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Flops and missed opportunities: Three empirical studies on adverse decision outcomes in innovation-related contexts

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Abstract

This doctoral thesis examines determinants and consequences of specific adverse decision outcomes in high-stakes, innovation-related contexts through three empirical studies. The first study investigates why decision-makers sometimes do not pursue eventually successful innovations further and, thus, commit a costly abandonment error. Drawing on the exploitation-exploration paradigm, uncertainty theory, and dual information processing, we elaborate a stepwise process model of abandonment error occurrence at the project level. Testing the model with survey data from 149 managers, the results show that the type of innovation project is associated with the level of uncertainty decision-makers perceive. Those perceptions of uncertainty shape how decision-makers cognitively approach project evaluation and decision-making, thereby affecting decision quality and, by extension, the likelihood of abandoning an eventually successful innovation. Overall, the study contributes to the nascent research on abandonment errors and the literature on decision-making in innovation projects. Drawing on the theory of risk-type preference shifts, the second study investigates how recent yet distinct failures, i.e., commission errors (innovation flops) and omission errors (missed opportunities), dynamically influence managers' persistence with currently underperforming innovation projects. Using a metric conjoint experiment encompassing 1,424 decisions by 89 managerial decision-makers, the study demonstrates that a recent commission error is associated with a lower likelihood of persistence than a recent omission error. In addition, the findings reveal that decision-maker heterogeneity, i.e., differences in self-regulatory ability (action versus state orientation) and cognitive style (extent of rational thinking), further shapes persistence decisions. The study contributes to research on persistence, particularly in the context of innovation development, and the theory of risk-type preference shifts. The third study examines how and when missing out on leveraging a desirable strategic investment opportunity influences subsequent firm behavior. Focusing on corporate acquisitions, which share many characteristics with innovation investments, the study analyzes a global dataset of 446 acquisition announcements in competitive bidding situations from 2000 to 2022. Drawing on the behavioral theory of the firm and related research on behavioral decision-making, the study reveals that bidders who miss out on acquiring their desired targets tend to spend more on subsequent acquisitions than those who complete respective deals. External evaluations, as reflected in stock market reactions to completion and abandonment announcements, further influence this behavioral mechanism. The findings illuminate how missing out on leveraging a desirable opportunity shapes subsequent organizational investment behavior in high-stakes decision contexts. Overall, the three studies of this doctoral thesis contribute to theory, prior literature, and practice by providing unique insights into the determinants (first study) and subsequent behavioral consequences (second study and third study) of specific adverse decision outcomes. While the first study advances the understanding of project-specific and cognitive antecedents of premature abandonment, the other two studies illuminate the behavioral implications of distinct types of failure for individual and organizational decision-making.

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List of abbreviations

ACS	Action Control Scale
ATT	Average treatment effect on the treated
AVE	Average variance extracted
CapEx	Capital expenditures
CAR	Cumulative abnormal return
CB-SEM	Covariance-based structural equation modelling
CE	Commission error
CI	Confidence interval
HLM	Hierarchical linear modeling
HTMT	Heterotrait-monotrait (ratio of correlations)
IHS	Inverse hyperbolic sine
L1	Level 1
L2	Level 2
LB	Lower bound of confidence interval
LOP	Likelihood of persistence
M	Mean
OE	Omission error
OLS	Ordinary least squares
PLS-SEM	Partial least squares structural equation modelling
PSM	Propensity score matching
ROA	Return on assets
SD	Standard deviation
SE	Standard error
UB	Upper bound of confidence interval
VIF	Variance inflation factor

List of symbols

α	Cronbach's alpha
λ	Indicator loading
ρ_A	Composite reliability (Dijkstra & Henseler, 2015)
ρ_C	Composite reliability (Heise & Bohrnstedt, 1970)

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1 General introduction

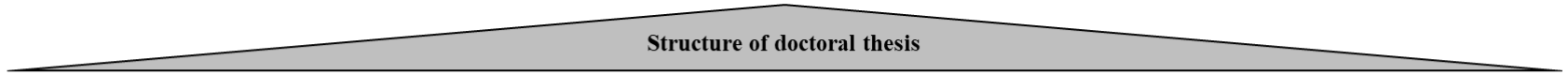
Choosing the "right" innovation endeavors to invest in is an essential yet inherently difficult decision under uncertainty, one that entails the persistent risk of pursuing bad choices and missing good ones (Csaszar, 2012). In other words, organizational entities constantly face the risk of pursuing unsuccessful innovation opportunities or projects and abandoning eventually successful or desirable ones, resulting in costly flops and missed opportunities. Both adverse decision outcomes are detrimental to performance (Csaszar, 2013) and occur frequently in the context of innovation (Sharapov & Dahlander, 2025). Due to their negative performance implications, frequent occurrence, and resultant practical relevance, flops and missed opportunities have garnered the attention of scholars. Using terms like errors of commission and omission (e.g., Klingebiel, 2018), false positives and negatives (e.g., Berg, 2016), Type 1 and Type 2 errors (Garud et al., 1997), or continuation and abandonment errors (e.g., Long et al., 2020), scholars have begun to research determinants and consequences of flops and missed opportunities. Broadly, the current understanding is that organizational decision-making structures or decision rules (e.g., Joseph & Gaba, 2020), inventor network characteristics (Kumar & Operti, 2023), innovation process characteristics (e.g., Long et al., 2020), and decision-makers' cognition (e.g., Berg, 2016) determine the occurrence of the two adverse decision outcomes. On the side of consequences, scholars suggest (Dye et al., 2014; Klingebiel, 2018) and show (Klingebiel et al., 2022) that producing flops and experiencing missed opportunities evoke distinct behavioral responses. Despite scholarly interest in the two adverse decision outcomes, relevant questions remain unanswered, creating compelling research gaps that I outline below.

First, the innovation literature lacks a process-based understanding of how erroneous abandonment decisions occur on the project level. Indeed, previous research has predominantly focused on erroneous pursuit decisions or flops (e.g., Eliëns et al., 2020; Markovitch et al., 2015), leaving the emergence of missed opportunities underexplored. Second, the literature

lacks a nuanced understanding of how recently experienced adverse decision outcomes dynamically influence managers' decision-making in current innovation projects. Although prior research argues that flops can indeed lower the motivation to pursue subsequent innovation endeavors (Shepherd & Cardon, 2009; Shepherd et al., 2009; Välikangas et al., 2009), these studies neglect that innovation failure may also arise from missed opportunities (Klingebiel et al., 2022). Therefore, prior research cannot paint a complete picture of how and when distinct failure experiences dynamically shape individuals' decision-making in innovation projects. Third, it is largely unclear how missing out on leveraging a desirable strategic investment opportunity affects firm behavior. Correspondingly, an open question remains whether – and under what circumstances – missed opportunities influence firms' pursuit of subsequent investment opportunities (e.g., Wood et al., 2022).

To address these research gaps, this doctoral thesis employs an interdisciplinary, multi-method approach, reflected in three empirical studies. The first study (chapter 2), titled "Why eventual "winners" may not be pursued: The connection between innovation project type and abandonment error occurrence," leverages survey data to test a conceptual process model, which suggests that innovation project type serves as the trigger of a cognitive process that ultimately determines the likelihood of abandoning an eventually successful innovation project. The second study (chapter 3), titled "How distinct failure types shape persistence with underperforming innovation projects: A conjoint experiment," employs a conjoint experiment to analyze managers' persistence decision-making after recently experienced flops or missed opportunities, while simultaneously accounting for individual differences in self-regulatory ability and cognition. The third study (chapter 4), titled "The ones that got away: Missed acquisitions, market reactions, and subsequent acquisition behavior," draws upon data of corporate acquisitions to examine firms' response to missed investment opportunities. Since acquisitions share many features with innovation investments (e.g., Guler, 2018), they provide a suitable setting for studying the context-dependent behavioral implications of missing out.

Figure 1: Structure of doctoral thesis



	Chapter 1: General introduction		
	Chapter 2: First study	**Chapter 3: Second study**	**Chapter 4: Third study**
Title	**Why eventual "winners" may not be pursued: The connection between innovation project type and abandonment error occurrence**	**How distinct failure types shape persistence with underperforming innovation projects: A conjoint experiment**	**The ones that got away: Missed acquisitions, market reactions, and subsequent acquisition behavior**
Authors	Björn Hofmann & Monika C. Schuhmacher	Björn Hofmann, Monika C. Schuhmacher, & Kumar R. Sarangee	Björn Hofmann, Julian Nickel, Petrit Ademi, & Monika C. Schuhmacher
Overarching research question	How does the type of innovation project affect abandonment error occurrence?	How do recent yet distinct types of failure shape the decision-making of heterogeneous individuals in currently underperforming innovation projects?	How does missing out on leveraging a strategic opportunity influence firms' subsequent spending behavior in light of external evaluations?
Predominant theoretical background	Exploitation-exploration paradigm (e.g., March, 1991), uncertainty theory (e.g., Packard & Clark, 2020), and dual information processing theory (e.g., Epstein et al., 1996)	Risk-type preference shifts (Klingebiel, 2018)	Behavioral theory of the firm (e.g., Cyert and March, 1963) and related research on behavioral decision-making (e.g., Dye et al., 2014)
Method	Survey	Conjoint experiment with post-experimental survey	Secondary data analysis
Academic conferences	30th IPDMC 2023, Lecco (Italy) 24th G-Forum 2020 (virtual edition) 26th IPDMC 2019, Leicester (UK)	31st IPDMC 2024, Dublin (Ireland) 26th G-Forum 2023, Darmstadt (Germany)	None yet
Status	Working paper (first R&R, International Journal of Innovation Management, VHB Rating 2024: B)	Working paper (second R&R, Journal of Product Innovation Management, VHB Rating 2024: A)	Working paper (being prepared for submission)
	Chapter 5: Concluding remarks		

Figure 1 provides an overview of the structure of this doctoral thesis, including the overarching research questions, the predominant theoretical backgrounds, the methods, and the current status of all three empirical studies. Overall, this doctoral thesis seeks to expand the scholarly and practical understanding of flops and missed opportunities in innovation-related contexts across multiple levels of investigation, shedding light on determinants and consequences. On the side of determinants, the first study examines how abandonment errors occur on the project level. On the side of consequences, the second study examines how recent flops and missed opportunities differ in their influence on individuals' decision-making in innovation projects, while accounting for decision-maker heterogeneity. Complementarily, the third study investigates the behavioral implications of missed opportunities on the organizational level, focusing on subsequent firm investments in strategic opportunities in light of external evaluations by influential stakeholders.

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2 First study: Why eventual "winners" may not be pursued: The connection between innovation project type and abandonment error occurrence

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Abstract:
This study investigates how the erroneous abandonment of an innovation project can occur. We formulate a process model of abandonment error occurrence and test it by analyzing survey data from 149 managers with decision-making authority in innovation projects. Our findings show that the more exploratory (rather than exploitative) an innovation project is, the higher the perceived level of uncertainty among the project's decision-makers. As an innovation project becomes increasingly uncertain, decision-makers rely more heavily on intuition than on rationality. This tendency can backfire, as only a more extensive use of rationality leads to a higher abandonment decision quality. Indeed, greater reliance on intuition reduces the quality of abandonment decisions. However, higher decision quality is ultimately crucial for reducing the likelihood of abandonment errors. Our paper primarily contributes to the nascent literature on abandonment errors and the benefits and downsides of rational and intuitive approaches to innovation project decision-making.

Keywords:
Abandonment error, innovation project type, cognition, decision-making

2.1 Introduction

In the context of innovation project decision-making, scholars have long and rightfully argued that abandoning "losers" and pursuing "winners" is one of a firm's most essential tasks (Cooper, 2008; Cooper & Kleinschmidt, 1993). Unfortunately, fulfilling this task is rarely straightforward. Any given firm's decision-makers are fallible due to cognitive limitations, and innovation project decision-making is an inherently cognitive task under uncertainty (e.g., Schweitzer et al., 2020). Consequently, the evaluation of new products or services is not always accurate and prone to decision errors (e.g., Kim & Wilemon, 2002). Following this perspective, previous literature has primarily focused on why decision-makers might continue to pursue a "losing" innovation project, either before or after its launch (e.g., Biyalogorsky et al., 2006; Eliëns et al., 2018; Markovitch et al., 2015; Roeth et al., 2020; Sarangee et al., 2019). The pre-launch abandonment of an eventually "winning" innovation project has received much less scholarly attention by comparison. Our paper aims to shift the attention to this complementary phenomenon, which we call *abandonment error* (Long et al., 2020).

An abandonment error occurs when decision-makers fail to evaluate the eventual success of an innovation accurately and decide to abandon an inherently good project (Berg, 2016; Garud et al., 1997; Sah & Stiglitz, 1986). Unfortunately, a "winner" only reveals itself after commercialization. Thus, an abandonment error surfaces when another firm successfully launches an innovation project similar to the one the focal firm evaluated as unattractive and abandoned as a consequence (Klingebiel, 2018). Committing an abandonment error is costly from the perspective of the focal firm (Csaszar, 2013). It causes explicit costs that accrue until project abandonment and implicit opportunity costs in the form of foregone gains. Although firms can always decide to commercialize the initially abandoned innovation project later, competitive preemption only leaves residual gains lower than the initially achievable gains (Wood et al., 2022). In other words, the focal firm does not capitalize on the full potential of an eventually lucrative opportunity. Therefore, understanding why and how decision-makers

might inaccurately evaluate inherently good innovation projects and commit abandonment errors becomes relevant.

Previous literature on abandonment error occurrence in innovation projects is nascent. Literature streams across organizational design, the design of innovation processes, and the use of cognition in innovation project decision-making have begun to shed light on the phenomenon. At the intersection of organizational design and (innovation) project decision-making, scholars have employed formal modelling to demonstrate the effects of various organizational decision-making structures on the likelihood of abandonment error occurrence (e.g., Christensen & Knudsen, 2010; Csaszar, 2013; Sah & Stiglitz, 1986). Some innovation scholars, in contrast, have focused on how innovation process design determines the timing, frequency, and stringency of evaluation and decision-making, which might foster or reduce abandonment error occurrence (e.g., Long et al., 2020; van Oorschot et al., 2010). Other scholars have highlighted the importance of minimizing abandonment errors but researched the effects of selected cognitive variables and decision-making approaches on decision effectiveness in general without explicitly investigating erroneous abandonment (e.g., Hammedi et al., 2011).

Although representing a crucial first step, the nascent literature on abandonment error occurrence in innovation project decision-making reveals one major and one minor shortcoming. A major shortcoming is the neglect of the type of innovation project, i.e., exploitative versus exploratory (March, 1991), serving as a context in which evaluation and decision-making take place (see Long et al., 2020). This oversight leaves a blind spot in the scholarly discussion of abandonment error occurrence, as any innovation project is either more exploitative or more exploratory, reflected by an assignment of relative importance to each objective at the project's initiation (e.g., Salge et al., 2013). Moreover, exploitation and exploration have distinct implications for the uncertainty decision-makers perceive (March, 1991), shaping their evaluation and decision-making approaches in the innovation project (e.g.,

Packard & Clark, 2020). Although previous conceptual research has indeed proposed that abandonment errors relate to exploitation and exploration (e.g., Csaszar, 2013; Garud et al., 1997), the concrete relational mechanisms remain ambiguous and untested, hindering theoretical advancement. Likewise, practitioners should know how project type can affect the accuracy of abandonment decisions, given that nearly 80% of all innovation projects are terminated before commercialization (Markham & Lee, 2013). The minor yet important shortcoming is that most relevant literature is non-empirical, further limiting research progress. Overall, we formulate the following research question that we aim to address empirically: *How does the type of innovation project affect abandonment error occurrence?*

We approach this question in the following ways. We conceptualize innovation project type from a knowledge perspective. Accordingly, an innovation project as the domain of interest can either lean towards the exploitation of existing knowledge or the exploration of new knowledge (Levinthal & March, 1993; March, 1991), thus lying on an exploitation-exploration continuum (e.g., Xu et al., 2017). Drawing from uncertainty theory, we argue that the location of the innovation project on the continuum has distinct implications for decision-makers' subjective perceptions of uncertainty and the evaluation and decision-making approaches they use (Packard & Clark, 2020). In particular, uncertainty perceptions should affect decision-makers' use of rationality and intuition – two prominent evaluation and decision-making styles in innovation projects (e.g., Dayan & Di Benedetto, 2011; Eliëns et al., 2018; Eling et al., 2015; Schweitzer et al., 2020) – which subsequently affect the quality of an abandonment decision and, by extension, abandonment error occurrence. Overall, we elaborate a conceptual, stepwise process model of abandonment error occurrence with innovation project type as the trigger. We test the model by analyzing survey data from experienced managers with decision-making authority in abandoned innovation projects.

Our model sheds light on abandonment error occurrence, an often neglected but highly relevant adverse outcome of innovation project decision-making. With our process model, we

contribute to the literature in several ways. First, while previous research suggests that firms must explore more to avoid missing out on eventually successful innovations (e.g., Garud et al., 1997), we show that a dominant focus on exploration on the project level can foster abandonment error occurrence through a distinct processual mechanism. Second, uncertainty theory posits that different evaluation and decision-making approaches should have distinct implications for making predictive errors (Packard & Clark, 2020). We enrich this discussion by introducing the concept of abandonment error to uncertainty theory and show how and why this error occurs. Third, literature on the potential benefits and drawbacks of rationality, intuition, and related cognitive constructs for innovation project decision-making tends to focus on the pursuit of "losing" innovation projects (e.g., Eliëns et al., 2018; Markovitch et al., 2015; Roeth et al., 2020). We add to this literature by focusing on the complementary phenomenon, i.e., the abandonment of eventually "winning" projects.

2.2 Conceptual background and review of the literature

2.2.1 The concept of abandonment error in innovation project decision-making

According to decision theory, most decision-making tasks produce decision errors, i.e., deviations from a superior decision (see Csaszar, 2013). Decisions usually have a binary character in these tasks, such as accepting or rejecting a specific choice alternative. Decision errors occur when the superior decision would have been the opposite of the actual decision. Assuming that decision-makers do not deviate from a superior decision on purpose, decision errors are often the result of faulty judgment and a lack of evaluation accuracy, creating a mismatch between the ex-ante evaluation of a choice alternative and its actual ex-post performance (e.g., Garud et al., 1997; Sah & Stiglitz, 1986). Here, we consider the outcome of "rejecting a superior alternative" (Christensen & Knudsen, 2010, p. 71), i.e., a decision error that results from an underestimation of the choice alternative's potential success (Berg, 2016).

We argue that the context of innovation project decision-making is particularly susceptible to this phenomenon, which we call abandonment error (see Long et al., 2020). Decision-makers must regularly evaluate the uncertain, inherent quality (potential success) of innovation projects (choice alternatives) to decide on continuation or abandonment (binary character of accepting versus rejecting) (e.g., Cooper, 2008). Given the fallibility and cognitive limitations of decision-makers, the uncertainty surrounding innovation project decision-making facilitates the occurrence of decision errors in general and abandonment errors in particular (Stewart, 2000). Relatedly, the sheer frequency of innovation project abandonment provides fertile ground for error occurrence. Decision-makers abandon approximately 80% of innovation projects before commercialization (Markham & Lee, 2013), which implies that at least some inherently good projects are abandoned. Indeed, abandonment errors in innovation development are not rare (Bonabeau et al., 2008), and research suggests that there are hidden treasures among terminated innovation projects (Qin & van der Rhee, 2021). Moreover, the context of innovation project decision-making is worth investigating because abandonment errors generate tangible and intangible costs for firms, thus having distinct performance implications (Csaszar, 2013). Indeed, the development of innovations is high-stakes, and committing abandonment errors in today's highly competitive and fast-paced market environments can mean a disadvantage in competition (e.g., Garud et al., 1997).

Two clarifications are necessary to delineate the concept of abandonment error in innovation project decision-making more precisely. First, abandonment implies purposeful consideration (Klingebiel, 2018). With purposeful consideration, we mean that decision-makers are aware of the specific project when researching and developing innovations, e.g., during idea generation, project initiation, and development. Abandonment then happens through actively rejecting to pursue the innovation project further, terminating it sometime before commercialization. Missing purposeful consideration of a project would instead shift the focus to pure neglect, which is not the focus of this study.

Second, whether an innovation project is of good quality is not immediately evident to the decision-maker and only surfaces through launch onto the market. In the case of a firm's abandonment, a revelation of quality only occurs when a similar project eventually proves successful elsewhere (Garud et al., 1997). Indeed, Tellis (2013, p. 70) emphasizes that an abandonment error only becomes observable in retrospect when a firm fails "to adopt or commercialize an innovation that is eventually developed by a rival and turns out to be successful." Good projects that lack any form of implementation, e.g., due to an entire population of firms opting for non-pursuit, are inherently unobservable and thus not the focus of this study. Therefore, we exclusively concentrate on observable abandonment errors, i.e., eventual "winners."

2.2.2 Determinants of abandonment errors

Our understanding of abandonment errors allows for a meaningful synthesis of prior literature discussing its determinants. Although scholars employ different notations, such as omission errors (e.g., Csaszar, 2013), Type 2 errors (e.g., Hammedi et al., 2011), or false negatives (e.g., Berg, 2016), conceptual similarities allow for an integration of the literature.

The first literature stream concerns the domain of organizational design. Here, scholars use the term "project" but remain agnostic concerning its meaning (see Csaszar, 2013). Thus, a project can refer to an innovation project (Christensen & Knudsen, 2010) or, e.g., a financial asset (Csaszar, 2012). Since many studies in this domain rely on formal theoretical modelling, starting with the seminal study of Sah and Stiglitz (1986), principal insights are generalizable to most managerially relevant decision tasks (Csaszar, 2013), with innovation project decision-making being no exception.

Based on this premise, organizational design scholars have investigated the effects of different decision-making structures on the likelihood of abandonment error occurrence (Christensen & Knudsen, 2010; Csaszar, 2012, 2013; Sah & Stiglitz, 1986, 1988).

Organizational decision-making structure essentially determines information aggregation and who has the final say in accepting projects: any involved decision-maker in a parallel decision-making chain (polyarchical or decentralized structure), one specific decision-maker at the end of a sequential chain (hierarchical or centralized structure), a committee of decision-makers (adhering to pre-determined voting rules), or hybrid forms. For example, an early and central finding by Sah and Stiglitz (1986) is that a polyarchical structure has a higher acceptance rate and commits fewer abandonment errors than a hierarchical one. Since this seminal study, scholars have extended their investigations to committees and hybrid structural forms between polyarchy and hierarchy (Christensen & Knudsen, 2010; Csaszar, 2013; Sah & Stiglitz, 1988). Although most research in organizational design employs computational modelling to investigate abandonment error occurrence, the study by Csaszar (2012) is an exception. Using data on mutual funds, he empirically corroborates the finding that decentralized decision-making structures commit fewer abandonment errors than organizations with a centralized structure. Overall, the insights of this literature stream seem generalizable to innovation project decision-making, which can be centralized, decentralized, or committee-driven depending on the individual firm (Cooper, 2008).

Apart from the literature stream on organization design, two literature streams deal more explicitly with innovation project decision-making. First, the literature stream on innovation process design focuses on when evaluation and decision-making take place (Long et al., 2020; van Oorschot et al., 2010). The design of the innovation process determines the timing and frequency of evaluation and decision-making, which can have implications for decision-making stringency. For example, a stage-gate process consists of multiple information-gathering stages that precede formal decision points, so-called gates, in which decision-makers evaluate projects in light of specific deliverables and pre-determined criteria (Cooper, 2008). Key insights include that evaluation after every possible stage leads to a lower likelihood of abandonment error than limiting evaluation frequency (Long et al., 2020). However, early, rigorous decisions

dictated by such a stage-gate process might also foster premature abandonment (van Oorschot et al., 2010). As such, the design of innovation processes seemingly has implications for the occurrence of abandonment errors.

Second, the other innovation-centric literature stream focuses on the use of cognition in innovation project decision-making and sheds light on the distinct ways decision-makers process information to make innovation-related decisions (e.g., Camuffo et al., 2020; Hammedi et al., 2011; Oraiopoulos & Kavadias, 2020). In particular, scholars suggest that decision-makers' cognition shapes their evaluation and decision-making accuracy, investigating cognitive constructs such as reflexivity and procedural rationality (Hammedi et al., 2011), convergent and divergent thinking (Berg, 2016), preference and interpretive diversity in committees (Oraiopoulos & Kavadias, 2020), and a scientific approach to decision-making (Camuffo et al., 2020). In contrast to the majority of studies in the previous streams, this research produces empirical results and incorporates abandonment error as an essential part of argumentation. However, it does not account explicitly for the decision error's concrete manifestation. For example, Hammedi et al. (2011) argue that minimizing abandonment errors reflects high screening performance. However, they do not directly capture abandonment errors in their dependent variable, i.e., decision-making effectiveness.

Taken together, research on abandonment error occurrence in the unique setting of innovation projects is nascent despite the phenomenon's prevalence and negative implications for performance. We argue that there are two shortcomings worth addressing. First, previous literature remains silent on a fundamental contextual characteristic of an innovation project: whether it is exploitative or exploratory (Long et al., 2020). This gap is intriguing, as a focus on either exploitation or exploration should have very different implications for the uncertainty decision-makers perceive in an innovation project (e.g., Benner & Tushman, 2003; March, 1991). Relatedly, scholars suggest that the uncertainty embedded in a decision context is the primary determinant of how individuals approach decision-making (Packard & Clark, 2020;

Packard et al., 2017; Wiltbank et al., 2006). Therefore, an innovation project's location on the exploitation-exploration continuum should have, by extension, implications for decision outcomes. Indeed, prior research suggests that exploitation and exploration relate to abandonment error occurrence (Csaszar, 2013; Garicano & Posner, 2005; Garud et al., 1997), but how this relationship unfolds at the project level remains unclear and untested.

Second, prior innovation research on the determinants of abandonment errors is mostly non-empirical or fails to account for the concrete manifestations of abandonment errors. In this paper, we seek to address these shortcomings to improve the theoretical and practical understanding of abandonment error.

2.3 Theoretical background and hypotheses

2.3.1 Differentiation and classification of innovation projects

We draw from the exploitation-exploration paradigm to differentiate innovation project types. According to this framework, an innovation project can lean towards either the "exploitation of old certainties" or the "exploration of new possibilities" (March, 1991, p. 71). From a knowledge perspective, exploitative projects build upon existing knowledge, whereas exploratory projects depart from existing knowledge (Levinthal & March, 1993). Correspondingly, searching for information in exploitative projects occurs near the existing experience and in well-defined solution spaces (Atuahene-Gima & Murray, 2007; March, 1991; Rowley et al., 2000). In contrast, exploratory projects demand a search for information beyond current experience in ill-defined solution spaces. Exploitative projects deal with existing market and technological domains, while exploratory projects venture into new ones (He & Wong, 2004; Jansen et al., 2006).

Literature suggests that exploitation and exploration are mutually exclusive within one domain of interest, i.e., high values of one necessarily imply low values of the other (Gupta et al., 2006). Thus, an innovation project as a single domain of interest can be classified as either

more exploitative or more exploratory, depending on its location on the exploitation-exploration continuum (e.g., Salge et al., 2013; Xu et al., 2017).

2.3.2 The relationship between innovation project type and perceived project uncertainty

The distinction between an exploitative and exploratory project has implications for perceived project uncertainty. Indeed, seminal research suggests that exploitation and exploration differ in uncertainty almost by definition (e.g., Levinthal & March, 1993; March, 1991). Thus, assuming that innovation projects that lean strongly towards exploitation on the exploitation-exploration continuum are less uncertain than those that are more exploratory seems reasonable (e.g., Schleimer & Faems, 2016). However, we deem such an assumption overly simplistic. Therefore, drawing from recent developments in uncertainty theory, we not only seek to consider the level of uncertainty ascribed to a specific decision context, i.e., an innovation project, but also in what ways that context is uncertain.

To classify the level of uncertainty in a decision context, Packard et al. (2017) emphasize that all decisions comprise a set of available options and possible outcomes, resulting in multiple option-outcome pairs between an option and some subset of possible outcomes. Sets can be open (i.e., an infinite number of possible elements) or closed (i.e., a finite number of possible elements). When sets for options and associated outcomes are closed, decision-makers confront lower-level uncertainty, such as risk or ambiguity. While outcome probabilities are known under conditions of risk, they are unknown but principally knowable under conditions of ambiguity. However, no objective outcome probabilities are assignable when one or both sets are open because some options, outcomes, or both are unknown or unknowable, indicating higher-level uncertainty.

Another important feature of a decision context is whether uncertainty feels reducible or irreducible (Packard & Clark, 2020). Seminal work in organizational information processing

has generally assumed that all uncertainty is reducible through information acquisition (e.g., Galbraith, 1974; Tushman & Nadler, 1978). However, in a recent theory piece, Packard and Clark (2020) challenge this view and argue that the total uncertainty of a decision context consists of a reducible (mitigable) and an irreducible (immitigable) component. Whereas mitigable uncertainty is reducible via processing additional information, immitigable uncertainty is not. Immitigable uncertainty stems from human actors' free will as a source of behavior and its possibility to influence relevant outcomes. Moreover, firm-internal computative capacity might be insufficient to process all necessary information, and information itself could be difficult and costly to acquire or even indeterminate (see also Forbes, 2007), rendering principally mitigable uncertainty immitigable.

We assume that decision-makers perceive an exploitative (exploratory) innovation project, i.e., the relevant decision context, to be subject to lower-level (higher-level) uncertainty with a proportionally dominant mitigable (immitigable) component. In exploitative projects, organizational actors deliberately close sets of options and outcomes in dealing with familiar domains (Griffin & Grote, 2020; Rosing et al., 2011). As a result, the uncertainty of the decision context perceivably decreases for decision-makers (Packard et al., 2017). The option-outcome space is comparatively well-defined, and the required information for decision-making is accessible and located near existing experience (Atuahene-Gima & Murray, 2007; Rowley et al., 2000), making uncertainty feel mitigable. In contrast, in exploratory projects, organizational actors deliberately open the sets of available options and associated outcomes by generating many alternate routes while venturing into unknown domains (Griffin & Grote, 2020; Rosing et al., 2011). The result is perceivably higher-level uncertainty because some options, outcomes, or both might be unknown or utterly unknowable, a typical characteristic of more radical forms of innovation (Packard et al., 2017). Likewise, the option-outcome space is comparatively ill-defined (Atuahene-Gima & Murray, 2007; Rowley et al., 2000), reducing the possibility of relying on existing or easily accessible information and making uncertainty feel more

immitigable. Similarly, seeking to enter new markets or technological domains widens the internal and external scope of the firm as more human actors become relevant for project outcomes, further increasing the immitigable component of total uncertainty (Packard & Clark, 2020; Reymen et al., 2015). Taken together, we hypothesize:

> **Hypothesis 1 (H1):** *The more exploratory an innovation project on the exploitation-exploration continuum, the higher the perceived innovation project uncertainty.*

2.3.3 The relationship between perceived project uncertainty and approaches to evaluation and decision-making

Once the uncertainty surrounding an innovation project forms the basis of the decision context, decision-makers can use rationality and intuition as two prominent cognitive approaches for project evaluation and decision-making (e.g., Eliëns et al., 2018; Eling et al., 2015; Schweitzer et al., 2020; Sukhov et al., 2021). Whereas intuition (nonconscious information processing) is automatic, holistic, affectively charged, and rapid, rationality (conscious information processing) is controlled, analytic, logical, and slow (Epstein et al., 1996; Hodgkinson & Sadler-Smith, 2018). Intuition draws from subjective or unspecified criteria to evaluate and make decisions about innovation projects, resulting in a quick, holistic judgment (Dane & Pratt, 2007; Sukhov et al., 2021). In contrast, rationality focuses on collecting information to engage in logical, rule-based analysis based on pre-specified formal criteria to form a judgment (Dean & Sharfman, 1993, 1996; Sukhov et al., 2021).

We hypothesize that perceived innovation project uncertainty shapes how extensively decision-makers rely on intuition or rationality for evaluation and decision-making in an innovation project. In particular, the information-based challenges surrounding immitigable, high-level uncertainty – e.g., indeterminate or even too much information that overburdens existing computative capacity (Forbes, 2007; Packard & Clark, 2020) – could push decision-makers towards increasingly using efficient intuition (e.g., Khatri & Ng, 2000). Given these challenges, collecting and formally analyzing information might feel less useful or impossible

(Forbes, 2007), precisely because some project outcomes are unknown or utterly unknowable (Packard et al., 2017; Packard & Clark, 2020). Therefore, intuitive foresight based on gut feelings and holistic associations likely becomes preferable under conditions of immitigable, high-level uncertainty (Taggart & Valenzi, 1990), with decision-makers employing subjective and unspecified criteria to evaluate and make sense of an innovation project's inherent quality (Sukhov et al., 2021). In contrast, we expect rationality to be decision-makers' preferred form of information processing as long as uncertainty is perceivably mitigable and at a lower level. Based on these arguments, we hypothesize:

> **Hypothesis 2a (H2a):** *There is a negative relationship between perceived innovation project uncertainty and the use of rationality by innovation project decision-makers.*
>
> **Hypothesis 2b (H2b):** *There is a positive relationship between perceived innovation project uncertainty and the use of intuition by innovation project decision-makers.*

2.3.4 The relationship between approaches to evaluation and decision-making and decision outcomes

Systematic, formal, and rule-based logical analysis of collected information is a hallmark of rationality (e.g., Dean & Sharfman, 1996; Evans, 2008; Hodgkinson et al., 2009). Ceteris paribus, collecting relevant information and conscious formal analysis should provide a reasonable basis for evaluating a project against pre-specified performance criteria and firm objectives, enabling effective decision-making to sort out low-performers and projects of poor quality (Cooper, 2008). Furthermore, due to rationality's tendency to adhere to formal criteria (Sukhov et al., 2021), decision-makers might be able to reduce cognitive biases and the use of inappropriate heuristics (e.g., Tversky & Kahneman, 1974). Likewise, decision-makers who rely more strongly on rationality might be able to keep emotions under control, which otherwise may inhibit accurate innovation decision-making (see Eliëns et al., 2018). As such, conscious, rational information processing can be relatively precise (Dijksterhuis & Nordgren, 2006), potentially translating into an accurate separation of signal from noise (Stewart, 2000).

Regularly increasing efforts to collect and analyze as much information as possible should enable decision-makers to make more informed decisions, thereby leading to a higher-quality abandonment decision. In sum, we hypothesize:

> **Hypothesis 3 (H3):** *There is a positive relationship between the use of rationality by innovation project decision-makers and abandonment quality.*

When using intuition, decision-makers nonconsciously link information cues in an associative and holistic manner through pattern recognition and matching (Dane & Pratt, 2007; Gore & Sadler-Smith, 2011). Correspondingly, intuitive decision-making results in rapid initial judgments by mapping information cues onto deeply held subjective and unspecified cognitive criteria, often by drawing from domain-relevant experience (Dane & Pratt, 2007; Sukhov et al., 2021). Generally, this process includes a non-negligible affective component and focuses on what initially appears good and coherent instead of rational and logical (e.g., Epstein et al., 1996). Innovation project decision-makers usually possess rich domain experience with regard to evaluating different ideas and projects. As such, intuition produces a holistic grasp of an innovation project's potential success (Sukhov et al., 2021), leading to a confident judgment about whether the project is good or bad (Calabretta et al., 2017; Shirley & Langan-Fox, 1996). However, domain experience can lead to overconfidence and be misleading (Kahneman & Klein, 2009). For example, overconfidence can hamper evaluation and decision accuracy regarding the success of an innovation project (Markovitch et al., 2015). Furthermore, intuitive decision-makers might cut through many information cues only superficially, i.e., at the expense of detail and the risk of overlooking or failing to incorporate crucial information into evaluation and decision-making (Hodgkinson et al., 2009). Therefore, greater reliance on intuition should reduce the quality of abandonment decisions. Consequently, we hypothesize:

> **Hypothesis 4 (H4):** *There is a negative relationship between the use of intuition by innovation project decision-makers and abandonment quality.*

Finally, we hypothesize that a higher quality of an abandonment decision within an innovation project decreases the possibility of abandonment error occurrence. Indeed, the quality of an abandonment decision should equal higher decision precision, which implies the minimization of erroneous decisions (Hammedi et al., 2011; Stewart, 2000). Furthermore, relying on the best available information to form valid assumptions is a hallmark of decision quality (Dooley & Fryxell, 1999). High-quality abandonment decisions that ensure decision-makers have made their best effort to reduce potential blind spots in innovation project evaluation and decision-making should thus decrease the occurrence of abandonment errors. The abandonment decision will be more accurate and ensure fewer eventual "winners" are killed. Thus, we hypothesize:

> **Hypothesis 5 (H5):** *There is a negative relationship between abandonment quality and abandonment error occurrence.*

2.4 Methodology

2.4.1 Data collection and sample characteristics

We deemed a quantitative, survey-based research design appropriate for testing our conceptual model of abandonment error occurrence for two reasons. First, our primary focus was not to develop a new theory inductively through qualitative research. Instead, we sought to test hypotheses grounded in the exploitation-exploration framework, uncertainty theory, and the literature on innovation project evaluation and decision-making. Second, to our knowledge, secondary data to operationalize all of our conceptual model's variables of interest does not exist. Gaining insight into cognitive processes and abandonment error occurrence on the project level is likely only possible by surveying our target audience directly.

We targeted experienced managers to serve as our key informants, as senior and middle managers generally play a crucial role in a firm's innovation activities and participate in innovation project decision-making (Wilden et al., 2023). However, our desired key informants are usually very difficult to access through manual sampling or are reluctant to participate in

surveys. Therefore, we contracted the panel provider Dynata to recruit managerial participants and Qualtrics to host our survey, in line with previous innovation research (e.g., Camacho et al., 2019). Overall, we think this data collection approach served our research aim well.

Dynata initially recruited 360 survey respondents from its US executive panel. We used several screening questions at the beginning of our online survey to filter out unsuitable respondents. First, we inquired about the respondents' occupational situation, organizational tenure, and managerial position. Respondents were screened out at this stage in case they were not employed (leading to a screen out of n = 9 respondents), had an organizational tenure of less than a year (n = 13), or did not have any managerial responsibilities (n = 17). Second, we were interested in whether the respondents worked for firms that developed innovations in projects with the aim of commercialization, aiming to screen out respondents from non-innovating firms (n = 82). Third, we asked whether respondents could recall at least one innovation project abandoned before commercialization in their firm to exclude respondents who could not identify such a project (n = 44). This question was essential for the remainder of the survey, as respondents had to think of and provide information about one abandoned innovation project of their choosing. Almost all variables in our analysis referred to the abandoned innovation project recalled by the respondent. Fourth, respondents who were not members of the project team or did not have decision-making authority in the abandoned innovation project were screened out (n = 1). Lastly, some respondents did not finish the survey despite fulfilling all screening criteria (n = 2), leading to 192 survey completions (i.e., 53.3% of initially recruited participants).

We further excluded speeders (n = 20) from the final sample (Mason & Suri, 2012), defined as respondents who completed the survey at least twice as fast as the median duration (Leiner, 2019). Excluding speeders reduced the sample to 172 responses (i.e., 47.8%). Moreover, we checked for implausible answers that concerned our primary endogenous variable, i.e., abandonment error occurrence. We asked about abandonment error occurrence in several ways

and eliminated highly inconsistent responses (n = 23). For example, if another firm had launched a comparable innovation to the one the focal firm abandoned, we asked follow-up questions about their similarity and the comparable innovation's success on five-point unipolar scales. If a participant indicated low values of similarity and success (i.e., less than 3 on a five-point scale) but indicated later in the survey that they had experienced a harmful abandonment error on our main measurement scale, we excluded the observation. This data-cleaning procedure reduced the final sample to 149 eligible responses (i.e., 41.4%).

Sample characteristics suggest we were able to reach our desired informants. Respondents predominantly include senior managers (55.7%) and middle managers (38.3%) with varying functional backgrounds. As senior and middle managers typically participate in innovation project decision-making (Wilden et al., 2023), we are confident that our respondents provided reliable and valid information concerning our variables of interest. Indeed, the vast majority of respondents (91.9%) had decision-making authority (the rest were active project team members). Furthermore, respondents had organizational tenure of at least four years (87.2%) and had worked on more than six innovation projects throughout their careers (89.3%). Organizational tenure and experience have been shown to affect information accuracy positively (Homburg et al., 2012), further strengthening our confidence in the data.

On the project level, most abandoned projects had up to 30 project team members (79.7%) and an initially assigned budget of less than 10 million USD (77.2%). In addition, developmental activities mainly included creating new or improved goods (40.9%) and digital products (30.9%). On the firm level, firms varied in size, belonged to different primary industries, and served business-to-consumer and business-to-business markets, overall indicating a balanced sample of firms.

2.4.2 Construct operationalization

We predominantly relied on established measurements from prior literature to operationalize our constructs. However, we adapted items to match our specific study context where necessary. We measured all constructs on seven-point scales (see Appendix A for an overview).

Project-related variables. We operationalized innovation project type, i.e., exploitative versus exploratory, using a semantic differential with three items by Xu et al. (2017). Choosing a semantic differential seems appropriate here, as individual projects represent single domains of interest where high values of exploitation imply low values of exploration and vice versa (Gupta et al., 2006; Salge et al., 2013). Correspondingly, increasing values on the scale imply an increasing proportion of exploration in the innovation project.

For perceived innovation project uncertainty, we used four items from the scale by Dayan and Elbanna (2011). Higher values on the scale imply higher-level uncertainty. Likewise, higher values on the scale should imply a higher proportion of immitigable uncertainty, as confidence in accurate prediction of outcomes dwindles due to increasingly unknowable outcomes and information-processing difficulties (Packard et al., 2017; Packard & Clark, 2020). Conversely, lower values imply lower-level uncertainty that is perceivably more mitigable.

Evaluation and decision-making variables. We relied on established scales for rationality and intuition to measure approaches to evaluation and decision-making throughout the abandoned innovation project (Dayan & Elbanna, 2011; Dean & Sharfman, 1996; Feurer et al., 2019). The five-item scale of rationality reflects how extensively decision-makers relied on information-gathering and analytic techniques throughout the innovation project. Conversely, higher values on the five-item scale for intuition imply that innovation project decision-makers relied extensively on, e.g., gut feelings and personal judgment throughout the project.

Decision outcome variables. Abandonment quality captures whether the ultimate decision to abandon the focal innovation project was made based on the best available information, valid

assumptions, and in line with the firm's current financial situation and strategic direction. We used and adapted four items from the decision quality scale by Dooley and Fryxell (1999) to measure decision quality in an abandonment context.

We had to develop a new scale to measure abandonment error occurrence, as no appropriate comprehensive measurement existed in prior literature. We wanted the scale to reflect the following central characteristics of an abandonment error. First, another firm developed and successfully commercialized a similar innovation in the years following project abandonment (Garud et al., 1997). Second, environmental conditions changed in a way that would have helped the project to succeed in the market (Klingebiel, 2018), reflecting the misevaluation of future external circumstances at the time of the abandonment decision. Third, the abandonment decision has led to high opportunity costs for the abandoning firm (Tellis, 2013). In addition, we deemed an existing one-item scale for decision disturbance by Elbanna et al. (2013) appropriate to complement our developed items. Specifically, decision disturbance reflects the extent to which a decision has had negative and unexpected consequences for a firm. This single item complements our scale well, as abandonment errors are usually surprising, not immediately apparent, and have negative consequences (e.g., Csaszar, 2013). Overall, higher values on the four-item scale imply that firms experienced a salient and harmful abandonment error. In contrast, lower values indicate the absence of an abandonment error.

Control variables. We included external turbulence and decision-making structure in the innovation project as control variables for our outcome variables. External turbulence comprises technology and market turbulence components (Jaworski & Kohli, 1993). We measured technology and market turbulence on three-item scales adapted from Sethi and Iqbal (2008) and Jaworski and Kohli (1993). After factor analysis and similar to prior research (e.g., Kock & Gemünden, 2016), we eliminated one item with an insufficient factor loading and combined both constructs. Decentralization is a single-item construct that we developed based on Sah and Stiglitz (1986). It reflects whether any decision-maker in the project was eligible to

make a definitive decision on continuation or abandonment. Since we only investigated abandoned innovation projects, the latter decision is relevant and represents decentralization regarding abandonment decisions. As prior theoretical literature suggests that both variables might affect abandonment error occurrence (Garud et al., 1997; Sah & Stiglitz, 1986), we included them in our analysis and expected that they would also affect abandonment quality.

2.4.3 Common method bias

Common method bias might threaten our results, as we relied on survey data from single respondents. Therefore, we employed measures to reduce common method bias before data collection and conducted statistical tests during data analysis to assess whether common method bias might be problematic. First, we used different response formats for variables (i.e., a semantic differential as well as Likert-type scales), predominantly relied on established measures, and ensured respondent anonymity before collecting data (Podsakoff et al., 2003). Second, and following previous innovation research (Klein et al., 2021), we tested for pathological collinearity using the full collinearity assessment approach to uncover indications of common method bias in structural equation modelling (Kock, 2015; Kock & Lynn, 2012), i.e., our analytical approach (see section 2.5.1). Therefore, we created an artificial dependent variable with randomly generated values between 0 and 1 and regressed it on all of our model's constructs (Kock & Lynn, 2012). The highest variance inflation factor (VIF) for the predictor constructs was below the conservative threshold of 3.3 for this operation, indicating that the model is likely free of common method bias (Kock, 2015). Complementarily, Harman's single-factor test showed that no single factor accounted for more than 50% of the variance. One factor explained 31.97% of the variance. Combining these statistical results, we assume that common method bias does not significantly threaten our results.

2.5 Analysis and results

2.5.1 Statistical analysis

We performed composite-based partial least squares structural equation modelling (PLS-SEM) to analyze our survey data and used the *SmartPLS4* software (Ringle et al., 2022). We chose PLS-SEM over covariance-based structural equation modelling (CB-SEM) for three reasons. First, we focused on exploratory research for theory development and extension rather than testing an already mature theory or model for which CB-SEM is preferable (Hair et al., 2019). In other words, we aimed to understand the relatively nascent phenomenon of abandonment error. The fact that our key informants are challenging to access complements this argument. The statistical power of PLS-SEM is always larger than or equal to that of CB-SEM (Reinartz et al., 2009), which helps to uncover relationships when they exist in a population more easily (Hair et al., 2021). Indeed, the higher statistical power that PLS-SEM guarantees "is quite useful for exploratory research that examines less developed or still developing theory" (Hair et al., 2019, p. 7). Second, our complex theoretical model includes many different constructs, indicators, and model relationships. CB-SEM faces limitations as models become more complex, making PLS-SEM preferable (Hair et al., 2019). Lastly, two more recently proposed motivators for using PLS-SEM include whether the residual variances of indicators have meaning for focal constructs and whether the measurement error is unlikely to be large (Guenther et al., 2023). Both seemingly apply in our case. In particular, the construct abandonment error occurrence is not strictly unidimensional, as its indicators capture different aspects of the phenomenon (see section 2.4.2), implying comparatively meaningful residual variances. Furthermore, measurement error is unlikely to be large, as we predominantly used established or adapted measures. Considering all the above-mentioned aspects, PLS-SEM seems to be the method of choice for our analysis.

We used the path weighting scheme with a pre-specified maximum number of 3,000 iterations and a stop criterion of 10^{-7} for estimation (Ringle et al., 2022). Furthermore, we

applied non-parametric bootstrapping with 10,000 subsamples to test the significance of indicator loadings in the measurement model and the significance of path coefficients in the structural model (e.g., Guenther et al., 2023).

2.5.2 Measurement model results

Following Guenther et al. (2023), we inspected indicator loadings, internal consistency reliability (based on composite reliability and Cronbach's alpha), convergent validity (average variance extracted), and discriminant validity (heterotrait-monotrait (HTMT) ratio of correlations and Fornell-Larcker criterion) to assess the overall quality of our reflective measurement model and also report descriptive statistics and inter-construct correlations in Tables 1 and 2 below. We conclude that our reflective measurement model is of sufficient quality by evaluating indicator reliability, internal consistency reliability, convergent validity, and discriminant validity against widely accepted threshold values (see Guenther et al., 2023). In particular, all indicator loadings are above 0.708 and significant, composite reliability and Cronbach's alpha are above 0.708 for each construct, and average variance extracted is above 0.5 (Table 1). The HTMT values of all construct pairs are below the more conservative threshold of 0.85, and so are the upper bounds of the (one-sided) percentile-based bootstrap confidence intervals except for one construct pair (Table 2). However, as the upper bound of the respective confidence interval is only slightly above the more liberal threshold value of 0.9 (i.e., 0.907), we deem this result as of marginal concern.

2.5.3 Structural model results and additional analyses

We examined collinearity issues, the significance of model relationships, and the model's explanatory power to assess our structural model of abandonment error occurrence (Hair et al., 2021). All VIF values among the predictor constructs were below the recommended threshold value of 3, indicating that collinearity is unlikely to be a critical issue.

Table 1: Measurement model assessment: indicator loadings, internal consistency reliability, and convergent validity

Constructs (main)	Indicators	λ	α	ρ_A	ρ_C	AVE
Exploitative vs. exploratory innovation project			**0.752**	**0.840**	**0.854**	**0.662**
(adapted from Xu et al., 2017)	Item 1	0.759**				
	Item 2	0.749**				
	Item 3	0.898**				
Perceived innovation project uncertainty			**0.851**	**0.864**	**0.900**	**0.693**
(adapted from Dayan & Elbanna, 2011)	Item 1	0.869**				
	Item 2	0.859**				
	Item 3	0.720**				
	Item 4	0.869**				
Rationality			**0.850**	**0.851**	**0.893**	**0.625**
(adapted from Dean & Sharfman, 1996; Feurer et al., 2019)	Item 1	0.818**				
	Item 2	0.791**				
	Item 3	0.814**				
	Item 4	0.716**				
	Item 5	0.807**				
Intuition			**0.872**	**0.898**	**0.906**	**0.660**
(adapted from Dayan & Elbanna, 2011; Feurer et al., 2019)	Item 1	0.831**				
	Item 2	0.876**				
	Item 3	0.775**				
	Item 4	0.709**				
	Item 5	0.854**				
Abandonment quality			**0.784**	**0.784**	**0.861**	**0.607**
(adapted from Dooley & Fryxell, 1999)	Item 1	0.769**				
	Item 2	0.730**				
	Item 3	0.810**				
	Item 4	0.799**				
Abandonment error occurrence			**0.855**	**0.869**	**0.902**	**0.697**
(own scale; Item 4 adapted from Elbanna et al., 2013)	Item 1	0.888**				
	Item 2	0.801**				
	Item 3	0.795**				
	Item 4	0.848**				
Constructs (controlled)	**Indicators**	**λ**	**α**	**ρ_A**	**ρ_C**	**AVE**
External turbulence			**0.839**	**0.852**	**0.885**	**0.606**
(adapted from Sethi & Iqbal, 2008; Jaworski & Kohli, 1993)	Item 1	0.792**				
	Item 2	0.774**				
	Item 3	0.723**				
	Item 4	0.754**				
	Item 5	0.834**				
Decentralization			**n.a.**	**n.a.**	**n.a.**	**n.a.**
(own scale)	Item 1	1.000				

Symbols and abbreviations: λ = indicator loading; α = Cronbach's alpha; ρ_A = composite reliability ρ_A (Dijkstra & Henseler, 2015); ρ_C = composite reliability ρ_C (Heise & Bohrnstedt, 1970); AVE = average variance extracted.
Note: ** = $p < 0.01$; significance tests based on non-parametric bootstrapping with 10,000 subsamples.

Table 2: Measurement model assessment: descriptive statistics, inter-construct correlations, and discriminant validity

	Construct	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	**Exploitative vs. exploratory innovation project** M = 4.308 SD = 1.701	0.813							
(2)	**Perceived innovation project uncertainty** M = 5.062 SD = 1.343	0.295 **0.335** **(UB: 0.508)**	0.833						
(3)	**Rationality** M = 5.843 SD = 0.952	0.126 **0.204** **(UB: 0.331)**	0.259 **0.301** **(UB: 0.483)**	0.791					
(4)	**Intuition** M = 5.002 SD = 1.465	0.206 **0.242** **(UB: 0.405)**	0.492 **0.545** **(UB: 0.688)**	0.410 **0.484** **(UB: 0.606)**	0.812				
(5)	**Abandonment quality** M = 5.798 SD = 0.937	0.264 **0.331** **(UB: 0.468)**	0.430 **0.530** **(UB: 0.709)**	0.558 **0.678** **(UB: 0.848)**	0.266 **0.311** **(UB: 0.461)**	0.779			
(6)	**Abandonment error occurrence** M = 4.813 SD = 1.582	0.265 **0.300** **(UB: 0.475)**	0.614 **0.705** **(UB: 0.821)**	0.311 **0.361** **(UB: 0.517)**	0.747 **0.833** **(UB: 0.907)**	0.229 **0.269** **(UB: 0.437)**	0.835		
(7)	**External turbulence** M = 5.875 SD = 0.911	0.153 **0.188** **(UB: 0.347)**	0.319 **0.373** **(UB: 0.560)**	0.552 **0.650** **(UB: 0.765)**	0.423 **0.494** **(UB: 0.636)**	0.487 **0.590** **(UB: 0.775)**	0.399 **0.451** **(UB: 0.600)**	0.778	
(8)	**Decentralization** M = 5.007 SD = 1.852	0.166 **0.202** **(UB: 0.348)**	0.289 **0.303** **(UB: 0.462)**	0.413 **0.447** **(UB: 0.587)**	0.613 **0.651** **(UB: 0.743)**	0.374 **0.416** **(UB: 0.565)**	0.569 **0.609** **(UB: 0.725)**	0.494 **0.519** **(UB: 0.634)**	n.a.

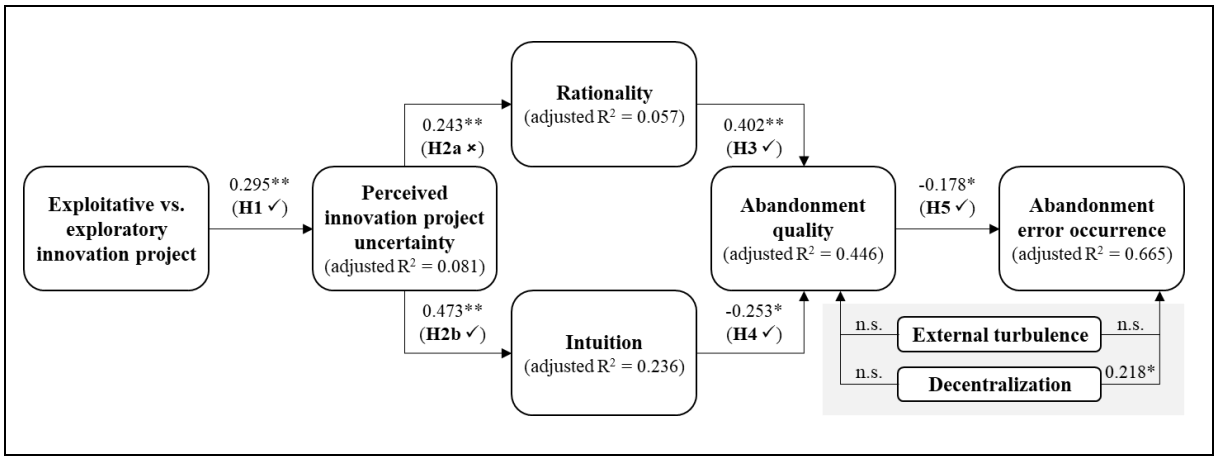
Abbreviations: M = mean; SD = standard deviation; UB = upper bound of confidence interval.

Note: The square root of the average variance extracted (AVE) is shown on the diagonal in light grey cells to facilitate the assessment of the Fornell-Larcker criterion. Non-bold values represent the corresponding inter-construct correlations. Bold values without parentheses represent the corresponding values for the heterotrait-monotrait ratio of correlations (HTMT) (Henseler et al., 2015). Bold values in parentheses represent the 95th percentile obtained by bootstrapping (based on the percentile approach with 10,000 bootstrap samples).

Inspecting our main paths (while controlling for all alternative paths between main constructs), we find that innovation project type (exploitative versus exploratory) positively relates to perceived innovation project uncertainty ($\beta = 0.295$, $p < 0.01$). The more exploratory the innovation project becomes, the higher the perceived (immitigable) uncertainty, supporting H1. Perceived innovation project uncertainty subsequently translates into greater reliance on rationality ($\beta = 0.243$, $p < 0.01$) and intuition ($\beta = 0.473$, $p < 0.01$). Therefore, we have to refute H2a but can confirm H2b. Subsequently, we find that greater reliance on rationality in project evaluation and decision-making improves the quality of abandonment decisions ($\beta = 0.402$, $p < 0.01$). However, more extensive use of intuition decreases the quality of abandonment decisions ($\beta = –0.253$, $p < 0.05$). These findings support H3 and H4. Lastly, a higher decision quality reduces abandonment error occurrence ($\beta = –0.178$, $p < 0.05$), thereby confirming H5.

Among the control variables, decentralization of abandonment decision-making (abandonment polyarchy) affects the occurrence of abandonment errors ($\beta = 0.218$, $p < 0.05$), suggesting that abandonment decentralization (any decision-maker has the right to abandon a project) may lead to premature termination of innovation projects. Figure 2 below depicts our structural model and main findings.

Figure 2: Structural model results



Note: ** = $p < 0.01$; * = $p < 0.05$.

Regarding our main endogenous variable of interest, i.e., abandonment error occurrence, the structural model demonstrates satisfactory explanatory power. Indeed, the corresponding R^2 value is 0.665, implying moderate to high explanatory power (Hair et al., 2021).

In additional analyses (see Appendix B), we found other effects of interest. In particular, the total effect of innovation project type (exploitative versus exploratory) on abandonment error occurrence is highly significant ($\beta = 0.229$, $p < 0.01$), with its direct effect being non-significant. Therefore, the type of innovation project does not directly affect the occurrence of abandonment error. Instead, the type of innovation project only shapes the occurrence of abandonment errors indirectly, i.e., by seemingly triggering a processual, stepwise mechanism.

2.6 Discussion

In this study, we derive and test a conceptual process model of abandonment error occurrence on the level of a single innovation project. After delineating the phenomenon in detail, we argue that the type of innovation project is a neglected determinant and process trigger. We draw from the exploitation-exploration framework (e.g., Levinthal & March, 1993), uncertainty theory (e.g., Packard & Clark, 2020), and literature on rational and intuitive evaluative decision-making in innovation development (e.g., Eliëns et al., 2018; Schweitzer et al., 2020) to substantiate our model. Drawing from these perspectives helps theorize how decision-makers perceive the uncertainty inherent to innovation projects and make evaluative decisions, ultimately shaping decision outcomes. Finally, we test our hypotheses by analyzing survey data from experienced senior and middle managers.

Our results show that most of our formulated hypotheses hold. We find that the more exploratory (versus exploitative) the innovation project, the stronger the uncertainty perceived by the innovation project's decision-makers, and thus the level of uncertainty and its immitigability. We find that higher perceived innovation project uncertainty leads to greater reliance on intuition and, contrary to our initial hypothesis, greater reliance on rationality. An

explanation might be that senior and middle managers may rely on intuition and rationality throughout an innovation project to make evaluative decisions (e.g., Eling et al., 2015; Sukhov et al., 2021). Furthermore, there could always be a need to collect and analyze at least some additional information to address the mitigable component of total uncertainty, even if it does not dominate. Still, as the immitigable component of uncertainty becomes increasingly substantial, we find that the reliance on intuition is stronger, as indicated by a path coefficient nearly twice the size of rationality's path coefficient.

We also show that rationality and intuition affect the quality of abandonment. A more extensive use of rationality in project evaluation and decision-making improves the quality of abandonment decisions. This result adds nuance to the literature, which finds that rationality increases the effectiveness of strategic decisions (Elbanna & Child, 2007) and idea-screening decisions (Hammedi et al., 2011). In contrast, a more extensive use of intuition reduces abandonment quality. This result aligns with prior literature showing the downsides of intuition in innovation project decision-making (e.g., Eliëns et al., 2018). However, the literature on rationality and intuition does not explicitly examine abandonment decisions or their subsequent implications. Indeed, although prior literature "has provided little guidance regarding whether a more rational or intuitive style is preferable" for evaluation and decision-making (Schweitzer et al., 2020, p. 281), our results suggest that rationality is preferable for abandonment decisions.

Lastly and importantly, we find that a higher quality of an abandonment decision reduces abandonment error occurrence, going beyond previous literature that only implies this relationship without explicit investigation (e.g., Hammedi et al., 2013). Therefore, the risk of misevaluation and erroneous non-pursuit of an inherently good innovation project (an eventual "winner") decreases with a higher abandonment quality.

2.6.1 Theoretical implications

We contribute to the literature by introducing a new processual mechanism with a previously overlooked phenomenon as the relevant outcome (see Makadok et al., 2018). That is, we show how and why an abandonment error may occur.

First, the literature on (potential) determinants of abandonment errors discusses structural and cognitive determinants. We enrich this conversation by introducing exploitation and exploration as important contextual factors of innovation projects (Long et al., 2020), connecting innovation project type with the cognitive aspects of subjective uncertainty perception and the use of rationality or intuition for evaluation and decision-making. In doing so, we address calls for research on the (cognitive) micro-foundations of decision-making in the specific context of innovation projects (Tuncdogan et al., 2019).

Second, we contribute to the anecdotal discussion on the relationship between exploitation, exploration, and the occurrence of abandonment errors (e.g., Csaszar, 2013; Garicano & Posner, 2005; Garud et al., 1997). Although the respective research argues that exploration is necessary to not miss out on successful innovations, the concrete underlying mechanisms remain somewhat ambiguous and empirically untested. Focusing on the project level in our empirical analysis, we show that increased exploration might actually foster abandonment errors through a distinct process. Specifically, we find that the type of innovation project does not affect abandonment error occurrence directly but through decision-makers' subjective perception of uncertainty, cognition, and decision-making. This finding supports a processual view of abandonment error occurrence, providing insight into the underlying mechanisms of the (indirect) connection between exploitation, exploration, and abandonment error occurrence.

Third, uncertainty theory posits that subjective perception of the level and (im)mitigability of uncertainty in a decision context shapes how individuals and collectives approach decision-making (Packard et al., 2017; Packard & Clark, 2020). Furthermore, recent work suggests that different decision logics have distinct implications for making errors in prediction (Packard &

Clark, 2020). However, uncertainty theory is not very concrete on what prediction errors comprise. By introducing a model of abandonment error occurrence that depicts a cognitive uncertainty management process, we highlight that abandonment error – or the underestimation of an innovation project's future value – is a construct worthy of incorporation into models of uncertainty theory.

Lastly, we contribute to the literature on the benefits and drawbacks of rationality, intuition, and related cognitive constructs for innovation project evaluation and decision-making (e.g., Eliëns et al., 2018; Markovitch et al., 2015; Roeth et al., 2020). While this literature tends to focus on (erroneous) continuation decisions and the pursuit of "losing" projects, we focus on the abandonment of eventual "winners," making a needed addition to this research. In doing so, we address calls for research on the performance implications of rationality and intuition, e.g., by showing that a more extensive use of intuition for abandonment decisions seemingly does not go hand in hand with a "right hunch" but instead may lead to opportunity costs and missed innovation success (Schweitzer et al., 2020, p. 282). Therefore, we go beyond literature that treats innovation project abandonment as a definitive end of the road with apparently no implications for competitive performance (e.g., Green et al., 2003). Overall, we show that rationality trumps intuition when decision-makers consider terminating an innovation project.

2.6.2 Managerial implications

Our conceptual process model of abandonment error occurrence helps to formulate recommendations for practitioners. First, managers should be aware that the type of innovation project, i.e., exploitative versus exploratory, might affect their evaluation and decision-making processes in suboptimal ways. For example, managers should avoid making abandonment decisions based on intuition, even when dealing with a more exploratory innovation project. Indeed, greater reliance on intuition decreases the quality of abandonment decisions, with lower decision quality going hand in hand with a higher likelihood of abandonment error occurrence.

To limit the use of intuition, firms could establish clear decision criteria for abandoning innovation projects that simultaneously facilitate the use of rationality.

Second, in times of greatly expanding information availability and big data, firms should invest in strengthening their technological capabilities. For example, technologies such as artificial intelligence could complement internal observational and computative capacity (Packard & Clark, 2020), possibly further enhancing the efficacy of rational information gathering and analysis to reduce uncertainty to an acceptable level. Moreover, combining rationality with suitable technologies to absorb and analyze new information constantly could increase evaluation accuracy, improve decision quality, and thus reduce abandonment error occurrence in exploitative as well as exploratory projects.

2.6.3 Limitations and future research

Our study has limitations. First, we used a research design based on survey data from single respondents. When seeking to investigate the occurrence of abandonment errors, future research could collect data from multiple respondents to better understand team dynamics as well as team evaluation and decision-making processes in abandoned innovation projects. Still, our sample comprises experienced senior and middle managers with decision authority and a deep understanding of innovation development activities, which gives us confidence in our results.

Second, we focused on a single innovation project as the decision context and found that the type of innovation project can trigger a process that may increase the likelihood of abandonment errors. More exploratory projects are perceived as more uncertain and thus strongly promote the use of intuition, which may ultimately lead to lower decision quality and an increased likelihood of abandonment errors. This finding seems contradictory to the anecdotal insight of prior research that exploration should decrease the risk of missing out on successful innovations (Csaszar, 2013; Garud et al., 1997). However, the difference between these findings might ultimately stem from the level of analysis. Engaging in various projects

and broadening the portfolio through exploration might indeed help avoid missing out on successful innovations when decision-makers are good selectors (Klingebiel & Rammer, 2014). Therefore, differentiating between project and portfolio levels of analysis might matter and constitute a fruitful avenue for future research on abandonment errors.

2.6.4 Conclusion

Abandonment errors reflect inaccuracies in innovation project evaluation and decision-making. Our study introduces a process model of abandonment error occurrence to explain this largely neglected phenomenon and raise awareness that project abandonment might not always be beneficial, i.e., when eventual "winners" are killed. We hope that we made an important first step to increase the understanding of abandonment error occurrence, as the phenomenon remains an intriguing field for future research in a hypercompetitive world in which pursuing the right innovation projects is arguably more important than ever.

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3 Second study: How distinct failure types shape persistence with underperforming innovation projects: A conjoint experiment

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Abstract:
This study investigates the differential effect of distinct failure types on the likelihood of persisting with underperforming innovation projects while accounting for traditional persistence-shaping forces and decision-maker heterogeneity. We treat innovation failure as a dichotomy and distinguish between a commission error (a flop) and an omission error (a missed opportunity). We use a metric conjoint experiment to model the complexity of persistence decision situations in innovation projects. Based on a sample of 1,424 decisions made by 89 managerial decision-makers, our findings indicate that a recent commission error is associated with a lower likelihood of subsequent persistence than a recent omission error. Accounting for heterogeneity in self-regulatory ability and cognitive style, we further find that this differential effect is stronger for action-oriented decision-makers and that rational decision-makers value specific attributes of the currently underperforming innovation project when deciding upon persistence. Our findings contribute to previous research on decision-making in persistence situations, particularly in innovation development.

Keywords:
Innovation project decision-making, failure, commission and omission errors, persistence, metric conjoint analysis

3.1 Introduction

The decision of whether to persist with an underperforming innovation project is a difficult one with potentially massive implications for a firm's performance (e.g., Patzelt et al., 2011). Although the alluring possibility that success is only one more investment away principally exists (Drummond, 2014), strengthening persistence with questionable or losing courses of action often devolves into "throwing good money (or resources more generally) after bad" (Sleesman et al., 2012, p. 541). Persisting despite negative information about a course of action's prospects is widespread in innovation project decision-making and often detrimental (e.g., Eliëns et al., 2018; Schmidt & Calantone, 2002). Even though a large body of work has already identified various setting-agnostic antecedents and contextual features that influence persistence (for comprehensive reviews, see Sarangee et al., 2014; Sleesman et al., 2012; Sleesman et al., 2018), we point out that extant research has predominantly focused on isolated decision situations concerning a singular course of action. In other words, it is comparatively less clear how experiencing the outcome of a previous course of action influences the decision to persist in a present or ongoing course of action facing negative information. Our research aims to address this gap by adopting a dynamic, experience-driven perspective to examine decision-making in innovation projects.

Some have suggested that experiencing failure decreases persistence in subsequent decision situations. For example, research at the intersection of organizational behavior and psychology has shown that failure associated with a previous course of action reduces persistence with a subsequent, currently underperforming course of action (Ku, 2008). Relatedly, prior innovation research argues that the failure of an innovation project can lower the motivation to commit to following innovation efforts (Shepherd & Cardon, 2009; Shepherd et al., 2009; Välikangas et al., 2009). What these research endeavors have in common is that they almost exclusively link failure to a decision of continued pursuit. Indeed, innovation research traditionally defines failure as being the result of actively pursuing an innovation

project that eventually falls short of expectations (e.g., Markovitch et al., 2015; Morais-Storz et al., 2020). However, we argue that there is another, often-neglected side to the coin of failure, as experiencing failure may not result solely from a pursuit decision.

We dichotomize failure by the type of decision that led to the adverse outcome and, therefore, explicitly distinguish between commission and omission errors (Klingebiel, 2018). A *commission error* results from pursuing a (post-hoc) bad course of action, and an *omission error* from not pursuing a (post-hoc) good course of action further (e.g., Csaszar, 2012). In an innovation context, the former manifests as a commercialized innovation project that proved unsuccessful (i.e., a flop), whereas the latter reflects an innovation project not brought to market that proved successful for others (i.e., a missed opportunity) (Klingebiel et al., 2022). Distinguishing between these two types of failure is meaningful because they generate distinct costs (Garud et al., 1997), harm a firm's competitive and financial performance (e.g., Kumar & Operti, 2023), and are likely to elicit different decision-making behaviors (Dye et al., 2014). We strongly believe that accounting for both types of failure is necessary to better understand failure's influence on decision-making in underperforming innovation projects – i.e., those projects that probably should be terminated on a reasonable basis. Treating failure as a dichotomy, we expect its effect on persistence to be more nuanced than previously assumed.

Therefore, this paper aims to explore the differential effect of the two types of failure on decision-makers' likelihood of persisting with underperforming innovation projects and illuminate when said effect is more or less pronounced. To do so, we draw from the theory of risk-type preference shifts (Klingebiel, 2018), which suggests that the recently experienced type of failure determines decision-makers' relative preference for taking the risk of producing a flop versus the risk of missing out. The mechanism proposed by the theory essentially reflects that decision-makers try to avoid re-experiencing the most recent type of failure in a subsequent decision situation (Dye et al., 2014). In addition, we posit that this mechanism is subject to previously neglected motivational and cognitive boundary conditions grounded in

heterogeneity among decision-makers. Specifically, we assume that the extent to which decision-makers actually translate their relative risk preference into a goal-striving behavior depends on their self-regulatory ability in the form of failure-related action-state orientation (Diefendorff et al., 2000; Kuhl, 1994a). Moreover, the extent to which decision-makers even consider recently experienced failure in current decision-making efforts should depend on the prevalence of a rational thinking style, which fundamentally relies on logical and analytical reasoning in the present (e.g., Epstein et al., 1996).

We follow the lines of past literature and utilize metric conjoint analysis to model the prevalent complexity of innovation project decision-making (e.g., Behrens et al., 2014; Patzelt et al., 2011). Conjoint analysis is appropriate for our methodology, as it allows accounting for several attributes of a decision situation and simultaneously enables the investigation of individual-level differences in decision-making (Green & Srinivasan, 1990). Indeed, conjoint analysis permits us to assess the effect of a recent failure-type experience while simultaneously controlling for well-established driving forces behind persistence that refer directly to attributes of the currently underperforming innovation project, i.e., resource investment (Arkes & Blumer, 1985), proximity to project completion (Conlon & Garland, 1993), and project innovativeness (Schmidt & Calantone, 2002). Our sample from an online experiment comprises 1,424 persistence decisions made by 89 managerial decision-makers actively involved in innovation projects.

Overall, our study contributes to research on persistence – particularly in the context of innovation development – and the theory of risk-type preference shifts. By using a more fine-grained treatment of failure and comparing the effects of a recent commission versus omission error, we show that failure may be associated with a lower and higher likelihood of persistence in underperforming innovation projects. Moreover, we contribute to the theory of risk-type preference shifts by identifying motivational boundary conditions to the theoretical mechanism, thus answering calls for research (Klingebiel, 2018). Lastly, we show that the mechanism

remains unaffected by a rational thinking style, demonstrating its robustness in light of specific cognitive factors.

The rest of the paper is organized as follows. First, we develop a theoretical framework and generate research hypotheses. Second, we discuss the methodology and empirically test the research hypotheses using data collected from an online conjoint experiment with managerial decision-makers in an innovation development context. Third, we present the results of the study, discuss the findings and contributions, and finally offer avenues for future research endeavors.

3.2 Theoretical background and hypotheses

3.2.1 A dynamic and experience-driven perspective on persistence

When decision-makers receive negative information about the performance and prospects of a course of action, they are compelled to decide whether to persist or withdraw. Despite considerable uncertainty about whether additional investments of money, time, or effort will reverse the course of action's unpromising trajectory, decision-makers usually tend to persist (Brockner, 1992; Staw, 1981; Staw & Ross, 1987). The tendency to persist is particularly pronounced in underperforming innovation projects and can result in substantial costs (e.g., Schmidt & Calantone, 2002). Due to the potentially detrimental effects of persistence, previous research spanning several disciplines has identified various context-agnostic determinants that explain why decision-makers persist despite negative news (e.g., Sleesman et al., 2012). Prominent determinants include, for example, personal responsibility for the initiation of a course of action (Staw, 1976) and the extent of sunk costs (Arkes & Blumer, 1985). Although this exemplary list is, of course, not exhaustive, it indicates that decision-makers individually decide upon persistence by responding to the specific circumstances that constitute a focal decision situation. Previous research predominantly links these circumstances to the present course of action (Sarangee et al., 2014; Sleesman et al., 2012). However, the decision to persist

does not take place in a vacuum, solely surrounding the present course of action, but likely resides in a more dynamic environment in which recent and past experiences impact the focal decision situation. Therefore, we argue that recently experienced outcomes associated with previous courses of action influence decision-makers' persistence with present courses of action subject to negative information.

The idea that prior decision outcomes influence subsequent decision-making is not new and underpins our theoretical framework. Individuals encode outcomes based on whether they meet or fall short of a subjectively relevant level of performance on a goal, with the former equaling success and the latter failure (e.g., Cyert & March, 1963). Distinguishing between success and failure experiences is crucial, as both shape subsequent decision-making behavior in distinct ways. For example, Thorndike's classic law of effect (1911) postulates that experiencing success increases the likelihood of making the same decision again in a similar situation, whereas failure reduces it. In other words, decision-makers will repeat decisions that led to success and avoid decisions that resulted in failure, a finding that fundamentally aligns with behavioral views of decision-making (Denrell & March, 2001; March, 1996). Indeed, some rare empirical research on sequential persistence decisions in the domains of psychology and organizational behavior has shown that decision-makers are more (less) likely to persist with a currently losing course of action when the decision to persist with a previous one resulted in a profit (loss) (Bragger et al., 2003; Ku, 2008). In other words, decision-makers will be more likely to persist when previous persistence in a similar decision situation was successful, thus indicating repetitive behavior. In contrast, they will be less likely to persist when previous persistence was unsuccessful, leading to an adjustment to, or a change in, their decision-making behavior.

In the following, we will focus exclusively on how experiencing failure shapes decision-makers' persistence with a currently underperforming innovation project. We define failure as a "deviation from expected or desired results" (Cannon & Edmondson, 2005, p. 300), which

reflects an undesired performance outcome associated with decision-making (Dahlin et al., 2018). We limit our theorizing to failure for two primary reasons. First, failure is more salient than success in the context of innovation development and, thus, likely has stronger implications for subsequent decision-making. Research shows that approximately 40% of all innovation projects fail after commercialization and roughly 60% are successful (e.g., Markham & Lee, 2013), demonstrating that experiencing failure in the marketplace is still rarer than experiencing success. In addition, the late-stage manifestation of failure in the marketplace usually carries major financial consequences detrimental to the commercializing firm. The combination of both aspects renders failure a highly salient phenomenon (Garzón-Vico et al., 2020), which attracts innovation decision-makers' attention and affects ongoing decision-making more strongly than success (e.g., Madsen & Desai, 2010). Second, we believe that the current treatment of failure in the innovation literature lacks nuance. Specifically, innovation research predominantly views failure as being the outcome of a decision to actively pursue and, by extension, commercialize an eventually unsuccessful project (for a review, see Markovitch et al., 2015). However, failure resulting from active pursuit is only one side of the coin.

3.2.2 The differential effect of failure types on the decision to persist

Following previous strategy and organizational research, we distinguish between a commission error (i.e., an innovation flop) and an omission error (i.e., a missed innovation opportunity) as two distinct types of (innovation) failure (e.g., Klingebiel, 2018; Klingebiel et al., 2022). This dichotomization of failure rests on explicitly accounting for the specific decision that eventually led to failure, i.e., pursuit or abandonment. Since conceptually differentiating between commission and omission errors "can reveal phenomena otherwise unobservable" (Csaszar, 2012, p. 629), accounting for these two types of failure opens up novel ways to theorize how adverse decision outcomes affect persistence with underperforming innovation projects.

Therefore, experiencing failure in innovation efforts may elicit a more diverse response than previously assumed.

To derive our conceptual model, we draw from the theory of risk-type preference shifts (Klingebiel, 2018), which builds on behavioral views of decision-making (e.g., Dye et al., 2014). The baseline proposition of this theory suggests that decision-making entities' propensity to take on exposure to potential commission and omission errors in current decision situations depends on the type of failure they experienced in the recent past. Specifically, decision-makers will demonstrate an omission-risk preference after a recent error of commission and a commission-risk preference after a recent error of omission. Whereas an omission-risk preference will push decision-makers towards abandonment, a commission-risk preference will drive (further) pursuit. Therefore, following a specific risk preference reflects a decision-maker's principal desire to avoid making the same error again going forward (Dye et al., 2014). In other words, if the decision to pursue (abandon) a previous course of action manifested as a failure recently, decision-makers will be less likely to pursue (abandon) a focal course of action currently under consideration.

The theory of risk-type preference shifts is particularly well-suited to explaining when decision-makers are more or less likely to persist with a currently underperforming innovation project after experiencing failure. Indeed, a previous innovation flop (commission error) and a missed innovation opportunity (omission error) will sensitize decision-makers to the idiosyncratic downside risk associated with each type of failure (Klingebiel et al., 2022). The downside risk of the former is a financial loss, and the downside risk of the latter is foregone income. Decision-makers will thus associate aversive consequences with a pursuit decision in the case of a commission error and an abandonment decision in the case of an omission error (e.g., Thorndike, 1911). The association of aversive consequences with the type of decision that led to failure also implies the anticipation of future regret (Sarangee et al., 2013; Wong & Kwong, 2007). Therefore, decision-makers should anticipate feeling regretful about further

persisting (not persisting) with a currently underperforming innovation project in case of a recent commission (omission) error, leading them to view taking the risk of omission (commission) as relatively more favorable in the present situation (Klingebiel, 2018). Consequently, we assume that a recent commission error experience translates into a lower likelihood of persistence with a currently underperforming innovation project than a recent omission error experience.

However, as we mentioned earlier, dynamic decision situations involve decision-makers' prior experiences as well as circumstances directly related to the present course of action. To evaluate the differential effect of distinct types of failure and model the general complexity of persistence decision situations appropriately (Keil et al., 2018; Sleesman, 2019), we control for three established persistence-shaping forces that relate to crucial attributes of the presently underperforming innovation project, i.e., resource investment, proximity to project completion, and project innovativeness. First, previous resource investment is synonymous with sunk costs, which refer to irrecoverable resource investments, such as money, time, or effort (e.g., Arkes & Blumer, 1985), and tends to increase the likelihood of persistence (Garland, 1990). Second, higher proximity to project completion increases the likelihood of persistence, as decision-makers replace initial goals with the goal of completing a course of action (Conlon & Garland, 1993). Third, the degree of innovativeness is an important attribute of initiated projects. Innovation projects can generally lean towards either the "exploration of new possibilities" or the "exploitation of old certainties" (March, 1991, p. 71). Exploratory projects exhibit a higher degree of innovativeness than exploitative ones for the focal firm and the served customers or markets (Jansen et al., 2006; Schleimer & Faems, 2016). Past research shows that more innovative projects induce stronger persistence than less innovative ones when a focal project is underperforming (Schmidt & Calantone, 1998, 2002). Despite accounting for the presumably strong effects of previous resource investment, proximity to project completion, and project

innovativeness, we expect the effect of recent failure-type experience based on risk-type preference shifts to remain robust. Accordingly, we hypothesize:

> **Hypothesis 1 (H1):** *Decision-makers will be less likely to persist with an underperforming project after a commission error than after an omission error, even when controlling for the persistence-increasing effects of (a) previous resource investment, (b) proximity to project completion, and (c) project innovativeness.*

However, the theory on risk-type preference shifts also suggests potential boundary conditions to the principal mechanism it proposes without being overly specific (Klingebiel, 2018). We follow up on this notion by arguing that aspects of decision-maker heterogeneity moderate the differential main effect of failure types on persistence.

3.2.3 The amplifying role of failure-related action-state orientation

The theory of risk-type preference shifts suggests that decision-makers' motivation after experiencing a recent, salient failure should revolve around reducing the likelihood of re-experiencing it in a subsequent decision situation (Dye et al., 2014; Klingebiel, 2018). In other words, preventing a similar type of failure becomes the desired end state for the decision-maker. Classic control theory postulates that minimizing the gap between a current state and a desired end state requires the self-regulation of thoughts and actions (e.g., Kuhl, 1985). In a broader model of self-regulation, the construct of action-state orientation has been proposed to bridge the gap between these two states (Kuhl, 1981). Therefore, we argue that action-state orientation plays an essential role in decision-making in underperforming innovation projects after experiencing failure, as it concerns individual differences in the ability to initiate and maintain context-induced intentions under demanding conditions (Diefendorff et al., 2000; Kuhl, 1994a).

Although action or state orientation can be situationally induced, people possess a global tendency towards being either more action-oriented or state-oriented, thus reflecting a more or less stable personality disposition (e.g., Kuhl, 1992). Individuals fall on a bipolar continuum of

action-state orientation, with the left pole being associated with state orientation and the right pole with action orientation. Action-state orientation comprises three dimensions, usually labeled in terms of their respective state-oriented pole: preoccupation, hesitation, and volatility (Diefendorff et al., 2000; Kuhl, 1994a; Kuhl, 1994b). The first dimension, with its corresponding action-oriented pole of disengagement, is of particular interest for the purpose of this paper. Indeed, the preoccupation-disengagement dimension has been labeled failure-related action-state orientation (e.g., Kuhl, 1985). It refers to an individual's ability to disengage from thoughts about undesirable experiences in the pursuit of a desired end state (e.g., Diefendorff, 2004). The state-oriented pole of preoccupation, therefore, describes the "inability to stop thinking about an event, especially an aversive one, even when one cannot do anything about it and, indeed, intends to focus on a new activity not related to it" (Kuhl, 1992, p. 108). That is, state-oriented people are preoccupied with ruminations about a failure experience, which hinders the enactment of intentions and goal striving. In contrast, the action-oriented pole of disengagement describes individuals who can rapidly detach from ruminative thoughts to enact an active, context-induced intention to move from a current state to the desired end state. Overall, people who score high (low) on the preoccupation-disengagement dimension (i.e., failure-related action-state orientation) are action-oriented (state-oriented) and find it less (more) difficult to enact their context-induced intentions under demanding conditions.

Correspondingly, we posit that failure-related action-state orientation moderates the differential effect of distinct failure types on subsequent persistence in an amplifying manner. Put differently, action-oriented decision-makers can and will incorporate the specific type of failure more strongly in their decision to persist than state-oriented ones, thus enhancing the mechanism proposed by the theory of risk-type preference shifts and, by extension, the differential main effect. After experiencing either a commission or omission error, the desired end state for a decision-maker revolves around preventing the most recently experienced type of failure in a subsequent decision situation. That is, reaching the desired end state becomes the

active, context-induced intention for action-oriented and state-oriented decision-makers. However, action-oriented decision-makers will be more able to enact this intention than state-oriented ones by translating it into strong and concrete behavioral responses in line with the mechanism of risk-type preference shifts. Although action- and state-oriented decision-makers feel equally bad about failure, the former can swiftly disengage from negative feelings and potential rumination to decisively enact the intention of preventing similar failures (van Putten et al., 2009). Importantly, disengagement does not mean that action-oriented decision-makers blindly disregard a prior failure experience in their decision to persist; they just do not dwell on the experience like state-oriented decision-makers. In fact, decision-makers with a strong action orientation have a tendency to deal with failures immediately and confidently after their occurrence (Rybowiak et al., 1999). In contrast, state-oriented individuals have intrusive thoughts about the failure event, which results in indecisiveness and behavioral passivity in their decision of whether to persist or not (Kuhl, 1992; Kuhl, 1994a). Overall, action-oriented decision-makers will try to enact their context-induced intention to avoid the last type of failure at the next available opportunity and with greater confidence. The stronger the action orientation, the more likely decision-makers will be not to persist after a commission error experience and to persist after an omission error experience, culminating in a decisive behavioral response and a stronger differential effect. On the other hand, more state-oriented decision-makers will be indecisive, passive, and less confident in their decision to persist due to their preoccupation with the failure event, demonstrating a less clear behavioral response and weaker differential effect. We hypothesize:

> **Hypothesis 2 (H2):** *Failure-related action-state orientation amplifies the effect of failure type on the likelihood of persistence, such that decision-makers with a stronger action orientation will show a lower (higher) likelihood of persistence after a commission error (an omission error) compared to those with a stronger state orientation.*

3.2.4 The attenuating role of a rational thinking style

Although the general desire to prevent recently experienced failures at the next possible opportunity should be relatively robust (Dye et al., 2014; Klingebiel, 2018), some decision-makers may still place less emphasis on past events when deciding on further persistence. In particular, traditional models of economic rationality (e.g., Edwards, 1954) suggest that prior decision outcomes should not influence current decision-making because of their irreversibility and virtual irrelevance for sound decisions in the here and now.

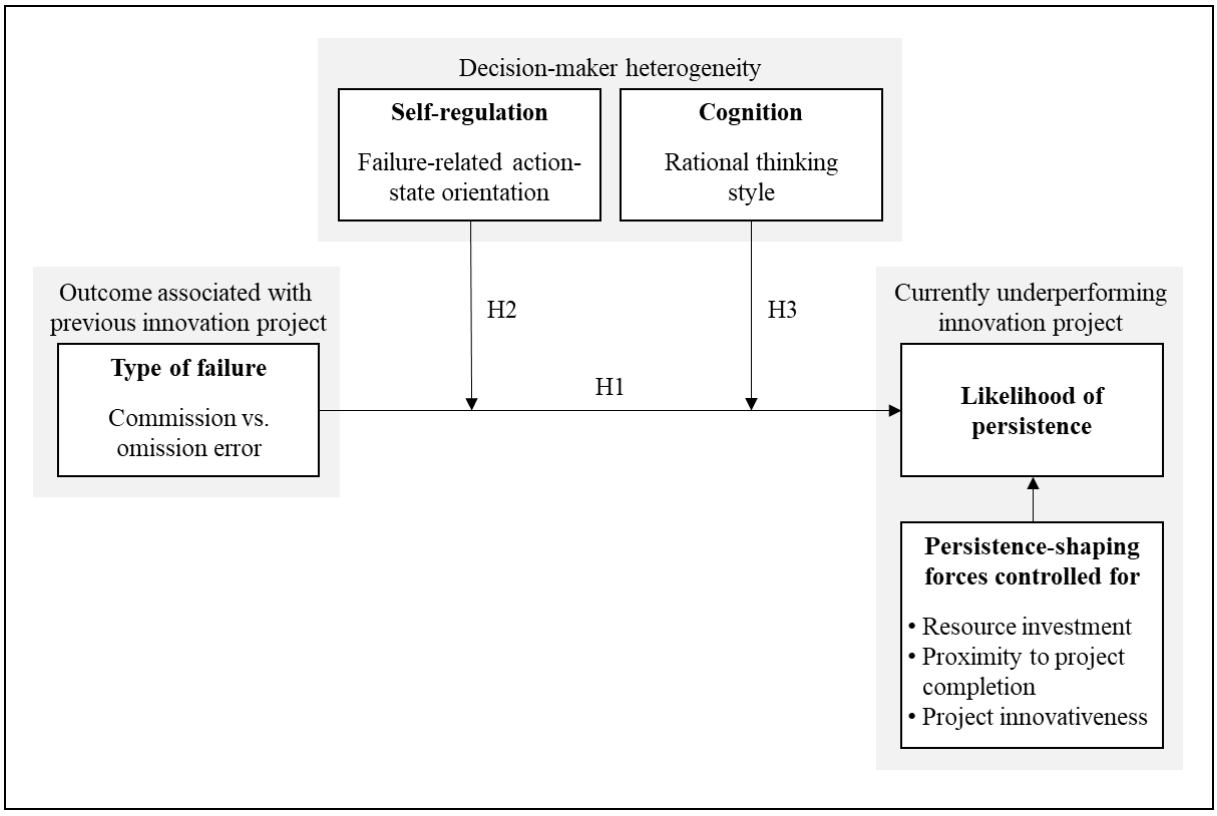
Therefore, a cognitive approach to decision-making based on rationality could attenuate the extent to which the principal mechanism proposed by the theory of risk-type preference shifts unfolds. In other words, decision-makers with a stronger rational thinking style should place less emphasis on the type of failure experienced in their decisions to persist than those with a weaker rational thinking style, attenuating the main differential effect in the process. In general, a rational thinking style has been shown to affect persistence with underperforming innovation projects (e.g., Eliëns et al., 2018). Highly rational decision-makers collect as much relevant information as possible and commit time and cognitive effort to think in-depth before deciding on a course of action (e.g., Dean & Sharfman, 1996), aiming at comprehensiveness to make the best possible decision under the given circumstances (e.g., Fredrickson & Mitchell, 1984). The decision-making of these individuals is also fundamentally rule-based (e.g., Evans, 2008). Since innovation project decision-making usually follows concrete decision rules based on criteria relating to the current project (Hart et al., 2003; Tzokas et al., 2004), rational decision-makers should be more likely to adhere to these rules in the present situation and incorporate them into their persistence decisions. Furthermore, rational decision-makers tend to reason affect-free without allowing emotions, such as anticipated regret triggered by a failure-type experience, to influence their analytic and logical decision-making process (e.g., Epstein et al., 1996). Because of all these reasons, rational decision-makers might not only deem information related to a past course of action, i.e., the type of previous failure, less

relevant, but should also de-emphasize it when deciding about a currently underperforming innovation project. In contrast, less rational decision-makers are more likely to incorporate information about previous commission and omission errors into their decision of whether to persist or not, as they pay more attention to the past despite its virtual irrelevance for current decision-making and, thus, more strongly subject themselves to the principal mechanism proposed by the theory of risk-type preference shifts. Accordingly, we hypothesize:

> **Hypothesis 3 (H3):** *A rational thinking style attenuates the effect of failure type on the likelihood of persistence, such that decision-makers with a stronger rational thinking style will show a higher (lower) likelihood of persistence after a commission error (an omission error) compared to those with a weaker rational thinking style.*

Figure 3 below provides a comprehensive overview of the conceptual model. It shows the hypothesized main effect, the hypothesized moderating effects, and the persistence-shaping forces controlled for.

Figure 3: Conceptual model



3.3 Methodology

3.3.1 Metric conjoint analysis

We chose metric conjoint analysis as our research method since it allows for simultaneous consideration of several persistence-shaping forces and a comprehensive assessment of the effect of a recent failure-type experience on the likelihood of persistence. For decades, conjoint analysis has been popular in marketing research and practice (Green & Srinivasan, 1990) and in entrepreneurship research (Lohrke et al., 2010), and is considered suitable for studying complex decision-making processes. More recently, conjoint analysis has been used to study innovation project decision-making, e.g., to investigate decision-makers' likelihood to exploit an innovation project (Behrens et al., 2014), to terminate an innovation project (Behrens & Patzelt, 2016), or to persist with an underperforming innovation project (Kier et al., 2022; Patzelt et al., 2011).

In conjoint analysis, respondents make a series of judgments regarding specifically developed profiles by researchers, which renders the decomposition of respondents' decisions possible to investigate their underlying structure (e.g., Shepherd & Zacharakis, 2018). While holding the broader decision context constant, the profiles vary in terms of the levels (e.g., high versus low) of theory-driven attributes (e.g., resource investment), and respondents must rate each presented decision profile on a single-item ordinal scale (e.g., likelihood of persistence). Decomposing respondents' decisions reveals the importance of each attribute and enables the investigation of individual-level differences in the emphasis respondents place on these attributes when making decisions. Consequently, conjoint analysis permits an accurate investigation of respondents' "theory in use" rather than their "espoused theories of action" (Argyris & Schön, 1974), thereby facilitating a real-time assessment of respondents' decision-making and decision rules. Conjoint analysis thus overcomes methodological shortcomings of post-hoc methods, which can be subject to biases inherent to retrospective reporting (Zacharakis & Shepherd, 2001).

3.3.2 Research instrument design

While designing our research instrument, we followed established conventions and published studies (e.g., Holland & Shepherd, 2013; Patzelt et al., 2011). Our corresponding online questionnaire consisted of three major parts that align with the typical chronological order for metric conjoint experiments: (1) a general introduction to the decision task and detailed description of decision attributes, (2) a series of conjoint profiles, and (3) a post-experimental survey.

In the first part of the instrument, we explained the general decision situation. We instructed participants to assume the role of a senior manager responsible for making funding decisions on innovation projects in a fictional, mid-sized firm operating in a competitive industry. In their hypothetical role, they had to imagine attending a senior management meeting in which a funding decision regarding a specific innovation project had to be made. We mentioned that the focal innovation project was part of the firm's broader portfolio, aligned with the firm's principal strategic direction, and was currently in the development phase under the respondent's supervision. The latter aspect indicated that some sunk costs had already been incurred, an important prerequisite for persistence decisions (e.g., Arkes & Ayton, 1999). Most importantly, we mentioned that the focal innovation project had been underperforming (Patzelt et al., 2011) and currently did not meet the firm's standard performance criteria, i.e., sales and market share forecasts were below target and expected hurdle rates (Sarangee et al., 2019). Thus, the innovation project showed initial signs of failing.

We explained to the respondent that their primary task would be to evaluate whether further investment in this troubled innovation project is worthwhile. More precisely, we told them they would be presented with several hypothetical profiles of the focal underperforming innovation project throughout the decision task, all representing independent and unrelated decisions. Respondents would have to rate each project profile in terms of their willingness to continue investing, taking into consideration randomly manipulated levels of previous resource

investment, proximity to project completion, and project innovativeness as persistence-shaping forces (e.g., Schmidt & Calantone, 2002; Sleesman et al., 2012). Furthermore, we included a recently experienced type of failure as a decision attribute, accounting for the fact that persistence decisions usually do not take place in the absence of prior experiences. We defined attributes and their corresponding levels in detail (see section 3.3.5 below) and told participants there were no major funding limitations.

In the second part of the instrument, we first presented two practice profiles to familiarize respondents with the general procedure (e.g., Holland & Shepherd, 2013). The practice profiles were later excluded from the analysis. After completing the practice profiles, respondents proceeded to rate all possible profiles. We employed a 2x2x2x2 (2^4) full conjoint design, i.e., all four relevant attributes (type of failure, resource investment, project completion, and project innovativeness) varied at two levels each. The main test thus included 16 original profiles. To enable the analysis of test-retest reliability, we opted for partial replication and replicated eight randomly chosen profiles (Kier et al., 2022). Accounting for the two practice profiles, respondents thus had to evaluate 26 profiles in total, a number comparable to other conjoint studies in the context of innovation project decision-making, which included 33 (Behrens et al., 2014; Patzelt et al., 2011) and 38 (Kier et al., 2022) profiles in their studies.

Notably, this second part of the instrument consisted of two sub-parts, each containing 12 profiles (i.e., eight original profiles and four randomly replicated profiles). For each sub-part, respondents had to imagine making their decisions from the background of either a recent commission error or a recent omission error. Unlike the other three attributes, which constantly varied in level due to random manipulation in each sub-part, the selected failure-type experience remained constant within each sub-part. For example, if a given respondent was randomly instructed to rate the first 12 profiles from the background of a commission error, the remaining 12 profiles would have to be rated from the background of an omission error. We followed this approach because we wanted participants to take on a commission or omission error "mindset"

for each sub-part and not to constantly move in and out of mindsets, which would have likely been less desirable due to higher cognitive effort (Holland & Shepherd, 2013). To counteract potential ordering effects (Chrzan, 1994), the order of profiles in each sub-part and the corresponding type of failure shown as decision context were randomized.

The third and concluding part of the instrument was a post-experimental survey. The post-experimental survey included open and Likert-type questions about individual-level characteristics of respondents, such as their failure-related action-state orientation, rational thinking style, additional control variables, and demographics.

3.3.3 Data collection and sample

In line with previous research on innovation project decision-making, we contracted a leading online sampling company to recruit potentially suitable participants (e.g., Wilden et al., 2023). Specifically, we relied on services by Dynata, which manages a large US executive panel. Dynata constantly monitors the quality of its panels, ensuring sample representativeness and respondents' attention and motivation (Camacho et al., 2019). Still, to ensure that we reached our target group of managerial decision-makers in innovation development, we screened out respondents based on two criteria. First, respondents had to have the principal authority to make decisions about the future of innovation projects in their respective firms or departments and should have been actively involved in innovation project decision-making during the past three years (Wilden et al., 2023). Second, we required respondents to have managerial responsibility to substantiate their involvement in innovation decision-making further. Respondents who did not fulfill these criteria were screened out at the beginning of our online questionnaire.

Overall, 152 participants completed the online questionnaire. To ensure the reliability and validity of our data, we assessed respondents' attention, potential carelessness, and response plausibility, following previous research (e.g., Meade & Craig, 2012; Schüler et al., 2023). First, we included an attention check midway through the questionnaire and a bogus item at the end.

That is, participants had to indicate their attention directly after the first sub-part of the conjoint experiment (i.e., after 12 profiles) by answering whether they had evaluated more than six profiles so far. Likewise, respondents had to mark a predetermined point on a Likert-type scale in the post-experimental survey to indicate their ongoing active participation. 10 participants failed to pass the attention check, 25 failed to pass the bogus item check, and 2 failed both. Excluding these cases reduced the sample size to 115 participants (75.7%). Second, we controlled for respondents who were overly fast or unreasonably slow. Given a median completion time of 21 minutes, we excluded respondents who took less than 10 minutes (7 cases) or more than 90 minutes (4 cases) to complete the questionnaire, reducing the sample to 104 participants (68.4%). Lastly, we excluded obvious cases of straight lining (4 cases) and implausible answers (11 cases), reducing the final sample to 89 respondents (58.6%). Given the length and complexity of our questionnaire, we deemed such a rigorous filtering process necessary to ensure sufficient data quality. Given Shepherd and Zacharakis's (1999) recommendation that more than 50 respondents are typically sufficient for conjoint analysis, we deem our final sample size satisfactory.

Our final sample comprises individuals from the upper (29.2%), middle (52.8%), and lower management (18.0%) of their respective firms. Functional backgrounds predominantly comprise research and development (21.3%), marketing (12.4%), information technology (25.8%), and operations (23.6%). Most respondents have a bachelor's (48.3%), master's (31.5%), or doctoral degree (6.7%) and a background in business (36.0%), engineering (42.7%), or science (16.9%). Respondents' mean age is 43.6 years, and 71.9% are male. Mean organizational tenure is 11.4 years, and respondents have, on average, 10.5 years of decision-making experience in innovation development. Respondents' firms vary in size. For example, 49.4% have fewer than 500 employees, 36.0% more than 500 but fewer than 5,000 employees, and 14.6% more than 5,000 employees. Lastly, respondents' firms operate in several industries,

most notably in the technology hardware and equipment industry (22.5%), the software industry (16.9%), and the industrial services (e.g., utilities and energy) industry (18.0%).

3.3.4 Operationalization of the dependent variable

The dependent variable of our metric conjoint experiment is the likelihood that the respondent would continue investing in a specific profile of the underperforming innovation project, thus reflecting their inclination or aversion toward persistence. For this purpose, we specifically asked participants, "Given these conditions, how likely would you be to continue investing in the current project?" (Kier et al., 2022). We measured our dependent variable on a 7-point scale anchored by "Very unlikely (1)" to "Very likely (7)" (e.g., Patzelt et al., 2011).

3.3.5 Operationalization of decision-level variables (Level 1)

Respondents had to evaluate each profile of the underperforming innovation project based on the following four decision attributes: (1) previous resource investment (high versus low), (2) proximity to project completion (high versus low), (3) project innovativeness (high versus low), and (4) recent failure-type experience (commission versus omission error experience) (see also Appendix C for an exemplary depiction in the online questionnaire). In our analytic approach, we controlled for (1) through (3) as "usual suspects" of persistence decision-making to investigate the impact of recent failure-type experiences (Kier et al., 2022).

We defined the four decision attributes and their respective levels following prior literature (Table 3). Previous resource investment concerns the amount of financial and non-financial resources already invested in the innovation project, thus reflecting high or low sunk costs. Proximity to project completion reflects the degree to which the development phase of the underperforming innovation project is complete, implying that the project is still far away from (10% complete) or very close to commercialization (90% complete) (Conlon & Garland, 1993). Project innovativeness refers to the degree of newness to the focal firm and customers or

markets. Projects with low innovativeness (exploitative projects) build on the firm's technical capabilities and existing knowledge to refine and improve existing solutions for known customers or markets (e.g., Benner & Tushman, 2003; Jansen et al., 2006). Conversely, projects with high innovativeness (exploratory projects) depart from technical capabilities and knowledge to develop completely new solutions for emergent customers or markets. Finally, a commission error experience refers to a prior continuation (i.e., pursuit) decision that led to a costly failure of an innovation project. An omission error experience refers to a previous discontinuation (i.e., non-pursuit or abandonment) decision that enabled successful competitive preemption by a rival firm, reflecting a missed innovation opportunity (Klingebiel et al., 2022).

Table 3: Definition and operationalization of decision attributes

Decision attributes	Levels
Resource investment (e.g., Arkes & Blumer, 1985)	**Low level:** The amount of financial (i.e., money) and non-financial resources (i.e., time or effort) already invested in the innovation project is small.
	High level: The amount of financial (i.e., money) and non-financial resources (i.e., time or effort) already invested in the innovation project is large.
Proximity to project completion (e.g., Conlon & Garland, 1993)	**Low level:** The innovation project is still far from completion, as the development phase is only 10% complete.
	High level: The innovation project is very close to completion, as the development phase is already 90% complete.
Project innovativeness (e.g., Benner & Tushman, 2003; Jansen et al., 2006)	**Low level:** The innovation project builds on the firm's current knowledge and technical capabilities to refine and improve an already existing solution that meets the needs of current customers or markets.
	High level: The innovation project departs from the firm's current knowledge and technical capabilities to discover and create a completely new solution that meets the needs of emerging customers or markets.
Experienced type of failure (e.g., Klingebiel, 2018; Klingebiel et al., 2022)	**Omission error:** Imagine your decision to discontinue investing in the previous project enabled successful competitive preemption by a rival firm, and thus, your firm missed a valuable opportunity.
	Commission error: Imagine your decision to continue investing in the previous project resulted in a costly innovation failure for your firm.

Note: Studies in parentheses indicate relevant studies for definitions and operationalization. Failure-type experience represented the context in which persistence decisions were to be made.

3.3.6 Operationalization of individual-level variables (Level 2)

We collected data via a post-experimental survey to assess individual-level differences in persistence decision-making and test our hypothesized cross-level interactions. First, we collected data on respondents' action-state orientation using the scale by Diefendorff et al. (2000), which is a shortened version of Kuhl's (1994b) Action Control Scale (ACS-90). In line with our research focus, we used the eight items referring to the preoccupation-disengagement dimension of action-state orientation (i.e., failure-related action-state orientation). Each item represents a demanding situation for which respondents must choose between an action-oriented (coded as 1) or a state-oriented response (coded as 0). Respondents display a low (high) value in failure-related action-state orientation if they predominantly or exclusively select state-oriented (action-oriented) responses (Kuhl, 1994a). The overall score is the mean, with possible values ranging from 0 to 1. The scale has recently been used in an innovation-related context (Bledow et al., 2022). Second, we collected data on respondents' rational thinking style using items of the need for cognition scale by Epstein et al. (1996). In doing so, we followed Eliëns et al. (2018), who adapted the scale to an innovation project decision-making context, and used the three reverse-coded items they selected, adapting them slightly. Failure-related action-state orientation ($\alpha = 0.701$) and rational thinking style ($\alpha = 0.779$) both demonstrated satisfactory reliability (the operationalization of the two latent constructs, along with all respective items, is depicted in Appendix D).

Furthermore, we directly asked and controlled for demographics regarding respondents' age (in years), gender, educational level, and decision-making experience in innovation development (in years). We also controlled for individuals' risk propensity, measuring it with one item ("I take risks regularly.") that we took from the scale by Meertens and Lion (2008). The reason was that a disposition towards actively taking risks (i.e., commission risk in this case) should principally foster persistence with an underperforming project. All individual-level variables, their descriptive statistics, and bivariate correlations are shown in Table 4 below.

Table 4: Descriptive statistics and bivariate correlations

Variables	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Age	43.64	12.34	1.000						
(2) Gender	0.72	0.45	**0.213**	1.000					
(3) Educational level	3.31	0.79	**−0.160**	**−0.068**	1.000				
(4) Innovation decision-making exp.	10.52	9.35	**0.684**	**0.235**	**0.077**	1.000			
(5) Risk propensity[a]	4.89	1.46	0.018	0.038	−0.048	−0.029	1.000		
(6) Failure-related action-state orientation	0.62	0.27	0.034	**0.240**	**−0.097**	**0.080**	−0.025	1.000	
(7) Rational thinking style[a]	4.63	1.54	**0.088**	**−0.060**	0.032	**0.163**	**−0.055**	**0.111**	1.000

Note: Matrix based on the full sample of 89 managers. For better comprehension, means, standard deviations, and bivariate correlations were calculated with unstandardized variables. Numbers in bold are statistically significant at $p < .05$. Gender: 1 = male, 0 = female. Educational level: 1 = Less than high school, 2 = high school graduate, 3 = bachelor's degree, 4 = master's degree, 5 = doctorate. [a] = seven-point Likert-type scale.

3.3.7 Test-retest reliability

We used the workflow by Schüler et al. (2024) to assess the test-retest reliability of our metric conjoint experiment. The workflow includes four distinct steps. First, we calculated intraclass correlation coefficients for each profile across the main round of data collection and its corresponding replication. Second, we estimated a simple linear model with clustered standard errors for each round of data collected (i.e., main and replication). Third, we calculated a slope difference test for each focal parameter. Importantly, we found no statistical differences in the slopes of the estimated parameters, i.e., our decision-level variables (level 1), across the two rounds of data collected for our sample of 89 managers. Although this finding does not indicate an error-free replication, it suggests that response consistency is present and improves confidence in the results of our analysis. The fourth step concerns the specification of a fully pooled linear model with data from the main and replicated rounds of data collection, with two-way clustered standard errors for each round and respondent. This step can be seen as optional, and we only report findings of the main round of data collection in the analysis and results section. Overall, we conclude that test-retest reliability is satisfactory due to general response consistency, enabling us to proceed with data analysis and report our findings.

3.4 Data analysis and results

We used hierarchical linear modeling (HLM) to analyze our data and test our hypotheses (e.g., Aguinis et al., 2013) since HLM is the standard methodology for analyzing data from conjoint experiments (Wood & Mitchell, 2018). HLM is particularly suitable for accounting for the nested structure of our data (i.e., decisions nested in managers) and calculating cross-level interaction effects. That is, HLM can capture cross-level effects of variables located at the decision level (level 1) and the individual level (level 2), thus principally enabling the investigation of each decision attribute's importance for, and individual-level differences in, persistence decision-making.

To test our hypotheses, we used the original 1,424 observations (i.e., 16 decisions per manager) and excluded the replicated profiles from our analysis (e.g., Fu & Tietz, 2019). The intraclass correlation was 22%, indicating that roughly 22% of the variance in persistence decisions was due to differences between participants (e.g., Fu & Tietz, 2019). This is relevant for examining our hypothesized cross-level interaction effects. In reporting our results, we follow Ademi, Schuhmacher, and Zacharakis (2023). We first report the HLM results for all direct and cross-level interaction effects, where the coefficients reflect the change in the likelihood of persistence in an underperforming innovation project in response to a one-unit increase in the respective variables (Table 5). We then report the predicted values of our dependent variable at the different levels of the four decision attributes (Table 6) and the average marginal effects of failure-type experience in the presence of failure-related action-state orientation (Table 7) to investigate cross-level interaction effects (Busenbark et al., 2022). Lastly, we report the results of post-hoc analyses (Tables 8 and 9).

3.4.1 Main effects

Our main results (Table 5) demonstrate the importance of recent failure-type experience ($\beta = -0.367$, $p < .001$) for managers' persistence decisions, even when controlling for established

persistence-shaping forces such as previous resource investment ($\beta = 0.063$, $p = .516$), proximity to project completion ($\beta = 0.822$, $p < .001$), and project innovativeness ($\beta = 0.954$, $p < .001$). Specifically, the analysis of predicted values (Table 6) reveals that the likelihood of persistence after a recent commission error experience is 7.50% lower than after a recent omission error experience (4.529 versus 4.896 on a 7-point scale). Decision-makers who experience a specific type of failure thus tend to avoid re-experiencing the same type of failure, in line with predictions of the theory of risk-type preference shifts (e.g., Klingebiel, 2018). In other words, a previous pursuit (non-pursuit) decision that resulted in a costly innovation failure (missed innovation opportunity) will lead to a lower (higher) likelihood of persistence with a currently underperforming innovation project. These findings support H1.

Notably, the results also support the expected importance of proximity to project completion and project innovativeness as relevant decision-making attributes and persistence-shaping forces. The analysis of predicted values reveals that the likelihood of persistence is 19.11% higher for profiles with a high proximity to project completion (5.124) than for profiles with a low proximity to project completion (4.302). Similarly, managers favor profiles with high innovativeness (5.190) over those with low innovativeness (4.236), as indicated by a 22.52% increase in the likelihood of persistence. In contrast, the effect of previous resource investment in the form of sunk costs is not statistically significant. However, previous research shows that independent manipulation of sunk costs and proximity of project completion can strongly diminish the former's effect and even render it insignificant (Sleesman et al., 2012). Overall, our findings indicate that decision-makers employ persistence decision policies that incorporate specific decision attributes relating to the previous innovation project (i.e., type of failure) and the currently underperforming innovation project (i.e., proximity to project completion and degree of project innovativeness).

Table 5: Results of HLM regression

DV: Likelihood of persistence	Coefficient		SE	p-value	
Control variables					
Decision level (L1)					
Resource investment (high = 0.5 versus low = −0.5)	0.063		0.097	.516	
Proximity to project completion (high = 0.5 versus low = −0.5)	0.822	***	0.097	.000	
Project innovativeness (high = 0.5 versus low = −0.5)	0.954	***	0.110	.000	
Individual level (L2)					
Age	0.001		0.011	.925	
Gender	0.203		0.177	.250	
Educational level	−0.053		0.113	.636	
Innovation decision-making experience	0.001		0.012	.905	
Risk propensity	0.180	**	0.056	.001	
Failure-related action-state orientation	−0.172		0.274	.529	
Rational thinking style	−0.166	***	0.047	.000	
Main effect (L1)					
Experienced type of failure (CE = 0.5 versus OE = −0.5)	−0.367	***	0.083	.000	H1
Cross-level interaction effects (L1 × L2)					
Experienced type of failure × Failure-related action-state orientation	−0.783	*	0.323	.016	H2
Experienced type of failure × Rational thinking style	0.015		0.046	.755	H3
Constant	4.713	***	0.083		

Note: n = 1,424 decisions (level 1 = L1), nested in 89 managers (level 2 = L2). L1 variables are group-mean centered, and L2 variables are grand-mean centered. SEs are cluster robust. Random intercept random slope model. CE = commission error. OE = omission error. SE = robust standard errors.
*** = p < .001; ** = p < .01; * p < .05.

Table 6: Predicted values

Variables and levels	Predicted LOP		SE	p-value	95% CI	
Experienced type of failure					LB	UB
Omission error	4.896		0.098	.000	4.338	4.720
Commission error	4.529	− 7.50%	0.088	.000	4.724	5.068
Resource investment						
Low	4.681		0.094	.000	4.497	4.866
High	4.744	*+ 1.35%*	0.099	.000	4.551	4.938
Proximity to project completion						
Low	4.302		0.102	.000	4.102	4.502
High	5.124	*+ 19.11%*	0.093	.000	4.942	5.305
Project innovativeness						
Low	4.236		0.101	.000	4.038	4.434
High	5.190	*+ 22.52%*	0.100	.000	4.992	5.386

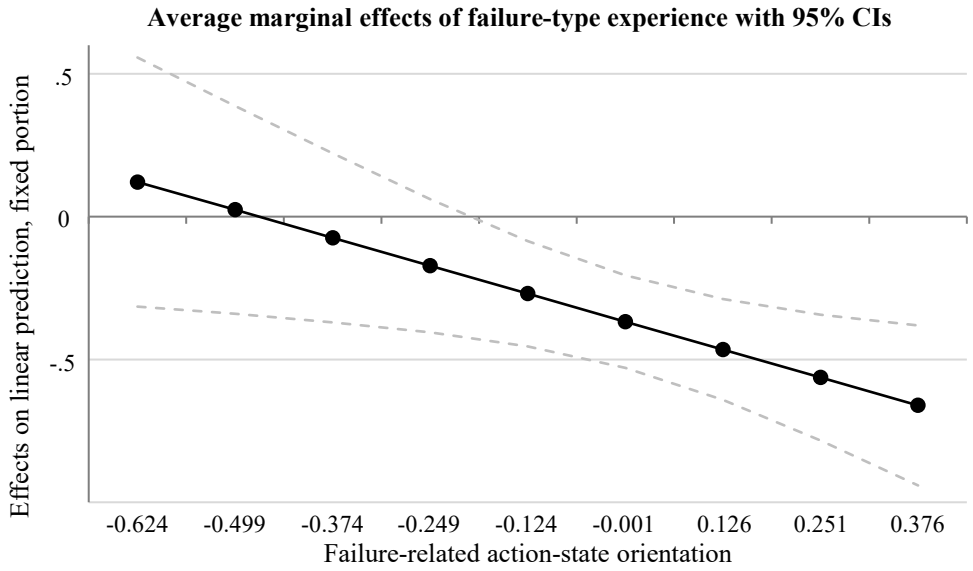
Note: Levels are group-mean centered. SEs based on Delta method. LOP = likelihood of persistence. CI = confidence interval. LB = lower bound. UB = upper bound.

3.4.2 Cross-level interaction effects

We examined cross-level interactions to test for moderating effects of failure-related action-state orientation and rational thinking style (Aguinis et al., 2013). Regarding the main differential effect of recent failure types, we find support for a moderating role of failure-related action-state orientation ($\beta = -0.783$, $p = .016$). Examining the average marginal effects, the main differential effect of recent failure-type experience becomes stronger as failure-related action-state orientation increases, thus supporting H2 (Table 7). In other words, the difference between a commission error and an omission error experience becomes larger as failure-related action-state orientation increases. Managers who score higher on the continuum show an even lower (higher) likelihood to persist with an underperforming innovation project after a recent commission (omission) error than managers who score lower. However, the main effect becomes insignificant at levels below the midpoint of the continuum, i.e., for managers classified as predominantly or exclusively state-oriented. We conclude that action-oriented managers strongly incorporate recent failure-type experiences in their persistence decisions, taking corresponding corrective action to reach their desired end state of similar failure prevention.

Table 7: Average marginal effects and corresponding visualization

Description	Level	dy/dx	SE	p-value	95% CI	
					LB	UB
Effect of experienced type of failure in the presence of different levels of failure-related action-state orientation	−0.624	0.121	0.222	.585	−0.315	0.557
	−0.499	0.024	0.186	.899	−0.340	0.387
	−0.374	−0.074	0.150	.622	−0.370	0.221
	−0.249	−0.172	0.119	.147	−0.405	0.061
	−0.124	−0.270	0.094	.004	−0.454	−0.086
	0.001	−0.368	0.083	.000	−0.530	−0.206
	0.126	−0.466	0.090	.000	−0.642	−0.289
	0.251	−0.563	0.112	.000	−0.784	−0.343
	0.376	−0.661	0.143	.000	−0.941	−0.381



Note: The different levels refer to the whole range of possible values of grand-mean centered failure-related action-state orientation. Levels of failure-related action-state orientation below (above) −.124 (midpoint of the scale) indicate stronger state (action) orientation. SEs based on Delta method.

In contrast, we do not find evidence for a moderating role of rational thinking style in the relationship between recent failure-type experience and the likelihood to persist with an underperforming innovation project ($\beta = 0.015$, $p = .755$), leading us to reject H3. That is, the corresponding main differential effect remains constant and robust regardless of whether managers display a stronger or weaker rational thinking style.

3.4.3 Post-hoc analyses and robustness check

Our results demonstrate that the differential main effect of the two types of failure on the likelihood of persisting with an underperforming innovation project does not depend on whether decision-makers think more or less rationally. However, more or less rational decision-makers could differ in their evaluation of decision attributes directly tied to the presently underperforming innovation project. Indeed, we find a moderating role of rational thinking style in our post-hoc analyses for the effects of proximity to project completion ($\beta = 0.191$, $p = .003$) and project innovativeness ($\beta = 0.177$, $p = .011$) (Table 8). The complementary analyses of

average marginal effects demonstrate that the main effects of the two decision attributes become stronger with higher scores in rational thinking style (see Table 9). In other words, decision-makers with a stronger rational thinking style place more emphasis on proximity to project completion and project innovativeness when deciding upon persistence than those with a weaker rational thinking style. We will elaborate on these results in the discussion section.

Furthermore, we checked the robustness of our results by re-running our analysis, including all main and replicated profiles (2,136 decisions in total). In accordance with our test-retest reliability checks, the results remain robust.

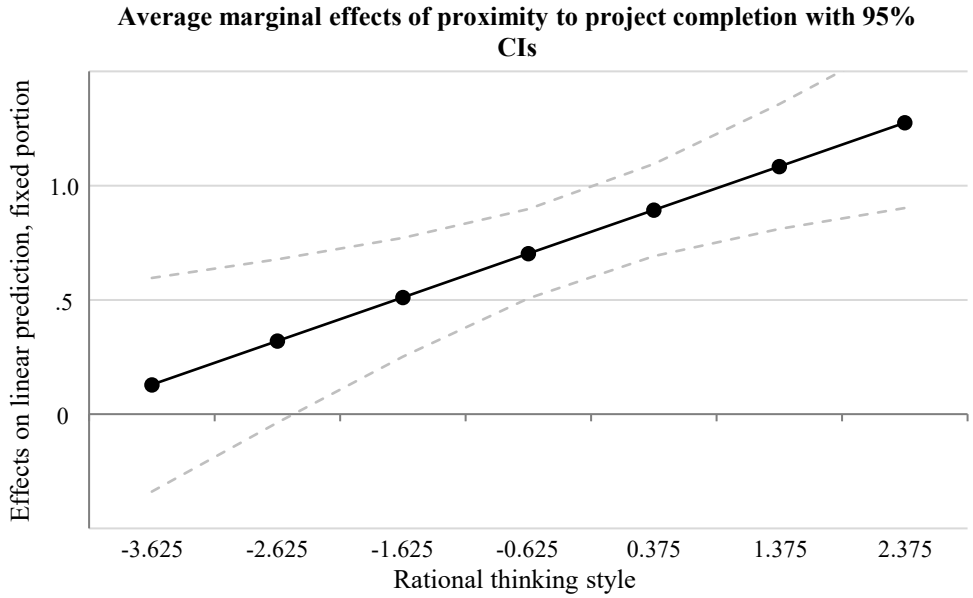
Table 8: Post-hoc HLM analyses

DV: Likelihood of persistence	Coefficient		SE	p-value
Cross-level interaction effects (L1 × L2)				
Resource investment × Rational thinking style	−0.088		0.066	.184
Proximity to project completion × Rational thinking style	0.191	**	0.064	.003
Project innovativeness × Rational thinking style	0.177	*	0.070	.011
Control variables	✓			
Main effect	✓			
Other cross-level interaction effects	✓			
Constant	✓			

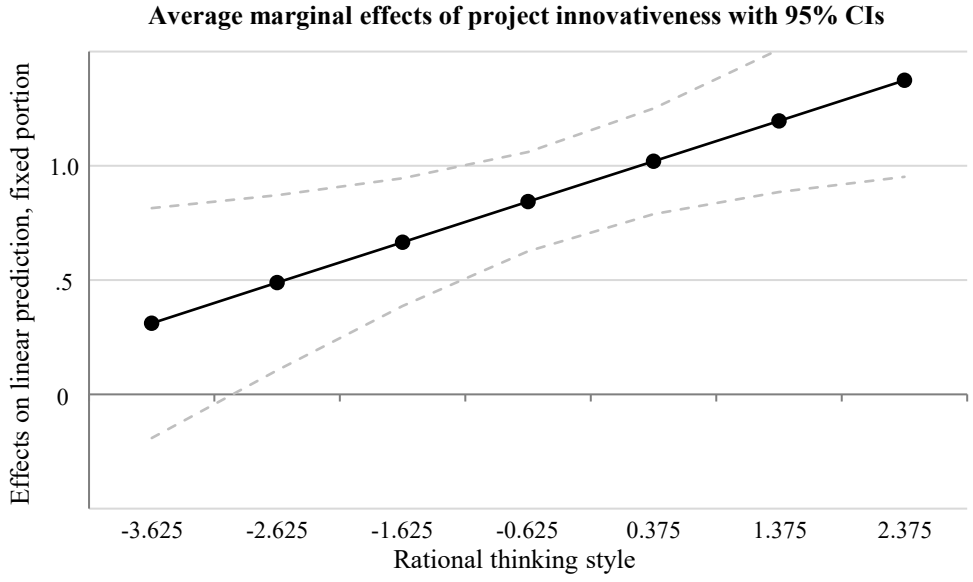
Note: n = 1,424 decisions (level 1 = L1), nested in 89 managers (level 2 = L2). L1 variables are group-mean centered and L2 variables are grand-mean centered. SEs are cluster robust. Random intercept random slope model. SE = robust standard errors.
** = p < .01; * p < .05.

Table 9: Post-hoc analyses of average marginal effects and corresponding visualizations

Description	Level	dy/dx	SE	p-value	95% CI	
					LB	UB
Effect of proximity to project completion in the presence of different levels of rational thinking style	−3.625	0.129	0.239	.588	−0.339	0.596
	−2.625	0.320	0.182	.079	−0.037	0.677
	−1.625	0.511	0.132	.000	0.252	0.771
	−0.625	0.702	0.100	.000	0.507	0.898
	0.375	0.893	0.103	.000	0.692	1.095
	1.375	1.084	0.139	.000	0.811	1.357
	2.375	1.275	0.190	.000	0.902	1.648



Effect of project innovativeness in the presence of different levels of rational thinking style	−3.625	0.311	0.257	0.225	−0.191	0.815
	−2.625	0.489	0.196	0.012	0.105	0.872
	−1.625	0.666	0.143	0.000	0.386	0.946
	−0.625	0.843	0.111	0.000	0.626	1.060
	0.375	1.020	0.118	0.000	0.789	1.251
	1.375	1.197	0.159	0.000	0.885	1.509
	2.375	1.374	0.215	0.000	0.952	1.796



Note: The different levels refer to the whole range of possible values of grand-mean centered rational thinking style. SEs based on Delta method.

3.5 Discussion

In today's hyper-competitive environments, managerial decision-makers often face a rather challenging decision, i.e., whether to persist with or withdraw from underperforming innovation

projects. Accounting for a dynamic, experience-driven view of persistence decision-making and drawing from the theory of risk-type preference shifts (Klingebiel, 2018), we show that recent adverse decision outcomes, in the form of salient yet distinct failure experiences, shape persistence alongside established and influential determinants. Specifically, we distinguish between a commission error (i.e., an innovation flop) and an omission error (i.e., a missed innovation opportunity) as distinct types of failure and find that the former reduces the likelihood of persistence among managerial decision-makers relative to the latter. In addition, we find that the differential effect of failure types depends on decision-makers' failure-related action-state orientation (e.g., Diefendorff et al., 2000; Kuhl, 1994a). An increasing action orientation amplifies the main effect, translating recent failure-type experiences into more pronounced corrective actions that aim at similar failure prevention. However, contrary to our initial expectations, we do not find that decision-makers with a stronger rational thinking style pay less attention to failure-type experiences in their persistence decisions than those with a weaker rational thinking style. Instead, rational decision-makers emphasize specific attributes relating to the current innovation project more than less rational decision-makers, as our post-hoc analyses show.

3.5.1 Contributions and implications

Our findings contribute to the literature on persistence decision-making and the theory of risk-type preference shifts. First, we add needed nuance to the discussion about how a recent salient failure experience affects persistence with a subsequent course of action. Previous seminal research at the intersection of organizational behavior and psychology has shown that failure reduces the likelihood of persisting with a subsequent course of action (Ku, 2008). Similarly, innovation research has suggested that the failure of an innovation project can decrease commitment to subsequent innovation endeavors (Shepherd & Cardon, 2009; Shepherd et al., 2009; Välikangas et al., 2009). Although highly insightful, these research endeavors associate

failure exclusively with active pursuit decisions (e.g., Markovitch et al., 2015) and, therefore, neglect that failure may also arise from a past abandonment decision. We address this shortcoming by dichotomizing failure based on the type of underlying decision that led to failure, i.e., pursuit or abandonment of a previous course of action. Accordingly, we draw from the theory of risk-type preference shifts and distinguish between a commission error and an omission error (Klingebiel, 2018; Klingebiel et al., 2022). Through such a fine-grained treatment of failure, we are able to show that a commission error is associated with a lower likelihood of persistence in a currently underperforming innovation project than an omission error. This differential effect indicates that the effects of experiencing failure are more nuanced than previously assumed, as failure may translate into a lower and higher likelihood of persistence depending on whether it resulted from the pursuit or abandonment of a previous innovation project. Thus, we show that experiencing an innovation flop has quite different implications for subsequent innovation project decision-making than a missed innovation opportunity.

Second, we answer calls for research on under-examined boundary conditions of risk-type preference shifts by investigating potential moderators rooted in heterogeneity among decision-makers (Klingebiel, 2018). We find an amplifying effect of failure-related action-state orientation (Diefendorff et al., 2000; Kuhl, 1994a), revealing its implications for innovation project decision-making. In the process, our research is novel as it is the first to introduce the concept of individual self-regulation to the theory of risk-type preference shifts. Specifically, we show that action-oriented managerial decision-makers show an even lower (higher) likelihood of persisting with an underperforming innovation project in the case of a recent innovation flop (missed innovation opportunity) than state-oriented ones. That is, action-oriented decision-makers are context-dependent risk-takers, demonstrating a particularly strong preference for omission risk after an innovation flop and commission risk after a missed innovation opportunity. In contrast, state-oriented decision-makers might not display a shift in

risk preferences at all, possibly due to indecisiveness and behavioral passivity. These insights inform research on individual-level coping strategies after experiencing failure in innovation efforts (e.g., Shepherd et al., 2011; Todt et al., 2018). Indeed, our results reveal how decision-makers cope with distinct types of failure depending on their action-state orientation by including the often-neglected concept of a missed innovation opportunity.

Third, our null finding regarding the hypothesized attenuating effect of a rational thinking style is meaningful in combination with our post-hoc analyses. We find that thinking more rationally does not weaken the differential effect of failure-type experiences on the likelihood of persisting with an underperforming innovation project, which demonstrates and validates the principally robust influence of past decision outcomes on current decision-making (Klingebiel, 2018). At least in a normative sense, outcomes of past decisions should not influence current persistence decision-making that aspires to be rational (e.g., Staw, 1981). However, by showing that managerial decision-makers with a stronger (versus weaker) rational thinking style pay particular attention to present attributes of the decision situation, we add a nuanced viewpoint to the extant literature on the role of rationality in innovation project decision-making. Previous literature finds that rationality may decrease persistence with underperforming innovation projects (Eliëns et al., 2018) or not (Roeth et al., 2020; Wong et al., 2008). The direct negative effect of a rational thinking style in our conjoint experiment ($\beta = -.166$, $p < .001$) aligns with the former finding. Nonetheless, we go beyond the investigation of direct effects in our post-hoc analyses and show that decision-makers with a stronger rational thinking style particularly emphasize the attributes of proximity to project completion and project innovativeness when deciding about persistence. In doing so, we answer calls for research on which information rational decision-makers attend to in underperforming innovation project decision-making (Eliëns et al., 2018). Terminating a nearly complete project might appear unreasonable and illogical to rational decision-makers compared to the disutility of late-stage termination, as commercialization could still hold some future utility. Likewise, exploratory innovation

projects tend to have a relatively higher potential for above-average value generation in the future and more substantial growth potential than exploitative innovation projects. Rational decision-makers might expect that exploratory projects often underperform initially and tolerate this underperformance because of the prospects of future growth. This insight aligns with recent research that has revealed growth potential as an important attribute for rational decision-makers when deciding on persistence with underperforming entrepreneurial ventures (Lin et al., 2022).

In addition, our study also has very interesting implications for practitioners, who should be cognizant of the consequences of recent innovation flops and missed innovation opportunities. Past innovation research has highlighted the role of interventions that reduce the likelihood of persisting with currently losing innovation projects due to their potentially harmful consequences (Sarangee et al., 2014). Sensitizing decision-makers to a recent innovation flop could function as such an intervention. Conversely, recalling missed innovation opportunities could create a sense of urgency among decision-makers, further strengthening persistence with currently underperforming innovation projects. After all, persistence might be warranted in some instances.

Moreover, competitive and technological environments differ regarding the relative costs associated with each type of failure, with stable (turbulent) environments having more severe ramifications for commission (omission) errors (Csaszar, 2013; Garud et al., 1997). In such cases, organizations could benefit from relying on action-oriented decision-makers to decrease the likelihood of re-experiencing the same error. Although action orientation is a relatively stable trait, it can also be induced by fostering a positive mood, strengthening intrinsic motivation, and decreasing the fear of failure (Kuhl, 1992). Organizational incentives and cultures could, therefore, be focused on cultivating and nurturing employees' action orientation.

Likewise, practitioners should also be aware that decision-makers with a strong rational thinking style heavily emphasize specific decision attributes relating to the present course of

action, i.e., proximity to project completion and project innovativeness, in their persistence decisions. That is, rational decision-makers are more likely to persist with underperforming projects close to commercialization and a high degree of innovativeness. If organizations aim to complete advanced projects and focus on exploration, they could employ decision-makers with a strong rational thinking style.

3.5.2 Limitations and future research

Our study has some limitations that open avenues for future academic endeavors. First, we could not research whether persistence is ultimately beneficial or detrimental due to methodological restrictions. The appropriateness of persistence is thus often unclear (e.g., Wong & Kwong, 2018). We encourage future research to investigate the post-hoc performance implications of persistence after commission and omission errors, such as the extent to which they affect meeting financial, strategic, and other project or organizational goals.

Second, analyses of mediating mechanisms in conjoint experiments are rare. However, it would be interesting to examine how and whether specific emotions, e.g., (anticipated) regret and affect (Wong & Kwong, 2007; Wong et al., 2006) or counterfactual thinking (Roese, 1997), mediate the relationship between failure-type experience and persistence. Although there are strong theoretical claims that principally support mediating mechanisms, other experimental approaches, such as traditional scenario-based experiments, could help to empirically identify potential mediating mechanisms and integrate emotional aspects and counterfactual thinking into the theory of risk-type preference shifts.

Lastly, future research could employ a qualitative approach to study the impact of commission and omission errors on a broader scale. For example, research could use expert interviews to shed light on which concrete lessons organizations and decision-makers encode from commission and omission errors and how these affect future organizational behavior and (innovation) performance (Morais-Storz et al., 2020).

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4 Third study: The ones that got away: Missed acquisitions, market reactions, and subsequent acquisition behavior

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Abstract:
Competitive bidding situations in corporate acquisitions naturally involve winners and losers. The latter, i.e., bidders that fail to acquire a coveted target, experience a missed acquisition. Drawing on the behavioral theory of the firm and related research on behavioral decision-making, we conceptualize a missed acquisition as a salient yet distinct failure experience and examine how it shapes firms' subsequent acquisition behavior. Using a global sample of 446 acquisition announcements between 2000 and 2022, our analysis shows that firms that miss out tend to spend more on subsequent acquisitions than those that close their respective deals. Moreover, stock market reactions to completion and abandonment announcements moderate this relationship. Specifically, the differential main effect becomes weaker as stock market reactions become more favorable. Our findings contribute to acquisition research and behavioral theory by showing how and when missing out on leveraging a strategic investment opportunity influences subsequent investment behavior.

Keywords:
Missed acquisitions, competitive bidding, failure, market perception, behavioral theory of the firm, behavioral decision-making

4.1 Introduction

Mergers and acquisitions (henceforth referred to as acquisitions) are strategic, and often large-scale, investments firms pursue to grow (Kim et al., 2011), change (Welch et al., 2020), and create value (Haleblian et al., 2009). Unsurprisingly, the competition for coveted targets is usually intense and involves other potential acquirers (Boone & Mulherin, 2007, 2009; Testoni, 2024). For example, Microsoft completed the acquisition of professional networking site LinkedIn for $26 billion after winning a public bidding contest against Salesforce in 2016. Missing out on acquiring LinkedIn – a potentially powerful customer relationship management tool – left the CEO of Salesforce, Marc Benioff, empty-handed and with a feeling of bitterness (Hunt, 2016). Such overt, publicized competition visibly separates winners from losers in contested bidding situations. On the one hand, Microsoft closed the deal and, thus, emerged as the winner. Salesforce, on the other hand, was unable to consummate the deal and lost, thereby missing out on the strategic opportunity to acquire its desired target and, by extension, reaping its originally intended acquisition-related benefits. Consequently, LinkedIn can be regarded as a *missed acquisition* for Salesforce due to interference from an alternative bidder, which eventually completed the deal.

We argue that missed acquisitions exhibit both scholarly and practical relevance, as they carry implications for a firm's performance. Indeed, firms may waste significant resources preparing for a prospective acquisition that eventually does not materialize (Haspeslagh & Jemison, 1991), and simultaneously cede intended acquisition-related benefits to a rival bidder. Similarly, missing out on leveraging a desirable strategic opportunity reflects a salient, albeit unique, failure experience (Klingebiel, 2018; Klingebiel et al., 2022). Since acquiring a focal target becomes the primary goal for a firm after publicly announcing its acquisition intent, falling short of achieving this goal is perceived as a failure by the respective firm (e.g., Muehlfeld et al., 2012). Likewise, almost clinching a deal means not obtaining a desired reward (Wadhwa & Kim, 2015), and seeing an alternative bidder complete the deal feels like a loss

(Haunschild et al., 1994). Despite their obvious relevance, missed acquisitions have received surprisingly little scholarly attention, and how firms respond to them remains an open question.

Nevertheless, some scholars have already begun researching unsuccessful acquisition attempts in the form of unconsummated deals, using related terms such as acquisition failure, withdrawal, and termination (e.g., Xing & Yi, 2024). Here, scholars have predominantly focused on the financial implications of unconsummated deals for bidders (e.g., Jacobsen, 2014; Savor & Lu, 2009; Tang, 2015; Xing & Yi, 2024) and for the targets not acquired (e.g., Boubakri et al., 2010; Fabozzi et al., 1988; Malmendier et al., 2016). Others have examined how a firm's total number of previously abandoned deals affects subsequent deal completion (Muehlfeld et al., 2012). Reflecting on these studies, however, we note two aspects worth mentioning. First, prior acquisition research has not examined the behavioral implications of unconsummated deals in competitive bidding contexts. The closest exception is a working paper by Campbell et al. (2022), which, however, focuses on unconsummated deals in non-competitive situations. Scholars correspondingly highlight that "the subsequent actions of failed bidders have not received much attention" (Welch et al., 2020, p. 852). Second, the treatment of bidding competition in previous research lacks the required nuance to examine missed acquisitions directly. The traditional approach to accounting for bidding competition, if at all, has been to merely control for the number of (additional) bidders on the deal level, thereby preventing a nuanced differentiation between winners (i.e., firms completing deals) and losers (i.e., those missing out) in multiple-bidder situations and their subsequent actions. To effectively capture the phenomenon of missing out in competitive bidding, we zoom in on individual deals with at least two known bidders, which enables us to observe the responses of all involved parties. Overall, we adopt a more nuanced, comparative perspective on competitive bidding than prior research on unconsummated deals to investigate how missing out on completing a deal (as opposed to closing it) influences the subsequent behavioral actions of involved firms.

We draw on the behavioral theory of the firm (e.g., Cyert & March, 1963; Gavetti et al., 2012) and related research on behavioral decision-making (e.g., Klingebiel, 2018) to theorize how missed acquisitions (versus deal completions) shape subsequent acquisition behavior. Specifically, we focus on firms' subsequent acquisition spending as a distinct and important aspect of their acquisition-related behavior (e.g., Gamache et al., 2015). Furthermore, and in line with prior research in the tradition of the behavioral theory of the firm, we argue that bidders' behavioral responses are contingent upon external evaluations (e.g., Dye et al., 2014), which provide performance assessments that managers consider when reflecting on their previous decisions, thereby guiding future ones (e.g., DesJardine & Bansal, 2019; Gamache & McNamara, 2019). Accordingly, we conceptualize external evaluations as a moderating force, operationalizing them as stock market reactions to previous acquisition decisions in the form of cumulative abnormal returns (CARs) (e.g., Kim et al., 2015; Xing & Yi, 2024). Analyzing a sample of 446 acquisition announcements with multiple competing public bidders between 2000 and 2022, we thus shed light on how and when missed acquisitions (versus deal completions) influence firms' subsequent acquisition spending.

With this paper, we make several contributions to the acquisition and behavioral literature. First, we introduce the novel concept of a missed acquisition by explicitly distinguishing between winners and losers in public bidding competitions, thereby bringing attention to missed acquisitions as a consequential yet previously neglected form of failure and competitive phenomenon. Second, we respond to calls for investigating the behavioral implications of unconsummated deals by building on our concept of missed acquisitions (Welch et al., 2020), which complements previous acquisition research that has predominantly focused on the financial implications of such unsuccessful acquisition attempts (e.g., Jacobsen, 2014; Savor & Lu, 2009). Finally, we contribute to the behavioral theory of the firm (Cyert & March, 1963; Gavetti et al., 2012) and related work on behavioral decision-making (Dye et al., 2014; Klingebiel, 2018). In particular, we identify an important boundary condition for behavioral

responses following acquisition outcomes. Prior research implicitly assumes that feedback associated with firm-external evaluations and firm-internal goal attainment necessarily aligns and points in the same direction. We relax this assumption by theorizing that firms may face divergent or mixed feedback. By accounting for stock market reactions as salient, publicly observable external evaluations that decision makers attend to when reflecting on their prior acquisition decisions and outcomes (DesJardine & Bansal, 2019; Gamache & McNamara, 2019; Kim et al., 2015), our study clarifies in a nuanced way when experiences of success and failure strengthen or constrain subsequent investment behavior in the aftermath of competitive bidding situations.

4.2 Theoretical background and hypotheses

4.2.1 Missing out as a distinct failure experience in corporate acquisitions

Conceptually, missing out on leveraging a strategic opportunity – a specific yet often neglected type of failure – is at the heart of this paper. A focal firm experiences missing out when three conditions apply. First, another firm, rather than the focal firm, must exploit the strategic opportunity of interest (Klingebiel et al., 2022). Second, missing out requires that the focal firm had actively considered the respective opportunity before eventually missing out (Klingebiel, 2018). That is, the opportunity must have been part of the focal firm's decision space. Feelings of missing out will be less salient, or may not arise at all, if the focal firm was unaware of the opportunity in the first place and thus lacked conscious decision-making agency over it. Lastly, the focal firm must regard the missed opportunity as principally attractive or desirable (e.g., Dickson & Giglierano, 1986). When this is the case, the focal firm is more likely to perceive another firm's preemptive exploitation of the opportunity as a loss of a desirable reward (Wadhwa & Kim, 2015). In short, a focal firm experiences missing out when another firm leverages an attractive or desirable strategic opportunity that the focal firm had deliberately considered but ultimately did not, or could not, exploit itself. In the following, we posit that

competitive acquisitions involving at least two public bidders for a coveted target firm provide a suitable context for exploring the phenomenon of missing out.

The acquisition process consists of a pre-deal phase and the eventual consummation of the deal (Welch et al., 2020). The pre-deal phase can be further subdivided into a private and a public stage (Boone & Mulherin, 2007). During the private stage, approximately half of the selling firms negotiate with multiple bidders, demonstrating early competition. However, competition among multiple bidders can also be present during the public stage (this paper's focus), where it becomes highly visible. The public stage begins when one bidder publicly announces its intent to acquire a coveted target, thereby revealing its active consideration of the strategic opportunity. However, observing the public bid, other interested acquirers may enter the bidding competition (e.g., Fishman, 1989). Bidders' desire to complete the deal is very strong after publicly announcing their intent to acquire. That is, acquiring the coveted target through deal completion becomes their primary goal, and falling short of that goal equals failure (Muehlfeld et al., 2012). Likewise, bidders feel more committed to acquire a target if the decision context is public and involves competing bidders, which confirms managers' initial belief that the target is indeed valuable and desirable (Haunschild et al., 1994). The public stage of the pre-deal phase ends on the date of deal consummation. Since the consummation date reveals the bidder who ultimately closed the deal, as well as the bidder(s) who did not (and missed out), competitive success and failure are clearly visible to the public. In other words, firms that do not close the deal experience failure in the form of a missed acquisition. That is, a competing bidder successfully leverages a strategic opportunity the focal firm deliberately considered and coveted, but did not, or could not, exploit itself.

Of course, a missed acquisition implies abandonment of a focal deal at some point during the acquisition process (synonymous terms are deal termination or withdrawal from a deal). Abandoning a focal deal has different reasons (Jacobsen, 2014), which, for example, differ regarding locus (reasons external or internal to the firm) and controllability (reasons

controllable or uncontrollable by the firm) (Xing & Yi, 2024). A potential acquirer that abandons a focal deal because of price-related reasons, i.e., by being outbid and refusing to increase the offer, has internal control over its abandonment decision. Conversely, changes in market and economic conditions, regulatory aspects, or reasons on the target's side (e.g., rejection by the target's board, a decision for another offer, or a breach of contract) are external and uncontrollable. Regardless of the underlying reason, the ultimate outcome of the deal remains the same. The focal firm is unable to fulfill its strategic goal of acquiring the coveted target and eventually misses out, as a competing bidder closes the deal and realizes acquisition-related benefits. However, we still know little about how unsuccessful and successful bidders behave in the aftermath of competitive bidding.

4.2.2 The effect of missed acquisitions on subsequent acquisition spending

The distinction between success and failure has been central to the behavioral theory of the firm (Cyert & March, 1963; Gavetti et al., 2012). Organizational entities interpret and code outcomes as successes or failures depending on whether they meet or fall short of predetermined subjective goals or levels of aspiration (e.g., Starbuck, 1963). In general, individuals and organizations alike are motivated to replicate behaviors or decisions that led to success (i.e., attainment of a goal) and to avoid those that led to failure (i.e., non-attainment of a goal) (Denrell & March, 2001). Thorndike's (1911) original law of effect states that if an entity experiences success in a specific situation, it will associate the behaviors or decisions that led to success with pleasurable or satisfying consequences. If an entity experiences failure instead, it will associate the underlying behaviors or decisions with aversive or painful consequences. In other words, success will foster repetition, while failure will motivate change.

Accordingly, prior literature in the tradition of the behavioral theory of the firm argues that experiencing success reduces the intensity of search for alternative options or actions, while experiencing failure increases it (Levinthal & March, 1993). On the one hand, firms that

experience success become unwilling to change their routines and complacent, even when the actual status quo might be inferior to other potential alternatives (e.g., Audia et al., 2000; Miller, 1994). On the other hand, firms that experience a specific type of failure are highly motivated to change their decision-making behavior in a way that reduces the risk of re-experiencing said failure in similar future situations (Dye et al., 2014; Klingebiel, 2018; Klingebiel et al., 2022). Thus, organizations that missed out will search for suitable alternatives that help to reduce the risk of missing out again at the next possible occasion (Klingebiel, 2018), likely leading to a different behavioral response than that of successful bidders.

Drawing on these behavioral insights, we posit that missing out on completing a deal (as opposed to completing it) influences subsequent acquisition behavior among competing bidders in distinct ways. In particular, we follow previous research and investigate bidders' subsequent acquisition spending in the year following a focal deal as a suitable behavioral response, as it directly reflects the willingness or motivation to pursue further acquisitions and the aggressiveness with which they are pursued (Gamache & McNamara, 2019).

Organizational entities view a missed acquisition as a failure because they do not attain their goal of acquiring the intended and desired target (e.g., Muehlfeld et al., 2012). Firms that missed out will take measures to reduce the risk of missing out again, driven by their strong principal motivation to prevent similar failures in the near future (Dye et al., 2014; Klingebiel, 2018). Consequently, we argue that such firms will spend more on subsequent acquisitions than successful bidders for several reasons. First, missed acquisitions imply ceding initially intended acquisition-related benefits to rival bidders, leaving the principal strategic need to realize those benefits unfulfilled. In contrast to firms that close deals, bidders who miss out will search more intensively for acquisition targets to address their yet unfulfilled strategic needs. Indeed, firms that are desperate to realize acquisition-related benefits, such as growth, have been shown to overpay for acquisitions (Kim et al., 2011). Second, and relatedly, missed acquisitions likely create a heightened sense of urgency, prompting unsuccessful bidders to take more immediate

action than successful ones. For example, innovation research shows that after missing out on eventually successful innovations, firms are more likely to roll out innovations simultaneously across multiple markets rather than sequencing rollouts, preferring immediacy over caution (Klingebiel et al., 2022). Similarly, experiencing failure shortens organizational time horizons, leading firms to search for quick solutions to identified problems in a time-efficient manner (DesJardine & Bansal, 2019). Firms that seek to complete prospective acquisitions more quickly, however, also tend to overspend (Pavićević & Keil, 2021). Third, previous research suggests that missing out will push affected firms to lower the critical decision threshold they use to evaluate acquisition opportunities during the search process (Dye et al., 2014; Garud et al., 1997). In an effort to reduce the risk of missing out again, loosening evaluation stringency encourages heightened pursuit, as a higher number of prospective acquisition targets becomes acceptable to the focal firm, thereby increasing the risk of pursuing potentially value-destroying acquisitions (e.g., through overpayment). Therefore, firms that missed out on a focal deal may be more likely to pursue additional acquisition opportunities or be willing to pay higher prices than their successful counterparts (at least in the short-term following a competitive bidding situation). Lastly, firms usually expend significant organizational resources to prepare for and complete an acquisition (Haspeslagh & Jemison, 1991). As the acquisition does not materialize, however, unsuccessful bidders can use unspent cash and freed-up resources more quickly to pursue new acquisition targets. For all these reasons, we hypothesize:

> **Hypothesis 1 (H1):** *Subsequent acquisition spending will be higher for firms that missed out on deal completion in competitive bidding situations than for firms that completed a deal.*

4.2.3 The moderating effect of stock market reactions

Prior literature on behavioral decision-making suggests that managers consider the opinions of external stakeholders when reflecting on past strategic decisions and determining their next moves, particularly when such stakeholders control firms' access to important resources and

can exert public pressure (e.g., Dye et al., 2014). Here, we focus on stock market reactions to announced acquisition events, reflecting external evaluations of said events by influential stakeholders. Stock market reactions represent the collective response of individual investors to new information regarding an acquisition event and thus an aggregated opinion that can significantly influence a firm's financial performance, access to capital, and public perception.

In this context, abnormal stock returns effectively capture the stock market's reaction to an event that carries new informational content (e.g., Sorescu et al., 2017). An abnormal return is the difference between the observed return and the return expected in the absence of the focal event (predicted by a benchmark asset pricing model). According to the semi-strong form of market efficiency, stock prices adjust immediately to new information, as investors revise their expectations of the focal firm's future cash flows (Fama, 1970). Thus, the change in stock price reflects the expected value – positive or negative – that the firm will derive from the announced event. However, suppose investors had already formed some expectations around the occurrence of a focal event (Warren & Sorescu, 2016). In that case, the corresponding stock market reactions should be interpreted as adjustments or updates to investors' existing expectations regarding a firm's future performance (Sorescu et al., 2017). In prior acquisition research, the sum of abnormal returns over a pre-specified event window, i.e., cumulative abnormal returns (CARs), is a prevalent performance measure (e.g., Haleblian et al., 2009). Strategic decision-makers rely on external performance evaluations, such as CARs, to inform their future acquisition behavior (e.g., Gamache & McNamara, 2019; Haleblian et al., 2006). Accordingly, we argue that stock market reactions to deal abandonment and completion announcements in competitive bidding shape firms' subsequent behavioral responses.

Stock market reactions to an abandonment or completion announcement can be positive or negative, rendering four scenarios possible based on the combination of the underlying acquisition decision and the stock market's post-hoc evaluation of it. Drawing from signal detection theory (Green & Swets, 1966), previous literature differentiates between positive hits,

negative hits, false positives, and false negatives (e.g., Dye et al., 2014; Garud et al., 1997). In this context, positive hits and negative hits constitute "good" decision outcomes. A positive hit refers to a correct pursuit decision, and a negative hit to a correct abandonment decision. Organizational entities view both decision outcomes as evidence of successful decision-making. Conversely, false positives and false negatives represent "bad" decision outcomes. A false positive reflects an erroneous pursuit decision (i.e., an error of commission) and a false negative an erroneous abandonment decision (i.e., an error of omission). Organizational entities view both as evidence of incorrect decision-making and salient manifestations of decision failure (Klingebiel, 2018; Klingebiel et al., 2022).

Transferring this logic to an acquisition context, we argue that stock market reactions provide external evaluative feedback about whether acquisition decisions and associated outcomes are perceived as value-enhancing or value-destroying, thereby influencing perceptions of success and failure. An abandonment decision that receives a positive stock market reaction indicates that investors expect that deal completion would have harmed the bidder (Liu & McConnell, 2015; Tang, 2015), thus constituting a negative hit. On the other hand, an abandonment decision receiving a negative stock market reaction implies that investors believe deal completion would have created value for the bidder, thus representing a false negative (i.e., an error of omission). On the side of pursuit, we interpret positive and negative stock market reactions analogously. A positive stock market reaction implies that deal completion creates value for the bidder and, accordingly, represents a positive hit. In contrast, an adverse stock market reaction indicates the opposite, reflecting a false positive (i.e., an error of commission). As mentioned previously, bidders will closely monitor external evaluations, i.e., the stock market's assessment of their acquisition decisions and associated outcomes, to inform their future acquisition behavior.

Consistent with behavioral accounts of decision-making, we argue that firms will repeat acquisition decisions that have received favorable feedback and avoid those that have received

unfavorable feedback (e.g., Denrell & March, 2001). Firms will associate positive stock market reactions (positive CARs) with pleasurable consequences and negative stock market reactions (negative CARs) with aversive consequences (e.g., Thorndike, 1911). Consequently, positive stock market reactions to an abandonment decision or a pursuit decision leading to completion will increase the likelihood of making the same decision again when an acquisition situation is re-encountered. Negative stock market reactions, in contrast, will increase the likelihood of making the opposite decision and changing behavior, thereby effectively counteracting a re-emergence of recent errors of omission or commission, respectively (Klingebiel, 2018). Overall, a positive stock market reaction to having missed out in a competitive bidding situation (negative hit) should dampen feelings of failure, whereas a negative stock market reaction (false negative or error of omission) should strengthen them. A positive stock market reaction to deal completion (positive hit) should further enhance feelings of success, while a negative one (false positive or error of commission) should decrease them.

In general, positive stock market reactions should increase firms' confidence that they have the capabilities and knowledge to make prudent acquisition decisions (Haleblian et al., 2006; Zollo, 2009). When completion decisions are positively evaluated, firms may be inclined to build momentum and maintain their acquisition activity through pursuit (Amburgey & Miner, 1992). For example, if positive stock market reactions accumulate over the years – especially strong ones – corresponding firms will pay higher acquisition premiums for a focal target to ensure completion (Gong et al., 2019). On the other hand, a positive evaluation of abandonment may cause organizational entities to feel a sense of relief, as a potentially harmful acquisition did not take place (Pickering, 1983), thus weakening the feeling of having missed out. Since acquisitions are significant events subject to public scrutiny, strategic decision-makers should be aware of the fact that they have just averted potential harm to their firm and may be inclined to extract valuable information from the abandoned deal (Dillon et al., 2016). Thus, they could see virtue in proceeding slowly and with greater caution (Campbell et al., 2022), rather than

with urgency and taking immediate action in the pursuit of subsequent acquisitions. Under this logic, positive market reactions should reduce differences in subsequent acquisition spending between firms that missed out and those that completed acquisitions.

In the domain of negative market reactions, we expect the opposite. By abandoning a potentially value-enhancing acquisition in the eyes of investors, organizational decision-makers believe they committed an error of omission, which further amplifies the negative feeling of having missed out. In an effort to rectify the omission error, firms will shift their relative risk preference towards pursuit (Klingebiel, 2018). Consequently, they will commit more to subsequent acquisition opportunities in the near term, thereby increasing their acquisition spending. In contrast, the pursuit of a value-destroying acquisition will hamper subsequent acquisition spending, as firms will refrain from taking the risk of making additional erroneous pursuit decisions, shifting their relative risk preference towards heightened caution and omission. Indeed, lower acquisition performance reduces the likelihood of making a subsequent acquisition (Haleblian et al., 2006). Therefore, the difference in subsequent acquisition spending between firms that missed out and those that completed acquisitions should be larger in the domain of negative CARs than in the domain of positive CARs (i.e., decrease with increasing CARs). Overall, we expect a weakening of the differential main effect (negative moderation) and hypothesize:

> **Hypothesis 2 (H2):** *Stock market reactions negatively moderate the differential main effect of focal deal outcome (i.e., a missed vs. completed acquisition) on subsequent acquisition spending, such that the difference in subsequent acquisition spending becomes smaller as cumulative abnormal returns increase.*

4.3 Methodology

4.3.1 Sample construction

We extracted global acquisition data involving multiple bidders from the Securities Data Corporation Platinum database (provided by the London Stock Exchange Group), covering the

period from 2000 to 2022. To ensure the strategic relevance of those deals, we applied screening criteria consistent with previous acquisition research. First, we focused on public acquirers, as they are more likely to engage in high-stakes acquisition deals that are significant to their long-term strategic positioning (Haleblian et al., 2009). Moreover, public firms are subject to greater regulatory scrutiny and disclosure requirements, enhancing data availability and reliability (Faccio et al., 2006; Officer, 2007). Second, we imposed a minimum deal value threshold of $50 million to capture economically and strategically meaningful acquisitions (Officer, 2007; Pavićević & Keil, 2021). Third, we restricted the sample to acquisitions resulting in a post-deal ownership stake exceeding 50%, ensuring that the focal transactions involved a clear transfer of control (Desyllas & Hughes, 2010). In addition, we excluded minority investments, buybacks, exchange offers, recapitalizations, asset acquisitions, divestitures, and spin-offs, as these transactions do not involve competitive bidding for corporate control or a comparable objective of acquiring a target firm (e.g., Haspeslagh & Jemison, 1991). Finally, we excluded deals in the financial, real estate, and government sectors, where acquisition activity is often driven primarily by regulatory or financial considerations rather than strategic motives (Haspeslagh & Jemison, 1991; Capron & Mitchell, 2009).

Applying these criteria resulted in 678 acquisition announcements. We then excluded acquisitions in which no prospective acquirer completed the deal, reducing the sample to 548. We further excluded observations with missing relevant financial or stock price data, yielding 446 acquisition announcements made by 405 firms (294 unique deals), with a roughly balanced distribution of deal completions and abandonments. For each competing bidder of a focal deal, we manually extracted subsequent deal values (see also section 4.3.2).

4.3.2 Operationalization of main variables

Dependent variable. We measured *subsequent acquisition spending* as the total value of acquisitions announced within 365 days following the effective abandonment or completion

date of a focal deal (e.g., Gamache & McNamara, 2019). First, subsequent acquisition spending reflects a focal firm's willingness to pursue acquisitions, the number of deals it favors, its aggressiveness in completing deals, and the size of target firms (Gamache & McNamara, 2019), making it suitable for our study's purpose. Second, prior research emphasizes the disproportionate influence of recent experiences on decision-making (Dahlin et al., 2018; Madsen & Desai, 2024). Extending the time window beyond 365 days would likely introduce unrelated events and other experiences that the firm would pay attention to, confounding our hypothesized effects.

Independent and moderator variables. Our main independent variable, the *focal deal outcome*, was operationalized as a binary variable coded as 1 for a missed acquisition (i.e., an eventually abandoned deal) and 0 for a completed acquisition. To assess the external evaluation of the focal deal outcome and its associated acquisition decision, we used *stock market reactions*, measured by CARs around the eventual abandonment or completion date. CARs provide managers with hard and timely evaluative performance feedback (e.g., Haleblian & Finkelstein, 1999; Hayward, 2002). While CARs rely on the assumption of semi-strong market efficiency (Fama, 1970), they are widely used in acquisition research as indicators of quality or performance (Cording et al., 2010; Haunschild & Miner, 1997), and have been shown to correlate with long-term acquisition outcomes (Healy et al, 1992; Sirower, 1997).

We computed CARs using the *eventstudy2* package in *Stata* (Kaspereit, 2021), applying a three-day event window (–1 to +1) to reduce the risk of confounding events (Brown & Warner, 1985; Jong & Naumovska, 2016). Abnormal returns were calculated using the market model, based on a 255-day to 46-day pre-announcement estimation window to reduce the risk of information leakage (Wade et al., 2006). If an announcement occurred on a non-trading day, the event date was shifted to the next available trading day (e.g., Gong et al., 2019). Notably, we explicitly focused on abandonment or completion announcements to avoid methodological concerns associated with using CARs around the initial acquisition announcement. Stock

market reactions to initial announcements can causally influence whether a deal is abandoned or completed, creating endogeneity through simultaneity bias. Indeed, research has shown that stock market reactions influence the likelihood of deal completion (Cao et al., 2023), making abandonment-date or completion-date CARs the more appropriate measures for our purposes.

4.3.3 Operationalization of control variables

Consistent with prior acquisition research, we control for deal-level, firm-level, and industry-level factors that may influence subsequent acquisition spending. To account for macroeconomic conditions, we include year fixed effects based on the focal deal year. All covariates are based on the most recent data available prior to the focal deal announcement.

Deal-level controls. Our control variables at the deal level refer to the focal deal, which was either abandoned or completed. We operationalized *strategic relatedness* between the acquirer and target as a binary variable equal to 1 when the two firms share the same two-digit SIC code and 0 otherwise (Beckman & Haunschild, 2002). Losing or acquiring a target from the firm's core industry may have stronger implications for subsequent acquisition behavior than a strategically distant opportunity. We also included the *number of bidders* to account for variation in the intensity of competition across focal deals. While our analyses focus on competitive deals, the total number of bidders may introduce additional variation that could confound the estimated effects. Highly competitive deals may increase the risk of overpayment (Bessler et al., 2015), deplete financial resources (Boone & Mulherin, 2007), or heighten perceptions of strategic threat (Porac et al., 1989; Wu & Klingebiel, 2025). Including this covariate allows us to isolate the effect of deal outcome within competitive settings. Additionally, we control *hostile takeovers* coded as 1 if present and 0 otherwise (Gamache & McNamara, 2019), as they require heightened managerial and financial commitment, potentially constraining subsequent acquisition spending (Comment & Schwert, 1995; Golubov et al., 2012). *Foreign target* was also included as a binary variable, coded 1 for cross-border

acquisitions and 0 otherwise. This variable captures integration challenges, regulatory differences, and currency-related risks that may affect subsequent spending (Bertrand, 2009).

Firm-level controls. On the firm level, we control for *bidder size*, measured as total assets. Larger firms typically have greater financial resources and access to capital, enabling continued acquisition activity (Kim et al., 2011). *Bidder financial slack*, measured as total assets divided by total liabilities, reflects the flexibility to fund additional deals (Hayward & Hambrick, 1997). *Bidder performance*, approximated through return on assets (ROA), indicates a firm's financial health and capacity to pursue acquisitions (Haleblian et al., 2009). *Bidder capital expenditures* (CapEx) are included to account for firms that may prioritize internal investments over external growth through acquisitions (Laamanen, 2007). To isolate the influence of prior experience, we control for *bidder completion experience*, i.e., the number of previously completed acquisitions, and *bidder abandonment experience*, i.e., the number of previously abandoned deals, in the last 10 years prior to the focal deal (Cuypers et al., 2017; Reuer et al., 2012). We include *target size*, measured as total assets, since larger deals require greater financial commitments, potentially reducing bidders' ability to engage in future acquisitions (Kim et al., 2011). *Target financial slack*, measured as total assets divided by total liabilities, is also included, as a financially flexible target may contribute internal resources that support post-deal growth (Hayward & Hambrick, 1997). *Target performance* (i.e., ROA) reflects the target's financial health and potential to enhance bidders' post-acquisition position (Beckman & Haunschild, 2002).

Industry-level control. Lastly, we control for *industry acquisition activity*, measured as the total number of large acquisitions in the acquirer's industry in the year prior to the focal deal announcement (McNamara et al., 2008; Haleblian et al., 2012). We display descriptive statistics and bivariate correlations in Table 10 below.

Table 10: Descriptive statistics and bivariate correlations

Variables	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) Subsequent acquisition spending	825.83	2,640.98	1.000																
(2) Focal deal outcome	0.53	0.50	0.032	1.000															
(3) Stock market reaction	–0.97%	7.23%	–0.014	–0.004	1.000														
(4) Strategic relatedness	0.70	0.46	–0.039	0.006	0.012	1.000													
(5) Number of bidders	2.20	0.52	0.029	0.108	0.036	0.097 *	1.000												
(6) Hostile takeover	0.07	0.25	0.060	0.081	0.023	0.068	–0.005	1.000											
(7) Foreign target	0.39	0.50	0.128 **	–0.011	–0.026	–0.050	–0.029	–0.009	1.000										
(8) Bidder size	32,219.49	374,345.80	0.350 **	–0.131 **	0.047	–0.046	–0.013	0.002	0.232 **	1.000									
(9) Target size	2,646.20	7,571.91	0.091 *	0.007	0.065	0.036	0.103 *	0.064	0.016	0.528 **	1.000								
(10) Bidder financial slack	3.02	3.84	–0.126 **	0.031	–0.037	0.079	–0.077	–0.014	0.011	–0.411 **	–0.328 **	1.000							
(11) Target financial slack	11.20	115.75	–0.012	–0.023	–0.046	–0.014	–0.051	–0.057	0.016	–0.219 **	–0.406 **	0.290 **	1.000						

(12)	Bidder performance	0.05	0.13	0.085 *	–0.109 *	0.034	–0.024	–0.081	0.023	0.093 *	0.164 **	0.131 **	0.063	–0.040	1.000					
(13)	Target performance	–0.05	0.31	0.038	–0.013	0.086	0.016	–0.022	0.044	0.033	0.049	0.280 **	–0.107 *	–0.029	0.188 **	1.000				
(14)	Bidder CapEx	1,387.99	14,436.50	0.248 **	–0.103 *	–0.002	–0.013	0.083	0.023	0.141 **	0.720 **	0.370 **	–0.337 **	–0.100 *	0.122 **	0.060	1.000			
(15)	Bidder completion experience	11.41	14.77	0.298 **	–0.118 **	0.007	–0.032	–0.015	–0.016	0.180 **	0.546 **	0.187 **	–0.245 **	–0.170 **	0.096 *	0.064	0.342 **	1.000		
(16)	Bidder abandonment experience	0.53	0.96	0.100 *	–0.063	–0.006	0.052	0.084 *	0.020	0.088 *	0.255 **	0.105 *	–0.095 *	–0.048	–0.015	0.056	0.186 **	0.314 **	1.000	
(17)	Industry acquisition activity	65.75	57.10	0.017	0.042	–0.042	0.218 **	–0.136 **	–0.078	–0.016	–0.075	–0.150 **	0.107 *	0.014	–0.010	–0.061	–0.151 **	0.139 **	0.015	1.000

Note: Means and standard deviations are based on untransformed variables. Stock market reactions (CARs) are winsorized at the upper and lower tails to account for methodological outliers. Correlations are based on variables as entered in the regression models. Pairwise sample sizes range from 501 to 548 due to missing data. Subsequent acquisition spending = the total value of acquisitions (USD millions) announced within 365 days after the effective abandonment or completion date. Focal deal outcome: 1 = missed acquisition, 0 = completed acquisition. Stock market reaction = cumulative abnormal returns around abandonment or completion announcement. Strategic relatedness: 1 = acquirer and target share the same two-digit SIC code, 0 = otherwise. Number of bidders = count of all bidders in a deal. Hostile takeover: 1 = present, 0 = otherwise. Foreign target: 1 = cross-border deal, 0 = otherwise. Bidder size = total assets of bidding firm (USD millions). Target size = total assets of target firm (USD millions). Bidder financial slack = total assets/total liabilities (of bidding firm). Target financial slack = total assets/total liabilities (of target firm). Bidder performance = bidding firm's return on assets (ROA). Target performance = target firm's return on assets (ROA). Bidder CapEx = capital expenditures of bidding firm (USD millions). Bidder completion experience = total number of deals bidder has completed over the last ten years. Bidder abandonment experience = total number of deals bidder has abandoned over the last ten years. Industry acquisition activity = total number of large acquisitions in a bidder's industry in the previous year.
** = $p < .01$; * $p < .05$.

4.4 Data analysis and results

4.4.1 Data transformation

Given the distributional characteristics of several variables, we applied variable-specific transformations. The natural logarithm was used to transform positive continuous variables. Specifically, we applied the ln (x + 1) transformation to firm size and CapEx. We used the inverse hyperbolic sine (IHS) transformation for variables with many zero, small, or negative values (including subsequent acquisition spending, CARs, and covariates capturing financial slack and performance). The IHS transformation is more flexible than the logarithmic transformation in accommodating frequent zero and negative values and is, therefore, better suited for such financial data (Bellemare & Wichman, 2020). For count variables, we employed a square-root transformation, including the number of bidders, bidders' completion experience, bidders' abandonment experience, and industry acquisition activity. To reduce the influence of extreme values and methodological outliers, we winsorized continuous variables at the 5th and 95th percentiles (Ellahie et al., 2025; Kennedy et al., 1992). For subsequent acquisition spending, we winsorized only the upper tail of the distribution, as the lower tail, including zero values, represents meaningful observations rather than outliers. CARs were mean-centered prior to constructing interaction terms to reduce non-essential multicollinearity (Cortina, 1993).

4.4.2 Model estimation

We estimated ordinary least squares (OLS) regressions with standard errors clustered by acquirer to account for repeated firm-level observations (Carnahan et al., 2017). The IHS-transformed dependent variable allows for linear estimation, as the transformation accommodates zero and negative values, thus reducing the need for censored regression models (Bellemare & Wichman, 2020). However, results remain robust using a Tobit specification (Gamache & McNamara, 2019), which would otherwise address censoring directly.

Variance inflation factors (VIFs) were all below 5, indicating a low risk of type II errors due to inflated standard errors. However, because VIFs may understate the risk of Type I errors, we also examined the bivariate correlations between our main independent variable, i.e., focal deal outcome, and each covariate (Kalnins & Hill, 2025). All correlations were below the conventional 0.3 threshold value (Table 10). As such, we conclude that multicollinearity-induced bias is unlikely.

To account for potential nonlinear effects, we included quadratic terms alongside the linear interaction in one of our models below. Omitting quadratic terms can distort interaction effects and inflate error rates (Cortina, 1993; Ganzach, 1998). Following Kalnins (2024), we estimate models with and without quadratic terms, report both models, and compare the results.

4.4.3 Main results

Table 11 below reports our main results from OLS regression. Model 1 includes only direct effects, Model 2 adds a linear interaction term between the focal deal outcome and stock market reactions, and Model 3 adds quadratic terms for stock market reactions to estimate additional direct and interaction effects (Kalnins, 2024). Model 1 (β = 0.928; SE = 0.316; p = .004) and Model 2 (β = 0.918; SE = 0.315; p = .004) show that the outcome of the focal deal significantly influences subsequent acquisition spending in the expected direction, thereby supporting H1. Thus, firms that missed out on acquiring a coveted target spend more on subsequent acquisitions than those that completed a deal.

Model 2 indicates that stock market reactions moderate the relationship between focal deal outcome and subsequent acquisition spending, as evidenced by a significant linear interaction effect (β = –12.331; SE = 4.799; p = .011). Moreover, the interaction effect with stock market reaction squared in Model 3 remains statistically significant and of the same sign as the linear interaction effect (β = –102.446; SE = 45.500; p = .025), indicating that the moderation is robust and not an artifact of model specification (Kalnins, 2024).

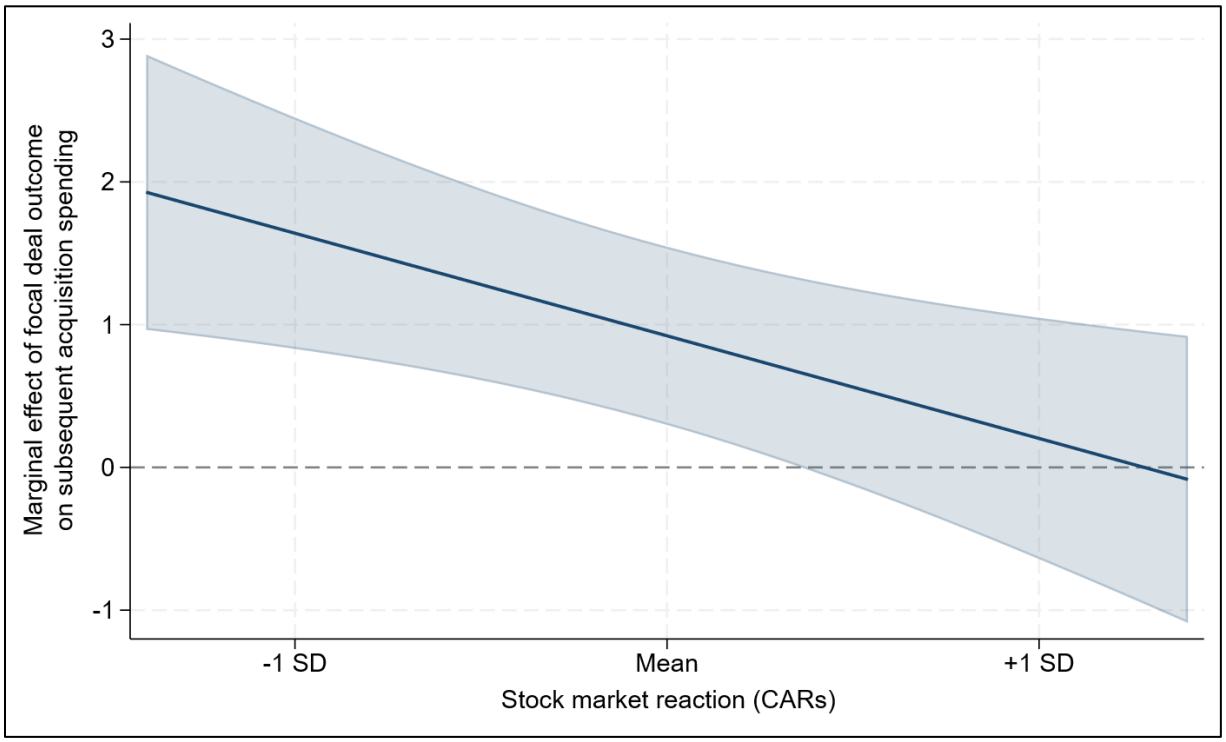
Table 11: Results of OLS regression

DV: Subsequent acquisition spending	Model 1				Model 2				Model 3			
	ß		SE	p-value	ß		SE	p-value	ß		SE	p-value
Control variables												
Acquisition relatedness	–0.282		0.348	.418	–0.232		0.348	.505	–0.176		0.347	.612
Number of bidders	1.844	†	0.999	.066	1.727	†	1.000	.085	1.865	†	0.991	.061
Hostile takeover	0.491		0.696	.481	0.440		0.706	.533	0.499		0.713	.484
Foreign target	0.095		0.363	.793	0.089		0.362	.807	0.049		0.360	.891
Bidder size	0.717	**	0.147	.000	0.712	**	0.146	.000	0.699	**	0.149	.000
Target size	–0.139		0.129	.283	–0.138		0.129	.287	–0.145		0.129	.259
Bidder financial slack	0.283		0.351	.421	0.297		0.355	.404	0.326		0.347	.348
Target financial slack	0.294		0.242	.225	0.261		0.242	.282	0.263		0.242	.277
Bidder performance	–0.017		1.475	.991	0.061		1.469	.967	0.334		1.481	.822
Target performance	–0.438		0.920	.635	–0.510		0.961	.596	–0.408		0.942	.665
Bidder capital expenditures (CapEx)	–0.007		0.095	.939	–0.003		0.095	.978	0.003		0.095	.975
Bidder completion experience	0.274	*	0.128	.033	0.273	*	0.127	.033	0.258	*	0.128	.044
Bidder abandonment experience	–0.194		0.304	.523	–0.238		0.303	.433	–0.231		0.303	.445
Industry acquisition activity	0.009		0.053	.864	0.005		0.052	.930	0.010		0.052	.853
Main direct effects												
Focal deal outcome	0.928	**	0.316	.004	0.918	**	0.315	.004	1.240	**	0.368	.001
Stock market reaction	–1.495		2.504	.551	6.094	†	3.610	.092	7.730	*	3.539	.030
Stock market reaction^2									41.021		35.731	.252
Interaction effects												
Focal deal outcome × Stock market reaction					–12.331	*	4.799	.011	–15.114	**	4.711	.001
Focal deal outcome × Stock market reaction^2									–102.446	*	45.500	.025
Constant	–6.414	**	2.030	.002	–6.210	**	2.041	.002	–6.330	**	2.045	.002
R^2	0.237				0.246				0.254			

Note: n = 446 acquisition announcements. Unstandardized coefficients are reported. Focal deal outcome: 1 = missed acquisition, 0 = completed acquisition. Standard errors are clustered by bidder. Year dummy variables included but not reported.
** = p < .01; * = p < .05; † = p < .10.

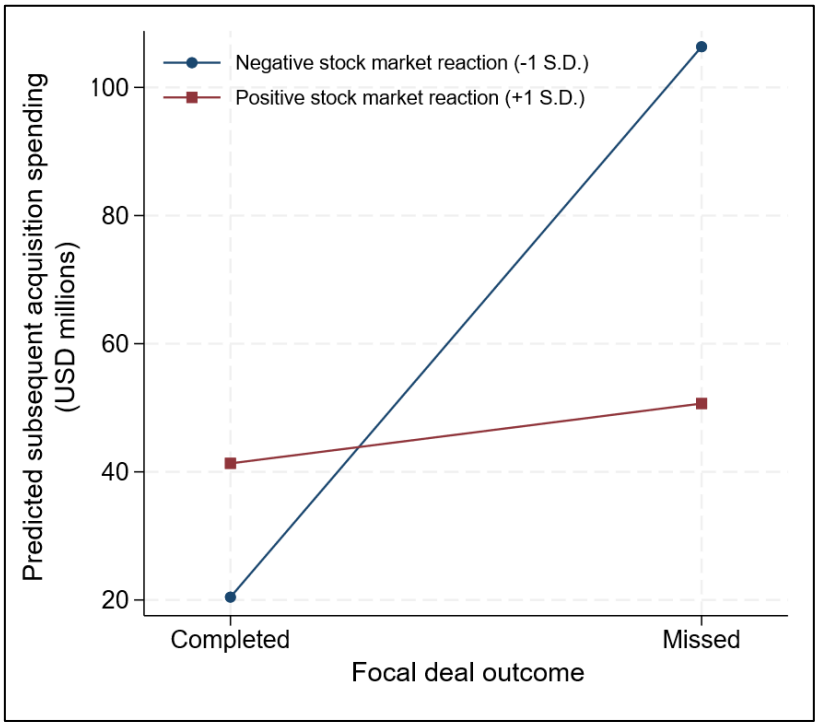
To aid interpretation, we first visualize the moderation using average marginal effects (Figure 4). The corresponding plot shows that the positive main effect of focal deal outcome on subsequent acquisition spending indeed weakens as stock market reactions become more favorable. At higher levels of stock market reactions, the effect becomes statistically insignificant, as 95% confidence intervals include 0. Second, a visualization of predicted values after retransformation into millions of USD unsurprisingly reveals a similar pattern (Figure 5). The visualization shows that the spending difference between completed and missed acquisitions is much larger in the domain of negative stock market reactions than in the domain of positive stock market reactions. Taken together, our results show that more favorable stock market reactions decrease the positive effect of missed acquisitions (relative to completed acquisitions) on subsequent acquisition spending, thereby confirming H2.

Figure 4: Average marginal effects of focal deal outcome



Note: Focal deal outcome is a binary variable, coded 1 for a missed acquisition (i.e., an eventually abandoned deal) and 0 for a completed acquisition.

Figure 5: Predicted values of subsequent acquisition spending



4.4.4 Additional analyses

To strengthen causal inference, we conducted propensity score matching (PSM) to address potential selection bias in our main independent variable (focal deal outcome) and to reduce concerns about systematic differences between firms that abandoned versus completed focal deals. Following Li (2013), we implemented 1:1 nearest-neighbor matching with a caliper of 0.05 based on the logit of the propensity score. The matching model included firm- and deal-level covariates, year fixed effects, and the linear and squared terms of stock market reactions at the initial announcement date. We used initial announcement CARs because they reflect market expectations at the time the bid becomes public, which may influence whether a deal is eventually completed or abandoned. Matching substantially improved covariate balance, i.e., the mean standardized bias declined from 12.4% to 7.1%, the Rubin B-statistic decreased from 57.0 to 32.2, and the Rubin R-ratio equaled 1.00, all indicating acceptable balance (Li, 2013). All treated and control observations fell within the region of common support. The estimated average treatment effect on the treated (ATT) was 1.21 (SE = 0.45; $p < .01$), indicating that

firms that missed a deal subsequently engaged in significantly higher acquisition spending than comparable firms that completed a deal.

Our primary analyses include all announced acquisitions within a 365-day window following the respective abandonment or completion announcement, capturing firms' acquisition intent and behavior regardless of whether these transactions are ultimately completed. To assess whether the results also hold when focusing only on consummated deals, we conducted a robustness check restricting the sample to announced acquisitions that were eventually completed. Because deal completion often occurs well after announcement, we did not restrict the timing of completion, i.e., the respective deals were only required to have been announced within the same 365-day window, regardless of the eventual completion date. Results remained consistent in magnitude and statistical significance (see Appendix E).

4.5 Discussion

In this study, we examine public firms' acquisition-related behavior in the aftermath of competitive bidding for prospective target firms. We differentiate between unsuccessful bidders (i.e., those unable to consummate a focal deal through eventual abandonment) and successful ones (i.e., those who complete a focal deal) to introduce the concept of a missed acquisition. We conceptualize a missed acquisition as a salient yet specific failure experience in which a bidder falls short of its intended goal of acquiring a coveted target because another bidder completes the deal. Missing out leaves a bidder's strategic need unfulfilled and implies ceding initially intended acquisition-related benefits to a rival bidder. Therefore, a missed acquisition differs from generic deal abandonment in single-bidder situations because only multiple-bidder situations evoke profound feelings of having lost in the competition for a desired and valuable target (Haunschild et al., 1994).

Using a global sample of 446 observations from 2000 to 2022, our study examines firms' acquisition spending during a 365-day window following a competitive public bidding

situation. Our analysis of the data reveals two central findings. First, firms that miss out spend more on subsequent acquisitions than those that successfully complete competitive deals. Second, stock market reactions to abandonment or completion announcements, as measured by CARs, moderate the observed effect. Specifically, the differential main effect on subsequent acquisition spending weakens as stock market reactions become more favorable. Additional analyses and robustness checks lend further credibility to our results.

Overall, our findings suggest that firms' post-deal acquisition behavior reflects not only whether a focal deal is completed or abandoned, but also how influential external stakeholders evaluate the deal outcome (and the underlying decision leading to it). When stock market reactions are more favorable, the difference in subsequent acquisition spending between missed and completed deals diminishes. This pattern suggests that positive external evaluations following deal abandonment reduce feelings of having missed out and perceptions of failure, even though the original internal goal of completing the deal was not achieved. Conversely, when stock market reactions are less favorable, firms that miss out exhibit stronger subsequent acquisition activity relative to firms that complete the deal.

4.5.1 Theoretical implications

Our study contributes to acquisition research and research in the tradition of the behavioral theory of the firm. First, we adopt a granular perspective on competitive bidding in the market for corporate control, as we explicitly differentiate between winners and losers in bidding for a specific target, enabling us to introduce the previously neglected phenomenon of a missed acquisition. Notably, prior research has already investigated situations of latent competition (e.g., Aktas et al., 2010; Testoni, 2024), as well as competition during the private (e.g., Boone & Mulherin, 2007) and public stage of the acquisition process (e.g., Gong et al., 2019; Muehlfeld et al., 2012). Latent bidding competition refers to a situation in which a prospective acquirer anticipates the presence of other potential acquirers but remains the sole bidder. During

the private stage of the acquisition process, competing bidders are often present, yet remain anonymous due to confidentiality agreements (Boone & Mulherin, 2009). Therefore, both situations preclude an empirical investigation of missed acquisitions, as competing bidders remain either latent or undisclosed. Although this is not the case in public bidding competitions, previous acquisition research in this domain tends to model competition by merely controlling for the number of bidders or the presence of a contested bid at the deal level (e.g., Gong et al., 2019; Jacobsen, 2014). In contrast, we take a granular perspective, zoom in on deals with multiple bidders, and clearly distinguish between winners and losers in the race for coveted targets. This approach enables us to investigate missed acquisitions, which, to date, have proven to be elusive competitive phenomena in prior acquisition research.

Second, we answer calls for research on the behavioral implications of abandoned deals (e.g., Welch et al., 2020). Previous acquisition research has almost exclusively focused on the financial implications of such unconsummated deals for bidders (e.g., Jacobsen, 2014; Savor & Lu, 2009; Tang, 2015; Xing & Yi, 2024) and for targets not acquired (e.g., Boubakri et al., 2010; Fabozzi et al., 1988; Malmendier et al., 2016). Building on our concept of a missed acquisition, we show that abandoned deals in competitive bidding situations have strong behavioral implications. Compared with completing a contested deal, missing out on a desired target leads firms to spend more on subsequent acquisitions. Although success has been shown to generate momentum and increase the likelihood of engaging in subsequent deals (Amburgey & Miner, 1992; Haleblian et al., 2006), missing out can also drive urgent strategic action and potentially spark momentum. This observation runs counter to previous research, which has shown that firms act more cautiously after unconsummated deals, for example, by increasing the time between acquisition bids or focusing on smaller targets (Campbell et al., 2022). Such research, however, does not explicitly account for multiple-bidder situations or head-to-head bidding competition. Therefore, ceding control of a desired target to another bidder in a competitive bidding situation seems fundamentally different from being unable to close a deal

as a sole bidder, at least from a behavioral perspective. Indeed, firms that miss out see themselves as losers in the competition for a desirable target (Haunschild et al., 1994), which prompts them to prefer swift countermeasures to rectify the failure experience over caution.

Third, we contribute to research in the tradition of the behavioral theory of the firm (Cyert & March, 1963; Gavetti et al., 2012) and behavioral decision-making (e.g., Dye et al., 2014; Klingebiel, 2018). We show that bidders' behavioral responses depend on whether the stock market evaluates their most recent acquisition decisions and associated outcomes positively or negatively. Specifically, we take a nuanced perspective by theorizing how firms behaviorally respond when firm-internal goal attainment and firm-external public evaluation provide potentially divergent evaluative performance feedback. Prior research in the behavioral domain has long emphasized that attaining a goal, i.e., experiencing success, fosters replication, whereas falling short of a goal, i.e., experiencing failure, triggers change and a search for alternative actions (e.g., Denrell & March, 2001). This logic, however, implicitly assumes that a firm's perception and, by extension, internal evaluation of goal attainment necessarily aligns with the external evaluation of said outcome, with both pointing in the same direction. We relax this assumption: a firm-internal initial strategic goal such as closing a focal deal may not be attained (indicating failure and reflecting a negative event from the firm's perspective), yet external stakeholders may evaluate this outcome positively. Conversely, a firm-internal strategic goal may be attained (indicating success and reflecting a positive event from the firm's perspective), yet external stakeholders may view the outcome negatively. This decoupling of firm-internal goal attainment from firm-external evaluations enables a nuanced investigation of firms' distinct behavioral responses after competitive bidding situations.

Accordingly, we show that firms' reactions to acquisition outcomes depend not only on whether a deal was completed (or not), but also on how influential external stakeholders publicly evaluate the focal deal outcome, which can change the meaning of success and failure. In other words, the moderation effect we find suggests that stock market-based external

evaluations determine whether a firm interprets missing out as a true setback calling for urgent countermeasures or as a potentially expedient abandonment that does not necessarily warrant immediate corrective action, generating a sense of relief (Pickering, 1983). In particular, our study extends behavioral theory by suggesting that the effect of goal non-attainment on subsequent behavior depends on whether a salient external evaluation signal legitimizes continued aggressive pursuit of strategic alternatives by creating a heightened sense of urgency (Klingebiel, 2018; Klingebiel et al., 2022), or instead encourages more cautious behavior going forward (see, e.g., Campbell et al., 2022). Indeed, an unfavorably evaluated missed acquisition, i.e., the non-completion of a potentially value-enhancing deal, seemingly evokes the former behavior, whereas a favorably evaluated missed acquisition, i.e., the non-completion of a potentially value-destroying deal, seemingly evokes the latter behavior. In the domain of unfavorable external evaluations, our results are consistent with prior work on risk-type preference shifts (Klingebiel et al., 2018), which generally posits that firms commit more after experiencing omission errors (negatively evaluated missed acquisitions) than after commission errors (negatively evaluated completed acquisitions). In the domain of favorable external evaluations, which seemingly render abandonment more defensible, our findings speak to research showing that deal abandonment can be viewed as a positive signal and evidence of managerial discipline (Jacobsen, 2014).

4.5.2 Managerial implications

Given that acquisitions often do not enhance, or even erode, the value of acquiring firms (e.g., Haleblian et al., 2009), our findings regarding the behavioral aftermath of competitive bidding situations have several important managerial implications. First, missing out on acquiring a coveted target triggers a behavioral response that might amplify the risk of pursuing potentially value-destroying deals in the following year. Therefore, boards should anticipate a heightened

deal appetite among managers who recently lost a bidding contest and establish governance mechanisms to guard against potential overspending.

Second, a positive stock market reaction following a missed acquisition may indicate external stakeholders' approval of deal non-completion. However, this approval does not change the fact that the firm still did not acquire the originally intended target, and a rival bidder may now benefit from owning it. In other words, the focal firm's underlying strategic need remains unfulfilled despite positive external evaluation, while a rival bidder reaps acquisition-related benefits and may gain a competitive advantage. Thus, missing out likely remains strategically and competitively consequential beyond the focal transaction. Taken together, these findings imply that positive stock market reactions to abandonment should not automatically be read as evidence that a firm's initial strategic goal has been attained and resolved, nor as indicating a beneficial competitive outlook.

Finally, the study underscores the strategic importance of pre-deal process choices. Entering highly public auctions increases the visibility and saliency of missed acquisitions. Where feasible, managers might pursue negotiated or exclusive processes that reduce public rivalry and thus curtail the pronounced psychological costs of suffering public defeat.

4.5.3 Limitations and future research

Our study has limitations that open avenues for future research. Foremost, the sample comprises only publicly listed bidders engaged in contests with disclosed rival bids. While this enhances measurement precision, it may underrepresent the occurrence of missed acquisitions because we cannot account for the private stage of the acquisition process. Scholars might deploy alternative data sources or qualitative methods to capture these settings.

Second, subsequent acquisition spending is an aggregate proxy for the willingness and aggressiveness in the pursuit of subsequent deals. Research could unpack other strategic

responses, such as firm-internal processual adjustments or innovation, to illuminate the specific levers firms pull after a missed acquisition.

Third, although endogeneity concerns were mitigated through propensity-score matching and extensive controls, unobserved factors (e.g., managerial overconfidence, board pressure, etc.) could still influence both the likelihood of missing out and subsequent spending. Supplementary experimental methods could strengthen our causal claims.

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5 Concluding remarks

The aim of this doctoral thesis was to advance the scholarly and practical understanding of adverse decision outcomes in innovation-related contexts, with a focus on flops and, particularly, missed opportunities. Through three empirical studies using different methodologies, this thesis provides in-depth insights into selected determinants and consequences of adverse decision outcomes across different levels. The first study shows how abandonment errors occur at the project level through a stepwise process that reflects contextual project features and their influence on cognition and evaluative decision-making, explaining why some firms may miss out on eventually successful innovations. The second study examines the differential effect of missed opportunities (versus flops) on the likelihood of persisting with currently underperforming innovation projects while simultaneously accounting for traditional drivers of persistence and heterogeneity among decision-makers. The study sheds light on how recent adverse outcomes dynamically shape decision-making on the level of the individual decision-maker. The third study, situated in the context of corporate acquisitions, investigates how missing out on a desirable strategic investment opportunity (versus leveraging it) affects subsequent organizational-level spending behavior, while accounting for external evaluations of decision outcomes as a boundary condition. Beyond contributions to the innovation and acquisition literatures, this doctoral thesis advances the understanding of how specific adverse outcomes emerge and subsequently shape individual or organizational decision-making behavior. That is, this work adds to a still "nascent stream of research" that investigates flops and missed opportunities (Klingebiel, 2018, p. 143), which has gained momentum as a demonstration of its relevance (e.g., Klingebiel et al., 2022; Kumar & Operti, 2023; Sharapov & Dahlander, 2025). Future research can build on this work's insights to further advance theory and practice.

First, while this work provides important insights into the processual occurrence of abandonment errors at the project level, our survey results cannot illuminate the more complex

dynamics of group decision-making and how they potentially contribute to missed innovation opportunities. Indeed, continuation and abandonment decisions are usually made by a cross-functional decision-making committee (e.g., Barczak et al., 2009). Therefore, future research could build on our processual model to examine how innovation committees address distinct types of project-related uncertainty and how resultant cognitions aggregate to the group level to inform evaluative decisions, thereby possibly affecting abandonment error rates. Relatedly, extant research has shown that group decision-making rules, such as voting or delegation, influence the likelihood of missing out (e.g., Joseph & Gaba, 2020; Sharapov & Dahlander, 2025). However, how and when psychological mechanisms such as groupthink (Janis, 1972) and different thought worlds among cross-functional committee members (Dougherty, 1992; Weeth et al., 2020) shape the occurrence of abandonment errors remains underexplored, offering promising avenues for future research. Ethnographic and related fieldwork, for example, could provide deeper insights into the workings and dynamics of group decision-making in innovation projects and their implications.

Second, although this work demonstrates that recent adverse decision outcomes directly influence individual persistence decisions and do so contingent on specific decision-maker characteristics (i.e., failure-related action-state orientation and the extent of rational thinking style), future research could expand our insights by exploring additional moderators or, alternatively, seeking to shed light on mediators. An analysis of additional moderators could help identify further boundary conditions for the behavioral mechanism proposed by risk-type preference shift theory (Klingebiel, 2018). For example, relevant questions could focus on how other coping strategies (e.g., Shepherd et al., 2011; Todt et al., 2018), regulatory foci (Crowe & Higgins, 1997), or cultural backgrounds shape the relationship between failure-type experiences and subsequent decision-making in innovation projects. The integration of potential mediating factors in said relationship, such as counterfactual thinking (Roese, 1997) and anticipated regret (Wong & Kwong, 2007) after flops or missed opportunities, provides

another interesting avenue. Future research could employ thoughtfully designed scenario-based experiments and complementary expert interviews to dive deeper into these questions.

Third, our findings open the possibility of broadening research on organizational responses to adverse decision outcomes. Our results show that missing out on a desirable strategic innovation-related investment opportunity triggers compensatory behavior, reflected in higher subsequent spending and commitment, as firms take measures to reduce the risk of missing out again. Future research could expand our insights and research other preventive measures firms take after missed opportunities and flops (e.g., Klingebiel et al., 2022). For example, scholars could examine whether and how affected firms change their competitive actions – such as new products, pricing, or marketing actions (Connelly et al., 2017) – or their organizational practices and internal structures to counteract re-experiencing recently suffered adverse outcomes. Such investigations could broaden the scope of behavioral decision-making theories, such as risk-type preference shifts, even further (e.g., Dye et al., 2014; Klingebiel, 2018). Here, the context of corporate acquisitions can provide a potential starting point for future research, as it allows for operationalizing different decision outcomes by combining deal outcomes (abandonment versus completion) with capital market-based evaluations (positive versus negative). Furthermore, scholars can access vast amounts of financial and textual data on public firms engaging in acquisitions (e.g., annual reports, 10-K filings, earnings calls), enabling them to operationalize several variables of interest and uncover the distinct implications of adverse decision outcomes.

Taken together, this doctoral thesis expands the theoretical and practical understanding of determinants and consequences of adverse decision outcomes in innovation-related contexts, thereby opening up interesting avenues for future research. I hope my doctoral thesis provides a helpful foundation for any researcher interested in studying the occurrence and implications of flops and missed opportunities, which remain highly relevant phenomena to scholars and practitioners alike.

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6 Appendices

Appendix A: Operationalization of latent constructs

Constructs (main)		
Exploitative vs. exploratory innovation project[a]		In the innovation project, we aimed to…
(adapted from Xu et al., 2017)	Item 1	…strengthen skills in areas where we already possessed significant experience / where we had no prior experience.
	Item 2	…enhance competencies in searching for solutions to customer problems near existing solutions / that were completely new.
	Item 3	…invest in enhancing skills in exploiting mature technologies that improve the productivity of current innovation operations / acquire entirely new organizational and technological skills.
Perceived innovation project uncertainty[b]		
(adapted from Dayan & Elbanna, 2011)	Item 1	It was very difficult to predict the outcomes of this innovation project.
	Item 2	It was not at all clear what kind of information should be collected to finish this innovation project.
	Item 3	There was a need for extra information when working on this innovation project.
	Item 4	There was much uncertainty about the actions that should be taken to finish this innovation project.
Rationality[c]		The decision-making process by the innovation project's decision-makers was characterized by...
(adapted from Dean & Sharfman, 1996; Feurer et al., 2019)	Item 1	...the gathering of relevant information.
	Item 2	...extensively looking for information.
	Item 3	...the thorough analysis of relevant information.
	Item 4	...the use of quantitative analytic techniques.
	Item 5	...the focus of attention on crucial information.
Intuition[c]		
(adapted from Dayan & Elbanna, 2011; Feurer et al., 2019)	Item 1	The project's decision-makers relied basically on personal judgment.
	Item 2	The project's decision-makers had to depend on a "gut feeling" because they did not have enough information.
	Item 3	The project's decision-makers trusted their hunches.
	Item 4	The project's decision-makers put faith in their initial feelings about other people and situations.
	Item 5	The project's decision-makers relied on intuition.

Abandonment quality[b]		
(adapted from Dooley & Fryxell, 1999)	Item 1	The abandonment decision was based on the best available information.
	Item 2	The abandonment decision made sense in light of the firm's financial situation.
	Item 3	The abandonment decision was consistent with the firm's strategy.
	Item 4	The abandonment decision was made based on valid assumptions.
Abandonment error occurrence[b]		Since the abandonment of the focal innovation project...
(own scale; Item 4 adapted from Elbanna et al., 2013)	Item 1	...another firm has developed and successfully commercialized a similar innovation.
	Item 2	...market conditions, customer preferences, or technological standards have changed in a way that would have helped the project to succeed.
	Item 3	...our firm has incurred opportunity costs (e.g., foregone sales, market share, etc.) as we missed a valuable opportunity to innovate with the project.
	Item 4	The abandonment decision had major negative and unexpected consequences for my firm.
Constructs (controlled)		
External turbulence[b]		
(adapted from Sethi & Iqbal, 2008; Jaworski & Kohli, 1993)	Item 1	The technology in our industry is changing rapidly.
	Item 2	There are frequent technological breakthroughs in our industry.
	Item 3	Technological changes provide big opportunities in our industry.
	Item 4	In our kind of business, customers' preferences change quite a bit over time.
	Item 5	Our customers regularly ask for new goods or services.
Decentralization[b]		In the innovation project…
(own scale, reflects abandonment polyarchy)	Item 1	...any decision-maker had the right to make a definitive continuation or abandonment decision.

Note: [a] = seven-point semantic differential; [b] = seven-point scale anchored "strongly disagree" and "strongly agree"; [c] = seven-point scale anchored "to a very small extent" and "to a very large extent."
Further information about the survey and its design can be obtained from the author of this doctoral thesis.

Appendix B: Overview of structural model paths

Paths controlled for in the structural model (direct effects)			
Exploitative vs. exploratory innovation project	→	Rationality	0.054
	→	Intuition	0.066
	→	Abandonment quality	0.119 *
	→	Abandonment error occurrence	0.066
Perceived innovation project uncertainty	→	Abandonment quality	0.312 **
	→	Abandonment error occurrence	0.372 **
Rationality	→	Abandonment error occurrence	0.001
Intuition	→	Abandonment error occurrence	0.436 **
Total effects (direct + indirect effects)			
Exploitative vs. exploratory innovation project	→	Perceived innovation project uncertainty	0.295 **
	→	Rationality	0.126
	→	Intuition	0.206 *
	→	Abandonment quality	0.210 **
	→	Abandonment error occurrence	0.229 **
Perceived innovation project uncertainty	→	Rationality	0.243 **
	→	Intuition	0.473 **
	→	Abandonment quality	0.291 **
	→	Abandonment error occurrence	0.527 **
Rationality	→	Abandonment quality	0.402 **
	→	Abandonment error occurrence	–0.070
Intuition	→	Abandonment quality	–0.253 *
	→	Abandonment error occurrence	0.480 **
Abandonment quality	→	Abandonment error occurrence	–0.178 **
External turbulence	→	Abandonment quality	0.171
	→	Abandonment error occurrence	0.034
Decentralization	→	Abandonment quality	0.168
	→	Abandonment error occurrence	0.188 *
Total indirect effects (comprised of specific indirect effects)			
Exploitative vs. exploratory innovation project	→	Rationality	0.072 *
	→	Intuition	0.140 **
	→	Abandonment quality	0.091 +
	→	Abandonment error occurrence	0.163 **
Perceived innovation project uncertainty	→	Abandonment quality	–0.022
	→	Abandonment error occurrence	0.155 *
Rationality	→	Abandonment error occurrence	–0.071 +
Intuition	→	Abandonment error occurrence	0.045
External turbulence	→	Abandonment error occurrence	–0.030
Decentralization	→	Abandonment error occurrence	–0.030
Specific indirect effects (selected)			
Exploitative vs. exploratory innovation project	→		
Perceived innovation project uncertainty	→		
Intuition	→	Abandonment error occurrence	0.061 **
Perceived innovation project uncertainty	→		
Intuition	→	Abandonment error occurrence	0.206 **
Rationality	→		
Abandonment quality	→	Abandonment error occurrence	–0.071 +

Note: ** = $p < 0.01$; * = $p < 0.05$; + = $p < 0.10$.

Appendix C: Decision contexts and exemplary hypothetical profile

(1) Descriptions of the two decision contexts, with each referring to a previous innovation project:

Decision contexts	Brief descriptions
Failed innovation experience	Imagine your decision to **continue investing** in the previous project resulted in a **costly innovation failure** for your firm.
Competitive preemption experience	Imagine your decision to **discontinue investing** in the previous project enabled successful competitive preemption by a rival firm, and thus, your firm **missed a valuable opportunity**.

(2) Exemplary hypothetical profile of the currently underperforming innovation project, which participants needed to evaluate from the background of the respective assigned decision context:

Current project's attributes	Levels
Resource investment	Low
Proximity to project completion	High
Project innovativeness	Low
If you want to revisit the definitions of attribute levels, click here.	

Given these conditions, how likely would you be to continue investing in the current project?

Very unlikely (1)	Unlikely (2)	Somewhat unlikely (3)	Neither unlikely nor likely (4)	Somewhat likely (5)	Likely (6)	Very likely (7)
○	○	○	○	○	○	○

Appendix D: Operationalization of latent constructs and reliability

Construct	Items	Cronbach's α
Failure-related action-state orientation (Diefendorff et al., 2000)	**Please select the option that generally applies most to you.** If I've worked for weeks on one project and then everything goes completely wrong with the project: • It takes me a long time to adjust myself to it. (*so*) • It bothers me for a while, but then I don't think about it anymore. (*ao*) If I had just bought a new piece of equipment (e.g., a laptop) and it accidentally fell on the floor and was damaged beyond repair: • I would manage to get over it quickly. (*ao*) • It would take me a long time to get over it. (*so*) If I have to talk to someone about something important and, repeatedly, can't find him or her: • I can't stop thinking about it, even while I'm doing something else. (*so*) • I easily forget about it until I see the person. (*ao*) When I am told that my work has been completely unsatisfactory: • I don't let it bother me for too long. (*ao*) • I feel paralyzed. (*so*) If I'm stuck in traffic and miss an important appointment: • At first, it's difficult for me to start doing anything else at all. (*so*) • I quickly forget about it and do something else. (*ao*) When something really gets me down: • I have trouble doing anything at all. (*so*) • I find it easy to distract myself by doing other things. (*ao*) When several things go wrong on the same day: • I usually don't know how to deal with it. (*so*) • I just keep on going as though nothing had happened. (*ao*) When I have put all my effort into doing a really good job on something and the whole thing doesn't work out: • I don't have too much difficulty starting something else. (*ao*) • I have trouble doing anything else at all. (*so*)	α =0.701
Rational thinking style[a] (adapted from Epstein et al., 1996; Eliëns et al., 2018)	**Please indicate the extent to which you agree with the following statements.** I don't enjoy thinking a lot when making project decisions. (*r*) I try to avoid thinking in-depth when making project decisions. (*r*) Thinking hard and for a long time when making project decisions gives me little satisfaction. (*r*)	α = 0.779

Note: [a] = seven-point scale, anchored by "Strongly disagree (1)" to "Strongly agree (7)".
(*so*) = state-oriented response, (*ao*) = action-oriented response. (*r*) = reverse-coded item (recoded before analysis such that higher values go hand in hand with a stronger rational thinking style).
Further information about the questionnaire and its design can be obtained from the author of this doctoral thesis.

Appendix E: Results of OLS regression (completed deals only)

DV: Subsequent acquisition spending (actual completions)	Model 1				Model 2				Model 3			
	ß		SE	p-value	ß		SE	p-value	ß		SE	p-value
Control variables												
Acquisition relatedness	–0.376		0.337	0.266	–0.339		0.337	0.316	–0.283		0.337	0.400
Number of bidders	1.809	†	1.006	0.073	1.722	†	1.007	0.088	1.839	†	1.005	0.068
Hostile takeover	0.243		0.631	0.701	0.205		0.634	0.746	0.249		0.646	0.701
Foreign target	0.165		0.344	0.631	0.160		0.343	0.640	0.123		0.341	0.719
Bidder size	0.697	**	0.142	0.000	0.694	**	0.142	0.000	0.687	**	0.144	0.000
Target size	–0.249	†	0.130	0.055	–0.248	†	0.129	0.056	–0.254	*	0.128	0.049
Bidder financial slack	0.203		0.335	0.545	0.213		0.338	0.528	0.243		0.331	0.463
Target financial slack	0.139		0.231	0.549	0.114		0.231	0.621	0.114		0.229	0.621
Bidder performance	–0.930		1.376	0.499	–0.872		1.382	0.528	–0.565		1.406	0.688
Target performance	0.380		0.861	0.659	0.327		0.903	0.718	0.443		0.878	0.614
Bidder capital expenditures (CapEx)	–0.118		0.092	0.202	–0.114		0.092	0.214	–0.107		0.092	0.248
Bidder completion experience	0.233	†	0.124	0.062	0.232	†	0.123	0.061	0.224	†	0.124	0.071
Bidder abandonment experience	–0.155		0.290	0.594	–0.187		0.289	0.519	–0.175		0.290	0.548
Industry acquisition activity	–0.021		0.051	0.676	–0.024		0.050	0.627	–0.021		0.050	0.680
Main direct effects												
Focal deal outcome	0.826	**	0.310	0.008	0.819	**	0.309	0.008	1.137	**	0.362	0.002
Stock market reaction	–0.425		2.362	0.857	5.209		3.480	0.135	7.562	*	3.404	0.027
Stock market reaction^2									62.903	†	34.616	0.070
Interaction effects												
Focal deal outcome × Stock market reaction					–9.156	*	4.567	0.046	–12.346	**	4.505	0.006
Focal deal outcome × Stock market reaction^2									–102.915	*	44.741	0.022
Constant	–4.605	*	2.002	0.022	–4.453	*	2.006	0.027	–4.751	*	2.013	0.019
R^2	0.206				0.211				0.218			

Note: n = 446 acquisition announcements. Unstandardized coefficients are reported. Focal deal outcome: 1 = missed acquisition, 0 = completed acquisition. Standard errors are clustered by bidder. Year dummy variables included but not reported.
** = p < .01; * = p < .05; † = p < .10.

7 Affidavit

I hereby declare that I completed the papers submitted and listed hereafter independently and with only those forms of support mentioned in the relevant paper or in the following supplementary list. When working with the authors listed, I contributed no less than a proportionate share of the work. In the analyses that I have conducted and to which I refer in the papers, I have followed the principles of good academic practice, as stated in the Statute of Justus Liebig University Giessen for Ensuring Good Scientific Practice.

8 List of papers

- **Hofmann, B.,** & Schuhmacher, M. C. (2026). Why eventual "winners" may not be pursued: The connection between innovation project type and abandonment error occurrence. *Working paper*.
- **Hofmann, B.**, Schuhmacher, M. C., & Sarangee, K. R. (2026). How distinct failure types shape persistence with underperforming innovation projects: A conjoint experiment. *Working paper*.
- **Hofmann, B.**, Nickel, J., Ademi, P., & Schuhmacher, M. C. (2026). The ones that got away: Missed acquisitions, market reactions, and subsequent acquisition behavior. *Working paper*.

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