 2011), the predicted effect of situational integral emotional complexity on escalation behavior is expected to differ according to the applied theoretical perspective.

In the following, I will outline the predicted effect patterns of integral situational emotional complexity on EoC, drawing from arguments based on Coping Theory and Cognitive Dissonance Theory.

According to Coping Theory, the sense of conflict associated with emotional complexity compared to experiencing univariate emotions is expected to trigger coping through behavioral withdrawal strategies. This argument is supported by prior research showing that a higher capacity for more complex emotional experiences may be functionally related to more resiliency (Ong & Bergeman, 2004) and cognitive flexibility (Rothman & Melwani, 2017), both expected to enable withdrawal strategies when facing escalation situations. Hence, building on the argumentation for the predicted effect relationships of negative situational integral emotions, according to Coping Theory, higher levels of emotional complexity are expected to decrease behavioral escalation tendencies.

On the other hand, according to Cognitive Dissonance Theory, experiencing emotional complexity in response to receiving negative feedback on a previously made decision in an escalation situation may stem from the discrepancy of beliefs and actions in expectation of withdrawal. Hence, as outlined in the hypothesis development for negative situational integral emotions, individuals aim to minimize the source for experiencing the tensions associated with emotional complexity by aligning their current actions and beliefs with the past decision to commit to the course of action.

Hypothesis 5a: Individuals who experience situational integral emotional complexity are less [Coping Theory] / more [Cognitive DIssonance Theory] likely to escalate their commitment than individuals who experience less situational integral emotional complexity.

The same line of argumentation can be applied to the assumed interaction effects between emotional complexity and personal responsibility in shaping behavioral EoC. Coping Theory predicts a distinct interaction pattern of negative integral situation emotions and personal responsibility in shaping behavioral EoC that differs from the predictions of Cognitive Dissonance Theory, given the changes in cognitive appraisals. When responsible for the initial path of action, emotional complexity intensifies from the changes in interpreting the negative project feedback as self- compared to other-centered. According to Coping Theory, this is expected to increase the likelihood of coping by withdrawing. In contrast, it should evoke opposite effects according to the strive for consistency underlying Cognitive Dissonance Theory. In both theoretical perspectives, when not personally responsible for initiating the course of action, the correlates between integral situational emotional complexity and behavioral escalation or de-escalation are expected to disappear.

Hypothesis 5b: Individuals who experience integral situational emotional complexity are less [Coping Theory]/ more [Cognitive Dissonance Theory] likely to escalate their commitment when personally responsible for the initial path of action than individuals who experience less integral situational emotional complexity.

3.3.4 Summary of Hypotheses

Hypothesis 1: Individuals who are personally responsible for initiating the troubled project are more likely to escalate their commitment than individuals who are not personally responsible.

Hypothesis 2: Escalation of commitment decreases over multiple decisions.

Hypothesis 3: Individuals with high cognitive flexibility are less likely to escalate their commitment than those with low cognitive flexibility.

Hypothesis 4a: Individuals who experience negative integral situational emotions are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment than individuals who experience less negative integral situational emotions.

Hypothesis 4b: Individuals who experience negative integral situational emotions are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment when personally responsible for the initial path of action than individuals who experience less negative integral situational emotions.

Hypothesis 5a: Individuals who experience situational integral emotional complexity are less [Coping Theory] / more [Cognitive DIssonance Theory] likely to escalate their commitment than individuals who experience less situational integral emotional complexity.

Hypothesis 5b: Individuals who experience integral situational emotional complexity are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment when personally responsible for the initial path of action than individuals who experience less integral situational emotional complexity.

4 RESEARCH STRATEGY

Marx, C.; Uebernickel F. (2023a) "Disentangling emotional and cognitive factors of escalation of commitment: Evidence for a physiological link" European Conference on Information Systems (ECIS).

Marx, C.; Uebernickel F. (2023b) "Unpacking the Black Box: A Cognitive Process Model of Escalation of Commitment in IS Project Management" International Conference on Wirtschaftsinformatik (WI).

This chapter describes this dissertation's research strategy, i.e., the methodological approach. In the first part of this chapter, I lay out the overall mixed-method research strategy and provide arguments for the choice of methods. Building on the overall research strategy, I describe the specific methodological approaches (e.g., procedure, sample, data gathering and processing, quantitative and qualitative data analysis) for both research streams - the psychophysiological laboratory experiment and the complementary exploratory approach.

4.1 RESEARCH APPROACH

This dissertation aims to uncover the cognitive and affective dimensions underlying behavioral EoC. The goal is to integrate the psychological micro-foundations of human behavior - cognition and emotion - with one of the most challenging phenomena in IS project management - EoC to distressed IS projects.

The core questions asked to achieve this research goal were: *What effect do emotional and cognitive factors have on EoC, and how does a decision-maker's emotions and cognition change during the decision-making process?*

To answer these research questions, this dissertation adopts a mixed-methods approach (Tashakkori & Teddlie, 2009; Venkatesh et al., 2013) that combines quantitative and qualitative methods and integrates neurophysiological and behavioral measures to investigate EoC in IS projects from different angles and levels of analysis. A mixed methods approach is appropriate given the nature of the research questions and the possibility of simultaneously generating and verifying theory in the same study (Tashakkori & Teddlie, 2009) Venkatesh et al. (2013, pp. 28–30) argue that mixed methods research is a powerful mechanism for IS researchers as it "addresses confirmatory and exploratory research questions simultaneously (...), provides stronger inferences than a single method or worldview (...), [and] provides an opportunity for a greater assortment of divergent and/or complementary views".

As outlined before (Chapter 3.1), EoC is a multidimensional, highly complex phenomenon shaped by various interrelated elements. Given this complexity and the benefits of mixed-method research, using different methods to assess different facets of the phenomenon (i.e., the complementary research streams as presented in the research framework) enables an enriched, elaborated understanding of the cognitive and affective dimensions underlying behavioral EoC compared to either approach alone.

4.1.1 Choice of Methods

As a foundation for the mixed methods approach, the systematic literature review in Chapter 2 provided a comprehensive overview of the existing research on the phenomenon of interest and the relevant theoretical and conceptual foundations for developing the research framework presented in Chapter 3. Building on the two research streams forming the research framework, the empirical part of this dissertation consists of a quantitative, confirmatory part and a qualitative, exploratory part, complementing and extending the insights gained from the quantitative research stream.

The first part uses the method of a psychophysiological between-subject randomized controlled laboratory experiment, including psychophysiological, self-reported, and behavioral measures, to gain confirmatory knowledge by testing the developed hypotheses. A laboratory experiment was chosen as it allows the demonstration of causality through controlled variation (i.e., high internal validity),

which “is the foundation of empirical scientific knowledge” (Falk & Heckman, 2009, p. 2). The possibility to control the variation that is assumed to evoke the EoC effect (personal responsibility) in combination with a randomized distribution of participants to the manipulated categories is advantageous as the phenomenon of interest in this dissertation is influenced by a plethora of contextual, decision-related, individual, or relational factors (see Chapter 2.2). This argument gains further relevance given the focus on cognitive-emotional micro-foundations, which are particularly difficult to detect and isolate in non-controlled environments. In contrast, a laboratory setting allows the control and stabilization of confounding effects while enabling the employment of neurophysiological measures to capture the facets of the emotional EoC dimension.

When aiming to capture the emotional factors underlying behavioral escalation and how they change over time during sequential decision-making, psychophysiological measures pose significant advantages (Dimoka et al., 2012; Riedl & Léger, 2016; vom Brocke et al., 2020). Compared to self-reported data, with psychophysiological measures of emotions, there is no need for coding, deliberate falsification is excluded, and statements can be made about otherwise hidden underlying processes of decision-making (Dimoka et al., 2012). Particularly for emotional states that do not reach a decision-maker’s awareness, psychophysiological tools have advantages over self-report measures, which depend on conscious perception (Riedl & Léger, 2016). It also eliminates a potential source of error or inaccuracy that cannot be completely ruled out with behavioral or self-reported data. Possible confounding effects, such as socially desired behavior or manipulation, can be excluded (Dimoka et al., 2012). Compared to traditional measures, psychophysiological measures provide continuous data availability and allow dynamic stimuli (Dimoka et al., 2012). In addition to the methodological advantages, this choice of methods fits the research context as “neurophysiological tools are particularly valuable for measuring IS constructs that people are either unable, uncomfortable, or unwilling to truthfully self-report (...) [including] deep or hidden emotions (e.g., guilt, fears, and anger), (...) complex cognitive processes (...), [and] antecedents of human behaviors (e.g., beliefs, attitudes, and intentions)” (Dimoka et al., 2012, p. 680). When using psychophysiological measures, it is recommended to triangulate across different measures to improve reliability (Boudreau et al., 2001). Hence, I decided to measure situational integral emotions using data triangulation based on changes in the participants' electric heart activity over time using an EKG, the galvanic skin response in the form of EDA, and AI-based facial feature detection.

Complementary to a quantitative psychophysiological laboratory experiment, using qualitative research methods adds depth and potentially unearths the “cognitive black box” in the center of the research framework - the interpretation of emotions and cognitive evaluation of choices underlying behavioral tendencies. Hence, the second part adopts an explorative research approach using qualitative research methods. More specifically, I aim to complement and extend the quantitative findings using a qualitative thematic analysis of text-based cognitive reflections of decision-makers during the same decision-making simulation.

In the last step, the findings of the quantitative and qualitative research streams are synthesized using bridging into meta-inferences (Venkatesh et al., 2013). The purpose of integrating the quantitative and qualitative findings is to go beyond the findings from each study and develop an in-depth theoretical understanding of how cognition and emotion shape behavioral EoC over time.

Deep Dive - Psychophysiological Measures of Affect

Alongside ocular measures, physiological measures and newer tools like automatic facial feature detection can be used to assess the Peripheral Nervous System (PNS) activity to measure emotions (Riedl & Léger, 2016). One part of the PNS is the autonomic nervous system (ANS), which is "composed of sensory and motor neurons, which operate between the CNS and various internal organs, such as the heart, the lungs, the viscera, and the glands" (Shu et al., 2018, p. 2). Relevant to the detection of emotions are the sympathetic division - activating the body - and the parasympathetic division - relaxing the body - of the ANS (Riedl & Léger, 2016). With the elicitation of emotions, the sympathetic nerves of the ANS get activated, leading to changes in the physiological pattern that are inevitable and detectable (Kreibig, 2010). Sympathetic activation has been shown to affect cardiovascular, respiratory, and EDA, for instance, measures by heart rate, heart rate variability, blood pressure, finger temperature, or skin conductance response rate (Kreibig, 2010). Empirical evidence suggests "considerable ANS response specificity in emotion when considering subtypes of distinct emotions" (Kreibig, 2010, p.394).

Heart rate is modulated by the combined effects of the sympathetic and the parasympathetic nervous systems (Riedl & Léger, 2016; Stangl & Riedl, 2022). Cardiovascular activity can be measured using an EKG with electrodes that detect electrical activity produced by a heartbeat (Kreibig, 2010).

EDA describes the "changes in electrical conductance of the skin, including phasic changes that have been referred to as galvanic skin responses (GSR), that result from sympathetic neuronal activity" (Critchley, 2002, p. 132). EDA, often captured via electrodes on the palm, is a frequently used measure for autonomic sympathetic arousal as an indicator of emotional states (Riedl & Léger, 2016).

While cardiovascular activities and EDA of the sympathetic and the parasympathetic part of ANS are common and reliable measures of the arousal dimension of emotions (Riedl & Léger, 2016), the most reliable physiological measure of emotional valence is facial expression analysis (Lewinski et al., 2014; van Kuilenburg et al., 2005). Automatic face analysis seeks to discern human emotion through specialized software that can detect facial features associated with facial expressions (Girard et al., 2015). The AI-based facial coding software FaceReader™ Version 9 (Noldus Information Technology BV, Wageningen, Netherlands) uses deep artificial neural network technology to analyze and categorize facial expressions caused by the spatial occurrence of facial muscle contractions. The software is a reliable indicator of discrete emotions and is frequently used in emotion research (Chentsova-Dutton & Tsai, 2010; Lewinski et al., 2014).

4.2 PSYCHOPHYSIOLOGICAL LABORATORY EXPERIMENT

4.2.1 Experimental Procedure and Sample

Recruitment of Participants

An a priori power analysis using G*Power version 3.1 (Faul et al., 2007) suggested that the required sample size to achieve 95% power for detecting a small effect at a significance criterion of $\alpha = .05$ was N=56 for linear multiple regression analysis. I recruited 75 participants for a computer-based decision-making simulation at the University of St. Gallen, Switzerland's Behavioral Lab, between January and April 2022, as I expected that I would have to exclude participants due to the challenges of physiological measurement. Potential participants were made aware of the study using multiple channels like the weekly official study announcement e-mails from SonaSystems to a pre-selected set of students, physical flyers distributed in the University of St. Gallen, and posts in local social networks. Participants had to hold a degree in a business-related field or be enrolled in a business-related Master's program, doctoral program, or MBA program. To ensure sufficient practical and decision-making experience, I required at least two years of professional experience. I further required fluent English or German speaking skills and asked the participants to choose between the experiment's English and German versions. These requirements ensured that the participants could relate to the decision context and increased data quality.

Part of the study invitation was a short description of the study and Covid safety information:

"Decision-making simulation study with physiological signal recording. In this study, participants will participate in a managerial decision-making simulation (simulated investment choices in a new project) while we record physiological signals (EKG, EDA, facial expressions) to measure emotions. The experiment will take place in the Behavioral-Lab. Covid-19 Safety Information: Each candidate will perform the experiment in a room alone. The computer and the measurement devices will be sanitized and the room will be ventilated between each candidate. This is a standard lab study. To participate, sign up and go to the specific location at the chosen time. Duration: 45 minutes. Payment: 20 CHF. Minimum Master-level study program. Please wear eye lenses instead of glasses."

Laboratory Set-up

The experiment took place in the biometric measurement room of the Behavioral Lab of the University of St. Gallen, Switzerland. The location allowed for a highly controlled environment, minimizing potential interfering effects. The light conditions were held stable using sun-light-blocking curtains and artificial light. The room consisted of only necessary furniture to avoid distractions, including a desk with a stationary monitor, a keyboard, a mouse, a chair, and a lamp. Participants were left alone in the room between the study preparation and the debriefing phase to minimize distractions. To ensure that no technical problem

arose and to allow participants to quit the experiment at any time, I observed the participant during the experiment from a second room through a one-way mirror that appeared reflective on one side and transparent on the other. Participants were made aware of the mirror and that the experimenter could see them from the other room. Figure 7 shows pictures of the laboratory set-up and gives an overview of the resulting data types extracted using physiological, behavioral, and self-reported measures.

Figure 7 Laboratory Set-up

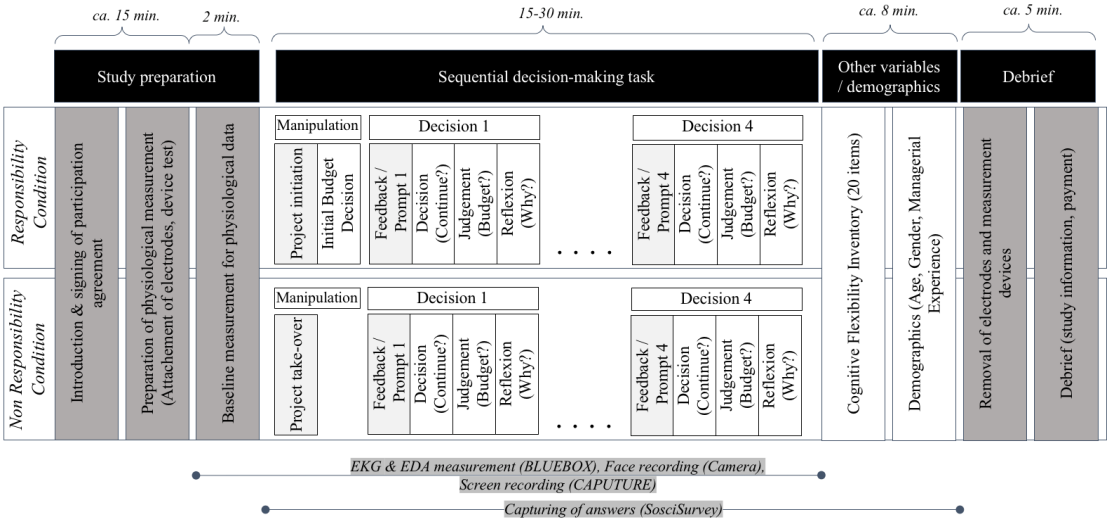
Procedure

Figure 8 gives an overview of the experimental procedure, including timeframes and details about the study preparation, the sequential decision-making task performed at a stationary computer in the laboratory, the gathering of additional variables and demographics, and, as a last step, the debrief. Each participant spent, on average, 47 minutes on the experiment, including preparation and debriefing.

The study preparation phase (approximately 17 minutes) consisted of introducing the experiment, signing the participation agreement, preparing the physiological measurement, and a baseline measurement test for calibration. Among other things, it was pointed out that skin conductivity and heart rate are measured during the computer-based experiment, and a camera records the face. After the participant had been informed about his/her rights, data protection, and the data collected during the study, the information sheet, privacy statement, and consent form were handed out. The participant had unlimited time to read through the documents and was allowed to ask questions afterward. After written consent to participate, the physiological measurement was prepared. Guided by step-by-step instructions, including visual aids, the participant attached two self-adhesive pre-gelled electrodes under the collarbones and another electrode to the lower left ribs. Then, two more electrodes were attached to the non-dominant hand. The measuring

devices were then connected, and the participant was positioned on a chair in front of the screen to adjust the camera and lighting conditions. Following a device test, the rest of the procedure was explained to the participant, including the opportunity to ask further questions. The last step of the study preparation phase was a two-minute baseline recording of the physiological signals. With the start of the screen and camera recording, the experiment began, and the participant was left alone in the room to minimize potential distractions.

Figure 8 Experimental Procedure



The design of the sequential decision-making task followed past research (Eliens et al., 2018; Sleesman, 2019) and took between 15 and 30 minutes. During the experiment, participants were randomly assigned to one of the two responsibility conditions and then presented with decision-making scenarios. I adopted the decision-making vignettes and the feedback prompts from the so-called blank radar plane case originally presented by Arkes and Blumer (1985), widely used in EoC research (Jackson et al., 2018). Within the decision-making simulation, participants took the role of a senior manager responsible for deciding about the continuation of an IS development project for the aviation industry. Participants received background information about the project and feedback on the project's performance at multiple points in time. The feedback was without exception negative, including, for instance, the information that a competitor has launched a similar radar system or that the project completion will be significantly delayed due to significant technical difficulties. In five sequential decisions, the participants had to decide whether to "authorize more funding" or "abandon the project" and, if they decided to continue, how much money they were willing to invest given the predefined budget. To avoid framing and social desirability bias, the question's wording was neutral and identical for each decision round: "The decision you face now is to either abandon the project or authorize more funding to continue the project. How do you decide?". After a maximum of five continuation decisions, or when the decision-maker decided to withdraw from the project, the decision simulation was over.

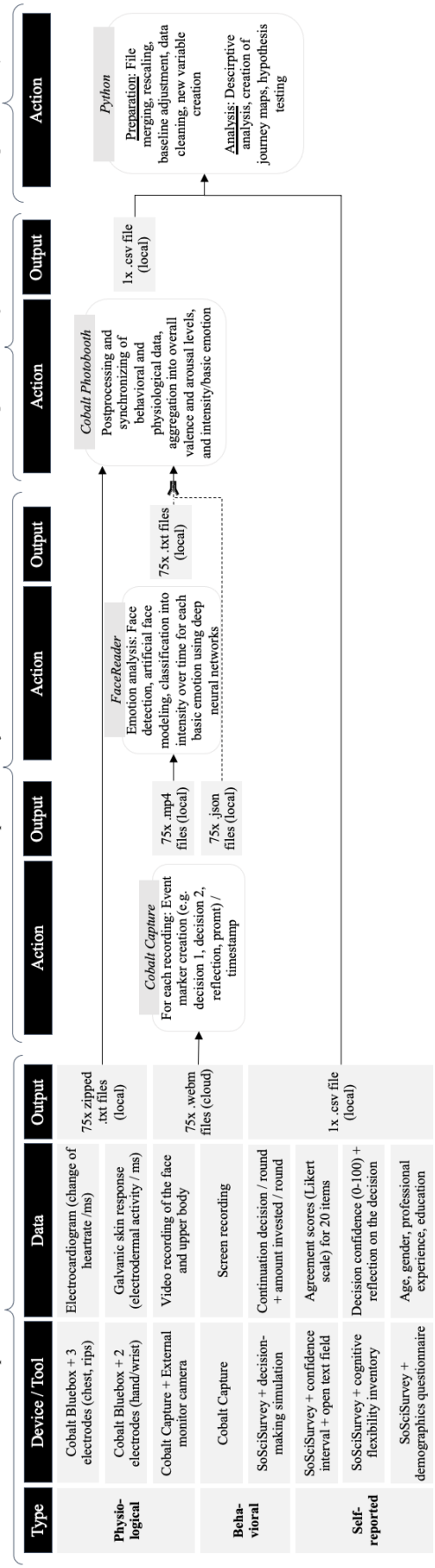
The participant was asked to complete a questionnaire measuring cognitive flexibility and other demographic variables, which took approximately eight minutes. The questionnaire and the decision vignettes can be assessed in the Appendix. As shown in Figure 8, simultaneous to the computer-based decision-making experiment, physiological signals were constantly measured, and the participant's face and the screen were recorded.

In the last step, the electrodes and measurement devices were removed, and the participant was informed about the manipulation in the decision-making simulation and the general background of the study. The participant was paid and received an information sheet containing study details and contact information.

4.2.2 Data Processing

Given that the experimental procedure was aiming for multiple data sources and steps, I will devote an adequate amount of detail to comprehensively describe the process of data processing from extraction to analysis, including the hard- and software tools used in each step. The overall process followed the recommendations of the Tech3Lab COBALT initiative (Léger et al., 2021) and can be grouped into four main steps: Data extraction, data codification, data triangulation, and data analysis. Figure 9 gives an overview of the elements and steps employed in this process and will be discussed in the following.

Figure 9 Process of Data Gathering and Triangulation



4.2.2.1 Data Extraction

The initial step - data extraction - consisted of the collection of physiological, behavioral and self-reported data. For extracting the physiological data, we used the COBALT Bluebox, which is based on the BITalino hardware reference (Courtemanche et al., 2022a). The COBALT Bluebox is part of the COBALT ecosystem, a set of psychophysiological instruments and analysis software designed and developed by the HEC Montréal Tech3Lab and the UX Chair (Léger et al., 2021). The COBALT Bluebox was connected to three electrodes at the participants' chest and rips and two electrodes attached to the wrist of the non-dominant hand. The data extracted was the change in the participants' electric heart activity over time using an EKG, and the galvanic skin response in the form of EDA. After each experiment, the data, including arousal and valence values per millisecond, was stored as zipped text files for each participant in an SD card within the COBALT Bluebox and was then transferred to be temporarily saved at the experimenter's computer. We additionally used the cloud-based software COBALT Capture (Courtemanche et al., 2022b) and an external camera attached to the monitor in front of the participants to record a video of the face and upper body during the experiment. Together with a time-stamped recording of the participants' screen (which I labeled behavioral data as it showed their behavior during the decision-making simulation), the videos were stored separately in the cloud using COBALT Capture. In addition to the video files and the zipped text files containing the physiological data, the third data output generated in the data extraction phase was a comma-separated-values (CSV) file exported from the online survey platform SoSciSurvey containing behavioral and self-reported data. Here, the continuation decision and the amount invested per round represent behavioral data, while the assessment of the decision confidence and the qualitative reflection on the decision were classified as self-reported. Within the category of self-reported data, I further extracted the agreement scores to the items of the Cognitive Flexibility Inventory and the answers to a demographic questionnaire at the end of the experiment using SoSciSurvey.

4.2.2.2 Data Codification

After extracting the different data types and formats, the second step was data codification, consisting of two main parts. For the first part, I used the video files in COBALT Capture and generated time-stamped labels for key events in the decision-making journey (e.g., baseline measurement, receiving negative feedback, decision-making, and reflection). Repeating this procedure separately for each participant recording allowed to dynamically code the changes according to the natural decision-making habits of the participants without them being restricted to time limits or pre-defined clicking paths. I exported and stored a JavaScript Object Notation (JSON) file for each participant containing the time-stamped event markers necessary for later data triangulation. For the following emotion analysis, I additionally exported the videos from the COBALT Capture platform and converted them into MP4 file format. In the second part of the codification step, those videos were uploaded to the AI-based facial coding software FaceReader™ Version 9 (Noldus Information Technology BV, Wageningen, Netherlands) for facial expression analysis. After the software detects the face, an artificial face

model is created describing 468 key points in the face, and a trained deep artificial neural network classifies the changes into the emotions angry, disgusted, happy, neutral, sad, scared, and surprised. Besides the intensities of individual facial expressions and their classification, the software calculates overall valence using the intensities of discrete positive and negative emotions and arousal levels based on the activation of 20 *Action Units* of the *Facial Action Coding System*. Those values were then exported and locally stored as separate text files for further processing.

4.2.2.3 Data Triangulation

Based on the outputs of the codification procedure and the physiological data from the COBALT Bluebox device, in a third step, I triangulated the different data streams and types using the cloud-based data processing and analysis platform COBALT Photobooth. As input data, we used the temporarily stored zipped txt files containing the EDA and EKG measurement data from Step 1 and the output text files we extracted from FaceReader zipped by participant number with the respective json files containing the event markers from Step 2. The data triangulation in COBALT Photobooth thereby synchronizes physiological data from three initial sources (EDA, EKG, facial expressions) with the behavioral data using the dynamically coded event markers. As a result of the data triangulation, I retrieved a nuanced, highly sensitive, and milliseconds-based journey of the participants' emotional states, including overall valence and arousal levels as well as intensities for the seven discrete emotional states over time and by key event in the decision-making journey. The output of this step is a consolidated csv file, which will be further used in the following data analysis step.

4.2.2.4 Variable Extraction

After merging the data sources, valence and arousal values were rescaled for later analysis and adjusted according to the baseline measurements. I excluded outliers and incomplete measurements based on predefined criteria and created the aggregated variables of negative emotions and emotional complexity. The last part of the processing phase was the creation of individual emotional journey maps mapped to the dynamically labeled events in the decision simulation and grouped by the level of responsibility and behavioral escalation tendency.

4.2.3 Summary of Key Variables

The following provides an overview of the key variables relevant to the analyses as presented in the methodology section of Marx and Uebernickel (2023a). In addition to those key variables, control variables (age, gender, education, professional experience, and decision confidence) were included, as those variables have been shown to affect escalation tendencies in past research (Sleesman et al., 2018).

4.2.3.1 Personal responsibility

As visualized in Figure 8, “each participant was randomly assigned to one of the two responsibility conditions (low, high). In the high personal responsibility condition, participants were asked to initiate the project themselves and to make an

initial budget decision within a given range. In the low responsibility condition, the participants did not initiate the project. Participants were told in the first decision round that they were taking over the project from someone else who had initiated it and given it a primary budget. In a manipulation check, participants answered on a seven-point scale how responsible they felt for the previous investment and for starting this project." (Marx & Uebernickel, 2023a, p.6).

4.2.3.2 Aggregated situational integral emotional states

Based on the milliseconds-based journey of the participants' emotional states, including overall valence and arousal levels as well as intensities for the seven discrete emotional states over time, I calculated aggregated emotional states for the quantitative analysis. Negative situational integral emotions were aggregated using "the harmonic mean of feeling sad, angry, disgusted, frustrated, or any combination of those emotions weighted by simultaneous arousal as a measure of intensity." (Marx & Uebernickel, 2023a, p.6). The harmonic mean was also used in combination with a weighting factor of arousal for calculating the score for situational integral emotional complexity. Here "only those combinations of emotions [were included] that contain conflicting potential (e.g., feeling angry and happy simultaneously)."(Marx & Uebernickel, 2023a, p.6).

4.2.3.3 Cognitive flexibility

I measured interpersonal differences in cognitive flexibility using the standardized cognitive flexibility inventory (CFI), consisting of 20 items (Dennis and Vander Wal, 2010) (Appendix). In a meta-review, Cherry et al. (2021) indicated that the CFI is the best measure to assess cognitive flexibility in self-assessments. Hence, the CFI was chosen over other measures of cognitive flexibility like the cognitive flexibility scale (Martin and Rubin, 1995), the personal psychological flexibility index (Kashdan et al., 2020), and the Wisconsin Card Sorting Test (Berg, 1948). Another advantage of using the CFI over other measures is that it "explicitly measures cognitive flexibility without including overlapping constructs and without evoking cognitive load due to lengthy measurement" (Marx & Uebernickel, 2023a, p.7).

4.2.3.4 Escalation of Commitment

"Most existing measures of escalation of commitment use a single decision or investment to measure participants' commitment and treat it as a dummy variable (Huang et al., 2019). However, concerns about the simplicity of such an operationalization, especially in the context of sequential decision-making, have been raised (Bateman, 1986). To address those problems, we propose a more elaborate calculation that acknowledges the multi-step decision design, the complex and continuous nature of the phenomenon, and the understanding of escalation of commitment as being formed by both the decision (continue funding) and the judgment (proportion invested). The core underlying assumption we apply for this is that people can differ in how much they escalate their commitment to a failing course of action. In line with this continuity assumption and the conceptualization, we developed a formula and included not only whether the participant withdrew or continued the project but also acknowledged the number

of decision rounds that the participant decided to persist with the failing course of action and the total amount of additional money invested in the project relative to the average and the maximum. The EoC score thereby captures the overall escalation tendency in sequential decisions. It allows for comparisons between participants withdrawing at different points in time and differing in the extent to exceed budget overall and per decision. The score was calculated for each participant based on the following formula and has been rescaled between 0 (no escalation tendency) and 1 (maximum escalation tendency).

$$\text{EoC} = \frac{m}{M} \cdot \frac{d}{D} \cdot \frac{S}{32} \cdot f_d$$

d refers to the decision score measured by the decision round in which the participant decided to withdraw from the project ranging from 0 to 4 with 4 indicating no abandonment of the project in any round. D refers to the average decision score over all participants. m is the rescaled mean of the budget proportions over all decisions for a participant. M refers to the mean of m over all participants. f is the Pearson correlation coefficient between d and the sum of the invested budget (S). The maximum budget a participant could invest throughout the simulation equals $32 million." (Marx & Uebernickel, 2023a, pp.7-8).

4.2.4 Quantitative Data Analysis

The quantitative analysis consists of two main steps: First, to replicate the escalation effect and investigate behavioral changes over time, I used a Mann-Whitney test comparing the low and high personal responsibility groups and the ordinary least squares (OLS) method for linear regression to analyze changes over time in the probability of persisting and the relative investment per decision.

Second, I applied moderated multiple regression analysis (Aguinis & Gottfredson, 2010) using OLS regression equations for testing the hypotheses about the role of cognitive and emotional factors, including the aggregated and non-aggregated values for emotional and cognitive factors.

4.3 Complementary Exploratory Approach

4.3.1 Procedure and Sample

The recruitment of participants, set-up, decision scenario, and overall procedure for the complementary exploratory research stream were identical to the confirmatory part.

In order to explore the underlying cognitive processes of those participants that escalated their commitment during the decision-making simulation, additional qualitative data was gathered simultaneously. The controlled setting of the laboratory experiment allowed "exploration regarding changes in cognitive patterns while mitigating potential confounding (...), enhancing replicability, and

facilitating the analysis of multiple decisions and decision-makers within the same controlled setting." (Marx & Uebernickel, 2023b, p.4).

During each decision, the participants were asked to explain as detailed as possible their current reasoning and thought processes in written form (minimum of 20 words). This free-form narrating approach has been used before to capture cognitive processes during decision-making (Moser et al., 2013) and poses a valuable extension to quantitative analysis. "The simulated study environment promotes a "safe space" for genuine introspection" that may be difficult to reach in real-world settings. (Marx & Uebernickel, 2023b, p.4).

From the 75 recruited participants, 57 showed behavioral EoC in the form of exceeding the budget limit by deciding at least once to invest further in the troubled project during the sequential decision-making scenario. For the qualitative analysis, only the free-form narrating text of those escalating participants was included. Decision-makers who withdrew from the project immediately after facing negative feedback have not been included in the analysis. This procedure yielded text-based narrating from a total of 170 decisions to persist.

4.3.2 Qualitative Data Analysis

4.3.2.1 Coding Procedure

The text data generated from the free-form narrating about the thought processes behind 170 decisions to persist in an escalation situation was analyzed using the qualitative data analysis software ATLAS.ti. To prepare the data, the text fragments were marked with the behavioral escalation tendencies of the decision-makers, whether they were personally responsible for initiating the project, how confident they felt in the respective decision, and how many continuation decisions precedent the current decision.

The coding followed a three-step, iterative procedure (Williams & Moser, 2019). In the first step, the text data was split into 270 conclusive segments and coded into reasons for persisting with the project using open coding. In the second step, axial coding was used to draw connections between the codes and to generate code categories. After several iterations, 13 main codes, which I called cognitive sub-patterns, remained that could be allocated to six categories, which I called cognitive patterns. The third step consisted of selective coding, focusing on those categories with the most supportive data. As part of the selective coding procedure, I identified the temporal mode of cognition (retrospective, introspective, prospective) as an overarching category and core narrative that connects the patterns and the sub patterns.

4.3.2.2 Process Model Development

To answer the second research question, I analyzed the obtained cognitive reasoning patterns and text-based emotional markers from a process perspective. Hence, this second part of the qualitative analysis focused on the sequences of events (i.e., processes) and the mechanisms and reasons for the evolution of these processes (Langley, 1999; Langley et al., 2013). Given the unfolding nature of the

EoC phenomenon and in line with previous EoC process models, I chose the lifecycle process model archetype to identify the sequences of cognitive reasoning (Mähring & Keil, 2008). The process model consists of periods of stability (cognitive phases) and events (cognitive phase-changing triggers) based on the foundations of the punctuated equilibrium model (Tushman & Romanelli, 1985). Following the procedural recommendations of Langley et al. (2013) for identifying phases, I detected the periods within which the cognitive reasoning patterns identified in the previous step were more uniform than across phases using the timeline of negative feedback prompts and key decisions as contextual guidance. Next, to identify the driving mechanisms sustaining the elements within one phase, I iterated between the coding of the cognitive reasoning patterns and the process model development. In a last step, I identified the events that initiated shifts in the importance and combination of cognitive reasoning patterns, serving as phase-changing triggers.

5 RESULTS

Marx, C.; Uebernickel F. (2023a) "Disentangling emotional and cognitive factors of escalation of commitment: Evidence for a physiological link" European Conference on Information Systems (ECIS).

Marx, C.; Uebernickel F. (2023b) "Unpacking the Black Box: A Cognitive Process Model of Escalation of Commitment in IS Project Management" International Conference on Wirtschaftsinformatik (WI).

This chapter presents the results of the empirical part of this dissertation and is organized into two subchapters. First, I report on the results of the quantitative analysis, including the testing of the hypotheses. In the second part, I present the results of the complementary qualitative analysis based on the free-form narrating of decision-makers during the decision simulation, consisting of a description of the cognitive reasoning patterns and the developed cognitive process model.

5.1 RESULTS OF THE QUANTITATIVE ANALYSIS

The following presents the results of the quantitative analysis consisting of descriptive statistics and the testing of the hypotheses based on the psychophysiological laboratory experiment conducted in 2022.

5.1.1 Descriptive Statistics

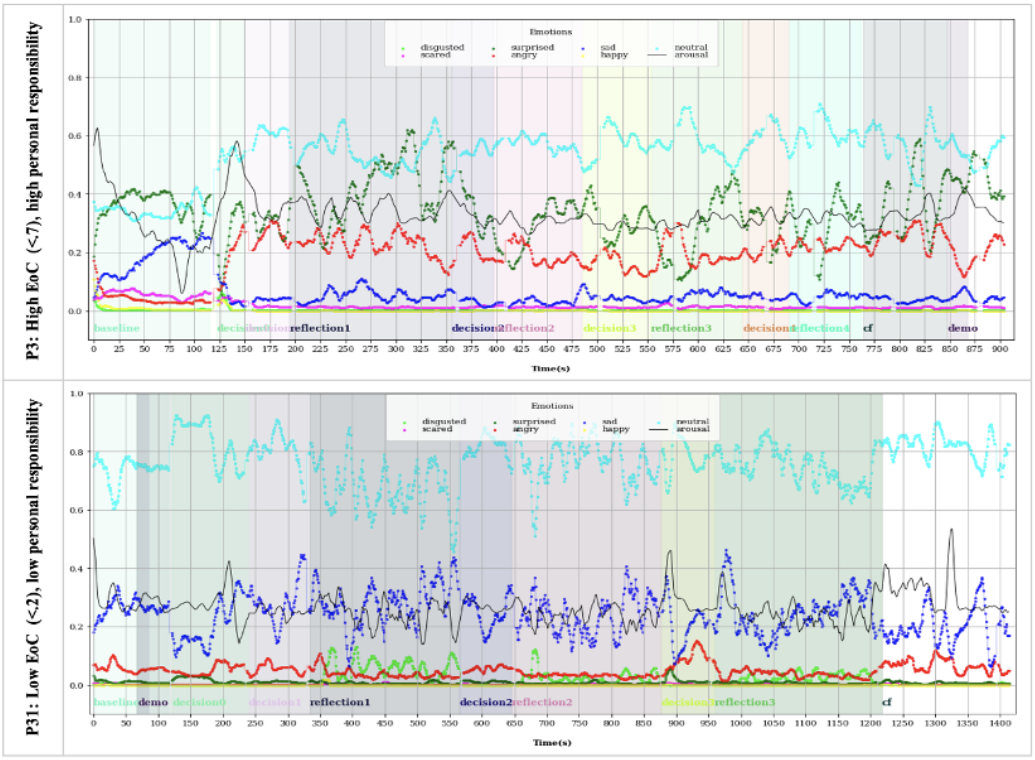
5.1.1.1 Participant Demographics

I recruited 75 participants for the experiment, from which two participants had to be excluded for data analysis as they failed the attention check. 61% were female, the average age was 26 years, and the participants had an average professional experience of 3.5 years. For the quantitative analysis involving physiological data, nine participants had to be excluded because of technical problems during the physiological data collection. Hence, the subset used for analyses involving emotions consisted of 64 participants.

5.1.1.2 Emotional Journey Maps

As a foundation for testing the hypotheses regarding the role of emotions, I created emotional journey maps for every participant where I could analyze the changes in discrete emotional states over time before losing information by aggregating them into negative emotions and emotional complexity and into event markers. For this, I removed participants with no value for emotions due to measurement errors, yielding 64 remaining participants for the analyses involving emotional factors. I randomly selected one participant from each EoC score quartile for in-depth visual analysis and compared their emotional journey maps.

Figure 10 Exemplary Emotional Journey Maps



The journey maps showed patterns of decline in surprise before de-escalation and generally higher relative values of surprise over other emotions, especially for participants with lower escalation of commitment scores. Further, the visual analysis indicated a dominance of negative over positive emotions regardless of the escalation of commitment score and peaks in anger and sadness at the beginning of the decision phases. For further analysis, I only incorporated the events labeled as the actual decision-making phase, excluding the following reflection part, where participants additionally answered questions about their confidence level and motives, baseline measurements, and the post-simulation surveys about cognitive flexibility and demographics.

5.1.2 Hypotheses Testing

I defined a significance criterion of $\alpha = .05$ for testing the hypotheses. The analysis will follow the order of the hypotheses as presented in Chapter 3.

5.1.2.1 Personal Responsibility & Adaptive Learning

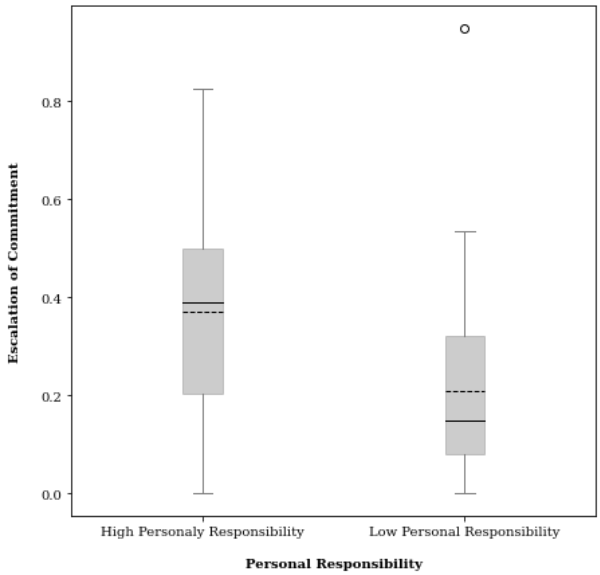
First, I will test the hypotheses derived from Paths A and B of the research framework in Chapter 3. Path A modeled the relationship between interpersonal differences in personal responsibility and behavioral escalation and was located on the behavioral layer. Path B included the element of time as it modeled the effect of adaptive learning from previous negative decision feedback on behavioral escalation in the current decision scenario. Given the conceptualization of adaptive learning as a cognitive function, this path was located at the cognitive layer.

Hypothesis 1

Hypothesis 1 states that individuals who are personally responsible for initiating the troubled project are more likely to escalate their commitment than individuals who are not personally responsible.

A Mann-Whitney Test indicated that the responsibility manipulation was successful: Perceived personal responsibility was significantly higher for decision-makers who initiated the project (Mdn = 6) than for decision-makers who were told to take over the already initiated project from someone else (Mdn = 3), U=9.2905, $p < .001$. Being personally responsible for the initial decision and escalation of commitment was positively correlated, $r(62) = .36$, $p = .004$ (Pearson correlation).

Figure 11 Boxplot - Personal Responsibility & EoC



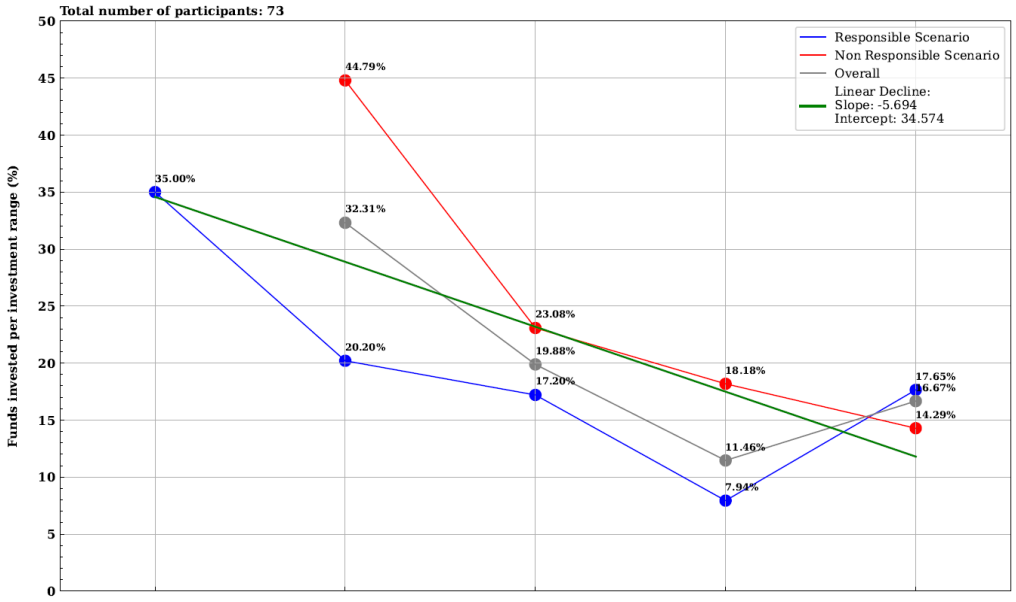
I compared the median EoC level of the two independent groups (low personal responsibility and high personal responsibility) using a Mann-Whitney Test. The test showed that the tendency to escalate was significantly higher for decision-makers who were personally responsible for the project initiation (Mdn = .388) than for decision-makers who were not personally responsible (Mdn = .147), U = 740.5, p = .001. **Hence, Hypothesis 1 was supported.**

Hypothesis 2

To test whether escalation of commitment decreases over multiple decisions (Hypothesis 2), I examined the effect of time in two ways. First, considering all participants, I investigated the probability of persisting for each decision round and analyzed changes over time. While the average probability of escalating commitment was 89.04 % in the first decision, it continuously decreased to a probability of 32.88 % to further persist with the failing course of action in the fourth decision round.

Second, considering only those participants who decided to persist in the specific decision round, I analyzed differences over time in the average investment proportions per decision to also capture the extent of escalation.

Figure 12 Proportions of Funds Invested Over Time



This declining effect is also visible when looking at the responsibility conditions separately. When considering the extent of escalation by looking at the relative investment per decision compared to the maximum investment and under consideration of the given range the participant could operate in, one can see a decline of escalation tendency over time, except for the fourth decision, where there is a slight increase in the relative investment proportion. Using the OLS method for linear regression, the best fit indicates a linear decline with a negative coefficient, $\beta = -5.701$, SD = .721, p =.001. **Hence, Hypothesis 2 was supported.**

5.1.2.2 Cognitive Flexibility & Situational Integral Emotions

Hypotheses 3 to 5b were derived from Path C and D in the research framework, modeling the effects of cognitive flexibility and situational integral emotions. The paths have been located at the cognitive and the affective layers.

As the research framework simultaneously incorporates cognitive and emotional factors, I applied moderated multiple regression analysis (Aguinis and Gottfredson, 2010) using OLS regression equations to test Hypothesis 3 to 5b. I included the control variables age and gender in all models as their inclusion led to a higher predicted variance in the dependent variable. All variables, including EoC, were standardized to a level between 0 and 1 for easier interpretation and comparability of coefficients.

Table 6 Hierarchical Multiple Regression Results

	Dependent Variable: Escalation of Commitment		
	Model 1	**Model 2**	**Model 3**
Age	0.013**	0.012**	0.012**
Gender (female = 0, male = 1)	-0.082*	-0.079	-0.082*
Personal Responsibility (No = 0, Yes = 1)	0.117**	0.073	0.043
Cognitive Flexibility	-0.060	-0.064	-0.066
Negative Emotions	0.345***	0.304**	0.374***
Emotional Complexity	0.444***	0.450***	0.348**
Negative Emotions X Personal Responsibility		0.120	
Emotional Complexity X Personal Responsibility			0.171
Constant	-0.326**	-0.304*	-0.280*
Observations	64	64	64
R_2	0.482	0.485	0.490
Adjusted R_2	0.428	0.420	0.426
Residual Std. Error	0.172 (df=57)	0.173 (df=56)	0.172 (df=56)
F Statistic	8.852*** (df=6; 57)	7.522*** (df=7; 56)	7.692*** (df=7; 56)
*Note: *p<0.1; **p<0.05; ***p<0.01*			

To test the main effects of cognitive flexibility, negative emotions, and emotional complexity on escalation of commitment when controlling for personal responsibility, age, and gender, a multiple regression model was calculated using OLS equations (Model 1). A significant regression equation was found ($F(6,57) = 8.852$, $p < .001$), with a R^2 of .482.

To test the unique contribution of the interaction effects of negative emotions and emotional complexity with personal responsibility for predicting escalation of commitment, I added them separately to Model 1 and calculated the changes in adjusted R^2 using F-statistics. The procedure followed the best-practice recommendations for estimating interaction effects by Aguinis and Gottfredson (2010). I created Model 2, which included the interaction between personal responsibility and negative emotions. A significant regression equation was found ($F(7,56) = 7.522$, $p < .001$), with an increased R^2 of .485.

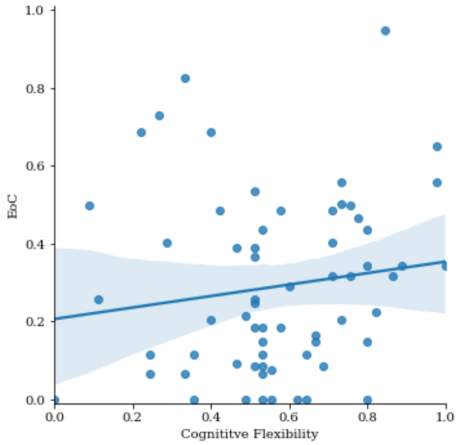
In the last step, I created Model 3, which additionally included the interaction between personal responsibility and emotional complexity. A significant regression equation was found ($F(7,56) = 7.692$, $p < .001$), with an increased R^2 of .490.

In the following, I will present the moderated multiple regression analysis results.

Hypothesis 3

Hypothesis 3 states that individuals with high cognitive flexibility are less likely to escalate their commitment than those with low cognitive flexibility.

Figure 13 Scatterplot - Cognitive Flexibility & EoC



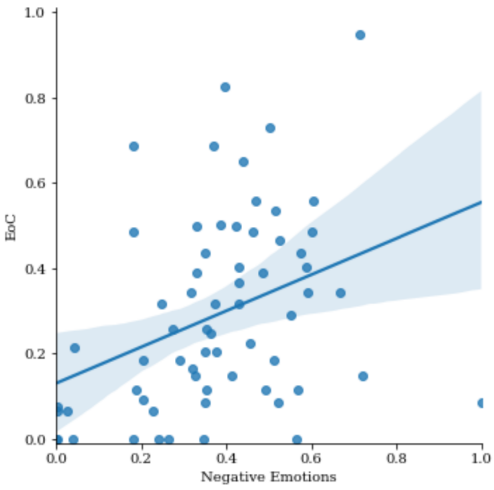
Contrary to the hypothesized relationship, a scatterplot (Figure 13) suggests a slightly positive relationship between cognitive flexibility and EoC.

When testing Hypothesis 3 by controlling for all other factors included in Model 1, cognitive flexibility did not significantly predict EoC, β = -.060, SE = .109, p = .586. **Hence, I rejected Hypothesis 3.**

Hypothesis 4a

Hypothesis 4a states that individuals who experience negative integral situational emotions are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment than individuals who experience less negative integral situational emotions.

Figure 14 Scatterplot - Negative Situational Integral Emotions & EoC



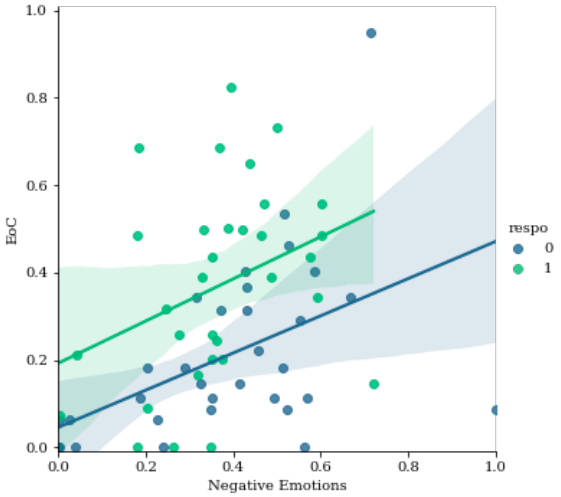
In line with the hypothesized relationship derived from Cognitive Dissonance Theory, the scatterplot (Figure 14) suggests a positive relationship between negative emotions and behavioral EoC.

Controlling for all other factors included in Model 1, I found a significant positive effect of negative emotions, β = .345, SE = .120, p = .006 on EoC. **Hence, Hypothesis 4a was supported.**

Hypothesis 4b

Hypothesis 4b states that individuals who experience negative integral situational emotions are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment when personally responsible for the initial path of action than individuals who experience less negative integral situational emotions.

Figure 15 . Scatterplot - Interaction (Negative Situational Integral Emotions)



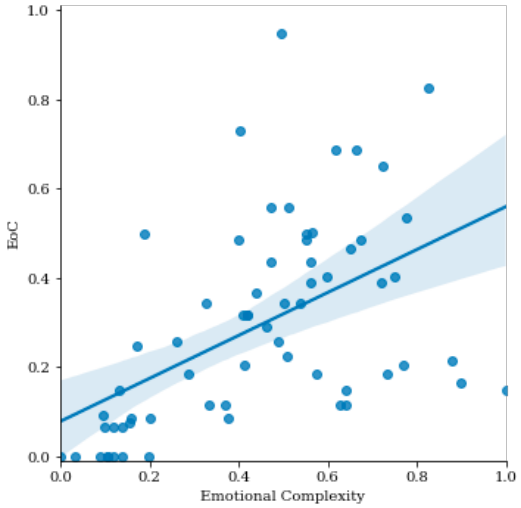
The scatterplot (Figure 15) indicates that the data may not support the hypothesized interaction.

While the main effect of negative emotions remained significant in Model 2 compared to Model 1 (β = .304, SE = .147, p = .043), the interaction effect of negative emotions and personal responsibility did not significantly predict the changes in escalation of commitment when controlling for all other factors in Model 2 (β = .120, SE = .242, p = .622). Adding the interaction term in Model 2 did not contribute a significant proportion of the accounted variance, $\Delta R^2 = .003$, p = .621. **Hence, I rejected Hypothesis 4b.**

Hypothesis 5a

Hypothesis 5a states that individuals who experience situational integral emotional complexity are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment than individuals who experience less situational integral emotional complexity.

Figure 16 Scatterplot - Situational Integral Emotional Complexity & EoC



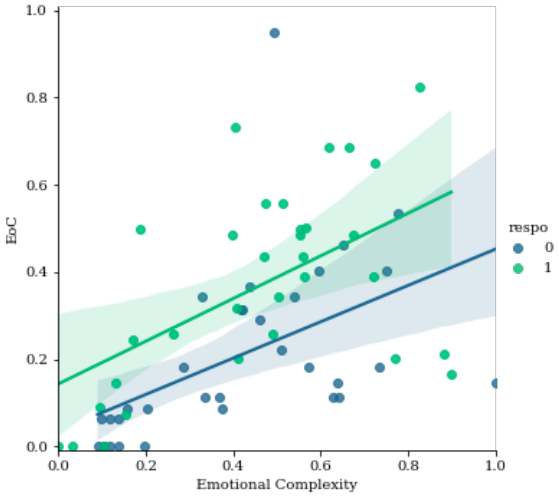
In line with the hypothesized relationship derived from Cognitive Dissonance Theory, the scatterplot (Figure 16) suggests a positive relationship between complex emotions and behavioral EoC.

Controlling for all other factors in Model 1, I further found a significant positive effect of emotional complexity, $\beta = .444$, $SE = .097$, $p < .001$ on escalation of commitment. **Hence, Hypothesis 5a was supported.** The standardized coefficients of the combined model (emotional complexity = .444, negative emotions = .345) and the significant change in R^2 when only adding emotional complexity ($\Delta R^2 = .190$, $p < .001$) showed that emotional complexity contributes a higher proportion of the accounted variance in escalation of commitment than negative affect. The main effect of emotional complexity also remained significant in Model 3 ($\beta = .348$, $SE = .142$, $p = .017$).

Hypothesis 5b

Hypothesis 5b states that individuals who experience integral situational emotional complexity are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment when personally responsible for the initial path of action than individuals who experience less integral situational emotional complexity.

Figure 17 Scatterplot - Interaction (Situational Integral Emotional Complexity)



The scatterplot (Figure 17) indicates that the data may not support the hypothesized interaction.

The interaction effect of emotional complexity and personal responsibility did not significantly predict the changes in escalation of commitment when controlling for all other factors in this model (β = .171, SE = .184, p = .357). Similar to Model 2, adding the interaction term in Model 3 did not contribute a significant proportion of the accounted variance, ΔR^2 = .008, p = .357. **Hence, I rejected Hypothesis 5b.**

5.1.3 Extended Quantitative Analysis

5.1.3.1 Individual Decisions

As described in the methodology section, I consider EoC as the overall tendency to persist with the failing project across all four decision points in the sequential decision-making scenario. Hence, an interaction effect may remain undetected as it only occurs in one (most likely in the first) decision round. To exclude this possibility and increase robustness, I repeated the moderated multiple regression analysis for each decision using two different dependent variables and the decision-specific values for negative emotions and emotional complexity. First, I included the binary decisions of whether or not to continue as the dependent variables. In the second step, I repeated the procedure using the relative proportion invested for each decision.

In both cases, the results mimic the findings from our initial analysis. With one exception, I could not find significant interaction effects or significant increases in R^2 when adding the interaction terms. In the third decision, when using the binary decision of whether or not to continue as the dependent variable, I found a significant positive interaction effect between personal responsibility and emotional complexity (β = .380, SE = .174, p = .033). However, adding the interaction term did not contribute a significant proportion of the accounted variance, ΔR^2 = .025, p = .130. Further, I could not find any significant interactions for the fourth decision. Consequently, a possible effect of time, suggesting that only

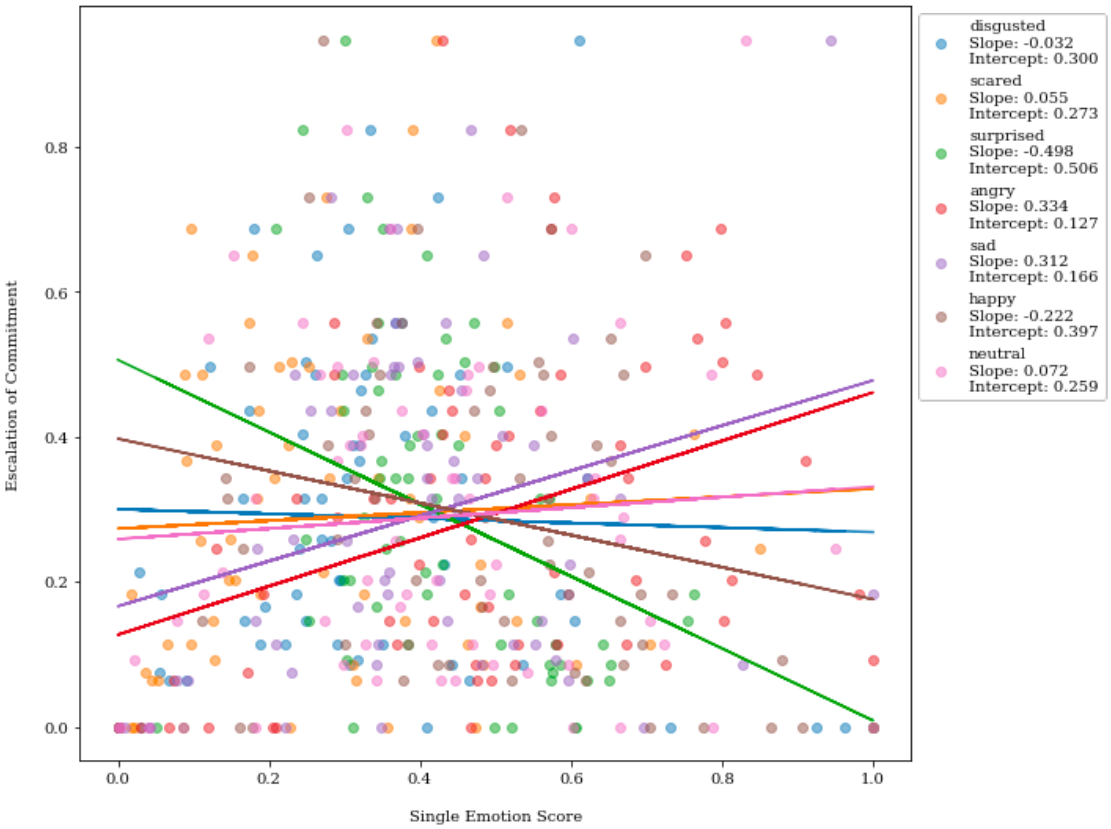
later decisions show the interaction between personal responsibility and complex emotions, can be ruled out.

5.1.3.2 *Discrete Emotions*

Aggregating distinct emotional states and their combinations into negative emotions and emotional complexity is necessary for testing the competing hypotheses stemming from Coping and Cognitive Dissonance Theory. However, this approach does not allow for insights into the role of the discrete emotional states underlying negative emotions and emotional complexity. Repeating the analysis with discrete emotional states and investigating positive and negative states simultaneously can help to obtain a more holistic picture.

Hence, I additionally investigated the effects of discrete emotional states (angry, sad, scared, disgusted, surprised, happy) on behavioral EoC. Fitted linear regression lines in a scatterplot showing the relationship between each emotional state and escalation of commitment indicated a negative linear relationship with EoC for the emotions happy (β = -.222) and surprised (β = -.498). On the other hand, feeling sad (β = .312) and angry (β = .334) have a positive linear relationship with EoC.

Figure 18 Discrete Situational Integral Emotions & EoC



Correlation analysis using Pearson's Correlation Coefficient supported these indications: There is a nonsignificant negative correlation between feeling happy

and escalation of commitment (r(62) = -.21, p = .103) and a significant negative correlation between surprised and escalation of commitment (r(62) = -.36, p = .003). Further, feeling angry (r(62) = .36, p = .003) and feeling sad (r(62) = .28, p = .026) are significantly positively correlated with EoC.

To test the effect of those discrete emotions on EoC while controlling for confounding factors, I created a new multiple regression model (Model 4) in which I included as independent variables the emotions surprised, happy, sad, angry, disgusted, and scared together with emotional complexity, cognitive flexibility, and the control variables age and gender, and the manipulation of personal responsibility.

Table 7 Hierarchical Multiple Regression Analysis - Comparison Model 1 & 4

	Dependent Variable: Escalation of Commitment	
	Model 1	**Model 4**
Age	0.013**	0.013**
Gender (female = 0, male = 1)	-0.082*	-0.102*
Personal Responsibility (No = 0, Yes = 1)	0.117**	0.061
Cognitive Flexibility	-0.060	-0.055
Negative Emotions	0.345***	
Emotional Complexity	0.444***	0.427***
Happy		-0.224
Surprised		-0.446**
Sad		0.406**
Angry		-0.099
Disgusted		-0.208
Scared		-0.096
Constant	-0.326**	0.128
Observations	64	64
R^2	0.482	0.545
Adjusted R^2	0.428	0.448
Residual Std. Error	0.172 (df=57)	0.168 (df=52)
F Statistic	8.852*** (df=6; 57)	5.652*** (df=11; 52)
*Note: *p<0.1; **p<0.05; ***p<0.01*		

A significant regression equation was found (F(11,52) = 5.652, p < .001), with a R^2 of .545. Controlling for all other factors, we found a significant negative effect of surprised (β = -.446, SE = .216, p = .044), and a significant positive effect of sad (β = .407, SE = .157, p = .012) and emotional complexity (β = .423, SE = .128, p = .002) on EoC. Further, the control variable age significantly predicted EoC in this model, β = .013, SE = .006, p = .040.

5.1.4 Interim Summary of Results

The analysis showed support for the effect of the manipulated interpersonal differences in personal responsibility on behavioral EoC - participants personally responsible for initiating the project were significantly more likely to escalate their commitment than participants from the non-responsible condition (Hypothesis 1). Further, I found support for the effect of learning on EoC, as the overall tendency to escalate decreased over time (Hypothesis 2). The multiple moderated regression analysis showed that negative situational integral emotions as well as complex situational integral emotions are significant predictors of behavioral escalation tendencies (Hypothesis 4a, 5a). However, I could find neither significant differences in behavioral EoC between participants with different cognitive flexibility levels (Hypothesis 3), nor support for the assumed interaction effects between personal responsibility and situational integral emotions (Hypothesis 4b, 5b).

Table 8 Overview of Supported and Rejected Hypotheses

Behavioral Layer	**Personal Responsibility**	**Hypothesis 1:** Individuals who are personally responsible for initiating the troubled project are more likely to escalate their commitment than individuals who are not personally responsible.	**Supported**
Cognitive Layer	**Adaptive Learning**	**Hypothesis 2:** Escalation of commitment decreases over multiple decisions.	**Supported**
	Cognitive Flexibility	**Hypothesis 3:** Individuals with high cognitive flexibility are less likely to escalate their commitment than those with low cognitive flexibility.	Rejected
Affective Layer	**Negative Situational Integral Emotions**	**Hypothesis 4a:** Individuals who experience negative integral situational emotions are more [Cognitive Dissonance Theory] likely to escalate their commitment than individuals who experience less negative integral situational emotions.	**Supported**
		Hypothesis 4b: Individuals who experience negative integral situational emotions are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment when personally responsible for the initial path of action than individuals who experience less negative integral situational emotions.	Rejected
	Situational Interal Emotional Complexity	**Hypothesis 5a:** Individuals who experience situational integral emotional complexity are more [Cognitive DIssonance Theory] likely to escalate their commitment than individuals who experience less situational integral emotional complexity.	**Supported**
		Hypothesis 5b: Individuals who experience integral situational emotional complexity are less [Coping Theory] / more [Cognitive Dissonance Theory] likely to escalate their commitment when personally responsible for the initial path of action than individuals	Rejected

The additional analysis of discrete situational integral emotions yielded a positive significant effect of feeling sad and a negative significant effect of feeling surprised on behavioral EoC. Table 9 provides a detailed summary of the effects of discrete emotions on EoC

Table 9 The Effect of Discrete Situational Integral Emotions on EoC

Category	Emotion	Correlation with Escalation of Commitment (Pearson)	Isolated Effect on Escalation of Commitment (Multiple Regression)*
Negative	Angry	Significant **positive** correlation r(62) = .36, p = .003	Non significant negative effect β = -.099, SE = .119, p > .100
	Disgusted	Non significant negative correlation r(62) = -.03, p = .819e	Non significant negative effect β = -.208, SE = .164, p > .100
	Sad	Significant **positive** correlation r(62) = .28, p = .026	Significant **positive effect** β = .407, SE = .157, p = .012
	Scared	Non significant positive correlation r(62) = .05, p = .683	Non significant negative effect β = -.096, SE = .147, p > .100
Hybrid	Surprised	Significant **negative correlation** r(62) = -.36, p = .003	Significant **negative effect** β = -.446, SE = .216, p = .044
Positive	Happy	Non significant negative correlation r(62) = -.21, p = .103	Non significant negative effect β = -.224, SE = .141, p > .100

** Including all discrete emotions, emotional complexity, cognitive flexibility, and the control variables age, and gender*

5.2 Results of the Qualitative Analysis

The following presents the results of the complementary qualitative analysis based on the free-form narrating of decision-makers during the decision simulation. The results are organized in two parts. First, I will describe the cognitive reasoning patterns identified from the three-step coding procedure. Second, based on the changes in cognitive reasoning over time, I will describe the developed process model. The patterns and process model descriptions are based on the results section in Marx and Uebernickel (2023b).

5.2.1 Cognitive Reasoning Patterns

Based on 267 explanations given by the participants for 170 decisions to persist, I identified 13 distinct sub-patterns. Table 10 shows the frequency of the 13 most relevant reasoning patterns across the dataset.

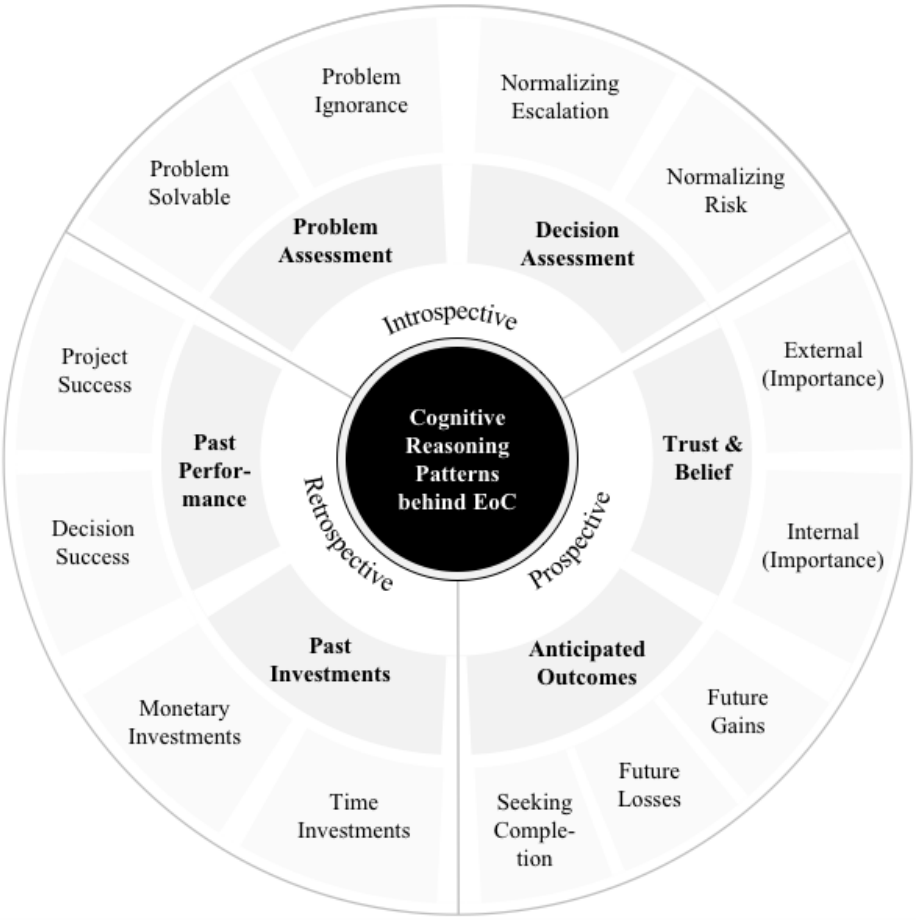
Table 10 Frequency of Cognitive Reasoning Patterns

Cognitive Cluster	Occurance
333_Strive for completion	45
212_Problem solvable	34
211_Problem ignorance	30
321_Anticipated future gains	30
312_Belief and trust (internal)	27
111_Past monetary investments	21
322_Anticipated future losses	15
222_Normalizing risk	12
311_Belief in importance (external)	12
121_Past project success	8
221_Normalizing escalation	6
112_Past time investments	4
122_Past decision success	3

The sub-patterns can be further summarized in six overarching cognitive reasoning patterns during EoC to a failing project. The six cognitive reasoning patterns underlying escalating behavior are past investments, past performance, problem assessment, decision assessment, trust and belief in the project and people, and anticipated outcomes. As described in the methodology section, I mapped those clusters based on their temporal focus into retrospective, prospective, and introspective cognition.

Figure 19 gives an overview of the cognitive reasoning clusters, the respective categories, and the cognition modes, including representative quotes from the text data.

Figure 19 Cognitive Reasoning Patterns behind EoC



In the following, I will describe each cognitive cluster based on the qualitative analysis.

5.2.1.1 Retrospective Cognition

Retrospective Cognition is characterized by a temporal focus on the past. I identified reasoning with past investments, including past monetary and past time investment, and past project and decision success as key reasoning patterns associated with retrospective cognition.

Past Investments

The cognitive pattern of past investments can be divided into past monetary and past time investments. People frequently justify their escalating behavior with the amount of money or time already invested in the current path, making this pattern one of the most mentioned reasons for persisting. Participants described feeling locked in the current path of action due to past monetary investments with statements like *"for all the previous amounts invested in this project, it would be disappointing to come to the end of the project"*. Similarly focused on the existing monetary investments made in the past, decision-makers note the increasing difficulty of changing courses: *"The funds already invested in the project are quite high, which would also make it very difficult to justify abandoning the project at this point"*. Besides monetary investments, time is mentioned as a resource

invested in the past that impacts the current decision: *"The project is ongoing. It would be a pity to interrupt it".* While sunk costs should be disregarded, most participants relied on past investments of time and money when deciding to continue with the troubled project, as this cluster is among the most frequent reasons overall.

Past Performance

Also categorized as retrospective cognition, I identified a stream of argumentation that focused on the project's past success even though the feedback about the project's performance was negative in all cases. Decision-makers directly point out apparent past project success and use this to justify not deviating from their previous decisions: *"First successes are visible. So this made me invest extra money even though our budget is exceeded."* Even when the project feedback clearly stated severe problems regarding the project performance, decision-makers evaluated the current state as successful and gained confidence in their decision to continue investing in the failing project: *"The technology works to some degree. So this has demonstrated successful performance so far. I am more confident now."* Within the same cluster on past success, I found decision-makers justifying additional investments with the previous success of their own decisions: *"The fact that (...) the previous decision of replacing the material proved to be successful influenced me in my decision to pursue the project and grand extra funding."*

5.2.1.2 Introspective Cognition

Introspective Cognition is characterized by a temporal focus on the present and the self. I identified cognitive processes related to assessing the problem, such as denial and minimization, as well as normalizing escalation and risk as part of assessing the decision as key introspective cognitive patterns during project escalation.

Problem Assessment

While augmenting with previous project success or invested resources signals retrospective cognition, arguments regarding assessing the problem focus more on the present state and internal factors. Biased problem assessment mainly manifests in two ways: Either the problem is being denied and the project is falsely interpreted as running smoothly despite objectively negative feedback, or the problem is acknowledged but downplayed in its severity and overstated in its solvability. Regarding the former, participants escalated their commitment to the failing project because their assessment of the current situation was erroneous. *"I feel excited about the project and I am looking forward to the new product"* is an example of how objectively negative project performance is not only being ignored but also transfigured to the contrary. The perception that the project is running smoothly is widespread among decision-makers, especially in later phases of the decision sequences: *"Now the project seems well on its way. I decided to grant more funding because the project is performing well".* When looking at the second manifestation of faulty problem assessment - downplaying the problem - decision-makers have, for instance, argued that *"adding the software to take care of the additional problem should be a minor problem".* Other participants gave similar

insights into their cognitive reasoning patterns, stating that *"the problem seems to be solvable with additional investments"*.

Decision Assessment

Similar to potentially faulty assessments of the current project performance and the interpretation of the severity and solvability of the problems, the category decision assessment is based on a misjudgment but targeted at the decision being made, not the problem. In this case, decision-makers normalize exceeding budget and time or taking unreasonable risks by further investing. The costs of the decision to continue with the troubled projects are thereby understated. As one of the participants put it: *"It often takes a little more money than expected because unforeseen events can happen. (...) The project seems very complex. Therefore, it's normal that during the process of developing the technology needed, there will be a few issues that will require more funding than initially required"*. Also, taking more risk with the decision to continue investing is assessed as being ordinary or necessary: *"An enterprise always has to take on some risk, especially in a high growth sector like high-tech - to me it sounds reasonable trying this new direction"*.

5.2.1.3 Prospective Cognition

Prospective Cognition is characterized by a temporal focus on the future. I identified cognitive processes related to internally and externally created trust and belief in the project and other people, as well as the anticipation of future outcomes, including anticipated losses and gains, as key prospective cognitive patterns.

Trust and Belief

The third category of cognitive clusters associated with reasoning during escalating behavior is focused on future events, predictions, and anticipation. Several participants associated their approval of more funding for the failing project with its importance and the general belief and trust in future success. I identified two types of attributed importance within this cognitive cluster: Externally created importance and internally created importance. The former refers to external indicators of importance, like the range of possible funding amounts, the complexity of the project, or the perceptions of others. Participants, for instance, stated that *"The Vice President seemed confident about the development. (...) Based on [her] descriptions, it seems to be a meaningful project, so it would be a pity to let it down. Also, I think that due to the nature of the project, as well as the amounts of funding granted so far that it is quite important"*. This externally created perception of project importance and the general belief in the project is also related to the trust decision-makers have in other stakeholders associated with the project: *"I believe in the engineer. (...) Also, I am trusting my employees to turn this around"*. Internally created perceptions of project importance refer to people's general belief in the project and its success. This subjectively attributed, performance-independent value is used to justify a continuation of the investment: *"Considering the importance of the project, I think it was ok to approve more funding even though we are clearly over budget", "I decided to pursue this project because I believe that the project has potential in the future"*.

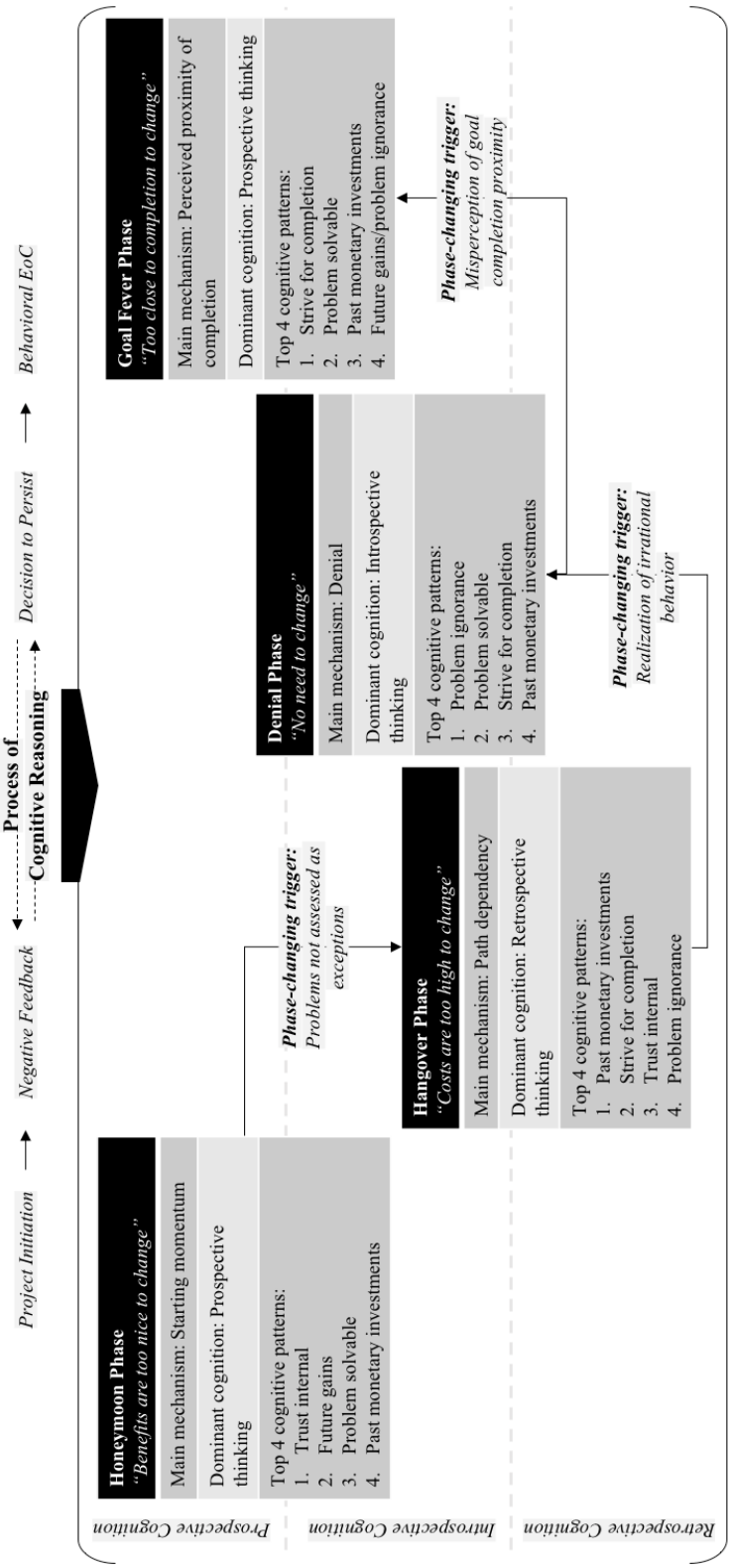
Anticipated Outcomes

The second pattern related to future-oriented cognition is the anticipation of outcomes. Within this cluster, I identified three types of reasoning: Continuing to invest in the failing project to maximize future gains, to minimize future losses, and to reach completion. While focusing on potential future gains and goal completion is related to anticipated positive emotions, hope, and optimism, avoiding future losses is fear-based and more pessimistic. Hope-based anticipation of future gains included statements like "*I am still hoping the project will be successful"* and *"Once the product is on the market, we will be able to compete and gain a lot".* Here, anticipated joy, hope, and picturing the potential future gains motivated the decision-makers to keep investing despite negative performance feedback. The foundation for this type of reasoning is optimism and overly focusing on benefits while neglecting the possibility of costs and risks associated with the decision to continue. On the other hand, anticipated regret and fear of losing money and other resources already invested in the project by not continuing funding is reflected in statements like: *"It is worth to continue also with all the problems - otherwise there will be a total loss of all the investments"*, and *"The additional investment result to be the best option to avoid a complete waste of the already invested 12 million".* In contrast to anticipated joy out of future gains, the foundation for this type of reasoning is the urge to avoid future losses. The third type of outcome anticipation promoting escalation behavior relates to striving for completion. As one participant put it: *"The project is so close to completion now - I can't abandon it"*. Seeking completion and the anticipated pleasure it will bring makes it more difficult for the decision-makers to abandon the failing project: *"It will be very difficult to market the product, but it must be finished".* Notably, while ambiguity concerning the actual completion rate of the project was intentional, most participants interpreted the project completion as being in very close reach after the second decision round and used this as a key foundation of their reasoning: *"Only one small step seems to be missing to get the project ready without errors. (...) I don't want to abandon now that we are almost there".*

5.2.2 Cognitive Process Model

I developed a process model of cognition (Figure 20) that shows different reasoning patterns for different process phases and reveals distinct phase-changing triggers.

Figure 20 Cognitive Process Model of EoC



In the following, I will describe the characteristics of each phase, its main stabilizing mechanism, and the phase-changing trigger.

5.2.2.1 Honeymoon Phase ("Benefits are too nice to change")

The Honeymoon Phase is characterized by optimism and a high level of intrinsic belief about the promising potential of the project driven by the recency of just having started the course of action. Hence, one of the main mechanisms fostering escalation behavior in this phase is starting momentum - "the energy associated with persisting with or extending the current trajectory" (Jansen, 2004, p. 277). The most dominant cognitive cluster underlying this phase is internal trust and belief - the internally created perceptions of project importance, like people's general belief in the project and its success. Also the second most crucial cognitive sub-cluster in this phase - the prospect of future gains - belongs to the category of anticipated outcomes and signifies prospective cognition. This focus on potential future benefits stemming from generally believing in the project overshadows potential costs and makes it appear rational to the decision-maker to keep investing more budget and time than initially planned in the troubled project. Hence, the force or energy that propels the endeavor forward at the beginning leads to overly optimistic assessments of future project developments and the solvability of the problems arising. During the Honeymoon Phase, problems are seen as exceptions on an overall successful and promising trajectory with no or only minor effects on future gains. The reasoning is further driven by general, unspecific trust, enthusiasm, and positive emotions.

5.2.2.2 Hangover Phase ("Costs are too high to change")

While in the Honeymoon Phase, negative project feedback was interpreted as exceptional and not defining for future outcomes, a shift in this assessment based on repetitive negative feedback can function as a phase-changing trigger. What follows, in this case, is what I call the Hangover Phase - a phase characterized by retrospective cognition focused on past investments. Decision-makers find themselves "stuck" given the resources already invested in the project and the resulting anticipation of loss should the project be abandoned. The cost-benefit assessment is accordingly skewed towards overemphasizing the potential abandonment costs compared to the Honeymoon Phase. Hence, the dominant mechanism contributing to escalating behavior in the Hangover Phase is path dependence, which refers to a process in which a decision-maker's range of available options is gradually reduced over time and eventually becomes locked in (Schreyögg et al., 2011). The central idea of path dependence is that positive feedback on past decisions encourages similar decisions. While previous positive decision feedback might seem counterintuitive in the given context, path dependence can still occur as decision-makers assess the problems in the project performance as not severe or even nonexistent in this phase: Problem ignorance is among the top four cognitive clusters relevant in the Hangover Phase. Additionally to becoming locked in through past investments of money and time and a misjudgment of the problem, the Hangover Phase can be characterized by partially realizing dysfunctional decision-making. Decision-makers start to distance themselves from the project, indicated by first doubts mentioned in this phase and a general shift towards more rational and external-focused arguments.

5.2.2.3 Denial Phase ("No need to change")

Following the Hangover Phase, the escalation process transitions into a Phase of Denial, triggered by the partial realization of irrational behavior. Denying that the project is not running ideally at this stage or understating the problem's severity and overstating its solvability - the cognitive sub clusters associated with problem assessment - are representative of the Denial Phase and indicate a shift from retrospective to introspective thinking. Escalating behavior is driven in this phase by a mismatch of the decision-maker's reaction to the partial realization of irrationality triggering this phase: The unpleasant realization of the project going sideways reaches a point where overstating potential costs would not justify continuing anymore. However, the reaction to this shift in decision awareness is not behavior change but denial and the minimization of the troubled situation. As a result, decision confidence increases, and previously rising doubts diminish.

5.2.2.4 Goal Fever Phase ("Too close to completion to change")

Decision-makers escalating their commitment to a failing course of action find themselves in a Phase of Denial until a specific point in time when the project completion or any other overarching goal is assessed to be in close reach. When this tipping point has been reached, the Phase of Denial transitions into what I call the Goal Fever Phase. A strong strive for completion characterizes decision-makers cognition in this phase, overshadowing potential arguments for changing the course of action. Hence, introspective cognition shifts towards prospective cognition, focusing on future-oriented thinking, anticipation, and forecasting. While, compared to the Denial Phase, problem awareness increases and problems are acknowledged, they are still misjudged as solvable or not severe in this phase. This focus on the solvability of specific issues differs from the first prospective phase (Honeymoon Phase), where the general belief in the project and a generic positive future assessment dominated thinking patterns. Further, in the Goal Fever Phase, decision-makers tend to mention regret, which may be related to the partial realization of previous decision mistakes. However, this realization does not translate into a course of action, as decision-makers find themselves unable to stop given the proximity of potential completion. Contributing to the strength of the goal completion effect dominating this phase is social pressure and the perception that not completing the project or changing the course of action is seen as giving up.

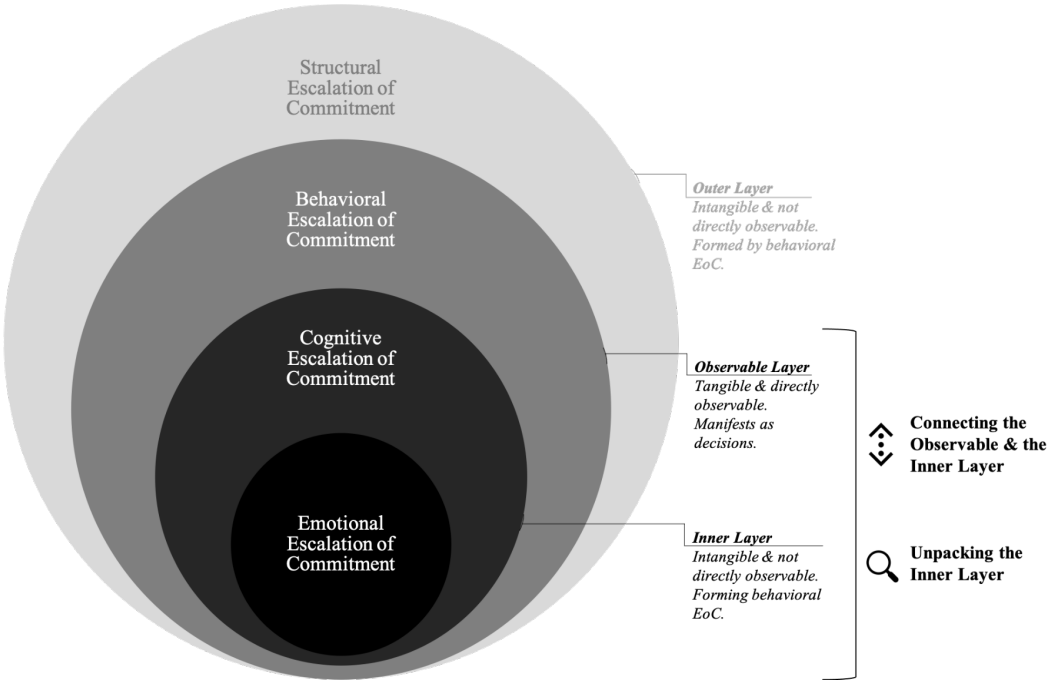
6 DISCUSSION

This chapter consists of three parts. First, I discuss the empirical results following the multilayered conceptualization of EoC. For this, I discuss how the results (1) connect the observable with the inner layer and (2) unpack the inner layer of EoC. Second, the insights gained from both research streams are consolidated into meta-inferences by developing a theoretical framework and propositions that describe and explain the cognitive-emotional dynamics during the phases of EoC and contribute to theoretical plurality. The third part of the discussion chapter discusses the implications of this dissertation for de-escalating commitment from a managerial and technological perspective.

6.1 Discussion of Results

Based on the systematic literature review, I conceptualized EoC as a multidimensional phenomenon consisting of four dimensions on the observable, outer, and inner layers (Chapter 2, Figure 2). I will interpret the results presented in the last chapter following this multilayer conceptualization of EoC. For this, I will discuss how the results (1) connect the observable with the inner layer and (2) unpack the inner layer of EoC. In the last step, both parts are consolidated into meta-inferences by developing a theoretical framework and seven propositions that describe and explain the cognitive-emotional dynamics during the phases of EoC and contribute to theoretical plurality.

Figure 21 Localization of the Results within the Layers of EoC



6.1.1 Connecting the Observable and the Inner Layer

In this dissertation, I disentangle the emotional and cognitive factors behind behavioral escalation tendencies in sequential decision-making, thereby connecting the observable with the inner layer.

6.1.1.1 Path A - Personal Responsibility

The results provide causal evidence that personal responsibility for initiating the project leads to higher behavioral EoC in sequential decision-making (Hypothesis 1). This indicates a successful replication of the general EoC effect and supports high personal responsibility for project initiation as a major determinant of EoC, which aligns with foundational studies and Self-Justification Theory (Brockner, 1992; Staw, 1976). When facing negative feedback, the feeling of personal responsibility enhances the threat associated with decision failure, which alters the need to justify those past decisions or attitudes in front of themselves or others

when social pressures are present. The escalating effect of personal responsibility contributes to Path A in the presented research framework, modeling the relationship between personal responsibility as a characteristic of the decision context.

6.1.1.2 Path B - Adaptive Learning

I localized the effect of learning from past decision outcomes, including the element of time within Path B in the research framework, thereby connecting the cognitive with the behavioral layer of EoC.

Following the law of effect, decision-makers should learn from adverse decision outcomes within one escalation situation and withdraw from the failing project. However, individuals still escalate their commitment to failing courses of action, even when they repeatedly receive negative feedback following their decision to persist. While the overall EoC effect was supported, the tendency to escalate commitment decreased over time on the single decision level (Hypothesis 2). As the project progressed and negative feedback continued, the probability of further persisting with the failing project and the relative amount participants were willing to invest declined. This finding aligns with the argument of differentiating the decision strategy from the individual decision level. Adaptive learning from the negative decision outcome of the previous decision counteracts EoC gradually at the single decision level. At the same time, EoC dominates when looking at the decision strategy as a whole. It thereby contributes to solving the paradox of escalation despite the cognitive ability to learn from past decision outcomes based on the law of effect (Wong & Kwong, 2018). The finding aligns with previous empirical research on sequential decision-making (Jackson et al., 2018) and cognitive theories on adaptive learning (Shepherd & Cardon, 2009).

As introduced in the review of EoC theories and antecedents, multiple contextual, project-related, relational, and individual forces drive individuals to persist with the failing course of action as an overall decision strategy (e.g., persisting to self-justify past beliefs or behavior). Support for Hypothesis 2 has shown that when looking at the individual decision level - where learning is based on the association of single decision-outcome pairs - adaptive learning from adverse decision outcomes is indeed counteracting the escalation effect - just not enough to manifest within the overall decision strategy, where learning is based on the association of multiple decisions with one consequence of that strategy.

The overall decline is also in line with self-justification theory, as over time, it may become increasingly difficult to rationalize one's actions to reduce cognitive dissonance (Brockner, 1992; Sleesman et al., 2012). The minor incline in escalation tendency in the penultimate decision round could be explained by the goal completion effect evening out learning effects at a stage where the project completion seems particularly close (Lant & Hurley, 1999).

The support for adaptive learning effects at the single decision level and the resulting decline of escalation tendency over time shows the complexity of counteracting cognitive forces and rationalization approaches in escalating situations. The EoC formula I developed to study emotional and cognitive

determinants captures overall EoC, thereby accounting for potentially counteracting learning effects on the individual decision level.

6.1.1.3 Path C - Cognitive Flexibility

Aiming to connect the cognitive with the behavioral layer further, I categorized interpersonal differences in cognitive flexibility, the ability to switch cognitive sets to adapt dynamically to changing environments (Dennis & Vander Wal, 2010), as a characteristic of the decision-maker within the research framework. In contrast to the predictions, I could not find a significant negative effect of high cognitive flexibility on EoC (Hypothesis 3). While cognitive flexibility is essential for tasks requiring simultaneous consideration of multiple concepts, switching between tasks, or adapting to changing environments, differences in cognitive flexibility had no significant influence on behavioral tendencies in the escalation situation.

The absence of the hypothesized effect may be explained by potential mediating effects of decision confidence, which is supported by a significant positive correlation of decision confidence with cognitive flexibility and EoC. Other explanations may be the relative homogeneity of the sample, the choice of measure, or the escalation scenario chosen in this study.

Notably, the effect was not only not significant, but I further found indications that a potential undetected effect could have the opposite direction than assumed. I previously hypothesized that when decision-makers assess the escalation situation and their previous persistence as dysfunctional, translating this realization into behavioral change is unlikely when they fail to adjust their cognitive sets accordingly (Betsch et al., 2001; Dane, 2010). However, given the significant *positive* correlation between cognitive flexibility and behavioral EoC, the ability to dynamically switch cognitive sets and swiftly adapt mental models may facilitate the cognitive rationalization processes that foster persistence over abandonment in escalation situations.

6.1.1.4 Path D - Situational Integral Emotions

Within the integrated model of cognitive-affective decision-making during EoC, the characteristics of the decision context and the decision-maker, incidental influences, expected decision outcomes, and the cognitive evaluation of the decision situation are all linked to the elicitation and the consequences of current emotions. Located within Path D in the research framework, testing Hypotheses 4 and 5 contributed to integrating the affective and behavioral layers.

The analysis of the emotional journey maps showed a general dominance of negative over positive emotions regardless of the escalation tendencies. The peaks in anger and sadness at the beginning of the decision phases can be interpreted as reactions to the negative project feedback. This supports the assumption that negative project feedback evokes primarily negative emotions and aligns with prior research (Shepherd & Cardon, 2009). With testing Hypotheses 4 and 5, I investigated how individual differences in intensity and complexity of those primarily negative emotions influence the behavioral tendency to escalate.

Aggregated Situational Integral Emotions

When looking at the specific role of situational integral emotions, I found that negative emotions (Hypothesis 4a) and emotional complexity (Hypothesis 5a) elicited from the decision context increased the behavioral tendency to escalate commitment. Hence, the findings present empirical support for Cognitive Dissonance over Coping Theory for explaining the role of emotional states in the context of EoC.

In line with the Cognitive Dissonance perspective underlying Self-Justification Theory, the findings indicate that individuals strive to resolve the unpleasant emotional experience arising from the inconsistency with their beliefs or past decisions and the escalation situation by maintaining consistency in beliefs and actions (Festinger, 1957; Harmon-Jones, 2000; Staw, 1976). It is unpleasant if something is not congruent with our past behavior, attitudes, or beliefs. We adjust our current behavior, beliefs, or attitudes to counteract this cognitive dissonance. In a situation where we repeatedly receive negative feedback, this loop of self-justification reinforces holding on to past decisions and ignoring the signs to withdraw or change directions. Hence, in the escalation decision-making simulation, this motivational tendency to reduce cognitive dissonance led to cognitive processes favoring persistence with previously made decisions, hence EoC.

The escalation-enforcing effect of negative situational integral emotions extends and integrates elements from the fragmented affective EoC discourse as portrayed in Chapter 2.2.3. More specifically, the findings extend the research on carried-over and anticipatory emotions (e.g., Roeth et al., 2020; Tsai & Young, 2010) with the focus on situational integral emotions. The support of Cognitive Dissonance over Coping Theory in predicting the effect direction of situational integral emotions on EoC challenges the findings of Wong et al. (2006, Study 3). I explain this contradiction with the conceptual and methodological differences consciously applied in my study, precisely, the nuanced conceptualization of EoC as a formula of judgment and decision, the dimensional approach applied to conceptualize emotions, the advantages of using psychophysiological measures and data triangulation from multiple measurement sources (including AI-based facial detection technology), and the application to a vignette-based (hence more realistic) sequential decision-making scenario.

Because people dislike internal inconsistencies (Pepitone & Festinger, 1959) and feel conflicted (Goetz et al., 2008), Cognitive Dissonance Theory predicts that they strive to simplify their complex states to reduce the unpleasant feelings of conflict, tension, and discomfort. I provide empirical evidence for this prediction and show that situational integral emotional complexity is an even stronger determinant of behavioral EoC than negative emotional states. This supports the assumption that emotional complexity plays a crucial role in judgment and decision-making in general and in explaining how EoC evolves in particular.

Given the changes in cognitive appraisals based on differences in personal responsibility, in addition to the direct effect of integral situation emotions and

personal responsibility, I argued that an interaction of both elements in shaping behavioral EoC is likely. Surprisingly, while the effects of personal responsibility, negative situational integral emotions, and situational integral emotional complexity were significant, I could not find support for a moderating effect of personal responsibility (Hypotheses 4b and 5b). The additional analyses for each decision support the absence of interaction effects. Hence, I interpret the results as robust. This indicates that current and decision-related negative emotional states and emotional complexity resulting from negative feedback increase the probability of project escalation, even when the decision-maker is not responsible for the initial course of action. Since separating responsibility for project initiation and continuation is one of the most prominent strategies for de-escalation (Marx & Uebernickel, 2022; Pan et al., 2004), this finding is particularly relevant. According to the results, low personal responsibility alone is insufficient to de-escalate commitment. Given the strong effects of emotional states independent from personal responsibility, de-escalation strategies should consider actions and conditions that acknowledge the escalation triggering potential of how people feel about negative project feedback, even when they are not responsible for the initial decision.

Discrete Situational Integral Emotions

The repetition of the analysis with the specific emotional states underlying negative emotions and emotional complexity helped to obtain a more nuanced picture of the emotional determinants. Notably, the additional moderated multiple regression analysis with discrete emotions did not test Hypothesis 4 and 5 but provided additional insights about the underlying discrete emotions shaping the effects of the analyzed aggregated concepts.

The analysis included anger, sadness, feeling scared, disgusted, surprised, and happy as discrete situational integral emotions instead of aggregations. Feeling sad about negative project feedback leads to higher behavioral EoC. Also, anger was positively correlated with EoC, which aligns with prior research (Tsai & Young, 2010). However, the effect was not significant when controlling for sadness. While sadness as a discrete emotion so far has received limited academic attention in the context of EoC, it is related to counterfactual emotions such as drop regret, which has been linked to escalating behavior (Hoelzl & Loewenstein, 2005; Sarangee et al., 2019; Wong & Kwong, 2007). Moreover, I found a pattern of decline in feeling surprised before de-escalation supported by a significant positive effect on EoC when controlling for all other discrete emotional states. While there exists no empirical research on the role of surprise in determining escalation behavior (see review in Chapter 2.2.3), the finding that feeling surprised leads to lower escalation behavior may counteract cognitive elements (ignoring, disregarding, or justifying feedback that is not in line with prior beliefs or behavior) underlying behavioral escalation. Feeling surprised in response to negative decision feedback in an escalation situation may indicate higher situational awareness, which evidently reduces escalation tendencies (Montealegre & Keil, 2000; Pan et al., 2004). While Ekman and Cordaro (2011) considered surprise a basic emotion, other researchers see a direct bridge between cognition and emotion in the state of surprise and

suggest a more complex conceptualization (Mellers et al., 2013). The indications gained from this additional analysis, particularly regarding the role of surprise as a marker for de-escalation, underline the reciprocal relationship between cognition and emotion.

6.1.2 Unpacking the Inner Layer

After showing the psychophysiological connection between the observable and the inner layer, the qualitative investigation helped unpack the inner layer further, particularly regarding cognitive appraisal, evaluation, and behavioral tendencies. The findings show that decision-makers use different cognitive reasoning patterns to justify escalating behavior. Those reasoning patterns change over time during the process of escalation, indicating a typical sequence of four different cognitive phases: Honeymoon Phase, Hangover Phase, Denial Phase, and Goal Fever Phase. Decision-makers' cognition differs between those phases regarding its temporal focus (retrospective, introspective, or prospective thinking), dominant mechanisms (starting momentum, path dependency, denial, or perceived proximity of completion), and which combination of cognitive reasoning patterns dominates. The transitioning between phases is triggered by changes in the problem assessment (retrospective thinking evoking trigger), in the degree of realizing irrational behavior (introspective thinking evoking trigger), and the misperception of the goal completion proximity (prospective thinking evoking trigger).

The cognitive reasoning patterns identified correspond to and extend existing academic knowledge about the mechanisms underlying escalation behavior. For instance, the reasoning pattern problem assessment can be related to early research from Staw and Ross (1987), who suggested that decision-makers are more likely to escalate their commitment when they perceive problems as temporary and easily solvable. Minimizing or denying the problem as part of this cognitive reasoning cluster can further be related to the decision-dilemma theory (Bowen, 1987), for example, applied by Priandi et al.(2020) in the context of EoC as a potential force for good, which argues that negative feedback as part of the escalation process is equivocal for decision-makers. Another example is the cognitive reasoning pattern associated with considering past monetary and time investments during the decision-making process - past investments. This pattern is in line with the sunk cost effect (Arkes & Blumer, 1985), which describes the tendency to continue with an endeavor when an investment of money, effort, or time has already been made. Along the same lines, the cognitive pattern of anticipated outcomes can be linked to well-established psychological concepts: What I observed mainly in the Goal Fever Phase, where people assumed close project completion and were dominated by the cognitive reasoning pattern of seeking completion, can be related to the planning fallacy - the tendency to underestimate the time, costs, and risks of future actions and at the same time overestimate the benefits of the same actions - and the general tendency to strive for the positive feeling of completing something (Kahneman & Tversky, 1979; Lovallo & Kahneman, 2003). Within the same cognitive reasoning cluster, Kahneman and Tversky’s (1979) prospect theory, including the aversion of losses compared to seeking equivalent gains (loss

aversion), can be linked to the cognitive reasoning pattern of future losses. Here, the anticipation of future losses and the strive to avoid these losses drives escalation in phases of prospective cognition. A last example is the Hangover Phase, characterized by doubts, first signs of regret, and decreasing decision confidence. This description also matches the qualitative indicators for cognitive dissonance as an underlying psychological tension and discomfort created by the inconsistency of behavior and beliefs (Brockner, 1992; Pepitone & Festinger, 1959).

When looking at the text analysis yielding the cognitive clusters associated with prospective thinking, I found that qualitative indications of emotions like fear, hope, and anticipated joy and regret play a crucial role during cognitive reasoning processes leading to further escalation. This aligns with the confirmatory research stream of this dissertation and existing research on the interaction of emotion and cognition during decision-making (Healey & Hodgkinson, 2017). The cognitive process model validates and extends existing process research. For instance, by deep diving into the cognitive elements underlying the behavioral and structural elements of escalation, I was able to extend and deepen Mähring and Keil's (2008) process model. I could further validate elements of Mähring and Keil's phase of unsuccessful incremental adaptation, where problems are assessed as easily solvable without changing the course of action and their phase of rationalized continuation, which corresponds to parts of the Hangover Phase.

6.2 Development of Meta-Inferences

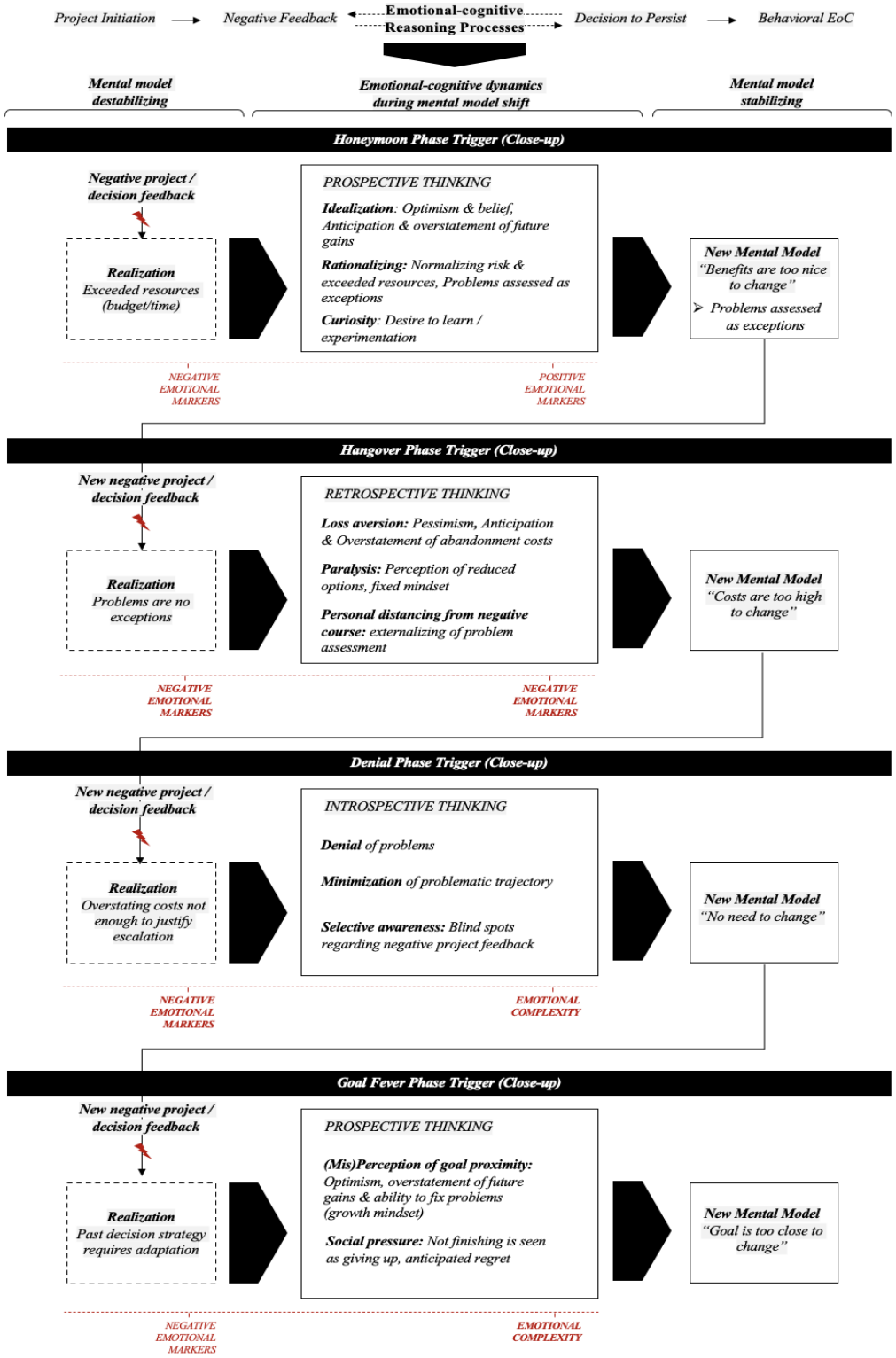
Based on the previous discussion of results, I synthesized the findings of both research streams using bridging into meta-inferences (Venkatesh et al., 2013). As stated in the description of the mixed-method research approach adopted in this dissertation, the purpose of integrating the quantitative and qualitative findings is to go beyond the findings from each research stream alone and develop an in-depth theoretical understanding of how cognition and emotion shape behavioral EoC over time.

6.2.1 EoC as Loops of Mental Model Adaptation

When only considering the visible layer - behavioral commitment escalation - one cannot determine the underlying factors and processes shaping overall escalation behavior on the decision strategy level. Looking beyond the behavioral surface into the cognitive and emotional dimensions, I theorize that escalation manifests as a constant loop of mental model adaptation. This process of mental model shifts is characterized by different combinations of cognitive reasoning patterns, shifts in temporal cognition mode, and the reciprocal interaction with emotions and their anticipation. The resulting cognitive-emotional process produces mental models that are increasingly immune to new realizations. Figure 22 gives a detailed overview of the phase-specific realizations, the process of the mental model destabilizing, the emotional-cognitive dynamics during the mental model shift, and the new mental model that aligns with the previous realization and thereby solves

the created cognitive tensions. Besides the higher abstraction level, the model can be located within the phase-changing triggers in the cognitive process model presented in Figure 20. The theoretical framework outlines each escalation phase's specific realizations, mental models, and dominant reasoning patterns. It further shows when the emotional markers (negative emotions, positive emotions, emotional complexity) are most relevant during each phase and across phases.

Figure 22 Applied Framework: Loops of Mental Model Adaptation



After initiating the project and receiving negative feedback about the project's performance, the Honeymoon Phase is triggered by the realization that the given resources are thoroughly exhausted and a continuation of the trajectory would mean exceeding budget and time. This realization contradicts previous motivations for starting the project and the general momentum towards continuation. The resulting dissonance creates cognitive tensions that manifest as negative emotional markers. To resolve the tensions, prospective cognitive reasoning patterns such as idealization, overstated optimism, normalization of risks, and general curiosity emerge. In their reciprocal relationship with positive emotional markers related to anticipation of gains, the problems are assessed as exceptions on an overall successful trajectory. This shift in cognition creates a new mental model - the belief that even with exceeded resources, the potential benefits when continuing the projects will be "too nice to change." This new mental model solves the cognitive tensions, aligning with the realization of exceeded resources. On the behavioral, directly observable layer, the decision-maker will consequently further invest in the troubled project and reframe from any kind of behavior change compared to the previous decision.

This state stabilizes until a new tipping point is reached. With continuous negative project feedback, a new realization triggers the shift to the Hangover-Phase: The problems are no longer seen as exceptions. At this moment, realizing that the project is in serious jeopardy is inevitable as it represents the "least resisting" cognition to change. It does, however, directly contradict the previously established mental model. Hence, with the realizations and the cognitive discrepancy comes cognitive dissonance and a peak in negative affect. In the following process of retrospective reasoning, the decision-maker overstates the costs and anticipates negative consequences when abandoning the project. By focusing on all the resources already invested in the project and the realization of the poor project performance, a state of cognitive "paralysis" evolves. Negative emotional markers reinforce this perception of reduced options and a fixed mindset, enabling the decision-maker to distance from the project personally. Given the dominance of pessimism and the retrospective thinking mode during this cognition shift, the new mental model is also cost-centered and based on anticipated losses: The mental model that is established as a result of the described cognitive-emotional dynamics is that the abandonment costs would be too high to change the course of action. Here, again, a mental model is created that aligns with the previous realization: "The project is not performing as it should - still, given everything already invested, it would be a too great loss to change the trajectory." Thus, while on the behavioral layer, no change is visible, and the decision-maker continues to invest in the failing project, also in this phase, on the cognitive-emotional layers, complex dynamics play out and result in a shift of mental models.

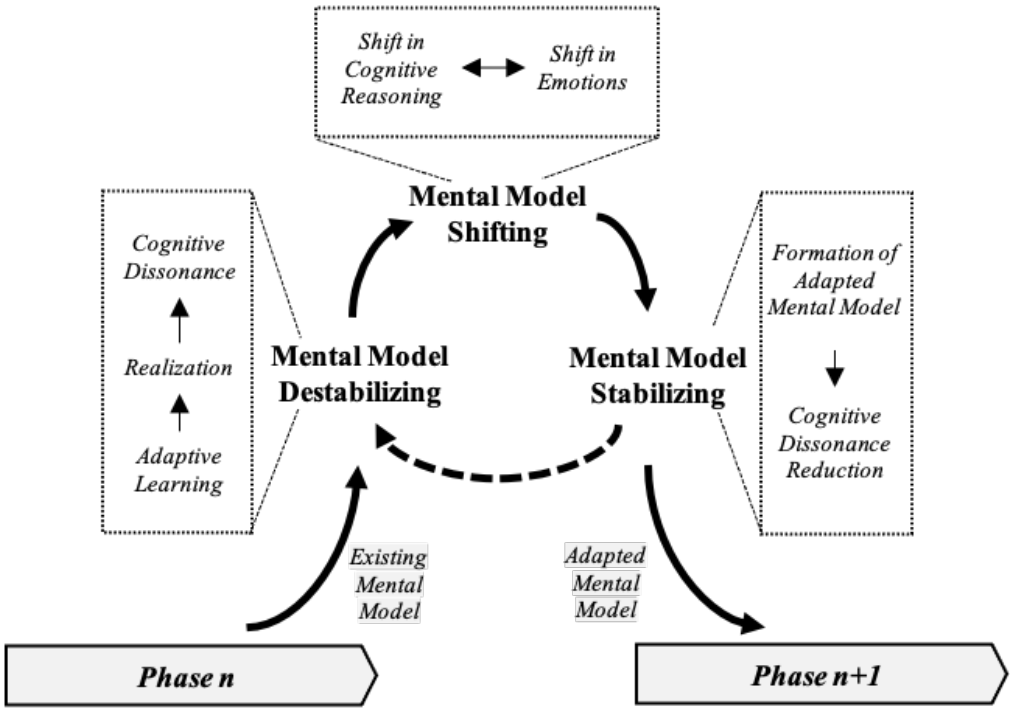
The new mental model is then again "threatened" when, given the continuation of negative feedback, the decision-maker reaches the tipping point of realizing that the abandonment costs would not justify a continued investment anymore. This is when the Denial Phase is triggered. Following the same logic of cognitive dissonance and resulting cognitive-emotional dynamics, introspective cognition

creates patterns of denial and minimization of the problematic trajectory ("downplaying the problem"). Interacting with high levels of emotional complexity, selective awareness helps the decision-maker minimize cognitive dissonance by developing "blind spots" regarding specific parts of the negative project path. The high level of emotional complexity and the nature of the newly created mental model indicate that this shift is more radical than in the previous phases. During the transition to the Denial Phase, the decision-maker develops the mental model that, given the absence of a problematic trajectory, there is no need to change decision strategies and withdraw from the project (denial). Hence, following the logic of least resistance, it must be easier for the decision-maker to develop this mental denial strategy than to change other positions about the project or decision assessment. This mental model again stabilizes as it aligns with the previous realization that the anticipation of abandonment costs would not justify persisting with a failing project.

With negative project feedback also continuing after having established the mental model of denial, at some point, the decision-maker realizes that the past decision strategy requires adaptation. This realization again creates peaks in negative emotional markers, as it contradicts the belief structures behind the denial of the problematic project states. When this realization is reached, the Goal-Fever Phase is triggered. This phase changes the temporal mode from introspective to prospective cognition. With the misperception of the project completion to be in close reach, optimistic thinking, and a growth mindset, the ability to turn the troubled project into a success is overstated. This "optimism trap" is further fueled by social pressures to finish the task and anticipated regret associated with the perception of being very close to completion. The positive emotions associated with those prospective cognition patterns further create high levels of emotional complexity. As a result, to solve the paradoxical tensions between the realization and the existing mental model, the mental model is adapted: While the past decision strategy was not successful and the poorly performing project requires adaptation, the (perceived) proximity of completing the project justifies a continuation - "The goal is too close to change".

The loops described above for each phase all show a repeating pattern: Initial mental model building, followed by realizations based on adaptive learning that create tensions in the form of contradictions and interdependencies with those mental models and, as a result, trigger cognitive-emotional dynamics producing a new mental model that resolves the tensions until the next stage of realization. Figure 23 visualizes this repeating pattern as an abstraction of the previously described framework. Interestingly, within those loops, the conflicting realizations do not evoke a respective adaptation of behavior in the form of withdrawing from the troubled project but an adaptation of the mental model.

Figure 23 Theoretical Framework: Loops of Mental Model Adaptation



In general, bridging the insights from both research streams yields a more complex view of the phenomenon of EoC that reaches beyond the behavioral dimension and can be translated into theoretical propositions about the nature of EoC.

EoC manifests as a constant loop of mental model adaptation when looking at the inner layer. This loop consists of initial mental model building, followed by realizations based on adaptive learning that create tensions in the form of contradictions and interdependencies with those mental models and, as a result, trigger cognitive-emotional dynamics producing a new mental model that resolves the tensions until the next stage of realization. I consequently propose that this process of changing cognition explains the underlying mechanisms behind the relationship between emotional markers and behavioral EoC.

➢ *Proposition 1: Behavioral EoC during sequential decision-making is formed by an underlying process of constant mental model adaptation.*

Negative developments of the chosen path of action produce realizations that contradict existing mental models. Hence, I propose that this cognitive discrepancy produces cognitive dissonance reflected by negative emotional markers. This can explain the strong empirical evidence found for the overall positive effect of negative situational integral emotions on behavioral EoC. The close-up of the phase-changing triggers showed that negative emotions can be located in every escalation phase at the beginning of the destabilization process. The analysis of the emotional journey maps supported this observation, showing a general dominance of negative over positive emotions and clear peaks in anger and sadness at the beginning of the decision phases.

➢ *Proposition 2: The paradoxical tensions between existing mental models and realizations based on adaptive learning during sequential escalation situations create cognitive dissonance, manifesting as negative and complex situational integral emotions.*

EoC does not necessarily mean being completely unaware of irrational tendencies and potentially harming the decision quality. While not visible when only looking at escalating behavior, cognition during escalation is shaped by realization, doubts, and regret. To resolve the tensions created by those realizations and minimize the dissonance created by the contradictions, a process of cognitive-affective dynamics is set into action. Hence, from the perspective of the person who is escalating commitment, further investing in the troubled project seems rational. This view aligns with Drummond's (1996) observation that discrete individual decisions may have underlying rationality, while the irrational escalation tendency lies in the cumulative effect of those decisions over time. It further supports Mähring and Keil's (2008) argument that the escalation process is not based on a failure to respond to problems but on a mismatch between the problem and the response, in this case, on a cognitive level. Conventional wisdom favors rationality over intuition to increase decision quality. On the other hand, and in line with Cognitive Dissonance Theory, there exists evidence that rational, not intuitive thinking can increase escalation behavior (Wong et al., 2008). My findings add to that latter view, as even when consciously reflecting on the decision by writing down the thought processes and reasons, decision-makers continued to escalate their commitment during the simulation. Hence, I propose that the urge to solve the described paradoxical tensions triggers the process of mental model adaptation.

➢ *Proposition 3: The process of mental model adaptation during sequential escalation situations is triggered by the urge to solve paradoxical tensions between existing mental models and realizations based on adaptive learning.*

Different combinations of cognitive reasoning patterns, such as selective information processing, denial, or overly optimistic evaluations, produce a new mental model that aligns with the previous change-triggering realization. During this adaptation process, not one cognitive factor creates the new mental model, but multiple patterns, which co-occur, interact with emotions, and differ in importance and intensity depending on the escalation phase. Thus, depending on the escalation phase, the mental model shift is characterized by different cognitive reasoning patterns, temporal cognition modes, and their interaction with emotions.

➢ *Proposition 4: Depending on the respective escalation phase, the cognitive-emotional process of mental model adaptation during sequential escalation situations is characterized by different combinations of cognitive reasoning patterns, shifts in temporal cognition mode, and the reciprocal interaction with emotions and their anticipation.*

The repetition of this process produces mental models that are increasingly immune to new insights based on adaptive learning, making it increasingly difficult to "break out of the loop". Therefore, I propose that mental model adaptation produces mental models that are increasingly immune to new realizations.

➢ *Proposition 5: The cognitive-emotional process of mental model adaptation during sequential escalation situations produces mental models increasingly immune to new realizations.*

In phases of prospective thinking, triggers grounded in external factors such as starting momentum and perceived goal proximity are more relevant for guiding the mental model-changing process than emotional triggers. In contrast, emotions play a significant role during retro- and introspective thinking. For instance, while the Honeymoon Phase (prospective thinking) is characterized by an initial cognitive tension that produces negative emotions, creating an adapted mental model is influenced by positive emotions related to optimism, enthusiasm, and general belief in the chosen trajectory. However, the quantitative analysis showed that emotions are not among the significant predictors of behavioral escalation during this phase. Hence, we contribute more relevance to the starting momentum, a mechanism grounded in external factors, for driving the dynamics that produce the new mental model. On the other hand, in the Hangover Phase, characterized by retrospective thinking, negative emotional markers have a significant positive effect on behavioral EoC. Hence, during this phase, the emotional influence on shifting mental models is higher than external factors in retrospective thinking phases. Similar effects can be observed when comparing the Denial and the Goal Fever Phase. Hence compared to intro- and retrospective thinking, prospective thinking is more vulnerable to the effect of emotional dynamics triggering mental model shifts that favor behavioral escalation.

➢ *Proposition 6: Compared to intro- and retrospective thinking, prospective thinking is more vulnerable to the effect of emotional dynamics triggering mental model shifts that favor behavioral escalation.*

During the Hangover Phase, a fixed mindset produces the feeling of paralysis and an overstatement of abandonment costs, leading to the new mental model favoring behavioral persistence. However, during the goal fever phase, a growth mindset leads to continuous persistence with the failing project via overstating the proximity of reaching the goal and the ability to solve existing problems. Hence, it depends on the escalation phase, whether a fixed or a growth mindset produces the cognition changes that foster behavioral escalation.

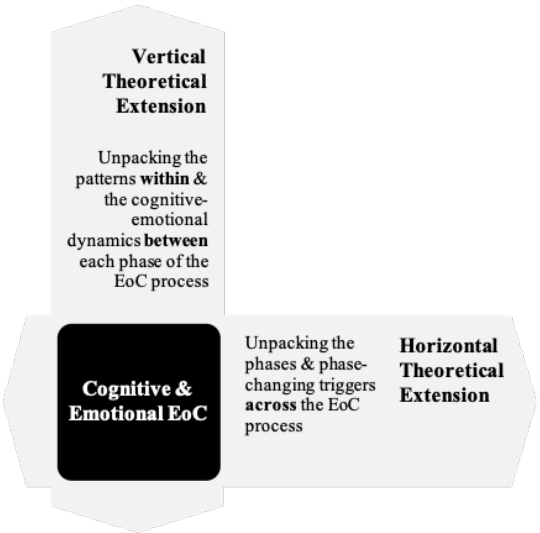
➢ *Proposition 7: It depends on the escalation phase, whether a fixed or a growth mindset produces the cognition changes that foster behavioral escalation.*

6.2.2 Towards Theoretical Plurality

Given those propositions, I argue for a plurality rather than a competition of theories for explaining behavioral EoC. This perspective is in line with Sleesman (2012), who stated that the multitude of perspectives on the EoC illustrates the merit of each as an explanatory force in this phenomenon. This wide range of theories is seen as a "testament to the robustness of escalation" (Staw & Ross, 1978, p. 555), aligning with the concept of a multi-theoretical perspective proposed by Staw and Ross (1978). In support of this perspective, also Keil et al. (2000, p.656) concluded that existing escalation theories should be considered complementary rather than mutually exclusive: "The theories that have been invoked to explain the escalation phenomenon are not mutually exclusive. Rather than viewing them as alternative theories, as they are frequently portrayed in the escalation literature, they should perhaps be viewed as complementary. Future research should attempt to combine elements of these theories to create a richer theory of this complex phenomenon." I follow this suggestion and apply a more comprehensive and nuanced understanding of escalation, drawing from the strengths of various theories in a cohesive manner.

I previously demonstrated the positive effect of negative situational integral emotions and situational integral emotional complexity on escalation behavior. Based on this finding, one interim conclusion was that the self-justification explanation related to Cognitive Dissonance Theory outperforms Coping Theory regarding the predictions about the effect direction of negative and complex emotions on escalation behavior. The additional qualitative analysis blends this competing view, indicating that a complementary approach towards theoretical plurality might be better fitted to explain escalation. The findings provide insights into the underlying mechanisms and unpack the emotional and cognitive escalation dimensions horizontally (process consisting of phases and phase-changing triggers) and vertically (detailed mechanisms within each phase of the process) (Figure 24).

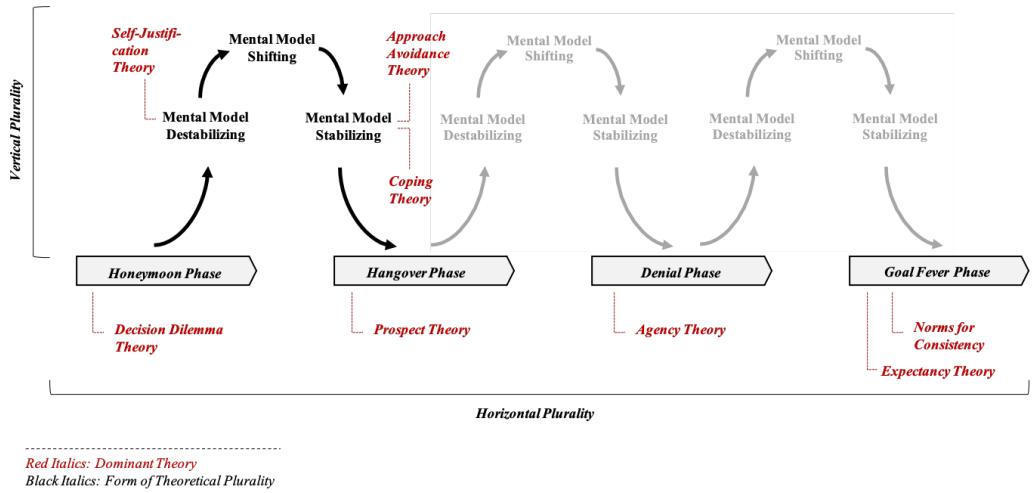
Figure 24 Vertical and Horizontal Theoretical Extensions



Further, identifying the mechanisms within the inner layer behind the directly observable dimension solves the paradox of behavioral escalation despite learning. An adaptation process is happening in escalation situations based on adaptive learning. This adjustment, however, manifests in shifts of the mental model, not the decision-making behavior, thereby explaining escalation.

Based on the theoretical framework and the types of theoretical extension, Figure 25 shows key escalation theories discussed in Chapter 2.2.2 in their horizontal and vertical application.

Figure 25 Vertical and Horizontal Theoretical Plurality Explaining EoC



On one hand, one can group those theories that differ in applicability depending on the cognitive phase of EoC, which I call horizontal plurality. In the Honeymoon Phase, for instance, we saw signs of curiosity and experimentation shaping cognition, which can be linked to elements of the Decision-Dilemma Theory (Bowen, 1987). While overall, in escalation situations, the feedback provided is unequivocally negative - in this first phase of escalation, the cognitive-emotional dynamics and positive emotional markers indicate some degree of perceived equivocality. Along the same lines, the dominant cognitive reasoning patterns in this phase relate to Bowen's (1987, pp.56-57) argument that when facing equivocal feedback, decision-makers argue with economic considerations, curiosity ("an additional opportunity to permit a strategy to work"), or want to learn about the phenomenon to gather more decision-relevant data. Hence, in the first phase of escalation, the Decision-Dilemma Theory can explain parts of the cognitive reasoning patterns underlying the mental model shift. In the Hangover Phase, the predictions of loss aversion and respective risk-seeking attitudes as part of Prospect Theory apply and underline the contextual effects of how the project feedback is framed. The theory posits that people are risk-averse when facing potential gains but risk-seeking when faced with potential losses (Kahneman & Tversky, 1979). However, those effects seem less strong in the Denial Phase, where Agency Theory (Jensen & Meckling, 1976) is better equipped to explain how the introspective thinking mode of the decision-maker and the overall individual (not project) achievement motivation contribute to rationalizing the newly created mental model favoring behavioral persistence. Managers may escalate their commitment to a

failing project to protect their reputation or career, even when it may not be in the best interest of the shareholders or the organization as a whole. And lastly, in the Goal Fever Phase, Norms for Consistency contribute to the dynamics of the mental model shift, as well as the Expectancy Theory (Vroom, 1964) and the related effects and anticipations regarding completing the project. People generally strive to align their behavior with previous commitments to avoid appearing indecisive or unreliable. In the Goal Fever Phase, decision-makers assess the probability that additional resource allocations will lead to goal attainment and the value of goal attainment, thereby generating a subjective expected utility associated with behavioral escalation.

On the other hand, one can categorize theories that can be applied to different stages within the process of the mental model shift within each phase, which I call vertical plurality. Those theories include Self-Justification (Rubin & Brockner, 1975; Staw, 1976), Coping (Lazarus & Folkman, 1984), and Approach Avoidance Theory (Lewin 1935) - each applicable to a different stage within the mental model adaptation loop. For instance, self-justification happens due to the urge to minimize cognitive dissonance created by the contradictions between the existing mental model and realizations from adaptive learning. Later in this adaptation process, when we observe the outcome of the cognitive-emotional dynamics - the establishment of a new mental model that is aligned with the previous realizations from adaptive learning, Approach Avoidance Theory offers a suitable lens. Individuals may be attracted to the potential success of a project but also repelled by the idea of accepting failure. This internal conflict can lead to a persistence in commitment, as individuals oscillate between the desire for success and the aversion to failure. Similarly, one can locate Coping Theory later in the adaptation process. Here, it is essential to note that despite the empirical findings found in the first part of this dissertation in favor of Cognitive Dissonance over Coping Theory, coping mechanisms may still be observed when we switch the focus of attention to a cognitive layer. Hence, one can also consider the mental model adaptation as a coping mechanism to avoid unpleasant cognitive dissonance. Continuing to invest in a failing project might be a way for individuals to cope with the stress and disappointment of acknowledging the project's failure.

6.3 Implications for De-Escalating Commitment

While this dissertation aims to uncover the cognitive and emotional factors and processes underlying EoC, the findings also have relevant implications for de-escalating commitment. I will discuss these implications from two perspectives: First, I will discuss de-escalation from a managerial perspective, including de-escalating actions and conditions mapped to the respective escalation phase and the cognitive-emotional dynamics they address. Second, I will outline technological possibilities to de-escalate commitment based on the psycho-physiological link

between behavioral and cognitive-emotional commitment escalation identified in this dissertation.

6.3.1 A Managerial Perspective on De-Escalating Commitment

Given the findings from existing research (Chapter 2.3.2, Figure 5) and the developed theoretical framework showing the loops of mental model adaptation behind the phase transitions during EoC, I created a phase-specific de-escalation framework (Figure 26). This framework acknowledges that EoC is a process that unfolds over time in the form of different cognitive-emotional phases and that those phases are characterized by different mental models and underlying cognitive-emotional dynamics adapted during the course of a phase transition. Hence, also the de-escalation strategy applied should be sensitive to (1) the escalation phase, (2) the temporal cognition mode, (3) the type of cognitive reasoning pattern that dominates the current situation, (4) the current mental model, and (5) the cognitive-emotional dynamics forming this mental model.

The figure shows which combination of de-escalation strategies and conditions best addresses the unique cognitive-emotional dynamics in each cognitive escalation phase.

Figure 26 Phase-Specific De-Escalation Strategies

Phase	Honeymoon Phase *"Benefits are too nice to change"*	Hangover Phase *"Costs are too high to change"*	Denial Phase *"No need to change"*	Goal Fever Phase *"Too close to completion to change"*
Charac-teristics	**Main mechanism:** Starting momentum **Cognition mode**: Prospective thinking **Main cognitive clusters**: Trust internal, future gains, problem solvable, past monetary investments **Primary theory:** Decision Dilemma Theory	**Main mechanism:** Path dependency **Cognition mode:** Retrospective thinking **Main cognitive clusters:** Past monetary investments, strive for completion, trust internal, problem ignorance **Primary theory:** Prospect Theory	**Main mechanism:** Denial **Cognition mode:** Introspective thinking **Main cognitive clusters**: Problem ignorance, problem solvable, strive for completion, past monetary investments **Primary theory:** Agency Theory	**Main mechanism:** Perceived proximity of completion **Cognition mode:** Prospective thinking **Main cognitive clusters:** Strive for completion, problem solvable, past monetary investments, future gains/problem ignorance **Primary theory:** Norms for consistency, Expectancy Theory
Mental Model Shift	(1) Realization: Exceeded resources (budget / time) (2) Cognitive-emotional dynamics: ***Idealization:*** Optimism & belief, Anticipation & overstatement of future gains ***Rationalizing:*** Normalizing risk & exceeded resources, Problems assessed as exceptions ***Curiosity:*** Desire to learn / experimentation (3) New Mental Model: Benefits are too nice to change	(1) Realization: Problems are no exceptions (2) Cognitive-emotional dynamics: ***Loss aversion:*** Pessimism, Anticipation & Overstatement of abandonment costs ***Paralysis:*** Perception of reduced options, fixed mindset ***Personal distancing from negative course:*** Externalizing of problems (3) New Mental Model: Costs are too high to change	(1) Realization: Overstating costs not enough to justify escalation (2) Cognitive-emotional dynamics: ***Denial*** of problems ***Minimization*** of problematic trajectory ***Selective awareness:*** Blind spots regarding negative project feedback (3) New Mental Model: No need to change	(1) Realization: Past decision strategy requires adaptation (2) Cognitive-emotional dynamics: ***(Mis)Perception of goal proximity:*** Overstatement of future gains & ability to fix problems ***Optimism:*** Overly optimistic forecasts, growth mindset ***Social pressure:*** Not finishing seen as giving up, anticipated regret (3) New Mental Model: Too close to completion to change
De-escalation strategies	Mitigate ***idealization*** driven escalation: [Actions] • Avoid homogenous opinions in groups (groupthink)** • Diverse teams** • Include external perspectives** • Make opportunity costs salient*** [Conditions] • Separation of roles**	Mitigate ***loss aversion*** driven escalation: [Actions] • Disregard level of sunk costs* • Positive outcome framing: Focus on potential gains from abandonment* [Conditions] • Interpretation of sunk costs as sunk*	Mitigate ***denial*** driven escalation: [Actions] • Foster critical self-assessment* • Increase receptivity to negative feedback* • Create diverse teams** • Include external perspectives** • Make project costs visible*** • General accessibility to information*** [Conditions] • Separation of roles** • Diversity of opinions**	Mitigate ***(mis)perception*** driven escalation: [Actions] • Visibility of project costs*** • Implement regular objective evaluations*** • Make opportunity costs salient*** [Conditions] • Accurate project status reporting***
	Mitigate ***rationalization*** driven escalation: [Actions] • Foster critical self-assessment* • Increase awareness of project risk and troubled trajectory* • Make project costs visible*** • Implement early warning systems*** • Implement regular objective evaluations*** [Conditions] • Accurate problem acknowledgment & assessment*	Mitigate ***paralysis*** driven escalation: [Actions] • Predefine decision rules** • Change the project management team** • Change the project championship** [Conditions] • Availability of alternative choices***	Mitigate ***minimalization*** driven escalation: [Actions] • Increase awareness of project risk and troubled trajectory* • Implement regular objective evaluations *** • Predefine minimum targets*** [Conditions] • Accurate problem acknowledgment & assessment* • Accurate project status reporting***	Mitigate ***optimism*** driven escalation: [Actions] • Avoid homogenous opinions in groups (groupthink)** • Predefine decision rules*** [Conditions] • Accurate problem acknowledgment & assessment* • Accurate project status reporting***
	Mitigate ***curiosity*** driven escalation: [Actions] • Frequently challenge assumptions* • Foster culture of critical thinking**** [Conditions] • Accurate problem acknowledgment & assessment* • Diversity of opinions**	Mitigate ***distancing*** driven escalation: [Actions] • Foster a culture that recognizes the role of exit champion**** [Conditions] • Organizational failure culture****	Mitigate ***selective awareness*** driven escalation: [Actions] • Frequently challenge assumptions* • Foster culture of critical thinking**** [Conditions] • Information symmetry across stakeholders**	Mitigate ***social pressure*** driven escalation: [Actions] • Use pressures: Make resource limits public**** • Process instead of outcome accountability**** [Conditions] • Deinstitutionalized structures ****

MICRO LEVEL: * Individual | MESO LEVEL: ** Group * Project | MACRO LEVEL: **** Organization & Environment**

6.3.1.1 De-escalation Strategies for the Honeymoon Phase

As the discussion outlined above, escalation in the Honeymoon Phase is driven by prospective cognition and starting momentum. Resulting cognitive-emotional dynamics of idealization, rationalization, and curiosity ease the realization-based cognitive dissonance by producing the mental model "benefits are too nice to change". Hence, when facing EoC in the Honeymoon Phase, strategies should mitigate (1) idealization-driven escalation, (2) rationalization-driven escalation, and (3) curiosity-driven escalation.

Actions that can mitigate the attributes of *idealization* processes, like an overstatement of future gains, overly optimistic prospects, and strong general beliefs in the project's success, include avoiding homogenous opinions in decision-making groups, creating diverse team set-ups, and involving external perspectives. Those meso level actions can help to re-create objectivity and balance in the cost-benefit analysis otherwise skewed by idealization. Further, making the opportunity costs salient to the decision-maker during this phase, can serve as an effective

"escape clause" mitigating idealization-driven escalation. Given the recency of starting the project and the resulting starting momentum accelerating the mental model shift that produces behavioral escalation, a favorable condition practitioners should strive for when finding themselves and their project stuck in the Honeymoon Phase of escalation is the separation of roles. Having separate roles attributed to initiating, evaluating, and deciding about the continuation of the troubled project mitigates idealization driven escalating by weakening responsibility effects.

Rationalization is another key cognitive-emotional dynamic responsible for the mental model shift in the Honeymoon Phase: Structural and severe problems are assessed as exceptions while exceeding resources and taking on more risk is normalized. Actions that can mitigate those rationalization processes include individual strategies in the area of awareness creation, like fostering critical self-awareness and the awareness of increased risk and the troubled trajectory of the project. Those actions, combined with project-related strategies like making the project costs visible, implementing early warning systems, and regular evaluations, foster an overall de-escalating condition of accurate problem acknowledgment and assessment. Shifting awareness towards those negative performance indicators (fostering acknowledgment) while enabling accurate interpretations of the continuation risk concerning potential costs and benefits (fostering assessment) thereby mitigates rationalization-driven escalation.

Besides idealization and rationalization, *curiosity* plays a central role when looking at the cognitive-emotional dynamics during the mental model shift in the Honeymoon Phase of escalation. Actions that foster the accurate acknowledgment and assessment of the problem can mitigate the equivocal feedback perception underlying curiosity (i.e., the idea that there is an economic argument for continuous investment despite exceeded resources) in this phase. Moreover, frequently challenging existing assumptions and establishing a context of diverse opinions mitigates curiosity-driven escalation. Along the same lines, on the organizational level, a culture of critical thinking enables the accurate assessment of the situation without omitting the potential costs of experimentation by further investing in the failing project.

6.3.1.2 De-escalation Strategies for the Hangover Phase

"The costs are too high to change" is the mental model dominating in the Hangover Phase, which usually follows the Honeymoon Phase during the process of escalation. EoC in the Hangover Phase is driven by retrospective cognition and path dependency. Realizing that the problems faced are no exceptions results in focusing on the potentially "lost" past investments and respective costs of changing the course of action. Hence, given the cognitive-emotional dynamics producing the mental model shift introducing the Hangover Phase, de-escalation strategies should mitigate (1) loss aversion-driven escalation, (2) paralysis-driven escalation, and (3) personal distancing-driven escalation.

Actions that can mitigate pessimism, the overstatement of abandonment costs, and negative emotional markers related to the *aversion of potential losses* when

discontinuing the project include framing and awareness about the nature of sunk costs. Regarding the latter, interpreting previous resource expenditures associated with the project as unredeemable (i.e., "sunk") and disregarding them for the current decision breaks the dynamics producing the Hangover mental model. While this strategy proves effective, it is challenging to implement in practice. Hence, practitioners should start by increasing awareness about the nature of sunk costs and explicitly labeling respective expenditures as "sunk." This labeling contributes to decoupling past investments and decisions about project continuations. An additional action that mitigates loss aversion-driven escalation in the Hangover Phase is shifting the focus in project reporting when preparing decision-relevant information from loss to gain framing. Here, discontinuing the project is reframed from losing resources invested to saving potential future resources "wasted" on the failing project. This positive outcome framing can range from highlighting alternative projects funded with the "saved" resources to already gained knowledge that can be transferred to other areas.

Making sure that decision-makers have alternatives when deciding to continue an already escalated project is a meso level project condition that also mitigates *paralysis*-driven escalation. The perception of reduced options and the fixed mindset attributed to this cognitive paralysis are mitigated by clearly defined decision rules. Having an escalation plan and a clear set of scenario-specific rules that decision-makers can apply helps to break the cognitive-emotional dynamics, leading to stabilizing the Hangover mental model. Further, changes in the project management or sponsorship team counteract the perception of reduced options in particular and paralysis-driven escalation in general.

To avoid *distancing*-driven escalation, where decision-makers externalize the project's problems and reason by distancing their previous continuation decisions from the troubled trajectory, organizations should build a failure culture that recognizes the role of the "exit champion." Not expecting negative career or reputation-related consequences from discontinuing a troubled project diminishes the expected costs that dominate in the Hangover mental model. Hence, recognizing the difficulty of withdrawing from a failing project and the resources spared by this decision makes externalization efforts obsolete and thereby mitigates distancing-driven escalation in the Hangover Phase.

6.3.1.3 De-escalation Strategies for the Denial Phase

Escalation in the Denial Phase is triggered by the realization that overstating the costs is not enough to justify further investments and is driven by introspective cognition. Cognitive-emotional dynamics of denial, minimization of problems, and selective awareness produce the mental model "there is no need to change." Hence, when facing EoC in the Denial Phase, strategies should mitigate (1) denial-driven escalation, (2) minimization-driven escalation, and (3) selective awareness-driven escalation.

On the micro level, *denial*-driven escalation can be mitigated by actions like critical self-assessment and increased receptivity to negative feedback. On the meso level, a diverse team, the inclusion of external perspective as well as a general separation

of roles helps accurately assess the project state as troubled. Further, increasing the general accessibility to information and making the project costs visible mitigates denial-driven escalation in this phase by correcting the situational assessment leading to the Denial mental model producing behavioral escalation.

Similar to denial-driven escalation, the cognitive-emotional dynamics responsible for shifting the mental model in this phase can be characterized by *minimization* attempts. De-escalating commitment by mitigating minimization-driven escalation can be achieved by increasing awareness about project risks and the general troubled trajectory of the project by implementing regular objective evaluations and predefining minimum targets. Those strategies contribute to more accurate project status reporting and force the decision-maker to acknowledge the problems.

Besides denial and minimization, the interplay of emotional complexity and introspective cognition in the Denial Phase elevates *selective awareness* to a central role in the cognitive-emotional dynamics shaping the Denial mental model. By frequently challenging existing assumptions and fostering an organizational culture of critical thinking, the creation of "blind spots" regarding negative project feedback can be avoided. Information symmetry across stakeholders is another key de-escalating condition that mitigates selective awareness-driven escalation. Enabling key stakeholders to assess the project state independently based on a complete and symmetric information base increases the chances that selective awareness towards positive over negative project developments is mitigated.

6.3.1.4 De-escalation Strategies for the Goal Fever Phase

Following introspective cognition in the Denial Phase, prospective cognition and the perceived proximity of completion drive escalation in the Goal Fever Phase: "Too close to completion to change" is the adapted mental model underlying behavioral escalation. Realizing that the past decision strategy requires adaptation results in a "blinded" strive for completion. Hence, given the respective cognitive-emotional dynamics producing the mental model shift introducing the Goal Fever Phase, de-escalation strategies should mitigate (1) misperception-driven escalation, (2) optimism-driven escalation, and (3) social pressure-driven escalation.

Most actions and conditions that mitigate the cognitive-emotional dynamics in the Goal Fever Phase are project-related or organizational strategies, hence located on the meso and macro levels. To mitigate the *misperception* of goal proximity, for instance, visible project and opportunity costs as well as regular objective evaluations, can improve the accuracy of the project status reporting. This strategy increases the likelihood of an accurate perception of how close the project is to completion, given the continuous problems arising.

Accurate project status reporting is also a favorable condition practitioners should strive for when mitigating *optimism-driven* escalation in the Goal Fever Phase. Here, an accurate acknowledgment and assessment of the problem via heterogeneous opinions in groups and predefined decision rules serve as a counterweight to overly optimistic forecasts driven by the general strive for completion. Further, enabling accurate problem assessment and project status

reporting shifts the decision-maker's focus back to thoroughly analyzing the current state and the implications of further investing.

Social pressure in the form of negative associations with discontinuation and favoritism toward people who show persistence is another key element within the cognitive-emotional dynamics in the Goal Fever Phase. Carefully designing incentive structures and forms of accountability on an organizational level that reward adaptive decision-making and learning from failure can mitigate these effects, for instance, by fostering process instead of outcome accountability. Moreover, separating the project from the primary goals and purposes of the organization, or even physically separating it, for instance, as a spin-off or as part of a dedicated unit (i.e., deinstitutionalization), can help to reduce social pressure-driven escalation. Additionally, using social pressures and norms for consistency in making the resource limits public can serve as a de-escalation strategy suitable in this context. However, correctly identifying the current phase as the Goal Fever Phase is crucial when applying this strategy, as making resource limits public in earlier phases could lead to higher justification tendencies and thereby enforce escalation.

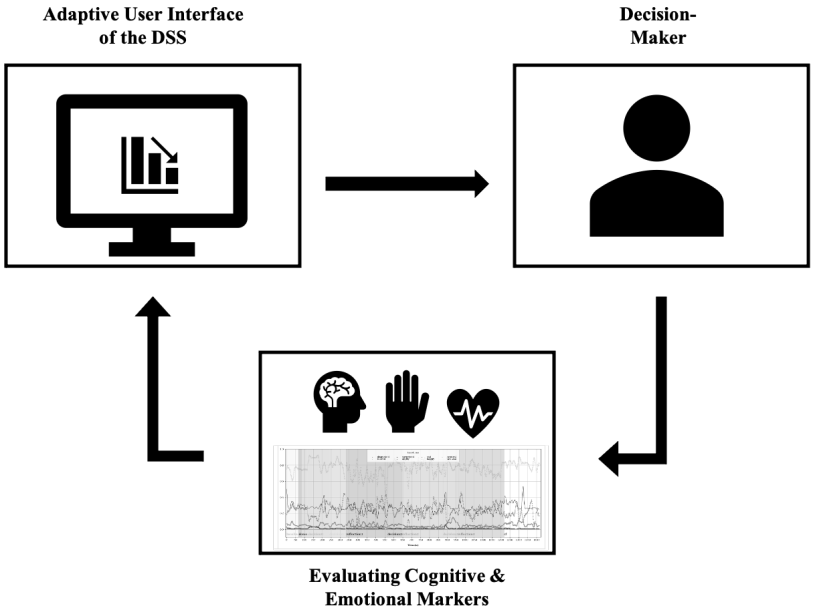
6.3.2 A Technological Perspective on De-Escalating Commitment

While the dissertation focused on disentangling cognitive and emotional factors and processes, the findings can be further applied to enhance decision-making in uncertain environments. Stakeholders involved in troubled IS projects should be aware of the EoC bias, the relevance of cognitive-emotional dynamics shaping and shifting their mental models, and the fallacy of underestimating the psychological forces driving towards persisting with failing courses of action. However, beyond managerial de-escalation strategies, the findings of this dissertation also imply a complementary technological route toward de-escalation of commitment.

Firstly, a better understanding of the cognitive-emotional factors and processes underlying EoC can inform the development of de-escalating decision support systems to increase decision quality and ease decision-making. The form of a decision aid can range from simple information displays to concrete decision recommendations based on the calculations and predictions of intelligent systems (Collins et al., 2021; Wilson & Daugherty, 2018). Research suggests that the aid of an AI-based system may lead to higher accuracy and quality, fewer errors, improved efficiency in managerial decision-making, and a reduction of decision biases (Ben Mimoun et al., 2017; Black & van Esch, 2020; Jussupow et al., 2021). The findings of this dissertation regarding the factors and processes shaping behavioral escalation can contribute to improving the development of those decision support systems aiming to de-escalate commitment. During the Denial Phase of escalation, for instance, the decision aid could focus on mitigating minimization-driven escalation by increasing the accuracy of the project status reporting and making the project costs visible.

Secondly, the identified psychophysiological link (cognitive and emotional markers signaling behavioral EoC) can serve as a foundation to advance de-escalating decision support systems into neuro-adaptive systems*:* Traditionally, the information flow during the use of a decision support system is unilateral - from the system toward the user. The advancements in machine learning and neuroscience tools have recently allowed researchers and engineers to develop adaptive systems with bilateral information flows that take physiological data as inputs (Aricò et al., 2018; Blankertz et al., 2016; Zander & Kothe, 2011). Such neuro-adaptive systems (also called biocybernetics systems or passive brain–computer interfaces) can passively decode the user's mental and emotional states and adapt accordingly (vom Brocke et al., 2020).

Figure 27 Neuro-adaptive Decision Support System for De-Escalation



With the application of neurophysiological tools, I uncovered a link between behavioral EoC and cognitive-emotional EoC represented in objectively measurable physiological markers. In particular, I found that peaks in negative emotions and emotional complexity signal increases in following behavioral escalation tendencies. This evidence provided for a general psychophysiological link can be the foundation for developing a neuro-adaptive decision support system aimed at de-escalating commitment (Figure 26). Applied to managerial decision-making, such a neuro-adaptive system could use real-time biofeedback of the decision-maker passively to warn about escalation potential or actively by adjusting the information displayed to the decision-maker or changing decision structures.

7 CONCLUSION

7.1 SUMMARY OF INSIGHTS

The mixed-method study disentangles the emotional and cognitive factors behind behavioral EoC to distressed IS projects in sequential decision-making and shows how cognitive-emotional dynamics shape this tendency over time. I thereby answer the posed research questions: *What is the effect of a decision-maker's emotional and cognitive factors on EoC and how does a decision-maker's emotions and cognition change during the process of EoC?*

Table 11 Summary of Empirical Findings

	Element in the Research Framework		Discussion of Insights
Connecting Observable and Inner Dimensions	**Behavioral Layer**	Personal Responsibility *(Path A)*	• Successful replication of the EoC effect by manipulating personal responsibility for project initiation. • Causal evidence for the positive effect of high personal responsibility on EoC. • Shows that characteristics of the decision-context influence the decision to persist. • In line with Self-Justification Theory and prior empirical EoC research. • Implications for de-escalation strategies: Separate roles and distribute responsibility.
	Cognitive Layer	Adaptive Learning *(Path B)*	• Evidence for the de-escalating effect of adaptive learning on the individual decision level (EoC tendency decreases over time). • Contribution to solving the paradox of escalation despite learning. • Shows that the previous decision outcomes influences the decision to persist. • Highlights importance of differentiation between one choice and sequential decision-making. • Integrates cognitive theories on adaptive learning and self-justification theory. • Implications for de-escalation strategies: Acknowledge the complexity of simultaneously deescalating and escalating forces.
		Cognitive Flexibility *(Path C)*	• Indications for a positive effect of cognitive flexibility on EoC (contrary to the hypothesized effect direction). • Shows limitations of quantitative methods to uncover cognitive reasoning and mental models during EoC. • Further research: Rule out mediating effect of decision confidence, implement different measures of cognitive flexibilities, and use more heterogenous sample.
	Affective Layer	Aggregated Situational Integral Emotions *(Path D)*	• Evidence for the escalating effect of negative situational integral emotions and the even stronger escalating effect of situational integral emotional complexity. • Empirical support for the effect direction predictions of Cognitive Dissonance Theory over Coping Theory. • Shows that current (situational) and decision-related (integral) emotions influences the decision to persist. • Psychophysiological correlates of behavioral escalation over time. • Implications for de-escalation strategies: Emotion detection and emotion regulation.
			• Personal responsibility does not moderate the effect of situational integral emotions on behavioral escalation. • Implications for de-escalation strategies: Mitigating the effects of personal responsibility is not enough to counteract escalation.

		Discrete Situational Integral Emotions *(Path D)*	• Additional insights regarding the role of discrete situational integral emotions indicate:
			  • Feeling sad is a significant discrete emotional marker for escalation.
			  • Surprise is a significant discrete emotional marker for de-escalation.

Unpacking Inner Dimensions	**Cognitive & Affective Layers**	Cognitive Appraisal, Cognitive Evaluation, Behavioral Tendencies *(Dotted Area)*	• Decision-makers use different cognitive reasoning patterns to justify escalating behavior (Past investments, past performance, problem assessment, decision assessment, trust and belief in the project and people, and anticipated outcomes). • There is a typical sequence of four different cognitive phases during EoC: Honeymoon Phase, Hangover Phase, Denial Phase, and Goal Fever Phase. Decision-makers' cognition differs between those phases regarding its temporal focus (retrospective, introspective, or prospective thinking), dominant mechanisms (starting momentum, path dependency, denial, or perceived proximity of completion), and which combination of cognitive reasoning patterns dominates. • The transitioning between phases is triggered by changes in the problem assessment, in the degree of realizing irrational behavior, and the misperception of the goal completion proximity.

The results connect the observable with the inner layer and unpack the inner layer of EoC. Both parts are consolidated into meta-inferences by developing a

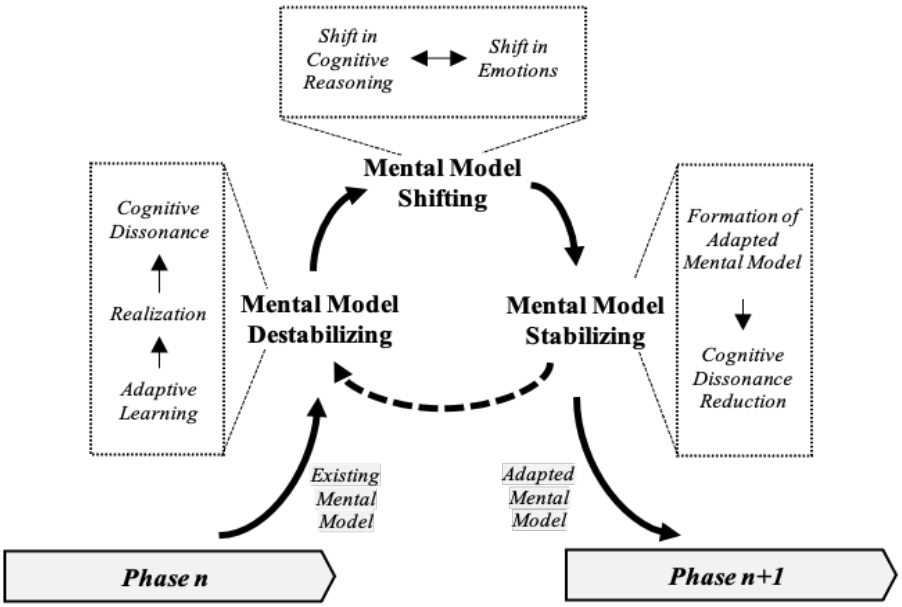
theoretical framework and seven propositions that describe and explain the cognitive-emotional dynamics during the phases of EoC and contribute to theoretical plurality.

Table 11 provides an overview of the insights gained based on the empirical part of this dissertation.

The confirmatory research stream provides causal evidence that personal responsibility for initiating the project leads to higher behavioral EoC in sequential decision-making. While the overall EoC effect is supported, as the project progressed and negative feedback continued, the probability of further persisting with the failing project declined. These findings represent evidence for the de-escalating effect of the cognitive ability to adaptively learn from negative decision feedback on the individual decision level and show the complexity of counteracting cognitive forces and rationalization approaches in escalating situations. With the differentiation into overall decision strategy and single decision level, the results contribute to solving the paradox of escalation despite learning. However, there is no support for the hypothesized de-escalating effect of individual differences in cognitive flexibility. In contrast, the results indicated a potential positive effect. In addition, the confirmatory research stream provides evidence for the escalating effect of negative and complex situational integral emotions on behavioral EoC. Specifically, feeling sad can be related to escalation tendencies, while feeling surprised indicates subsequent behavioral de-escalation. The results can be interpreted as support for the effect predictions of Cognitive Dissonance aligned with the Self-Justification explanation of escalation over Coping Theory. However, the findings indicate no support for the hypothesized interaction between emotional factors and personal responsibility. Beyond theoretical progress and empirical evidence for the role of specific emotional and cognitive elements, applying psychophysiological tools and AI-based emotional detection software uncovers a psychophysiological link between behavioral EoC and physiological correlates.

After showing the psychophysiological connection between the observable and the inner layer, the complementary qualitative investigation unpacks the inner layer further, in particular with regard to cognitive appraisal, evaluation, and behavioral tendencies. The findings of the qualitative research stream show that decision-makers use different cognitive reasoning patterns to justify escalating behavior. Those reasoning patterns change over time during the process of escalation, indicating a typical sequence of four different cognitive phases: Honeymoon Phase, Hangover Phase, Denial Phase, and Goal Fever Phase. Decision-makers' cognition differs between those phases regarding its temporal focus (retrospective, introspective, or prospective thinking), dominant mechanisms (starting momentum, path dependency, denial, or perceived proximity of completion), and the combination of cognitive reasoning patterns. The transition between phases is triggered by changes in the problem assessment, the degree of realizing irrational behavior, and the misperception of the goal completion proximity.

Figure 23 Theoretical Framework: Loops of Mental Model Adaptation



Based on the development of meta-inferences from bridging both qualitative and quantitative research streams, I develop an in-depth theoretical understanding of how cognition and emotion shape behavioral EoC over time. Specifically, I theorize that escalation manifests as a constant loop of mental model adaptation. This process of mental model shifts is characterized by different combinations of cognitive reasoning patterns, shifts in temporal cognition mode, and the reciprocal interaction with situational emotions and their anticipation. The repeated loop consists of initial mental model building, followed by realizations based on adaptive learning that create tensions in the form of contradictions and interdependencies with those mental models and, as a result, trigger cognitive-emotional dynamics, producing a new mental model that resolves the tensions until the next stage of realization. Based on the theoretical model, I formulate seven theoretical propositions about the nature of cognition and emotion during EoC and develop an argument for theoretical plurality.

In a last step, I integrate existing managerial de-escalation strategies with the developed theoretical framework modeling the loops of mental model adaptation behind the phase transitions during EoC, and proposed a set of phase- and cognitive-emotional dynamics-specific de-escalation strategies.

7.2 Summary of Contributions

7.2.1 Contribution to Academia

This dissertation integrates the psychological micro-foundations of human behavior - cognition and emotion - with one of the most challenging phenomena in IS project management - EoC to distressed IS projects. The main academic

contribution of this dissertation lies in disentangling the emotional and cognitive components and processes underlying IS project escalation.

Despite the relevance of understanding the causes and mechanisms underlying EoC in troubled IS projects, previous academic literature had not integrated cognitive and emotional dimensions. This dissertation effectively bridges this gap by offering a comprehensive perspective on how cognitive and emotional factors interplay to shape EoC dynamics. In particular, I contribute to advancing the nascent and fragmented field of affective EoC research. By providing empirical evidence for the effect predictions of Cognitive Dissonance over Coping Theory, I add to consensus creation in the academic debate about competing theories on the role of emotions in shaping EoC. Opening up the cognitive "black box" and further breaking down the escalation process into different phases based on a process perspective allowed for a more nuanced understanding of how cognitive-emotional dynamics shape behavioral tendencies over time.

In addition to testing theories, the study pioneers a layered understanding of EoC as loops of mental model adaptation by bridging the qualitative and quantitative streams into meta-inferences. The theoretical framework and the developed propositions provide an in-depth understanding of how cognition and emotion shape behavioral EoC over time, which can be applied beyond the study context. Recognizing the complexity and interrelatedness of emotional and cognitive factors promotes diverse approaches and perspectives in academia. Hence, this dissertation advocates for theoretical plurality through a detailed exploration of the cognitive-emotional dynamics and their manifestations in decision-making.

In addition, the findings contribute to current research on managing and governing complex IS projects in organizations. With the phenomenon of EoC, I introduce a novel theoretical perspective built on interdisciplinary research to the field of IS design, development, and project management that questions the current understanding of IS project failure as a static end. In the context of IS project distress and failure, a better understanding of the decision-making phenomenon that can determine whether distress turns into failure may generate more effective strategies for reducing destructive personal and organizational consequences.

The methodological contribution of this dissertation is two-fold. First, this research goes beyond traditional paradigms by merging tools and theories from neuroscience, the behaviorism-centered EoC discourse, and IS project management. The use of AI-based emotional detection software and psychophysiological tools not only reveals the underlying emotional and cognitive mechanisms of behavioral EoC but also provides an innovative methodological contribution. With the application of neurophysiological tools, I was able to uncover a link between behavioral EoC and physiological correlates, thereby "enhancing [...] decision-making in uncertain environments by using both cognitive and emotional markers" (Dimoka et al., 2012, p. 689). Second, by complementing the psychophysiological laboratory experiment with a qualitative research stream, this dissertation contributes to the growing field of mixed-method

research, underlining the methodological advantages of mixing methods for examining multifaceted phenomena like EoC.

7.2.2 Contribution to Managerial Practice

From a practical perspective, EoC is highly relevant in transforming processes, managing IS projects, managerial decision-making, and strategy formulation. Hence, unpacking the cognitive-emotional dynamics behind that phenomenon helps distinguish between healthy entrepreneurial persistence and irrational EoC potentially harming the entire organization. By disentangling the emotional and cognitive components underlying project escalation, this dissertation better explains what gives rise to EoC. A complete and nuanced understanding of this complex psychological phenomenon is the foundation for developing de-escalation strategies that help to turn distressed IS projects around. The cognitive reasoning patterns and the process model can help IS project managers identify the current escalation phase and choose the appropriate countermeasures that increase decision quality and help turn distressed projects around. Specifically, the developed phase-specific de-escalation model contributes to managerial practice and the de-escalation discourse. Stakeholders involved in troubled IS projects should be aware of potential EoC, the relevance of emotional and cognitive dynamics underlying this phenomenon, and the fallacy of underestimating unconscious forces driving towards persisting with failing courses of action. The de-escalation strategies may function as the foundation for developing training programs or workshops aimed at improving decision-makers' awareness of their current cognitive escalation stage and underlying cognitive-emotional dynamics.

7.3 Limitations and Future Research

7.3.1 Limitations

While the application of psychophysiological measures offered methodological advantages over traditional measures of emotions, those measures can be criticized for lack of specificity. Physiological responses can be elicited by various stimuli and not just specific emotions. For instance, an increased heart rate could result from excitement, fear, physical exertion, or certain medical conditions. To address this limitation, I purposefully applied a measurement strategy that allows data triangulation between multiple physiological sources. Particularly the integration of the AI-based facial detection software contributed to improving specificity.

Moreover, movements, technical glitches, or external interferences can introduce noise into physiological data, leading to potential misreadings. I tried to minimize the potential of those interferences by selecting a highly controlled laboratory environment that was specifically designed for biometric experiments. In addition, physiological measures can vary greatly among individuals. What might be a significant physiological response for one individual may be typical for another, leading to potential misinterpretation of data. To address this limitation, I included

a two-minute baseline measurement at the beginning of every experiment and normalized the physiological data following the guidelines provided by Léger et al. (2021).

Another limitation is related to the hypothetical decision simulation. While this approach allows for a more controlled setting, is particularly suitable for studying psychological micro-foundations, increases replicability, and enables the analysis of multiple decisions and decision-makers simultaneously, it could be criticized for its limits in external validity. The effects of emotions found in this artificial setting are expected to be larger in practice, when real careers and reputation is at stake.

In addition, while I applied carefully chosen restrictions in terms of professional experience and academic degree to the recruitment of participants, the sample may still differ from IS project managers.

7.3.2 Avenues for Future Research

The findings of this dissertation open several pathways for exploration and deeper understanding. The following avenues for future research are recommended to consolidate the insights further and expand our knowledge's boundaries.

The theoretical model presenting EoC as loops of mental model adaptions offers a cohesive framework for cognitive-emotional dynamics within EoC. However, empirical validation across different settings and industries is crucial in the next step to ensure its robustness, relevance, and adaptability.

The first research stream of the mixed methods approach provided empirical evidence for the escalating effect of complex and negative situational integral emotions (in particular, feeling sad) and the de-escalating effect of feeling surprised. Future research should build on these findings and delve deeper into the investigation of mediators. For instance, unpacking the mechanisms behind the de-escalating effect of surprise and considering whether individual traits underpin the reaction to surprise can offer richer insights. The absence of a notable effect of cognitive flexibility prompts a more nuanced inquiry. To circumvent potential alternative explanations, future research should consider different measures of cognitive flexibility and explore its impact across varied escalation scenarios, such as hiring decisions. Moreover, the previously outlined limitations offer possibilities for future research to strengthen the validity and reliability of the insights. For instance, addressing the concerns regarding the student sample, future research could replicate the study with IS project management professionals. Addressing the limitations associated with the hypothetical decision scenario, future research could adapt the decision-making simulation using scenarios generated from case study research or use portable measurement devices that enable the investigation of escalation scenarios in the field. Leveraging augmented reality or virtual reality could simulate IS project scenarios more vividly, enabling researchers to observe real-time and more immersive decision-making processes. While the study focuses on IS projects in general and is based on the argument that IS projects are particularly prone to EoC, comparing digital and non-digital projects and

investigating whether the cognitive and emotional dynamics differ across different IS project types or application domains would be intriguing.

From a methodological point of view, as the neurophysiological tools and methodologies evolve, future research could focus on employing advanced neuro-imaging techniques, such as functional magnetic resonance imaging, to delve deeper into the neural correlates of EoC.

As outlined in the discussion of technological strategies to de-escalate commitment based on my findings, another avenue for future research lies in developing and implementing neuroadaptive decision support systems. In a first step, building on the psychophysiological link between behavioral EoC and physiological correlates, it would be interesting to investigate the de-escalating potential of real-time biofeedback during escalation. A related array for future research is the exploration of how decision advice based on modern AI tools and digital platforms influences the cognitive-affective dynamics underlying EoC that my dissertation revealed (see (Marx et al., 2021) for a proposed research design).

8 REFERENCES

Abdel-Hamid, T. K. (1988). Understanding the "90% syndrome" in software project management: A simulation-based case study. *The Journal of Systems and Software*, *8*(4), 319–330.

Abrams, D. B., Turner, J. R., Baumann, L. C., Karel, A., Collins, S. E., Witkiewitz, K., Fulmer, T., Tanenbaum, M. L., Commissariat, P., Kupperman, E., Baek, R. N., Gonzalez, J. S., Brandt, N., Flurie, R., Heaney, J., Kline, C., Carroll, L., Upton, J., Buchain, P. C., … Wiebe, D. J. (2013). Affect. In *Encyclopedia of Behavioral Medicine* (pp. 49–50). Springer New York.

Aguinis, H., & Gottfredson, R. K. (2010). Best-practice recommendations for estimating interaction effects using moderated multiple regression. *Journal of Organizational Behavior*, *31*(6), 776–786.

Andrade, E. B., & Ariely, D. (2009). The enduring impact of transient emotions on decision making. *Organizational Behavior and Human Decision Processes*, *109*(1), 1–8.

Aricò, P., Borghini, G., Di Flumeri, G., Sciaraffa, N., & Babiloni, F. (2018). Passive BCI beyond the lab: current trends and future directions. *Physiological Measurement*, *39*(8), 08TR02.

Arkes, H. R., & Blumer, C. (1985). The psychology of sunk cost. *Organizational Behavior and Human Decision Processes*, *35*(1), 124–140.

Armstrong, S. (2017). Data, data everywhere: the challenges of personalised medicine. *BMJ* , *359*, j4546.

Aspinwall, L. G., & Richter, L. (1999). *Motivation and Emotion*, *23*(3), 221–245.

Babcock, L., Wang, X., & Loewenstein, G. (1996). Choosing the wrong pond: Social comparisons in negotiations that reflect a self-serving bias. *The Quarterly Journal of Economics*, *111*(1), 1–19.

Baghizadeh, Z., Cecez-Kecmanovic, D., & Schlagwein, D. (2020). Review and critique of the information systems development project failure literature: An argument for exploring information systems development project distress. *Journal of Information Technology Impact*, *35*(2), 123–142.

Baiman, S. (1990). Agency research in managerial accounting: A second look. *Accounting, Organizations and Society*, *15*(4), 341–371.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215.

Barsade, S. G., & Gibson, D. E. (2007). Why does affect matter in organizations? *The Academy of Management Perspectives*, *21*(1), 36–59.

Barton, S. L., Duchon, D., & Dunegan, K. J. (1989). An empirical test of staw and Ross's prescriptions for the management of escalation of commitment behavior in organizations. *Decision Sciences*, *20*(3), 532–544.

Bathallath, S., Smedberg, Å., & Kjellin, H. (2016). Managing project interdependencies in IT/IS project portfolios: a review of managerial issues. *International Journal of Information Systems and Project Management*, *4*(1), 67–82.

Baumeister, R. F. (1993). Understanding the inner nature of low self-esteem: Uncertain, fragile, protective, and conflicted. In *Self-Esteem* (pp. 201–218). Springer US.

Bazerman, M. H., Giuliano, T., & Appelman, A. (1984). Escalation of commitment in individual and group decision making. *Organizational Behavior and Human Performance*, *33*(2), 141–152.

Beauvois, J.-L., & Joule, R.-V. (1982). DissonanceVersusSelf-perception theories: A radical conception of Festinger's theory. *The Journal of Social Psychology*, *117*(1), 99–113.

Behrens, J., & Ernst, H. (2014). What keeps managers away from a losing course of action? Go/stop decisions in new product development. *Journal of Product Innovation Management*, 31(2), 361-374.

Ben Mimoun, M. S., Poncin, I., & Garnier, M. (2017). Animated conversational agents and e-consumer productivity: The roles of agents and individual characteristics. *Information & Management*, *54*(5), 545–559.

Berente, N., Salge, C. A. de L., Mallampalli, V. K. P., & Park, K. (2022). Rethinking Project Escalation: An Institutional Perspective on the Persistence of Failing Large-Scale Information System Projects. *Journal of Management Information Systems*, *39*(3), 640–672.

Berg, J. E., Dickhaut, J. W., & Kanodia, C. (2009). The role of information asymmetry in escalation phenomena: Empirical evidence. *Journal of Economic Behavior & Organization*, *69*(2), 135–147.

Beshears, J., & Milkman, K. L. (2011). Do sell-side stock analysts exhibit escalation of commitment? *Journal of Economic Behavior & Organization*, *77*(3), 304–317.

Betsch, T., Haberstroh, S., Glöckner, A., Haar, T., & Fiedler, K. (2001). The effects of routine strength on adaptation and information search in recurrent decision making. *Organizational Behavior and Human Decision Processes*, *84*(1), 23–53.

Binder, D. L. (1985). *Resource allocation: the escalation of commitment or cognitive bolstering? (Doctoral dissertation)* . The Ohio State University.

Black, J. S., & van Esch, P. (2020). AI-enabled recruiting: What is it and how should a manager use it? *Business Horizons*, *63*(2), 215–226.

Blankertz, B., Acqualagna, L., Dähne, S., Haufe, S., Schultze-Kraft, M., Sturm, I., Uščumlic, M., Wenzel, M. A., Curio, G., & Müller, K.-R. (2016). The Berlin brain-Computer Interface: Progress beyond communication and control. *Frontiers in Neuroscience*, *10*, 530.

Blanton, H., Cooper, J., Slkurnik, I., & Aronson, J. (1997). When bad things happen to good feedback: Exacerbating the need for self-justification with self-affirmations. *Personality & Social Psychology Bulletin*, *23*(7), 684–692.

Bobocel, D. R., & Meyer, J. P. (1994). Escalating commitment to a failing course of action: Separating the roles of choice and justification. *The Journal of Applied Psychology*, *79*(3), 360–363.

Bodenhausen, G. V. (1993). Chapter 2 - Emotions, Arousal, and Stereotypic Judgments: A Heuristic Model of Affect and Stereotyping. In D. M. Mackie & D. L. Hamilton (Eds.), *Affect, Cognition and Stereotyping* (pp. 13–37). Academic Press.

Boland, M. J., & Ross, W. H. (2010). Emotional intelligence and dispute mediation in escalating and DE-escalating situations. *Journal of Applied Social Psychology*, *40*(12), 3059–3105.

Bonney, L., Plouffe, C. R., & Wolter, J. (2014). "I think I can… I think I can": The impact of perceived selling efficacy and deal disclosure on salesperson escalation of commitment. *Industrial Marketing Management*, *43*(5), 826–839.

Booth, P., & Schulz, A. K. D. (2004). The impact of an ethical environment on managers' project evaluation judgments under agency problem conditions. Accounting. *Organizations and Society*, *29*(5–6), 473–488.

Boudreau, M.-C., Gefen, D., & Straub, D. W. (2001). Validation in Information Systems Research: A State-of-the-Art Assessment. *MIS Quarterly*, *25*(1), 1–14.

Bowen, M. G. (1987). The escalation phenomenon reconsidered: Decision dilemmas or decision errors? *Academy of Management Review*, *12*(1), 52.

Bragger, J. D. (2003). When success breeds failure: History, hysteresis, and delayed exit decisions. *Journal of Applied Psychology*, *88*(1), 6–14.

Brecher, E. G., & Hantula, D. A. (2005). Equivocality and escalation: A replication and preliminary examination of Frustration1. *Journal of Applied Social Psychology*, *35*(12), 2606–2619.

Brender-Ilan, Y., & Shertzer, Y. (2021). Throwing good money after bad: Leaders' personality traits model for escalation of commitment. *Academy of Management Proceedings*, *2021*(1), 12336.

Brief, A. P., & Weiss, H. M. (2002). Organizational behavior: affect in the workplace. *Annual Review of Psychology*, *53*(1), 279–307.

Brockner, J. (1992). The escalation of commitment to a failing course of action: Toward theoretical progress. *Academy of management Review, 17*(1), 39-61.

Brockner, J., & Rubin, J. Z. (1985). *Entrapment in escalating conflicts* (1985th ed.) Springer.

Brymer, R. A., Hitt, M. A., & Schijven, M. (2011). Cognition and human capital: The dynamic interrelationship between knowledge and behavior. In A. Burton-Jones & J.-C. Spender (Eds.), *The Oxford Handbook of Human Capital*. Oxford Academic

Burtscher, M. J., Kolbe, M., Wacker, J., & Manser, T. (2011). Interactions of team mental models and monitoring behaviors predict team performance in simulated anesthesia inductions. *Journal of Experimental Psychology. Applied*, *17*(3), 257–269.

Caldwell, D. F., & O'Reilly, C. A. (1982). Responses to failure: The effects of choice and responsibility on impression management. *Academy of Management Journal*, *25*(1), 121–136.

Cañas, J., Quesada, J. F., Antolí, A., & Fajardo, I. (2003). Cognitive flexibility and adaptability to environmental changes in dynamic complex problem-solving tasks. *Ergonomics*, *46*(5), 482–501.

Chazan, G. (2020). Berlin's 'Laughing Stock' Airport to finally open to passengers. Financial Times. https://www.ft.com/content/731c8e44-1c3e-4ece-9bde-051bebfe1431.

Chentsova-Dutton, Y. E., & Tsai, J. L. (2010). Self-focused attention and emotional reactivity: the role of culture. *Journal of Personality and Social Psychology*, *98*(3), 507–519.

Chirico, F., Salvato, C., Byrne, B., Akhter, N., & Arriaga Múzquiz, J. (2018). Commitment escalation to a failing family business. *Journal of Small Business Management*, *56*(3), 494–512.

Chong, V. K., & Syarifuddin, I. (2010). The effect of obedience pressure and authoritarianism on managers' project evaluation decisions. *Advances in Accounting*, *26*(2), 185–194.

Chulkov, D. V., & Barron, J. M. (2021). Escalation of commitment and CEO departures: theory and evidence. *Journal of Business Economics and Management*, *22*(6), 1416–1435.

Cofrancesco, S. R., & Spiker, B. K. (2019). Hot strategic cognition: A review of strategists' affective experiences within strategy formulation. *In Academy of Management Proceedings* (Vol. 2019, No. 1, p. 19050). Academy of Management.

Coleman, M. D. (2010). Sunk Cost, Emotion, and Commitment to Education. *Current Psychology* , *29*(4), 346–356.

Collins, C., Dennehy, D., Conboy, K., & Mikalef, P. (2021). Artificial intelligence in information systems research: A systematic literature review and research agenda. *International Journal of Information Management*, *60*, 102383.

Conlon, E. J., & Parks, J. M. (1987). Information requests in the context of escalation. *The Journal of Applied Psychology*, *72*(3), 344–350.

Conlon, & Garland. (1993). The Role of Project Completion Information in Resource Allocation Decisions. *Academy of Management Journal*, 36(2), 402-413.

Cooper, C. A., & Turgeon, L. (2021). The Phoenix pay system and intention to quit the federal public service. *Canadian Public Administration*, *64*(3), 389–420.

Coppens, K., & Knockaert, M. (2021). Committed to the venture or the family? A study of entrepreneurial persistence in distressed ventures. *Small Business Economics,* 58(1), 263-280.

Cornelio, R., Tristano, & Giorgio. (2021). What does it take to kill a megaproject? The reverse escalation of commitment. *International Journal of Project Management*, *39*(7), 774–787.

Courtemanche, F., Sénécal, S., Fredette, M., & Léger, P. M. (2022a). COBALT-bluebox: Multimodal user data wireless synchronization and acquisition system. *Declaration of invention No. AXE-0045*, HEC Montréal, Montréal, Canada.

Courtemanche, F., Sénécal, S., Léger, P. M., & Fredette, M. (2022b). COBALT-capture: Real-time bilateral exchange system for multimodal user data via the internet. *Declaration of Invention No. AXE-0044.* HEC Montréal, Montréal, Canada

Critchley, H. D. (2002). Electrodermal responses: what happens in the brain. *The Neuroscientist: A Review Journal Bringing Neurobiology, Neurology and Psychiatry*, *8*(2), 132–142.

Daft, R. L., & Weick, K. E. (1984). Toward a model of organizations as interpretation systems. *Academy of Management Review*, *9*(2), 284.

Dane, E. (2010). Reconsidering the trade-off between expertise and flexibility: A cognitive entrenchment perspective. *Academy of Management Review*, *35*(4), 579–603.

Dang, J., Xiao, S., & Liljedahl, S. (2014). Escalate shamefully, de-escalate angrily or gratefully: the influence of discrete emotions on escalation of commitment. *Scandinavian Journal of Psychology*, *55*(4), 380–388.

Davis, M. A., & Bobko, P. (1986). Contextual effects on escalation processes in public sector decision making. *Organizational Behavior and Human Decision Processes*, *37*(1), 121–138.

de Paula, D., Marx, C., Wolf, E., Dremel, C., Cormican, K., & Uebernickel, F. (2023). A managerial mental model to drive innovation in the context of digital transformation. *Industry and Innovation*, 30(1), 42-66.

Dennis, J. P., & Vander Wal, J. S. (2010). The cognitive flexibility inventory: Instrument development and estimates of reliability and validity. *Cognitive Therapy and Research*, *34*(3), 241–253.

DeTienne, D. R., Shepherd, D. A., & De Castro, J. O. (2008). The fallacy of "only the strong survive": The effects of extrinsic motivation on the persistence decisions for under-performing firms. *Journal of Business Venturing*, *23*(5), 528–546.

Devigne, D., Manigart, S., & Wright, M. (2016). Escalation of commitment in venture capital decision making: Differentiating between domestic and international investors. *Journal of Business Venturing*, *31*(3), 253–271.

Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, *64*(1), 135–168.

Dimoka, A., Davis, F. D., Gupta, A., Pavlou, P. A., Banker, R. D., Dennis, A. R., ... & Weber, B. (2012). On the use of neurophysiological tools in IS research: Developing a research agenda for NeuroIS. *MIS Quarterly*, 679-702.

Doherty, N. F., Ashurst, C., & Peppard, J. (2012). Factors affecting the successful realisation of benefits from systems development projects: Findings from three case studies. *Journal of Information Technology*, *27*(1), 1–16.

Drummond, H. (1996). *Escalation in Decision-Making: The Tragedy of Taurus (Doctoral Dissertation)*. Oxford University Press.

Dutton, J. E., & Ashford, S. J. (1993). Selling Issues to Top Management. *Academy of Management Review*, *18*(3), 397.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, *95*(2), 256–273.

Dweck, C. S., & Yeager, D. S. (2019). Mindsets: A View From Two Eras. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science*, *14*(3), 481–496.

Eggers, J. P., & Kaplan, S. (2009). Cognition and Renewal: Comparing CEO and Organizational Effects on Incumbent Adaptation to Technical Change. *Organization Science*, *20*(2), 461–477.

Ekman, P. (1992). An argument for basic emotions. *Cognition & Emotion*, *6*(3–4), 169–200.

Ekman, P., & Cordaro, D. (2011). What is Meant by Calling Emotions Basic. *Emotion Review: Journal of the International Society for Research on Emotion*, *3*(4), 364–370.

Elfenbein, D. W., Knott, A. M., & Croson, R. (2017). Equity stakes and exit: An experimental approach to decomposing exit delay. *Strategic Management Journal*, *38*(2), 278–299.

Eliëns, R., Eling, K., Gelper, S., & Langerak, F. (2018). Rational versus intuitive gatekeeping: Escalation of commitment in the front end of NPD. *The Journal of Product Innovation Management*, *35*(6), 890–907.

Elkin, R. A., & Leippe, M. R. (1986). Physiological arousal, dissonance, and attitude change: Evidence for a dissonance-arousal link and a" Don't remind me" effect. *Journal of Personality and Social Psychology*, *51*(1), 55.

Endler, N. S., & Parker, J. D. (1990). Multidimensional assessment of coping: a critical evaluation. *Journal of Personality and Social Psychology*, *58*(5), 844–854.

Falk, A., & Heckman, J. J. (2009). Lab experiments are a major source of knowledge in the social sciences. *Science*, *326*(5952), 535–538.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191.

Feldman, G., & Wong, K. F. E. (2018). When action-inaction framing leads to higher escalation of commitment: A new inaction-effect perspective on the sunk-cost fallacy. *Psychological science*, 29(4), 537-548.

Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Stanford University Press.

Filipowicz, A., Barsade, S., & Melwani, S. (2011). Understanding emotional transitions: the interpersonal consequences of changing emotions in negotiations. *Journal of Personality and Social Psychology*, *101*(3), 541–556.

Fineman, S. (2000). Emotional arenas revisited. In *Emotion in Organizations* (pp. 1–24). SAGE Publications Ltd.

Fischer, T., Davis, F. D., & Riedl, R. (2019). NeuroIS: A survey on the status of the field. In *Information Systems and Neuroscience* (pp. 1–10). Springer International Publishing.

Fiske, S. T., & Taylor, S. E. (2020). Social Cognition evolves: Illustrations from our work on Intergroup Bias and on Healthy Adaptation. *Psicothema*, *32*(3), 291–297.

Fleischmann, M., Amirpur, M., Benlian, A., & Hess, T. (2014). Cognitive biases in information systems research: A scientometric analysis. In *Proceedings of the European Conference on Information Systems (ECIS).*

Folkman, S., & Lazarus, R. S. (1988). The relationship between coping and emotion: implications for theory and research. *Social Science & Medicine*, *26*(3), 309–317.

Forgas, J. P. (1995). Mood and judgment: the affect infusion model (AIM). *Psychological Bulletin*, *117*(1), 39–66.

Forth, P. A., Reichert, T., de Laubier, R., & Chakraborty, S. (2020). Flipping the odds of digital transformation success. BCG. https://www.bcg.com/de-de/publications/2020/increasing-odds-of-success-in-digital-transformation.

Fox, S., & Hoffman, M. (2002). Escalation behavior as a specific case of goal-directed activity: A persistence paradigm. *Basic and Applied Social Psychology*, *24*(4), 273–285.

Frijda, N. H. (1993). Appraisal and beyond. *Cognition & Emotion*, *7*(3–4), 225–231.

Frijda, N. H. (2004). Emotions and Action. In A. S. R. Manstead, N. Frijda, & A. Fischer (Eds.), *Feelings and Emotions* (pp. 158–173). Cambridge University Press.

Fukofuka, P., Fargher, N., & Wang, Z. (2014). The influence of sunk costs, personal responsibility and culture on the tendency of accountants to facilitate escalation of commitment. *Pacific Accounting Review*, *26*(3), 374–391.

Garland, H. (1990). Throwing good money after bad: The effect of sunk costs on the decision to escalate commitment to an ongoing project. *The Journal of Applied Psychology*, *75*(6), 728–731.

Gavetti, G., & Levinthal, D. (2000). Looking forward and looking backward: Cognitive and experiential search. *Administrative Science Quarterly*, *45*(1), 113.

Gergen, K. J. (1976). Social psychology, science and history. *Personality & Social Psychology Bulletin*, *2*(4), 373–383.

Gigerenzer, G., Reb, J., & Luan, S. (2022). Smart heuristics for individuals, teams, and organizations. *Annual Review of Organizational Psychology and Organizational Behavior*, *9*(1), 171–198.

Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the Fittest? Entrepreneurial Human Capital and the Persistence of Underperforming Firms. *Administrative Science Quarterly*, *42*(4), 750–783.

Girard, J. M., Cohn, J. F., Jeni, L. A., Sayette, M. A., & De la Torre, F. (2015). Spontaneous facial expression in unscripted social interactions can be measured automatically. *Behavior Research Methods*, *47*(4), 1136–1147.

Greitemeyer, T., Lebek, S., Frey, D., & Traut-Mattausch, E. (2011). Why people try to actively change unchangeable situations: The role of anticipated affect. *Current Psychology*, *30*(3), 284–298.

Grimm, P. (2010). Social desirability bias. In J. N. Sheth & N. K. Malhotra (Eds.), *Wiley International Encyclopedia of Marketing*. John Wiley & Sons Ltd.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology: Journal of Division 1, of the American Psychological Association*, *2*(3), 271–299.

Gunia, B. C., Sivanathan, N., & Galinsky, A. D. (2009). Vicarious entrapment: Your sunk costs, my escalation of commitment. *Journal of Experimental Social Psychology*, *45*(6), 1238–1244.

Gurtner, A., Tschan, F., Semmer, N. K., & Nägele, C. (2007). Getting groups to develop good strategies: Effects of reflexivity interventions on team process, team performance, and shared mental models. *Organizational Behavior and Human Decision Processes*, *102*(2), 127–142.

Harmon-Jones, E. (2000). Cognitive dissonance and experienced negative affect: Evidence that dissonance increases experienced negative affect even in the absence of aversive consequences. *Personality and Social Psychology Bulletin*, *26*(12), 1490–1501.

Harrison, P. D., & Harrell, A. (1993). Impact of "adverse selection" on managers' project evaluation decisions. *Academy of Management Journal*, *36*(3), 635–643.

Harvey, P., & Victoravich, L. M. (2009). The influence of forward-looking antecedents, uncertainty, and anticipatory emotions on project escalation. *Decision Sciences*, *40*(4), 759–782.

He, X., & Mittal, V. (2007). The effect of decision risk and project stage on escalation of commitment. Organizational Behavior and Human Decision Processes, 103(2), 225-237.

Healey, M. P., & Hodgkinson, G. P. (2017). Making Strategy Hot. *California Management Review*, *59*(3), 109–134.

Heng, C.-S., Tan, B. C. Y., & Wei, K.-K. (2003). De-escalation of commitment in software projects: Who matters? What matters? *Information & Management*, *41*(1), 99–110.

Hinojosa, A. S., Gardner, W. L., Walker, H. J., Cogliser, C., & Gullifor, D. (2017). A Review of Cognitive Dissonance Theory in Management Research: Opportunities for Further Development. *Journal of Management*, *43*(1), 170–199.

Hodgkinson, G. P., Burkhard, B., Foss, N. J., Grichnik, D., Sarala, R. M., Tang, Y., & Van Essen, M. (2023). The heuristics and biases of top managers: Past, present, and future. *The Journal of Management Studies*, *60*(5), 1033–1063.

Hoelzl, E., & Loewenstein, G. (2005). Wearing out your shoes to prevent someone else from stepping into them: Anticipated regret and social takeover in sequential decisions. *Organizational Behavior and Human Decision Processes*, *98*(1), 15–27.

Hsieh, K.-Y., Tsai, W., & Chen, M.-J. (2015). If They Can Do It, Why Not Us? Competitors as Reference Points for Justifying Escalation of Commitment. *Academy of Management Journal*, *58*(1), 38–58.

Huang, T. Y., Souitaris, V., & Barsade, S. G. (2019). Which matters more? Group fear versus hope in entrepreneurial escalation of commitment. *Strategic Management Journal*, *40*(11), 1852–1881.

Hughes, D. L., Rana, N. P., & Simintiras, A. C. (2017). The changing landscape of IS project failure: an examination of the key factors. *Journal of Enterprise Information Management*, *30*(1), 142–165.

Jackson, A. T., Howes, S. S., Kausel, E. E., Young, M. E., & Loftis, M. E. (2018). The Reciprocal Relationships Between Escalation, Anger, and Confidence in Investment Decisions Over Time. *Frontiers in Psychology*, *9*, 1136.

Jansen, K. J. (2004). From Persistence to Pursuit: A Longitudinal Examination of Momentum During the Early Stages of Strategic Change. *Organization Science*, *15*(3), 276–294.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360.

Jussupow, E., Spohrer, K., Heinzl, A., & Gawlitza, J. (2021). Augmenting medical diagnosis decisions? An investigation into physicians' decision-making process with artificial intelligence. *Information Systems Research : ISR*, *32*(3), 713–735.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *The Journal of Economic Perspectives: A Journal of the American Economic Association*, *5*(1), 193–206.

Käkölä, T., & Taalas, A. (2008). On information systems project abandonment: An exploratory study of organizational practices. In Proceedings of the International Conference on Information Systems (ICIS).

Kallinikos, J., The London School of Economics and Political Science, Aaltonen, A., Marton, A., Hanken School of Economics, & Copenhagen Business School. (2013). The ambivalent ontology of digital artifacts. *MIS Quarterly 37*(2), 357–370.

Kaplan, S. (2011). Research in cognition and strategy: Reflections on two decades of progress and a look to the future: Cognition and strategy. *The Journal of Management Studies*, *48*(3), 665–695.

Keil, M., Depledge, G., & Rai, A. (2007). Escalation: The role of problem recognition and cognitive bias. *Decision Sciences,* 38(3), 391-421.

Keil, M. (1995). Pulling the plug: Software project management and the problem of project escalation. *MIS Quarterly,* 421-447.

Keil, M., & Mähring, M. (2010). Is your project turning into a black hole?. *California Management Review*, 53(1), 6-31.

Keil, M., Mann, J., & Rai, A. (2000). Why software projects escalate: An empirical analysis and test of four theoretical models. Mis Quarterly, 631-664.

Keil, M., Mixon, R., Saarinen, T., & Tuunainen, V. (1994). Understanding runaway information technology projects: Results from an international research program based on escalation theory. *Journal of Management Information Systems,* 11(3), 65-85.

Klingebiel, R., & Esser, P. (2020). Stage-Gate Escalation. *Strategy Science*, *5*(4), 311–329.

Kreibig, S. D. (2010). Autonomic nervous system activity in emotion: a review. *Biological Psychology*, *84*(3), 394–421.

Kret, M. E., & Bocanegra, B. R. (2016). Editorial: Adaptive Hot Cognition: How Emotion Drives Information Processing and Cognition Steers Affective Processing. *Frontiers in Psychology*, *7*, 1920.

Ku, G. (2008). Learning to de-escalate: The effects of regret in escalation of commitment. *Organizational Behavior and Human Decision Processes*, *105*(2), 221–232.

Langer, E. J. (1975). The illusion of control. *Journal of Personality and Social Psychology*, *32*(2), 311–328.

Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management review*, 24(4), 691-710.

Langley, A., Smallman, C., Tsoukas, H., & Van de Ven, A. H. (2013). Process Studies of Change in Organization and Management: Unveiling Temporality, Activity, and Flow. *Academy of Management Journal*, *56*(1), 1–13.

Lant, T. K., & Hurley, A. E. (1999). A contingency model of response to performance feedback. *Group & Organization Management*, *24*(4), 421–437.

Laureiro-Martínez, D., & Brusoni, S. (2018). Cognitive flexibility and adaptive decision-making: Evidence from a laboratory study of expert decision makers. *Strategic Management Journal*, *39*(4), 1031–1058.

Lee, J. S., Keil, M., & Wong, K. F. E. (2018). Does a tired mind help avoid a decision bias? The effect of ego depletion on escalation of commitment. *Applied Psychology,* 67(1), 171-185.

Lee, J. S., Keil, M., & Wong, K. F. E. (2021). When a growth mindset can backfire and cause escalation of commitment to a troubled information technology project. *Information Systems Journal*, *31*(1), 7–32.

Léger, P.-M., Courtemanche, F., Fredette, M., Labonté-Lemoyne, E., Coursaris, C., & Sénécal, S. (2021). Tech3Lab COBALT Research Ecosystem. *HEC Montréal, Montréal, Canada*.

Lerner, J. S., Li, Y., Valdesolo, P., & Kassam, K. S. (2015). Emotion and decision making. *Annual Review of Psychology*, *66*(1), 799–823.

Levinthal, D. A. (2011). A behavioral approach to strategy-what's the alternative? *Strategic Management Journal*, *32*(13), 1517–1523.

Lewinski, P., den Uyl, T. M., & Butler, C. (2014). Automated facial coding: Validation of basic emotions and FACS AUs in FaceReader. *Journal of Neuroscience, Psychology, and Economics*, *7*(4), 227–236.

Liang, B. (2019). The effects of self-efficacy, process feedback, and task complexity on escalation of commitment in new product development. *Journal of Business & Industrial Marketing*, *34*(8), 1641–1653.

Liang, B. (2021). The goal is attainable: the effects of goal gradient and sub-goals on escalation of commitment in a new product evaluation. *Innovation & Management Review*, 18(3), 258-275.

Lim, B.-C., & Klein, K. J. (2006). Team mental models and team performance: a field study of the effects of team mental model similarity and accuracy. *Journal of Organizational Behavior*, *27*(4), 403–418.

Loewenstein, G., & Lerner, J. S. (2003). The role of affect in decision making. *Handbook of Affective Sciences.*, *1199*(2003), 619–642.

Lohr, S. (2021). *What ever happened to IBM's Watson*. The New York Times. https://www.nytimes.com/2021/07/16/technology/what-happened-ibm-watson.html.

Mähring, M., & Keil, M. (2008). Information technology project escalation: A process model. *Decision Sciences*, *39*(2), 239–272.

Mähring, M., Keil, M., Mathiassen, L., & Pries-Heje, J. (2008). Making IT Project De-Escalation Happen: An Exploration into Key Roles. *Journal of the Association for Information Systems*, *9*(8), 19.

Mann. (1996). *The role of project escalation in explaining runaway information systems development projects: A field study (Doctory Dissertation).* Georgia State University.

Markoff, J. (2011). *Computer wins on "jeopardy!": Trivial, it's not*. The New York Times. https://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html.

Marx, C., Ampel, B., & Lazarine, B. (2021). The role of AI agents for de-escalating commitment in digital innovation projects. In *Proceedings of the International Conference on Information Systems (ICIS).*

Marx, C., & Uebernickel, F. (2022). How to turn around: Escalation of commitment in the context of ISD project distress. In *Proceedings of the International Conference on Information Systems (ICIS).*

Marx, C., De Paula, D., Haskamp, T., & Uebernickel, F. (2023). A cognitive perspective on digital transformation: Literature review and research framework. In *Proceedings of the Hawaii International Conference on System Sciences (HICSS).*

Marx, C., & Uebernickel, F. (2023a). Disentangling emotional and cognitive factors of escalation of commitment: Evidence for a psychophysiological link. In *Proceedings of the European Conference on Information Systems (ECIS).*

Marx, C., & Uebernickel, F. (2023b). Unpacking the black box: A cognitive process model of escalation of commitment in IS project management. In *Proceedings of the International Conference on Business Informatics (WI).*

Marx, C., Haskamp, T., & Uebernickel, F. (2023). Designing innovation in the digital age: How to maneuver around digital transformation traps. In L. Leifer & C. Meinel (Eds.), *Design Thinking Research: Understanding Innovation.* Springer.

Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & Information Systems Engineering*, *57*(5), 339–343.

Matthyssens, P., & Pauwels, P. (2000). Uncovering international market-exit processes: A comparative case study. *Psychology & Marketing*, *17*(8), 697–719.

Maylor, H. R., Turner, N. W., & Murray-Webster, R. (2013). How hard can it be?: Actively managing complexity in technology projects. *Research Technology Management*, *56*(4), 45–51.

McCain, B. E. (1986). Continuing investment under conditions of failure: A laboratory study of the limits to escalation. *The Journal of Applied Psychology*, *71*(2), 280–284.

McCarthy, A. M., Schoorman, F. D., & Cooper, A. C. (1993). Reinvestment decisions by entrepreneurs: Rational decision-making or escalation of commitment? *Journal of Business Venturing*, *8*(1), 9–24.

McFarland, C., & Ross, M. (1987). The relation between current impressions and memories of self and dating partners. *Personality & Social Psychology Bulletin*, *13*(2), 228–238.

McMullen, J. S., & Kier, A. S. (2016). Trapped by the entrepreneurial mindset: Opportunity seeking and escalation of commitment in the Mount Everest disaster. *Journal of Business Venturing*, *31*(6), 663–686.

McNamara, G., Moon, H., & Bromiley, P. (2002). Banking on commitment: Intended and unintended consequences of an organization's attempt to attenuate escalation of commitment. Academy of Management Journal, 45(2), 443-452.

Mellers, B., Fincher, K., Drummond, C., & Bigony, M. (2013). Surprise: a belief or an emotion? *Progress in Brain Research*, *202*, 3–19.

Molden, D. C., & Dweck, C. S. (2006). Finding "meaning" in psychology: a lay theories approach to self-regulation, social perception, and social development. *The American Psychologist*, *61*(3), 192–203.

Molden, D. C., & Hui, C. M. (2011). Promoting de-escalation of commitment: a regulatory-focus perspective on sunk costs. *Psychological Science*, *22*(1), 8–12.

Montealegre, R., & Keil, M. (2000). De-Escalating Information Technology Projects: Lessons from the Denver International Airport. *MIS Quarterly*, *24*(3), 417–447.

Moon, Conlon, D. E., Humphrey, S. E., Quigley, N., Devers, C. E., & Nowakowski, J. M. (2003). Group decision process and incrementalism in organizational decision making. *Organizational Behavior and Human Decision Processes*, *92*(1–2), 67–79.

Moon, H. (2001). Looking forward and looking back: Integrating completion and sunk-cost effects within an escalation-of-commitment progress decision. Journal of Applied psychology, 86(1), 104.

Moors, A., Ellsworth, P. C., Scherer, K. R., & Frijda, N. H. (2013). Appraisal theories of emotion: State of the art and future development. *Emotion Review: Journal of the International Society for Research on Emotion*, *5*(2), 119–124.

Morcov, S., Pintelon, L., & Kusters, R. (2021). Definitions, characteristics and measures of IT project complexity - a systematic literature review. *International Journal of Information Systems and Project Management*, *8*(2), 5–21.

Moser, K., Wolff, H.-G., & Kraft, A. (2013). The de-escalation of commitment: Predecisional accountability and cognitive processes. *Journal of Applied Social Psychology*, *43*(2), 363–376.

Narayanan, V. K., Zane, L. J., & Kemmerer, B. (2011). The Cognitive Perspective in Strategy: An Integrative Review. *Journal of Management*, *37*(1), 305–351.

Newman, M., & Sabherwal, R. (1996). Determinants of commitment to information systems development: a longitudinal investigation. MIS quarterly, 23-54.

Northcraft, G. B., & Neale, M. A. (1986). Opportunity costs and the framing of resource allocation decisions. *Organizational Behavior and Human Decision Processes*, *37*(3), 348–356.

Nouri, P. (2021). That's why they didn't let it go: exploring the roots of women entrepreneurs' escalation of commitment. Journal of Entrepreneurship in Emerging Economies, 13(2), 213-230.

Ohlert, C. R., & Weißenberger, B. E. (2020). Debiasing escalation of commitment: the effectiveness of decision aids to enhance de-escalation. *Journal of Management Control*, *30*(4), 405–438.

O'Neill, O. A. (2009). Workplace expression of emotions and escalation of commitment. *Journal of Applied Social Psychology*, *39*(10), 2396–2424.

Ong, A. D., & Bergeman, C. S. (2004). Resilience and adaptation to stress in later life: Empirical perspectives and conceptual implications. *Ageing International*, *29*(3), 219–246.

Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, *3*(3), 398–427.

Ortony, A., Clore, G. L., & Collins, A. (1988). The cognitive psychology of appraisal. In *The Cognitive Structure of Emotions* (pp. 34–58). Cambridge University Press.

Osborne, J. D., Stubbart, C. I., & Ramaprasad, A. (2001). Strategic groups and competitive enactment: a study of dynamic relationships between mental models and performance. *Strategic Management Journal*, *22*(5), 435–454.

Pan, G. S. C., Pan, S. L., Newman, M., & Flynn, D. (2004). 'Unfreezing-changing-refreezing' of actors' commitment: The transition from escalation to de-escalation of commitment to information technology projects. *In Proceedings of the European Conference on Information Systems (ECIS).*

Pan, S. L., Pan, G. S. C., Newman, M., & Flynn, D. (2006). Escalation and de-escalation of commitment to information systems projects: Insights from a project evaluation model. *European Journal of Operational Research*, *173*(3), 1139–1160.

Payne, S. J. (1991). A descriptive study of mental models. *Behaviour & Information Technology*, *10*(1), 3–21.

Pepitone, A., & Festinger, L. (1959). A Theory of Cognitive Dissonance. *The American Journal of Psychology*, *72*(1), 153.

Posner, J., Russell, J. A., & Peterson, B. S. (2005). The circumplex model of affect: an integrative approach to affective neuroscience, cognitive development, and psychopathology. *Development and Psychopathology*, *17*(3), 715–734.

Priandi, M., Fernandez, W., & Sandeep, M. S. (2020). 'Escalation of Commitment' as a Force for Good? Evidence from an Indonesian Digital Government Project. In *Proceedings of the Hawaii International Conference on System Sciences (HICSS).*

Rekar, P., Pahor, M., & Perat, M. (2023). Effect of emotion regulation difficulties on financial decision-making. *Journal of Neuroscience, Psychology, and Economics*, 16(2), 80.

Riedl, & Léger. (2016). Tools in NeuroIS Research: An Overview. In R. Riedl & P.-M. Léger (Eds.), *Fundamentals of NeuroIS: Information Systems and the Brain* (pp. 47–72). Springer Berlin Heidelberg.

Riedl, R., Fischer, T., & Léger, P.-M. (2017). A decade of NeuroIS research: Status quo, challenges, and future directions. In *Proceedings of the International Conference on Information Systems (ICIS).*

Roeth, T., Spieth, P., & Joachim, V. (2020). The interaction of intuition and rationality during escalated NPD decisions: An investigation of decision-makers' affective states. *International Journal of Innovation Management,* 24(04), 2050033.

Roetzel, P. G. (2015). The Impact of Creativity and Information Load on Escalation of Commitment. *In Proceedings of the European Conference on Information Systems (ECIS)*.

Ronay, R., Oostrom, J. K., Lehmann-Willenbrock, N., & Van Vugt, M. (2017). Pride before the fall: (Over)confidence predicts escalation of public commitment. *Journal of Experimental Social Psychology*, *69*, 13–22.

Rothman, N. B., & Melwani, S. (2017). Feeling Mixed, Ambivalent, and in Flux: The Social Functions of Emotional Complexity for Leaders. *Academy of Management Review*, *42*(2), 259–282.

Rubin, J. Z., & Brockner, J. (1975). Factors affecting entrapment in waiting situations: The Rosencrantz and Guildenstern effect. *Journal of Personality and Social Psychology*, *31*(6), 1054–1063.

Russell. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*(6), 1161–1178.

Russell, & Barrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: dissecting the elephant. *Journal of Personality and Social Psychology*, *76*(5), 805–819.

Russell, K., O'Raghallaigh, P., McAvoy, J., & Hayes, J. (2020). A cognitive model of digital transformation and IS decision making. *Journal of Decision Systems*, 29(1), 45-62.

Sabherwal, R., Sein, M. K., & Marakas, G. M. (2003). Escalating commitment to information system projects: findings from two simulated experiments. *Information & Management*, *40*(8), 781–798.

San Cristóbal, J. R., Carral, L., Diaz, E., Fraguela, J. A., & Iglesias, G. (2018). Complexity and project management: A general overview. *Complexity and Project Management: Challenges, Opportunities, and Future Research, 2018,* 4891286.

Sarangee, K. R., Schmidt, J. B., & Calantone, R. J. (2019). Anticipated regret and escalation of commitment to failing, new product development projects in business markets. *Industrial Marketing Management*, *76*, 157–168.

Sarangee, K. R., Woolley, J. L., Schmidt, J. B., & Long, E. (2014). De-escalation mechanisms in high-technology product innovation. *The Journal of Product Innovation Management*, *31*(5), 1023–1038.

Scharfstein, D. S., & Stein, J. C. (1990). Herd Behavior and Investment. *The American Economic Review*, *80*(3), 465–479.

Schaubroeck, J., & Williams, S. (1993). Type A behavior pattern and escalating commitment. *The Journal of Applied Psychology*, *78*(5), 862–867.

Schaubroeck, John, & Davis, E. (1994). Prospect theory predictions when escalation is not the only chance to recover sunk costs. *Organizational Behavior and Human Decision Processes*, *57*(1), 59–82.

Schmidt, J. B., & Calantone, R. J. (2002). Escalation of commitment during new product development. *Journal of the academy of marketing science*, 30, 103-118.

Schmidt, Montoya-Weiss, M. M., & Massey, A. P. (2001). New product development decision-making effectiveness: Comparing individuals, face-to-face teams, and virtual teams. *Decision Sciences*, *32*(4), 575–600.

Schoorman, F. D., & Champagne, M. V. (1994). Managers as informal third parties: The impact of supervisor-subordinate relationships on interventions. *Employee Responsibilities and Rights Journal*, *7*(1), 73–84.

Schreyögg, G., Sydow, J., & Holtmann, P. (2011). How history matters in organisations: The case of path dependence. *Management & Organizational History*, *6*(1), 81–100.

Schultze, T., Pfeiffer, F., & Schulz-Hardt, S. (2012). Biased information processing in the escalation paradigm: information search and information evaluation as potential mediators of escalating commitment. *The Journal of Applied Psychology*, *97*(1), 16–32.

Schultze, T., & Schulz-Hardt, S. (2021). Does change of responsibility reduce escalating commitment? A replication and theoretical extension. *Journal of Experimental Psychology. Applied*, 28(1), 189.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology*, *45*(3), 513–523.

Senge, P. M. (1992). Mental models. *Planning Review*, *20*(2), 4–44.

Shah, A. K., & Oppenheimer, D. M. (2008). Heuristics made easy: an effort-reduction framework. *Psychological Bulletin*, *134*(2), 207–222.

Shepherd, D. A., Covin, J. G., & Kuratko, D. F. (2009). Project failure from corporate entrepreneurship: Managing the grief process. *Journal of Business Venturing*, *24*(6), 588–600.

Shertzer, Y., & Brender-Ilan, Y. (2023). Why Do Leaders Escalate Their Commitment to a Failed Course of Action? A Moderated-Mediation Personality Traits Model. *SAGE Open*, *13*(1), 21582440231154456.

Shi, W., King, D. R., & Connelly, B. L. (2021). Closing the deal: Managerial response to short sellers following M&A announcement. *Journal of Business Research*, *130*, 188–199.

Shu, L., Xie, J., Yang, M., Li, Z., Li, Z., Liao, D., ... & Yang, X. (2018). A review of emotion recognition using physiological signals. *Sensors*, 18(7), 2074.

Simon, H. A. (1990). Bounded rationality. *Utility and probability*, 15-18.

Singer, M. S., & Singer, A. E. (1986). Individual differences and the escalation of commitment paradigm. Journal of Social Psychology, 126(2), 197-204.

Sinha, P. N., Inkson, K., & Barker, J. R. (2012). Committed to a failing strategy: Celebrity CEO, intermediaries, media and stakeholders in a co-created drama. *Organization Studies*, *33*(2), 223–245.

Sivanathan, N., Molden, D. C., Galinsky, A. D., & Ku, G. (2008). The promise and peril of self-affirmation in de-escalation of commitment. *Organizational Behavior and Human Decision Processes*, *107*(1), 1–14.

Sleesman, D. J. (2019). Pushing through the tension while stuck in the mud: Paradox mindset and escalation of commitment. *Organizational Behavior and Human Decision Processes*, *155*, 83–96.

Sleesman, D. J., Conlon, D. E., McNamara, G., & Miles, J. E. (2012). Cleaning up the big muddy: a meta-analytic review of the determinants of escalation of commitment. *Academy of Management Journal*, *55*(3), 541–562.

Sleesman, D. J., Lennard, A. C., McNamara, G., & Conlon, D. E. (2018). Putting Escalation of Commitment in Context: A Multilevel Review and Analysis. *Annals* , *12*(1), 178–207.

Snyder, C. R. (1994). *The Psychology of Hope: You Can Get There from Here*. Simon and Schuster.

Solberg, E., Traavik, L. E. M., & Wong, S. I. (2020). Digital Mindsets: Recognizing and Leveraging Individual Beliefs for Digital Transformation. *California Management Review*, *62*(4), 105–124.

Sproull, L. S. (1981). Beliefs in organizations. Handbook of organizational design, 2, 203-224.

Stangl, F. J., & Riedl, R. (2022). Measurement of heart rate and heart rate variability: A review of NeuroIS research with a focus on applied methods. In F. D. Davis, R. Riedl, J. vom Brocke, P. M. Léger, A. B. Randolph, & G. R. Müller-Putz (Eds.), *Information Systems and Neuroscience. NeuroIS 2022. Lecture Notes in Information Systems and Organisation* (Vol. 58). Springer, Cham.

Staw. (1976). Knee-deep in the Big Muddy: A study of escalating commitment to a chosen course of action. *Organizational Behavior and Human Performance*, *16*(1), 27–44.

Staw. (1981). The escalation of commitment to a course of action. *Academy of Management Review. Academy of Management*, *6*(4), 577–587.

Staw, Barry M. (1997). The escalation of commitment: An update and appraisal. *Organizational Decision Making.*, *397*, 191–215.

Staw, Barry M., & Ross, J. (1980). Commitment in an experimenting society: A study of the attribution of leadership from administrative scenarios. *The Journal of Applied Psychology*, *65*(3), 249–260.

Staw, & Fox. (1977). Escalation: The determinants of commitment to a chosen course of action. *Human Relations; Studies towards the Integration of the Social Sciences*, *30*(5), 431–450.

Staw, B. M., & Ross, J. (1987). Knowing when to pull the plug. *Harvard Business Review,* 65(2), 68-74.

Staw, & Ross. (1989). Understanding behavior in escalation situations. *Science*, *246*(4927), 216–220.

Steinkühler, D., Mahlendorf, M. D., & Brettel, M. (2014). How self-justification indirectly drives escalation of commitment. *Schmalenbach Business Review*, *66*(2), 191–222.

Sternberg, R. J., & Ben-Zeev, T. (2001). *Complex cognition: The psychology of human thought*. Oxford University Press.

Stone, J., & Cooper, J. (2001). A self-standards model of cognitive dissonance. *Journal of Experimental Social Psychology*, *37*(3), 228–243.

Strickland, E. (2019). IBM Watson, heal thyself: How IBM overpromised and underdelivered on AI health care. *IEEE Spectrum*, *56*(4), 24–31.

Strough, J., Mehta, C. M., McFall, J. P., & Schuller, K. L. (2016). Are older adults less subject to the sunk-cost fallacy than younger adults? *Psychological Science*, *19*(7), 650–652.

Stubbart, C. I. (1989). Managerial cognition: A missing link in strategic management research. *The Journal of Management Studies*, *26*(4), 325–347.

Sydow, J. (2009). Path dependencies in project-based organizing: Evidence from television production in Germany. *Journal of Media Business Studies*, *6*(4), 123–139.

Tang, M.-J. (1988). An economic perspective on escalating commitment. *Strategic Management Journal*, *9*(S1), 79–92.

Tashakkori, A., & Teddlie, C. (2009). Integrating qualitative and quantitative approaches to research. In *The SAGE Handbook of Applied Social Research Methods* (pp. 283–317). SAGE Publications, Inc.

Teger, A. I. (1980). *Too Much Invested to Quit: Pergamon General Psychology Series*. Pergamon Press Inc.

Thomas, H., & Porac, J. F. (2002). Managing cognition and strategy: Issues, trends and future directions. *Handbook of Strategy and Management*, 165.

Thorndike, E. L. (1898). "animal intelligence." *Nature*, *58*(1504), 390–390.

Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: evidence from digital imaging. *Strategic Management Journal*, *21*(10–11), 1147–1161.

Tsai, M.-H., & Young, M. J. (2010). Anger, fear, and escalation of commitment. *Cognition and Emotion*, *24*(6), 962–973.

Tushman, M. L., & Romanelli, E. (1985). Organizational evolution: A metamorphosis model of convergence and reorientation. *Research in Organizational Behavior*, *7*, 171–222.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*(4157), 1124–1131.

Tversky, & Kahneman. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, *5*(2), 207–232.

Tversky, & Kahneman. (1981). The framing of decisions and the psychology of choice. *Scienc, 211*(4481), 453–458.

Van Eerde, W., & Thierry, H. (1996). Vroom's expectancy models and work-related criteria: A meta-analysis. *The Journal of Applied Psychology*, *81*(5), 575–586.

van Kuilenburg, H., Wiering, M., & den Uyl, M. (2005). A model based method for automatic facial expression recognition. In *Machine Learning: ECML 2005* (pp. 194–205). Springer Berlin Heidelberg.

van Ments, L., & Treur, J. (2021). Reflections on dynamics, adaptation and control: A cognitive architecture for mental models. *Cognitive Systems Research*, *70*, 1–9.

van Oorschot, K. E., Langerak, F., & Sengupta, K. (2011). Escalation, DE-escalation, or reformulation: Effective interventions in delayed NPD projects. *The Journal of Product Innovation Management*, *28*(6), 848–867.

Venkatesh, V., University of Arkansas, Brown, S. A., Bala, H., University of Arizona, & Indiana University. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. *MIS Quarterly*, *37*(1), 21–54.

vom Brocke, J., Hevner, A., Léger, P. M., Walla, P., & Riedl, R. (2020). Advancing a NeuroIS research agenda with four areas of societal contributions. *European Journal of Information Systems*, *29*(1), 9–24.

Vroom. (1964). *Work and Motivation*. Wiley Publishing.

Wagar, B. M., & Thagard, P. (2004). Spiking Phineas Gage: a neurocomputational theory of cognitive-affective integration in decision making. *Psychological Review*, *111*(1), 67–79.

Wallace, L., Keil, M., & Rai, A. (2004). How software project risk affects project performance: An investigation of the dimensions of risk and an exploratory model. *Decision Sciences*, *35*(2), 289–321.

Walsh, J. P. (1995). Managerial and organizational cognition: Notes from a trip down memory Lane. *Organization Science*, *6*(3), 280–321.

Wang, Y., & Chiew, V. (2010). On the cognitive process of human problem solving. *Cognitive Systems Research*, *11*(1), 81–92.

Wang, Y., & Ruhe, G. (2011). The cognitive process of decision making. In *Strategic Information Systems* (pp. 1452–1464). IGI Global.

Warner, K. S. R., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, *52*(3), 326–349.

Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin*, *98*(2), 219–235.

Watson, D., & Walker, L. M. (1996). The long-term stability and predictive validity of trait measures of affect. *Journal of Personality and Social Psychology*, *70*(3), 567–577.

Weeth, A., Prigge, J.-K., & Homburg, C. (2020). The role of departmental thought worlds in shaping escalation of commitment in new product development projects. *The Journal of Product Innovation Management*, *37*(1), 48–73.

Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., & Blegind-Jensen, T. (2021). Unpacking the difference between digital transformation and IT-enabled organizational transformation. *Journal of the Association for Information Systems*, *22*(1).

Westphal, J. D., & Bednar, M. K. (2005). Pluralistic ignorance in corporate boards and firms' strategic persistence in response to low firm performance. *Administrative Science Quarterly*, *50*(2), 262–298.

Whyte, G. (1986). Escalating Commitment to a Course of Action: A Reinterpretation. *Academy of Management Review*, *11*(2), 311–321.

Wilkinson, N., & Klaes, M. (2012). Beliefs, heuristics and biases. In *An Introduction to Behavioral Economics* (pp. 115–145). Macmillan Education UK.

Williams, M., & Moser, T. (2019). The art of coding and thematic exploration in qualitative research. International Management Review, 15(1), 45-55.

Wilson, H. J., & Daugherty, P. R. (2018). Collaborative intelligence: humans and AI are joining forces. *Harvard Business Review*, *96*(4), 114–123.

Wong, K. F. E., & Kwong, J. Y. (2007). The role of anticipated regret in escalation of commitment. *Journal of Applied Psychology*, 92(2), 545.

Wong, K. F. E., & Kwong, J. Y. (2018). Resolving the judgment and decision-making paradox between adaptive learning and escalation of commitment. *Management Science*, 64(4), 1911-1925.

Wong, K. F. E., Kwong, J. Y. Y., & Ng, C. K. (2008). When thinking rationally increases biases: The role of rational thinking style in escalati*on of commitment. Applied Psychology,* 57(2), 246-271.

Wong, K. F. E., Yik, M., & Kwong, J. Y. Y. (2006). Understanding the emotional aspects of escalation of commitment: the role of negative affect. *The Journal of Applied Psychology*, *91*(2), 282–297.

Yamakawa, Y., & Cardon, M. S. (2017). How prior investments of time, money, and employee hires influence time to exit a distressed venture, and the extent to which contingency planning helps. *Journal of Business Venturing*, *32*(1), 1–17.

Yang, Chen, & Wang. (2020). What explains managers' escalating behaviors in a failing NPD project? The impact of managerial perceptions of opportunities and threats in a stage-gate process. *Journal of Small Business Management*, 1–39.

Yang, Chesbrough, H., & Hurmelinna-Laukkanen, P. (2022). How to Appropriate Value from General-Purpose Technology by Applying Open Innovation. *California Management Review*, *64*(3), 24–48.

Yang, M. M., Yang, F., & Li, X. (2023). Open innovation and de-escalation of commitment in underperforming new product development projects. *Journal of Business Research*, *164*, 113989.

Yeager, D. S., & Dweck, C. S. (2020). What can be learned from growth mindset controversies? *The American Psychologist*, *75*(9), 1269–1284.

Zander, T. O., & Kothe, C. (2011). Towards passive brain-computer interfaces: applying brain-computer interface technology to human-machine systems in general. *Journal of Neural Engineering*, *8*(2), 025005.

Zeelenberg, M. (1999). The use of crying over spilled milk: A note on the rationality and functionality of regret. *Philosophical Psychology*, *12*(3), 325–340.

Zhang, L., & Baumeister, R. F. (2006). Your money or your self-esteem: threatened egotism promotes costly entrapment in losing endeavors. *Personality & Social Psychology Bulletin*, *32*(7), 881–893.

Zorn, M. L., DeGhetto, K., Ketchen, D. J., Jr, & Combs, J. G. (2020). The impact of hiring directors' choice-supportive bias and escalation of commitment on CEO compensation and dismissal following poor performance: A multimethod study. *Strategic Management Journal*, *41*(2), 308–339.

Appendix A

List of Publications, **Carolin Valerie Marx**

Date: September 2023

Journal Publications:

1. De Paula, D., Marx, C., Dremel, C., Cormican, K., & Uebernickel, F. (2022). A Managerial Mental Model to Drive Innovation in the Context of Digital Transformation. *Industry and Innovation*, 30(1), 42-66.

Conference Proceedings:

2. Marx, C., & Uebernickel, F. (2023b). Unpacking the Black Box: A Cognitive Process Model of Escalation of Commitment in IS Project Management. *International Conference on Wirtschaftsinformatik (WI).*

3. Marx, C., & Uebernickel, F. (2023a). Disentangling Emotional and Cognitive Factors of Escalation of Commitment: Evidence for a Physiological Link. *European Conference on Information Systems (ECIS).*

4. Marx, C., de Paula, D., Haskamp, T., & Uebernickel, F. (2023). A Cognitive Perspective on Digital Transformation: Literature Review and Research Framework. *Hawaii International Conference on System Sciences (HICSS).*

5. Beermann, V., Haskamp, T., Marx, C., & Uebernickel, F. (2023). Addressing Inertia in Pro-Environmental Behavior through Nudges: A Review of Existing Literature and a Framework for Future Research. *Hawaii International Conference on System Sciences (HICSS).*

6. Hille, Z., Marx, C., Perscheid, M., & Uebernickel, F. (2023). Leading Digital Innovation Units: A Repertory Grid Study about Key Leadership Skills. *Hawaii International Conference on System Sciences (HICSS).*

7. Marx, C., Haskamp, T., de Paula, D., & Uebernickel, F. (2022). The Nexus of Design Thinking and Intrapreneurship: Insights from a Largescale Empirical Assessment. *Hawaii International Conference on System Sciences (HICSS).*

8. Marx, C., Haskamp, T., de Paula, D., & Uebernickel, F. (2022). Design Thinking Compass: Empirical Insights into the Status Quo. *Hawaii International Conference on System Sciences (HICSS).* Best Paper Award Runner Up.

9. Marx, C., & Uebernickel, F. (2022). How to Turn Around: Escalation of Commitment in the Context of ISD Project Distress. *International Conference on Information Systems (ICIS).* Best Paper in Track Award.

10. Marx, C., Ampel, B., & Lazarine, B. (2021). The Role of AI Agents for De-Escalating Commitment in Digital Innovation Projects. *International Conference on Information Systems (ICIS).*

11. Haskamp, T., Dremel, C., Marx, C., & Uebernickel, F. (2021). Understanding Inertia in Digital Transformation: A Literature Review and Multilevel Research Framework. *International Conference on Information Systems (ICIS).* Best Paper Award, CIO Forum.

12. Marx, C., de Paula, D., & Uebernickel, F. (2021). Dynamic Capabilities & Digital Transformation: A Quantitative Study on How to Gain a Competitive Advantage in the Digital Age. *European Conference on Information Systems (ECIS).*

13. Marx, C., Haskamp, T., de Paula, D., & Uebernickel, F. (2021). Design Thinking Diffusion Model: Empirical Insights into the Status Quo. *International Society for Professional Innovation Management (ISPIM).*

Book Chapters:

14. Marx, C., Haskamp, T., & Uebernickel, F. (2023). Designing Innovation in the Digital Age: How to Maneuver Around Digital Transformation Traps. In C. Meinel & L. Leifer (Eds.), *Design Thinking Research: Understanding Innovation*. Springer, Cham.

15. Marx, C. (2022). Design Thinking for Digital Transformation – Reconciling Theory and Practice. In C. Meinel & L. Leifer (Eds.), *Design Thinking Research: Achieving Real Innovation*. Springer, Cham.

16. Haskamp, T., Dremel, C., Marx, C., Rinkes, U., & Uebernickel, F. (2022). The New in the Old: Managing Inertia and Resulting Tensions in Digital Value Creation. In M. K. Brohman, G. S. Dawson, & K. C. Desouza (Eds.), *Digitalization and Sustainability*.

Appendix B – Decision Scenario

Source: Adapted from Arkes & Blumer (1985)

Software: SoSciSurvey

Project Introduction (High Responsibility Condition)

You are the Vice President of Operations for a mid-sized high-tech manufacturing firm.

You have 10 million dollars and 3 years to complete a research project that will develop a radar-scrambling device that would render a plane undetectable by conventional radar, in effect, a radar-blank plane.

Prior to the beginning of the project, Steve, the project engineer, informs you that he does not think that all 10 million dollars will be needed to successfully complete the project, but he does think that he will need at least 5 million dollars to complete the project.

Between 5 million dollars and 10 million dollars, how much money would you like to invest in the project?

Primary Budget: $ _____ million

Project Introduction (Low Responsibility Condition)

You are working as a senior manager for a mid-sized high-tech manufacturing firm. The Vice President of Operations for this firm is called Frank.

Frank has initiated a research project that will develop a radar-scrambling device that would render a plane undetectable by conventional radar, in effect, a radar-blank plane.

Frank had 10 million dollars and 3 years to complete the project. Prior to the beginning of the project, Steve, the project engineer, informed Frank that he does not think that all 10 million dollars will be needed to successfully complete the project, but he does think that he will need at least 5 million dollars to complete the project.

You heard from your colleagues that Frank decided to invest 5 million dollars in the project.

Manipulation Check (Both Conditions)

To what extent do you feel responsible for the previous investment of 5 million dollars?"	To a very small extend	To a very large extent
To what extent do you feel responsible for starting this project?	To a very small extend	To a very large extent

Decision [1] (High Responsibility Condition)

Two Years Later

Two years after the project started, Steve retired from the company and Jackie is the new project engineer.

You meet with Jackie to get an update on the project. Jackie informs you that Steve used the money you initially invested to purchase inexpensive materials that are of poor quality. As a result, all of the computer components in the plane keep short-circuiting. Jackie says that she is certain she can remedy the mistake, but that she will need an additional 3 million to 6 million dollars in funding.

The decision you face now is to either abandon the project or authorize more funding to continue this radar-scrambling project.

How do you decide?

Authorize more funding | Abandon the project

Decision [1] (Low Responsibility Condition)

Two Years Later

Two years after the project started, Frank retired from the company and you were promoted to replace Frank as the Vice President.

You meet with the new project engineer Jackie to get an update on the project. Jackie informs you that Steve, the former project engineer, used the money Frank initially invested to purchase inexpensive materials that are of poor quality. As a result, all of the computer components in the plane keep short-circuiting.

Jackie says that she is certain she can remedy the mistake, but that she will need an additional 3 million to 6 million dollars in funding.

The decision you face now is to either abandon the project or authorize more funding to continue this radar-scrambling project.

How do you decide?

Authorize more funding | Abandon the project

Investment [1] (Both Conditions)

Filter: If Decision [1] = "Authorize more funding"

You have decided to authorize more funding to continue this radar-scrambling project.

Between 3 million dollars and 6 million dollars, how much money would you like to authorize to continue the radar-scrambling plane?

Secondary Budget: $ [ ] million

Decision Confidence (Both Conditions)

Repeated after every investment decision

Please indicate how confident you were with your decision from 0% (not confident all) to 100% (very confident)

Not confident at all — Very confident

Cognitive Reasoning (Both Conditions)

Repeated after every investment decision

Please explain why you decided the way you decided. Which factors had an impact on your decision? (Minimum 20 words)

Decision [2] (Both Conditions)

Filter: If decision [1] = "Authorize more funding"

Three Months Later

Three months after you provided the additional funding for Jackie to replace the faulty parts that Steve had purchased, you ask Jackie for an update on the project.

You are pleased to learn that the computer components are now working properly. Jackie also informs you that she believes the project will be finished on schedule. However, she informs you that the radar-scrambling device also scrambles other electronic devices, such as the pilot's communication system.

She informs you that the problem can be fixed with a new software system for the radar-scrambler, but that she needs an additional 2 million to 5 million funds to purchase the new software system.

The decision you face now is to either abandon the project or authorize more funding to continue this radar-scrambling project.

How do you decide?

Authorize more funding — Abandon the project

Investment [2] (Both Conditions)

Filter: If decision [2] = "Authorize more funding"

You have decided to authorize more funding to continue this radar-scrambling project.

Between 2 million dollars and 5 million dollars, how much money would you like to authorize to continue the radar-scrambling plane?

Tertiary Budget:$ million

Decision [3] (Both Conditions)

Filter: If decision [2] = "Authorize more funding"

A follow up after three Months.

After another 3 months have passed, you visit the engineering department to view the radar-scrambling plane.

You are pleased to learn that the additional funding you granted solved the problem with the radar-scrambler affecting other devices. Jackie informs you that the plane is ready for a test flight. She asks if you would like to ride aboard the plane during the test flight. You are excited to see how well the plane is working and decide to ride aboard the plane. During the test flight everything works perfectly. None of the radar systems are detecting the plane.

30 min after take-off, the pilot informs you the test is over and he is landing the plane. Once on the ground, you ask the pilot why he landed the plane so shortly after the flight began. He informs you that the additional weight of the radar-scrambling device caused the plane to burn the fuel faster than expected.

The pilot suggests that the fuel tanks be upgraded to allow for longer flights but that it would cost an additional 4 million to 7 million dollars in funding. The decision you face now is to either abandon the project or authorize more funding to continue this radar-scrambling project.

How do you decide?

Authorize more funding | Abandon the project

Investment [3] (Both Conditions)

Filter: If decision [3] = "Authorize more funding"

You have decided to authorize more funding to continue this radar-scrambling project.

Between 4 million dollars and 7 million dollars, how much money would you like to authorize to continue the radar-scrambling plane?

Quaternary Budget:$ _____ million

Decision [4] (Both Conditions)

Filter: If decision [3] = "Authorize more funding"

Another 3 Months Later.

Three months later, you discover that another firm has already begun marketing a similar product that takes up less space and is much easier to operate than your design.

Jackie informs you that the project is 90% complete. She informs you that she is pleased with all of the progress that has been made despite the issues that have arisen along the way. Jackie informs you that although the upgraded fuel tanks allow the plane to fly much further than before, the fuel tanks cost more than expected.

She informs you that she will need an additional 1 million to 4 million dollars in funding to pay for the remainder of the project. The decision you face now is to either abandon the project or authorize more funding to continue this radar-scrambling project.

How do you decide?

Authorize more funding

Abandon the project

Investment [4] (Both Conditions)

Filter: If decision [4] = "Authorize more funding"

You have decided to authorize more funding to continue this radar-scrambling project.

Between 1 million dollars and 4 million dollars, how much money would you like to authorize to continue the radar-scrambling plane?

Quinary Budget:$ million

Appendix C – Cognitive Flexibility Inventory (CFI)

Source: (Dennis & Vander Wal, 2010)

Software: SoSciSurvey

Please use the scale below to indicate the extent to which you agree or disagree with the following statements.	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I am good at "sizing up" situations	○	○	○	○	○	○	○
I have a hard time making decisions when faced with difficult situations	○	○	○	○	○	○	○
I consider multiple options before making a decision	○	○	○	○	○	○	○
When I encounter difficult situations, I feel like I am losing control	○	○	○	○	○	○	○
I like to look at difficult situations from many different angles	○	○	○	○	○	○	○
I seek additional information not immediately available before attributing causes to behavior	○	○	○	○	○	○	○
When encountering difficult situations, I become so stressed that I can not think of a way to resolve the situation	○	○	○	○	○	○	○
I try to think about things from another person's point of view	○	○	○	○	○	○	○
I find it troublesome that there are so many different ways to deal with difficult situations	○	○	○	○	○	○	○
I am good at putting myself in others' shoes	○	○	○	○	○	○	○
When I encounter difficult situations, I just don't know what to do	○	○	○	○	○	○	○
It is important to look at difficult situations from many angles	○	○	○	○	○	○	○
When in difficult situations, I consider multiple options before deciding how to behave	○	○	○	○	○	○	○
I often look at a situation from different viewpoints	○	○	○	○	○	○	○
I am capable of overcoming the difficulties in life that I face	○	○	○	○	○	○	○
I consider all the available facts and information when attributing causes to behavior	○	○	○	○	○	○	○
I feel I have no power to change things in difficult situations	○	○	○	○	○	○	○
When I encounter difficult situations, I stop and try to think of several ways to resolve it	○	○	○	○	○	○	○
I can think of more than one way to resolve a difficult situation I'm confronted with	○	○	○	○	○	○	○
I consider multiple options before responding to difficult situations	○	○	○	○	○	○	○