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# Corporate Entrepreneurship Managers' Project Terminations: Integrating Portfolio-Level, Individual-Level, and Firm-Level Effects

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Corporate entrepreneurship managers often need to terminate projects to maximize their innovation portfolios' commercial prospects. Drawing on the attention-based view of the firm, we develop a model for how past project failure experience, the firm's growth rate, and their hierarchical level impact managers' attention to a project's fit with the corporate portfolio strategy and the balance of the portfolio when terminating projects. Using data from a conjoint study with 6,944 assessments of project terminations made by 217 managers, we provide insights into corporate entrepreneurship decision making and how portfolio-level, individual-level, and firm-level aspects interact in explaining project termination.

## Introduction

Successful corporate entrepreneurship in uncertain environments requires that firms pursue a portfolio of projects that are continuously evaluated, selected, prioritized, and terminated when they do not meet expectation thresholds (McGrath, 1999; McNally, Durmusoglu, Calantone, & Harmancioglu, 2009). Project termination refers to *the release of a project's resources and the reassignment of project team members to other duties* (Pinto & Prescott, 1988, 1990). While the innovation literature has found that managers' termination decisions are prone to decision biases, such as escalation of commitment

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(Schmidt & Calantone, 1998, 2002), and that timely termination can be facilitated by the use of evaluation tools and processes (Behrens & Ernst, 2014; Biyalogorsky, Boulding, & Staelin, 2006; Boulding, Morgan, & Staelin, 1997), the corporate entrepreneurship literature has primarily investigated the emotional and learning consequences of project terminations (Corbett, Neck, & deThienne, 2007; Shepherd, Covin, & Kuratko, 2009; Shepherd, Patzelt, Williams, & Warnecke, 2014).

A shortcoming of both literatures is that they usually see projects as independent of each other instead of embedded in a corporate innovation portfolio (Shepherd et al., 2009). A portfolio perspective on project termination, however, is theoretically important because it acknowledges projects' aggregate properties that impact firm performance (Girotra, Terwiesch, & Ulrich, 2007; Lin & Lee, 2011) but are not meaningful for individual projects. For example, important portfolio attributes found to impact firm performance include (1) the project's strategic fit with the existing portfolio (i.e., *the project's fit with the portfolio's markets and technologies that are tied to the overall business strategy*; Chao & Kavadias, 2008; Griffin, 1997; Leiponen & Helfat, 2010; Lin & Lee; McNally, Durmuşoğlu, & Calantone, 2013) and (2) portfolio balance (i.e., *the project's contribution to a diverse project mix in the portfolio*; Benner & Tushman, 2003; Lin & Lee; McNally et al., 2013; O'Reilly & Tushman, 2008; Simsek, 2009). However, there is no research that explores how these portfolio characteristics impact corporate entrepreneurship managers' project terminations, which is surprising given that appropriate terminations in light of the *entire* portfolio are critical for maximizing the portfolio's commercial value (Girotra et al.; Kester, Griffin, Hultink, & Lauche, 2011). *Therefore, the purpose of our study is to explore the relationship between portfolio characteristics and corporate entrepreneurship managers' project termination decisions. Additionally, we investigate managers' personal characteristics, the organizational environment, and their hierarchical position within the firm as multi-level contingencies in this relationship.*

We draw on a cognitive psychology perspective and the attention-based view (ABV) of the firm (Ocasio, 1997) to propose that managers' focus of attention (reflected by their past project failure experience), situated attention (reflected by the firm's growth rate), and the structural distribution of attention within the firm (reflected by their hierarchical positions) moderate the relationship between portfolio characteristics and the likelihood of project termination. Drawing on data from a conjoint field study with 6,944 assessments of project terminations made by 217 corporate entrepreneurship managers, we offer important new insights for the corporate entrepreneurship and innovation literatures.

First, we contribute to the discussion on how corporate entrepreneurship and innovation managers terminate projects based on their personal experience, the firm's organizational characteristics, and their hierarchical position within the firm (Behrens, Ernst, & Shepherd, 2014; Hornsby, Kuratko, Shepherd, & Bott, 2009; Kuratko, Ireland, Covin, & Hornsby, 2005; McNally et al., 2013; Phan, Wright, Ucbasaran, & Tan, 2009) by acknowledging the complexity of such decisions and theorizing on and empirically investigating how multiple levels of analysis impact the relationship between portfolio attributes and the likelihood of project termination. Second, since "the larger picture of how failures may contribute to subsequent successes may be more easily appreciated when the innovative unit of consequence is the entrepreneurial project portfolio rather than the individual project" (Shepherd et al., 2009, p. 597), we add to the corporate entrepreneurship and innovation literatures by focusing on the interaction of innovation portfolio characteristics and managerial failure experience in project terminations. Third, extending recent theorizing on how *multiple* project failures (rather than one-time failure events) impact team members of entrepreneurial and innovative projects (Shepherd, Haynie, & Patzelt, 2013),

our study is the first to recognize the impact of multiple failures on managerial decisions. Finally, by exploring portfolio decision-making differences between top managers and middle managers (Barnett, 2008; Behrens et al.), we gain significant insights into how their divergent thinking can lead to different composition preferences for corporate entrepreneurship and innovation project portfolios.

## Theory and Hypotheses

### A Portfolio Perspective on Terminating Entrepreneurial Projects

Effective corporate entrepreneurship in dynamic business environments implies that managers see projects as options (McGrath, 1999) or probes (Brown & Eisenhardt, 1997) that explore the unknown and are terminated appropriately. For example, some projects are initiated with an option to abandon them later because they provide a valuable learning opportunity even if the final intended product outcomes will not be reached (Barnett, 2008; McGrath, 1999). Further, managers sometimes misjudge the potential market (Read, Dew, Sarasvathy, Song, & Wiltbank, 2009) or the feasibility of a technology (Tushman & Rosenkopf, 1992) at project start, leading to early termination. Finally, high levels of resource slack (e.g., cash) can lead managers to pursue too many uncertain new projects and be less critical in their evaluations when projects are started (George, 2005). In these cases, it is key that projects are terminated and resources are redeployed to other projects in the portfolio that show promise (Barnett; Brown & Eisenhardt; McGrath).

In order to facilitate appropriate and timely termination, managers rely on a number of evaluation tools and processes, including predetermined decision rules (Behrens & Ernst, 2014; Boulding et al., 1997), as well as design termination systems, policies, and procedures (Biyalogorsky et al., 2006). These number-based approaches are, however, less useful when it comes to terminating uncertain and exploratory (i.e., entrepreneurial) projects. First, for such projects, it is hardly possible to assess their long-term impact in the short term based on initial financial and other numbers gathered for the project. Indeed, high levels of uncertainty motivate some managers to escalate their commitment (Staw, 1976). Second, even if these tools can help assess the current performance of an individual project, they usually do not capture the project's embeddedness in the project portfolio. For example, they may neglect synergies between projects that justify the continuation of a project although its performance is below some threshold. Therefore, in addition to quantitative and threshold-based approaches, managers rely on other criteria when they assess project termination in light of the firm's portfolio. These criteria are more qualitative and are subject to managers' perceptions of other information and environmental stimuli (cf. Cyert & March, 1963). Specifically, managers consider two important attributes in portfolio management: the extent to which a project contributes to (1) *strategic fit*, or aligning the portfolio with the overall corporate strategy, and (2) *portfolio balance*, or balancing the portfolio with respect to radically versus incrementally innovative projects (e.g., Cooper, Edgett, & Kleinschmidt, 2002; Jonas, Kock, & Gemünden, 2013; McNally et al., 2013).

First, strategic fit refers to *a project's alignment with the portfolio's characteristics that are tied to the overall business strategy*. For example, projects high in strategic fit address the markets that are defined by the firm's strategy, and they develop technologies tailored to these markets (Chao & Kavadias, 2008; Griffin, 1997; Leiponen & Helfat, 2010; Lin & Lee, 2011). Strategic fit is seen as a key success factor in the innovation literature (Chao & Kavadias; Griffin), and the business venturing literature has found that

strategically aligned portfolios lead to improved innovation and/or firm performance (Lin & Lee). Indeed, strategic fit has been identified as an important factor for different aspects of portfolio management, such as the ability to develop disruptive technologies or speed up the innovation process (Reinertsen & Smith, 1991). Although strategic fit might be high at project start, it declines, for example, when corporate management changes the overall strategy of the firm (Chao & Kavadias; Griffin). For instance, the management of a pharmaceutical firm might decide to focus its project portfolio on cancer drugs in order to exploit more synergies within the portfolio (e.g., distribution, marketing, sales) (Girotra et al., 2007). As a consequence, managers may perceive that a drug development project for another indication (e.g., cardiovascular diseases) does not fit the firm's portfolio strategy. Project termination becomes more likely when managers perceive that the project does not fit with the desired portfolio strategy anymore (Cooper, Edgett, & Kleinschmidt, 1999).

Second, portfolio balance refers to *the contribution of a project to the overall diversity of the portfolio* (Benner & Tushman, 2003; Lin & Lee, 2011; O'Reilly & Tushman, 2008; Simsek, 2009). Specifically, a highly balanced portfolio includes projects with varying degrees of risk and different time horizons (McNally et al., 2013). For the context of this study, we focus on balancing innovation radicalness (i.e., incrementally versus radically innovative projects) because this distinction is central to the literature on innovation and corporate entrepreneurship (Pérez-Luño, Wiklund, & Cabrera, 2011), and it implicitly captures different risk levels and time horizons. That is, a project contributes to portfolio balance if termination makes the portfolio less diverse with respect to incremental versus radical projects. Companies tend to perform better when they have more diverse portfolios in terms of radicalness and product lines.<sup>1</sup> However, a project's contribution to balancing the portfolio diminishes when, for example, several radical projects fail due to their inherent risk. In this situation, managers can re-balance the portfolio by terminating an incremental project and re-allocating the resources to (new) radical projects. We will now theorize to what extent managers allocate attention to their perceptions of strategic fit and portfolio balance when terminating entrepreneurial projects.

## **Corporate Entrepreneurship Managers' Attention, Portfolios, and Project Termination**

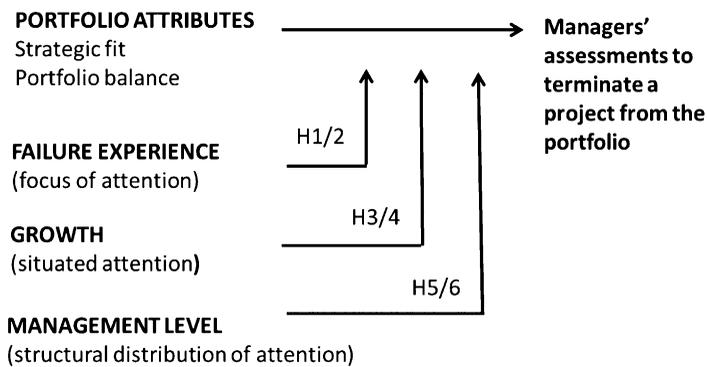
In order to explore the role of corporate entrepreneurship managers' perceptions of portfolio attributes in project termination, we draw on cognitive psychology research suggesting that individuals perceive environmental stimuli (e.g., information about portfolio fit and balance) and that these perceptions (which can be correct or incorrect) impact the evaluation of a specific situation (e.g., project termination) but only if the perceptions are attended to (Mack, Tang, Tuma, Kahn, & Rock, 1992; Merikle & Joordens, 1997; Rock, Linnett, Grant, & Mack, 1992). That is, perceptions are antecedents to decisions, and attention to perceptions is the "filter" that determines whether perceived stimuli

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1. It is important to acknowledge that strategic fit and portfolio balance may not be entirely independent of each other but may actually correlate to some extent (i.e., strategic fit can influence portfolio balance and vice versa). While we acknowledge this possibility, this mutual influence is an antecedent to the levels of the attributes attended to by the managers (i.e., decision cues) in a particular situation and thus external to our model. That is, consistent with most prior work on strategic decision making (e.g., Hitt, Ahlstrom, Dacin, Levitas, & Svobodina, 2004; Patzelt, Shepherd, Deeds, & Bradley, 2008; Tyler & Steensma, 1995), one assumption that we make is that strategic fit and portfolio balance represent decision cues for managers' project termination.

Figure 1

A Model of Corporate Entrepreneurship Managers’ Attention, Portfolio Characteristics, and Project Terminations



impact decisions (consistent with a moderating effect of attention). Following this stream of research, we assume, first, that managers vary in terms of the attention they pay to perceived stimuli (Merikle & Joordens). Further, we assume that perceptions do not require attention in the first place since attention only comes into play once perceptions are formed (Cowan, 1988; Treisman, Sykes, & Gelade, 1977).

When making termination decisions, managers have only limited attentional resources. That is, there are limits to their ability to consider the range of consequences of their behaviors, the value attributed to these consequences, and the availability of possible alternatives to their actions (Simon, 1947). In firms, economic and social structures create, channel, and distribute managerial attention into discrete attentional processes that guide decisions (Simon). Thus, ABV interprets firms as systems of structurally distributed attention, in which attention refers to “the noticing, encoding, interpreting, and focusing of time and effort by organization decision-makers on both (a) *issues*: the available repertoire of categories for making sense of the environment: problems, opportunities, and threats; and (b) *answers*: the available repertoire of action alternatives: proposals, routines, projects, programs, and procedures” (Ocasio, 1997, p. 189). Managers selectively notice, interpret, and bring into conscious consideration the aspects of their environment that they consider relevant to making decisions, and the stronger they attend to a certain aspect, the stronger it impacts their decisions (March & Simon, 1958; Ocasio; White, 1992). That is, there are differences in how managers attend to whether a project contributes to improving the portfolio’s fit with the corporate strategy and portfolio balance, and there is variance in how strongly these decision cues impact project terminations. Ocasio suggested that variance in managers’ attention is regulated at three different levels of analysis: the level of individual cognition (i.e., focus of attention), the level of social cognition (i.e., situated attention), and the level of the organization (i.e., structural distribution of attention). Based on these arguments, Figure 1 provides an overview of our research model, which we will detail below.

**Focus of Attention, Portfolios, and Project Termination**

At the level of individual cognition, attentional processes focus managers’ energy, effort, and mindfulness on “those issues and activities being attended to, and inhibit[s]

perception and action towards those that are not (Kahneman, 1973)” (Ocasio, 1997, p. 190). While managers’ cognition is influenced by a multitude of factors (for a review, see Carpenter, Geletkanycz, & Sanders, 2004), this study focuses on managers’ *past project failure experience*. Project failure refers to “the termination of an initiative to create organizational value that has fallen short of its goals” (Shepherd, Patzelt, & Wolfe, 2011, p. 1229). However, not all terminations are failures, and some projects may be managed with an option to abandon before the product is finalized (Barnett, 2008; McGrath, 1999). Yet, because failure upsets the status quo in a firm, which often motivates managers to search for possible solutions (McGrath, 2001) and triggers learning (Shepherd et al., 2011), it appears that failure—rather than termination for other (e.g., strategic) reason—has a strong and long-lasting impact on managers’ cognition when terminating projects (Shepherd et al., 2009, 2011), including their attention to a project’s strategic portfolio fit and contribution to portfolio balance.

Managers often have feelings of “psychological ownership” over projects (Pierce, Kostova, & Dirks, 2001), making termination an experience of loss of something important, which can cause strong and enduring negative emotions (Shepherd et al., 2011). These emotions are felt both *after* the project termination event and, through anticipation, *before* termination (i.e., when the termination decision approaches) (Shepherd et al., 2013). Negative emotions draw managers’ attentional focus during information processing (Mogg, Mathews, Bird, & Macgregor-Morris, 1990) toward issues that are directly related to the termination event and the project itself (cf. Bower, 1992), such as, for example, how to communicate project termination to other managers or team members, how to re-allocate team members right after the project is terminated, how to find a new project, etc. In contrast, considerations of how project termination affects overall corporate strategy (i.e., assessing strategic fit) require more general assessments of the company’s current and future markets, its targeted shares of these markets, and appropriate current and future technological developments for market entry (Chao & Kavadias, 2008; Griffin, 1997; Leiponen & Helfat, 2010; Lin & Lee, 2011). Similarly, assessing the contribution of an entrepreneurial project to portfolio balance goes beyond the project’s immediate properties and requires assessments of the portfolio’s other projects’ innovation radicalness and the portfolio’s status without the project to be terminated. When anticipating negative emotions, managers will thus attend less to strategic fit and balance because they are more peripheral to the actual project under consideration.

Additionally, failure experience can reduce managers’ (anticipated) negative emotions from termination and can thus help them refocus their attention on strategic fit and portfolio balance. First, failure experience can increase coping self-efficacy—namely “the beliefs in one’s capabilities to mobilize the motivation, cognitive resources, and courses of action needed to recover from major setbacks arising from the organization’s entrepreneurial activities” (Shepherd et al., 2009, p. 593). Higher coping self-efficacy reduces managers’ negative emotional reactions to project termination and allows them to direct attention toward a wider array of issues than those immediately surrounding the termination event (Benight, Flores, & Tashiro, 2001), including the project’s strategic fit and contribution to portfolio balance. Managers can also learn to anticipate and emotionally prepare for future project terminations (Shepherd et al., 2013) and become used to this stimulus due to repeated exposure (i.e., habituation), thus progressively reducing their (anticipated) negative emotional reaction (Belschak, Verbeke, & Bagozzi, 2006). These reduced negative emotions provide them with the attentional resources (Fredrickson, 2001) to consider strategic fit and portfolio balance when terminating projects. Therefore, we propose the following:

**Hypothesis 1:** The negative relationship between a project's fit with the desired portfolio strategy and the likelihood that managers will terminate the project is stronger when failure experience is high than when it is low.

**Hypothesis 2:** The negative relationship between a project's contribution to the balance of the portfolio and the likelihood that managers will terminate the project is stronger when failure experience is high than when it is low.

### **Situated Attention, Portfolios, and Project Termination**

At the level of social cognition, the “principle of situated attention indicates that what decision-makers focus on, and what they do, depends on the particular context they are located in” (Ocasio, 1997, p. 190). Managers' attentional focus is influenced by the characteristics of their current situation, and this situated attention guides their decisions and behavior (Fiske & Taylor, 1991). The *firm's growth rate* is an important indicator of managers' current situation and the situation of their organization. Models of firm growth describe how the firm's internal structure and processes change with the size of the organization (e.g., Lee, 2010), and it is known that environmental dynamics impact managerial decisions (Sutcliffe, 1994; Sutcliffe & Huber, 1998). Second, growth in terms of adding a new labor force can represent a substantial change in the firm's internal social processes and culture (Yu, Engleman, & Van de Ven, 2005), which influences the cognition and thus attentional focus of the organization's members (Shepherd, Patzelt, & Haynie, 2010). Third, the business venturing literature emphasizes that growth is an important strategic goal for many innovation-driven firms (Lin & Lee, 2011), yet there is variance in how successfully firms achieve this goal (Moreno & Casillas, 2008).

Pursuing a growth strategy is associated with challenging and complex managerial tasks, which might deplete managers' attentional resources available for considering strategic fit and portfolio balance in project termination. For example, growth requires managers to establish new organizational structures and hierarchies, integrate new employees into the company's work force, and establish new processes for effective knowledge assimilation and integration (Autio, Sapienza, & Almeida, 2000). Further, the addition of new product lines may add complexity that could tax managers' cognitive resources (Hutzschenreuter & Horstkotte, 2013). That is, in a situation of high growth, myriad additional complex issues can emerge that leave little attentional resources available for managers to thoroughly evaluate whether the project to be terminated fits with the firm's strategy and portfolio balance (cf. Barnett, 2008; Ocasio, 1997).

Second, growth is often associated with an innovative and entrepreneurial culture within a firm (Bradley, Wiklund, & Shepherd, 2011), where “new ideas and creativity are expected, risk-taking is encouraged, failure is tolerated, learning is promoted, product, process, and administrative innovations are championed, and continuous change is viewed as a conveyor of opportunities” (Ireland, Hitt, & Sirmon, 2003, p. 970). In such cultures, managers constantly attend to new project opportunities (Pérez-Luño et al., 2011), which can even lead to “entrepreneurial spirals”—that is, deviation-amplifying loops between the entrepreneurialness of managerial mindsets and the culture of the organization (Shepherd et al., 2010). Managers' attentional focus on newness might diminish considerations of strategic fit and portfolio balance when terminating projects in high-growth firms. For example, if a project pursues highly innovative technological developments, managers might decide against termination even if the project is not necessarily in line with the firm's strategy or the desired portfolio balance. Alternatively, projects that are less innovative might be terminated even if they are important from a portfolio perspective

because they help align the portfolio with the overall business strategy and contribute to balancing different types of innovations. Further, to the extent the entrepreneurial culture in high-growth firms is reflected in the firm's identity—its central, enduring, and distinctive character as perceived by those within it (Albert & Whetten, 1985)—this identity influences managerial attention. In “a firm with an identity associated with entrepreneurship, decision makers are more willing to take substantial actions with incomplete information, and they have greater confidence in their ability to exploit these opportunities (cf. Covin & Slevin, 1989; Lumpkin & Dess, 1996)” (Barnett, 2008, p. 620). Making termination decisions with incomplete information can mean that considerations of strategic fit and portfolio balance are neglected at the expense of information that is more directly linked to the focal project's characteristics. Similarly, greater confidence in project management skills suggests that managers in high-growth firms are more focused on the development of *individual* projects and the steps that can bring them to a successful end, whereas they attend less to the project's fit with the overall corporate strategy and its contribution to portfolio balance, attributes that show only a weak (or no) link to the focal project's success.

Finally, research on strategic decision making has found that in quickly growing firms trying to keep up with competitors, managers might be caught in a “speed trap”—the need for fast action and decision making (Eisenhardt, 1989), which has traditionally been conceptualized as an exogenous feature of the surrounding context (Perlow, Okhuysen, & Repenning, 2002). Fast action requires that managers quickly make decisions, including project termination decisions. However, managers generally cannot attend to all available information in a short time period, which typically conflicts with thoroughly attending to aspects that are not directly linked to the project itself, including how the project fits within the portfolio. That is, the faster a firm grows, the less likely managers are to attend to information about a project's fit with the desired portfolio strategy and its balance when making termination decisions. Therefore, we propose the following:

**Hypothesis 3:** The negative relationship between a project's fit with the desired portfolio strategy and the likelihood that managers will terminate the project is weaker when the growth rate is high than when it is low.

**Hypothesis 4:** The negative relationship between a project's contribution to the balance of the portfolio and the likelihood that managers will terminate the project is weaker when the growth rate is high than when it is low.

### **Structural Distribution of Attention, Portfolios, and Project Termination**

According to the principle of structural distribution of attention, “attentional processes of individual and group decision makers are distributed throughout the multiple functions that take place in organizations” (Ocasio, 1997, p. 191). Specifically, managerial attention is considerably different for managers in governance functions than for those in more operational functions (Barnett, 2008). While governance functions are mainly occupied by top management, middle managers take on more operational functions, which influences the decisions they make (Floyd & Lane, 2000; Ocasio & Joseph, 2005). According to McGrath, Ferrier, and Mendelow (2004, p. 96), “in a multi-project firm there are likely to be major disagreements between those who ‘own the option’ [top managers] and those who ‘are the option’ [middle managers].” Since a number of studies have emphasized divergent thinking between top and middle managers (Behrens et al.,

2014; Floyd & Lane; Floyd & Wooldridge, 1992, 1997), we propose that when terminating projects, corporate entrepreneurship managers at the top hierarchical level within the firm attend differently to a project's strategic fit as well as to balancing the portfolio compared with middle managers.

First, although strategic aspects are part of most managers' work to a certain extent, there are considerable differences in the attention managers pay to these issues based on their hierarchical level. While middle managers focus their attention on strategy implementation, top managers' role is to craft these strategies and evaluate whether they are put into practice by subordinates (Floyd & Wooldridge, 1992). Middle managers typically communicate their assessments of active projects to top managers (including their opinion as to whether a project should be terminated). Top managers then evaluate these proposals within the context of the firm's resources and environment. In doing so, their task is to attend to strategic aspects of the business (Floyd & Lane, 2000), such as the project's fit with the overall corporate strategy. Moreover, since top managers' job is to sustain the firm's performance over time, they are more attentive to long-term issues than middle managers (Floyd & Lane; Floyd & Wooldridge, 1992, 1997). This long-term perspective emphasizes the need to maintain a balanced portfolio of short-term incremental projects as well as long-term radical entrepreneurial projects (Benner & Tushman, 2003; O'Reilly & Tushman, 2008; Simsek, 2009).

Second, particularly in uncertain environments, project evaluations proposed by middle managers produce "a focus on risk aversion in upper managers" (Barnett, 2008, p. 625). Since middle managers championing a project "attend to indicators of success, interpret ambiguous information in favorable ways, and consciously and unconsciously overlook signs of failure (Garud, Kumaraswamy, & Nayyar, 1998)" (Barnett, p. 619), top managers' task is to be critical and focus their attention on potential project failures and loss minimization by strictly controlling strategic and financial limits (McGrath et al., 2004). Strategic limits might involve the current portfolio composition not deviating too much from the intended corporate strategy, emphasizing the need to consider strategic fit in project terminations. Limits to intended financial expenses may imply that the number of expensive and uncertain radical projects stays in a certain range, making considerations of portfolio balance an important aspect of project terminations. In contrast, due to middle managers' tendency to assess projects in an overly favorable manner suggests a focus on individual project success (Garud et al.) rather than on minimizing organizational risks by considering strategic fit and portfolio balance in project terminations.

Third, middle managers are usually closer to customers than top managers (Floyd & Lane, 2000; Kuratko et al., 2005) and attend to information about customer problems, preferences, and buying behaviors related to a specific product/project (Behrens et al., 2014). Further, due to their focus on implementation, middle managers are in contact with the firm's and the industry's technological developments (Ireland, Hitt, Bettis, & De Porras, 1987). Information on customer preferences and new technologies can be an important input for these managers' assessments of project terminations because it reduces the market and technological uncertainty associated with individual projects (Jaworski & Kohli, 1993). For example, middle managers might support continuing a project because they are convinced that the current technological problems can be solved or that customers will buy the product even if it is not in line with the core business strategy or the desired portfolio balance. In contrast, top managers are typically more distant to the project's operations (Floyd & Lane), and there are information asymmetries (Raes, Heijltjes, Glunk, & Roe, 2011) about customer evaluations and technological issues. Therefore, when terminating projects, top managers are more likely to consider project-specific characteristics only to a limited extent but will instead attend more to core

strategic issues, such as the project's strategic fit and contribution to portfolio balance. Therefore, we propose the following:

**Hypothesis 5:** The negative relationship between a project's fit with the desired portfolio strategy and the likelihood that managers will terminate the project is stronger for top managers than for middle managers.

**Hypothesis 6:** The negative relationship between a project's contribution to the balance of the portfolio and the likelihood that managers will terminate the project is stronger for top managers than for middle managers.

## Research Method

### Sample and Data Collection

Our sample consisted of German managers involved in start and termination decisions for entrepreneurial projects within their firms. Using the Creditreform Database, we identified the largest 900 German firms (in terms of turnover) in research and development (R&D)-intensive industries (e.g., chemical industry, automotive industry, consumer goods, and others) because acting entrepreneurially is central to how these firms achieve their missions, how they compete, and how they are assessed by stakeholders. We focused on large firms because they usually have more substantial project portfolios than small firms (Cooper et al., 1999). As reported by our study's participants, the companies had grown 5.1% with respect to employees (standard deviation 9.4%) on average over the last year before the study, and the companies' average R&D investment turnover ratio was 5.6% (standard deviation 1.1%). Within 3 months, we were able to contact 745 managers from 704 firms on our list via telephone (after randomizing the initial list of 900 firms). We asked the managers if they were involved in project/portfolio termination decisions within their firm. If they claimed they were, we explained the general purpose of our study and asked them to participate. Every participant was promised a customized report with the study's results. We sent them an e-mail with a link to an online website that contained the research instrument (see below). If they had not participated after 3 weeks, we reminded the managers via an e-mail to please do so.

All together, 217 managers from 172 firms participated, representing a response rate of 29% (in terms of managers contacted). On average, the participants were 42 years old (standard deviation 9.3 years), and 85.7% of them were male. In addition, 40.1% had a degree in engineering, 27.6% had a degree in the natural sciences, 17.1% had a degree in business studies, and the rest (15.2%) had other degrees. As for employment field, 22.6% worked in the chemical industry, 18.0% worked in the consumer goods industry, 24.0% worked in the automotive industry, and the rest worked in other industries (mostly in the electronics industry). Further, 63.1% of the managers worked in the R&D department, 12% worked in the marketing department, 6.5% worked in the strategy department, and 18.4% worked in other departments. The participants had an average of 16.7 years (standard deviation 8.3 years) of total work experience, and they had worked for their current firm for 6 years on average (standard deviation 5.3 years). Further, 30.3% held a PhD, 58.5% had a master's degree, and the rest had a bachelor's degree. Regarding their positions within the firm, 11.1% were top managers, 68.7% were middle managers, and the rest were lower-level managers. These numbers indicate that the managers in our sample had substantial managerial responsibility. Furthermore, they reported that they received 17% (standard deviation 8%) flexible and performance-based salary proportions.

When asked on a 7-point Likert-type scale (1 = “not much,” 7 = “very much”) how much experience they had with managing innovation portfolios, the managers answered with a 4.58, and when asked how strongly they were involved in the decision processes of innovation portfolio management, they answered with a 4.65. These numbers indicate that the managers felt qualified to participate in our study (on a self-reported basis).

## Conjoint Analysis

We used a metric conjoint experiment to collect data on managers’ assessments of the likelihood of terminating a project from the corporate portfolio. Conjoint analysis was developed from empirical research on how people actually make decisions (Green, Krieger, & Wind, 2001) and “is based upon rigorous research of information processing in judgment and decision making” (Brønn & Olson, 1999, p. 356). In the conjoint task, participants make assessments of specific profiles. *Profiles* are combinations of theoretically derived *attributes* that represent the research variables (Priem & Harrison, 1994). In each profile, each attribute is typically represented by one of two levels (high or low). An *experimental design* determines which attribute level is used for a specific profile and the number of profiles needed to test the research hypotheses. Since each participant makes assessments of a number of profiles, conjoint analysis generates nested data such that a set of assessments (level 1) is nested within each participant (level 2).

The profiles used in our experiment were described by five attributes (i.e., two representing the independent variables strategic fit and portfolio balance and three representing control variables; see below). With two possible levels for each attribute, a fully crossed factorial design would yield  $2^5 = 32$  profiles with different combinations of attribute levels. Since all profiles in metric conjoint studies are replicated to test for respondents’ reliability, a final experiment would consist of  $2 \times 32 = 64$  profiles for each participant to assess, which is a time-consuming task. Therefore, we applied an orthogonal factorial experimental design (Hahn & Shapiro, 1966) to reduce the number of unique attribute combinations from 32 to 16 in order to keep the task manageable for participants, which resulted in 32 fully replicated profiles for each participant. Furthermore, we included a practice profile to familiarize the managers with the experimental task, but this profile was not included in the analysis. Therefore, the assessment task contained 33 profiles in total. That is, we collected assessments of 16 different attribute combinations from each manager and confirmed the reliability of managers’ assessments by performing test-retest checks of original and replicated profiles (Shepherd & Zacharakis, 1997).

We randomly assigned both the order of the profiles and the order of attributes in two ways each, resulting in four versions of the experiment ( $2 \times 2$  matrix), and participants were randomly assigned to one of the four versions. To test for possible order effects, we compared the mean score across the four different versions. No differences between the two different orders of profiles within the experiment or the two different orders of attributes within the profiles were statistically significant ( $p > .10$ ), indicating no substantial order effects.

## Advantages of Conjoint Analysis

Project termination decisions are complex and often associated with substantial biases, including, for example, escalation of commitment (Guler, 2007). The complexity and biases inherent in termination decisions make retrospective methods, such as questionnaires and interviews, difficult to use because these methods are prone to errors when

decision makers' introspection is inaccurate (Fischhoff, Gonzalez, Lerner, & Small, 2005). Conjoint analysis allows researchers to collect data on managers' assessments *as they are being made*, which eliminates biases emerging from missing retrospection (Shepherd & Zacharakis, 1997). Further, since independent variables are exogenously defined and not provided by the respondent, common method bias is typically not a problem for the experimental approach and research model we employ (cf. Podsakoff, MacKenzie, Lee, & Podsakoff, 2003, p. 899). Based on these characteristics, conjoint studies have often been used to study termination decisions, including entrepreneurs' decisions to terminate underperforming firms (DeTienne, Shepherd, & De Castro, 2008), alliance managers' decisions to terminate alliances (Patzelt & Shepherd, 2008), and scientists' decisions to terminate research projects (Patzelt, Lechner, & Klaukien, 2011).

In addition, the current research comprises potential challenges related to the endogeneity of variables and the causality of relationships. On the one hand, the characteristics of the portfolio should influence managers' termination decisions, but on the other hand, project terminations impact the composition of the firm's actual portfolio. Further, while we argue that failure experience influences project termination decisions, it might also be an outcome of such decisions in the past. Similarly, while our theory suggests that a firm's growth rate influences terminations, it could be an outcome of not terminating projects prematurely. The challenge of disentangling these reverse relationships is difficult to address in cross-sectional questionnaire designs, but it can be overcome using conjoint analysis when decision cues are presented as predefined stimuli for the scenario assessments, thereby excluding issues of endogeneity (Shepherd & Zacharakis, 1997).

## Survey Instrument and Variables

Participants were first provided with a description of the project attributes and their operationalizations (see below). Afterwards, they evaluated a series of hypothetical profiles describing projects, and they assessed the likelihood that they would terminate these projects from the corporate portfolio. In a post-experiment questionnaire, we collected demographic data and details about the firms.

**Dependent Variable.** The dependent variable of our study is managers' assessments of the likelihood that they would terminate an entrepreneurial project from the corporate innovation portfolio. Consistent with other studies on project termination (Patzelt et al., 2011; Patzelt & Shepherd, 2008; Shepherd et al., 2009), we asked managers to assess the likelihood that they would terminate a project using a 7-point Likert-type scale (1 = "very unlikely," 7 = "very likely").

**Independent Variables at Level 1 (Decision Profiles).** In the profiles, we used two project attributes to describe the entrepreneurial project's characteristics (each with two levels). Consistent with cognitive psychology, the attributes were described in terms of participants' *perceptions* of the portfolio characteristics, not in terms of objective numbers (which might lead to different perceptions for different participants). Specifically, attribute descriptions were derived from definitions of the variables in previous studies (Cooper et al., 1999, 2002). *Strategic fit*: "The project fits very well with the desired portfolio strategy of your firm" (high) versus "The project shows little fit with the desired portfolio strategy of your firm" (low). *Portfolio balance*: "The project increases the balance within the innovation portfolio in terms of different project types (e.g., radical and incremental

projects)” (high) versus “The project contributes little to increasing the balance within the innovation portfolio in terms of different project types (e.g., radical and incremental projects)” (low).

**Moderator Variables at Level 2.** In the post-experiment questionnaire, we asked participants about their *failure experience*. Specifically, participants were asked, “How many of the projects that you managed in your company have failed? Please give a percentage.” Second, following other studies, we measured *growth* as employee growth over time (Vaessen & Keeble, 1995; Zahra, 1993). In the post-experiment questionnaire, we asked participants about the relative growth rates of their firms with the following request: “Please estimate what percentage your company has grown in the last year regarding employees.” Following cognitive psychology, we intentionally asked managers about their perceptions of their firm’s growth rate rather than using objective data. Third, we captured managers’ hierarchical level by two dummies for top managers and lower-level managers, respectively (middle managers were the reference category).

**Control Variables at Level 1.** In the profiles, we added three control variables that have been found to impact portfolio decisions (e.g., Cooper et al., 1999). First, *value maximization* denotes the extent to which the focal project contributes to maximizing the financial value of the portfolio and was described by two levels: “The project contributes fundamentally to the value maximization of the innovation portfolio (high)” versus “The project contributes little to the value maximization of the innovation portfolio” (low). Second, *resource effectiveness* refers to the allocation of a firm’s resources to the “right projects” and was described by the following levels: “The project can be managed perfectly with existing resources (e.g., budget, team)” (high) versus “The project can hardly be managed with the existing resources (e.g., budget, team)” (low). Finally, the variable *technological uncertainty* was described by the following: “The technology underlying the project is known to the company” (certain) versus “The technology underlying the project is new to the company” (uncertain).

**Control Variables at Level 2.** At the level of the managers and their firms, we used additional control variables. We used dummy variables to control for the educational background of each participant (using the categories *business education*, *science education*, and *engineering education* versus the rest as the reference category) because education is a major determinant of managerial decision making (Hitt & Tyler, 1991). Further, we used dummy variables to control for industry effects (using the categories *chemical industry*, *consumer goods industry*, and *automotive industry* versus the rest as the reference category) because strategic decisions differ across industries (Hitt & Tyler). Moreover, we used managers’ *firm tenure* (measured as years within the company) as another control variable as it is also known to impact managers’ decision policies (Baron, 2009). *Perceived firm success* was also added as a control since the perception of success is known to impact managerial decisions (Hornsby et al., 2009). Participants were asked, “How successful is your company from your perspective?” and answered on a 7-point Likert-type scale (1 = “not at all successful,” 7 = “very successful”). We also controlled for *firm turnover* as a proxy for the firm’s resource endowments, which influence strategic allocation decisions (Haynie, Shepherd, & McMullen, 2009). Finally, since a firm’s profitability is a major driver of managerial decision making (Zahra, 1993), we entered the variable *profit growth*, which we measured by asking participants to “Please estimate what percentage your company has grown in the last year regarding profit.” Again, we refer to managers’ perceptions of growth consistent with cognitive psychology.

## Results

### Descriptive Statistics and Correlations

To test the reliability of the managers' assessments, we computed Pearson correlations between their assessments of the original and replicated project profiles. The mean test-retest correlation across managers was .82, which is similar to other studies (Shepherd, 1999; .69). Further, the mean  $R^2$  of the individual assessment models was .80, again similar to previous work (Shepherd; .78). These values demonstrate that participants consistently performed the conjoint tasks and that their answers show high reliability. Because we used an orthogonal fractional factorial design, the correlations between level 1 variables are zero. However, variables describing the individuals and their firms (level 2) are not orthogonal and may correlate. Table 1 presents the correlations of the level 2 variables. As the values show, correlations are only small to modest. Thus, there is no reason to assume that multicollinearity substantially influences our results.

### Hierarchical Linear Modeling Analysis

Data analysis was performed using hierarchical linear modeling (HLM) since the 6,944 data points are not independent of each other. Each of the 217 participants made 32 assessments, but participants' cognitive models differ. Therefore, our data structure is hierarchical, with level 1 representing participants' assessments, and level 2 capturing characteristics of participants and their respective firms. Table 2 presents the results. We present the coefficients, standard errors (in parentheses), and levels of significance (indicated by asterisks) for the impact of the projects' characteristics in corporate entrepreneurship managers' assessments of whether to terminate the projects from the corporate innovation portfolio. Specifically, model 1 in Table 2 represents the "controls only" model and captures the results for the intercept level 1 controls and level 2 controls. As expected, the results of this model reveal significant main effects for all three level 1 controls (i.e., value maximization, resource effectiveness, and technological uncertainty). In model 2, we entered only the main effects of the level 1 independent and level 2 moderator variables of our study. As expected, the results show that managers assess a higher likelihood of terminating an entrepreneurial project if it shows less strategic fit with the corporate strategy (coefficient =  $-1.168$ ;  $p < .001$ ) and contributes less to balancing the portfolio (coefficient =  $-0.226$ ;  $p < .001$ ). Further, none of the level 2 control variables show a significant main effect relationship with managers' likelihood of terminating a project from the portfolio.

To test our hypotheses, model 3 explores the interaction effects between the level 1 and level 2 variables. The hypothesized interaction between portfolio balance and managers' failure experience in explaining project termination is not significant ( $p > .05$ ). Thus, there is no support for hypothesis 2. However, we did find significant interactions between failure experience and strategic fit (coefficient =  $-0.006$ ;  $p < .05$ ). Additionally, there are significant interactions between firm growth and strategic fit (coefficient =  $0.019$ ;  $p < .01$ ) and between growth and portfolio balance (coefficient =  $0.040$ ;  $p < .001$ ). Model 3 also reveals significant interactions between top management position and strategic fit (coefficient =  $-0.647$ ;  $p < .05$ ) and between top management position and portfolio balance (coefficient =  $-0.401$ ;  $p < .05$ ).<sup>2</sup> To illustrate

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2. Since one firm in our sample provided 46 respondents, as a robustness check, we ran model 3 with a level 2 control dummy variable indicating that specific firm. The results did not change, nor was the control variable significantly associated with the dependent variable. We thus decided to leave the 46 respondents from this firm in the final sample.

Table 1  
Correlations of Level 2 Variables

	Mean	Standard deviation	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Business education	0.171	n.a													
2 Science education	0.277	n.a	-0.280**												
3 Engineering education	0.401	n.a	-0.371**	-0.506**											
4 Chemical industry	0.226	n.a	-0.069	0.504**	-0.307**										
5 Automotive industry	0.180	n.a	-0.111	-0.275**	0.246**	-0.303**									
6 Consumer goods industry	0.240	n.a	0.139*	-0.128	0.0330	-0.253**	-0.263**								
7 Firm tenure	6.11	5.258	-0.108	0.040	0.121	0.083	0.011	0.018							
8 Perceived firm success	5.59	1.094	0.094	0.008	-0.094	-0.007	-0.093	0.167*	0.006						
9 Firm turnover	6.925	2.318	0.070	0.016	0.008	-0.005	0.022	0.297**	-0.078	0.221**					
10 Profit growth	37.82	152.51	-0.051	0.126	-0.086	0.040	0.149*	-0.089	-0.012	0.101	0.023				
11 Lower level manager	0.200	n.a	0.137*	-0.184**	-0.085	-0.190**	-0.068	0.122	-0.153*	0.087	0.063	0.080			
12 Failure experience	19	24	-0.155*	0.059	-0.056	0.016	0.090	-0.036	-0.25	-0.024	-0.063	0.038	-0.068		
13 Employee growth	5.12	9.358	-0.016	-0.101	0.062	-0.057	0.017	-0.094	-0.112	0.081	-0.159*	-0.008	0.101	0.080	
14 Top manager	0.110	n.a	0.082	-0.176**	0.079	-0.231**	0.129	0.127	0.013	0.014	0.074	-0.095	-0.015	-0.161**	0.161*

N = 217.  
\*  $p < 0.05$ , \*\*  $p < 0.01$

Table 2

## Results of the HLM Analysis

Variable	Model 1 (controls)	Model 2 (main effects)	Model 3 (full model)
Intercept	3.987*** (.031)	3.987*** (.030)	3.987*** (.030)
Level 1 controls			
Value maximization	-1.839*** (.097)	-1.839*** (.089)	-1.839*** (.086)
Resource effectiveness	-0.725*** (.069)	-0.725*** (.066)	-0.725*** (.063)
Technological uncertainty	-0.330*** (.098)	-0.331*** (.089)	-0.330*** (.085)
Level 2 controls			
Business education	-0.066 (.102)	-0.105 (.102)	-0.099 (.102)
Science education	-0.073 (.101)	-0.082 (.099)	-0.087 (.099)
Engineering education	0.005 (.087)	-0.015 (.088)	-0.013 (.088)
Chemical industry	-0.040 (.092)	-0.024 (.092)	-0.033 (.092)
Automotive industry	-0.241* (.092)	-0.238** (.093)	-0.240* (.093)
Consumer goods industry	-0.197* (.097)	-0.199* (.099)	-0.200* (.099)
Firm tenure	-0.002 (.006)	-0.003 (.006)	-0.003 (.006)
Perceived firm success	0.023 (.026)	0.023 (.027)	0.024 (.027)
Firm turnover	0.038* (.015)	0.036* (.015)	0.036* (.015)
Profit growth	0.000 (.000)	0.000 (.000)	0.000 (.000)
Lower level manager	-0.223** (.078)	-0.221** (.081)	-0.236** (.082)
Level 1 main effects			
Strategic fit		-1.168*** (.076)	-1.169*** (.073)
Portfolio balance		-0.226*** (.061)	-0.226*** (.055)
Level 2 main effects			
Failure experience		-0.002 (.001)	-0.002 (.001)
Employee growth		-0.000 (.003)	-0.002 (.003)
Top manager		-0.113 (.096)	-0.068 (.096)
Cross-level effects			
Strategic fit × Failure experience			-0.006* (.003)
Portfolio balance × Failure experience			-0.003 (.002)
Strategic fit × Employee growth			0.019** (.006)
Portfolio balance × Employee growth			0.040*** (.007)
Strategic fit × Top manager			-0.647* (.295)
Portfolio balance × Top manager			-0.401* (.170)

Unstandardized coefficients, standard errors in parentheses, N = 6,944 decisions nested within 217 managers.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

All possible interactions between level 1 and level 2 variables are included in the models but are omitted from the table to improve clarity.

HLM, hierarchical linear modeling.

the nature of these significant interactions, we used HLM software to plot them in diagrams, for which the  $y$ -axis represents the managers' assessed likelihood of terminating a project from the portfolio, and the  $x$ -axis represents strategic fit and portfolio balance, respectively (Figure 2). The graphs show separate lines for high and low failure experience (Figure 2a), high and low firm growth (Figure 2b and c), and top and middle managers (Figure 2d and e). For high and low levels, HLM software provides values at the 25th and 75th percentiles, respectively.

Figure 2a shows that the negative relationship between a project's fit with the desired portfolio strategy and the likelihood that managers will terminate the project is stronger when failure experience is high than when it is low, thus supporting hypothesis 1. Figure 2b shows that the negative relationship between strategic fit and the likelihood that

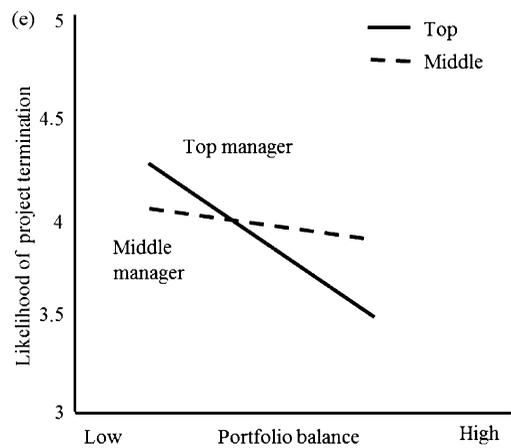
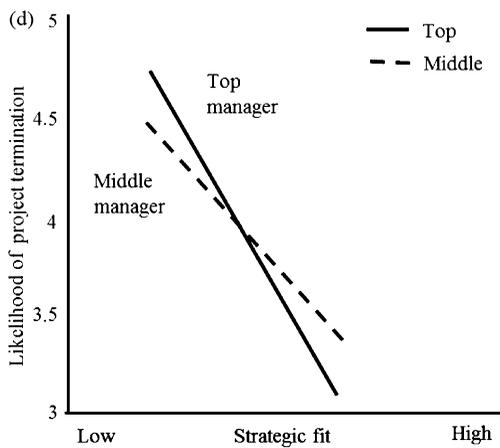
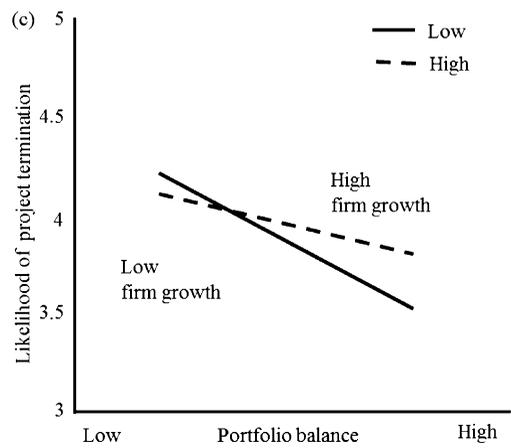
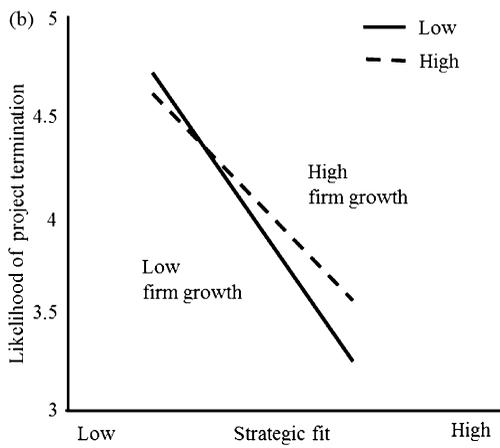
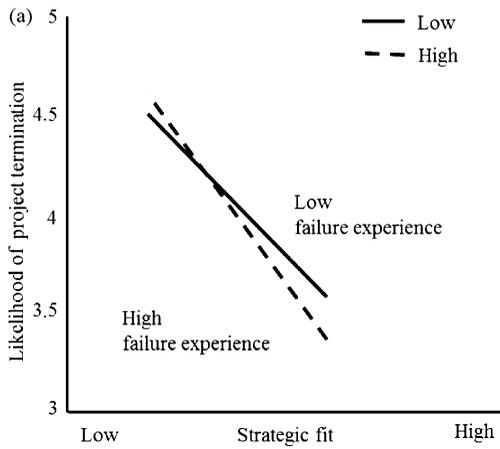
Figure 2

Moderating Relationships Between Research Variables

(a): High and Low Failure Experience

(b, c): High and Low Firm Growth

(d, e): Top and Middle Managers



managers will terminate the project is weaker when the growth rate is high than when it is low, thus supporting hypothesis 3. Figure 2c shows that the negative relationship between a project's contribution to the balance of the portfolio and the likelihood that managers will terminate the project is weaker when the growth rate is high than when it is low. Hence, there is support for hypothesis 4. Figure 2d shows that the negative relationship between strategic fit and the likelihood that managers will terminate the project is stronger for top managers than for middle managers, thus supporting hypothesis 5. Finally, Figure 2e shows that the negative relationship between a project's contribution to the balance of the portfolio and the likelihood that managers will terminate the project is stronger for top managers than for middle managers, thus supporting hypothesis 6.

## Discussion

### Theoretical Implications

This study has implications for research into different aspects of corporate entrepreneurship and innovation management. First, although not directly hypothesized, the underlying assumption of our study was that managers' project terminations depend on the firm's overall project portfolio. Consistent with this assumption, we found that both a project's fit with the overall corporate strategy and its contribution to balancing the portfolio with respect to radically and incrementally innovative projects were important aspects managers consider, thus extending previous studies' focus on a focal project's characteristics. Even more importantly, our study contributes to research on corporate entrepreneurship and innovation management by exploring how multiple levels of analysis impact managers' decision making. We provide evidence that there is considerable heterogeneity in managers' attention to portfolio characteristics when terminating projects. This heterogeneity can be explained by characteristics of the individual manager (i.e., his or her prior project failure experience [hypothesis 1] and the hierarchical position he or she holds within the firm [hypotheses 5 and 6]) as well as by characteristics of the firm (i.e., the firm's growth rate [hypotheses 3 and 4]). Thus, understanding corporate managers' decisions involves complex interactions between individual-level, portfolio-level, and firm-level effects (cf. Shepherd, 2011). Investigating these multilevel interactions is important because it sets the contextual boundaries of existing theorizing (Whetten, 1989) on how corporate entrepreneurship and innovation managers judge projects based on the characteristics of the corporate portfolio (e.g., McNally et al., 2009, 2013). In exploring these interactions, our study addresses a call in the corporate entrepreneurship literature to investigate how cognitive and organizational factors impact firms' innovative behaviors (Phan et al., 2009).

Second, we theorized about and empirically explored the interaction of portfolio characteristics and managerial failure experience in termination decisions, and we found that failure experience multiplies the impact of strategic fit on the likelihood of project termination (hypothesis 2). This finding adds to corporate entrepreneurship research that tries to understand the implications of project failures for the managers and employees involved—an important research stream given that innovative projects often fail due to high levels of technological and market uncertainty (Jaworski & Kohli, 1993). While existing work has typically focused on how the failure of one specific project impacts the failed individuals' emotions, motivation, learning, and commitment to subsequent projects and their organization (McGrath, 1999; Shepherd et al., 2009, 2011, 2013, 2014), we demonstrate that the consequences of previous managerial project failures go beyond an

immediate reaction in terms of emotions and learning. Indeed, as Shepherd et al. (2009) speculated, these consequences appear to have far-reaching effects on the firm's portfolio composition and thus innovation strategy.

Third, our theoretical model and empirical analysis acknowledged that failure can be more than a one-time event. We provide empirical evidence that the impact of a project's fit with the corporate strategy on managers' likelihood to terminate that project is greater for managers with high failure experience than for managers with low failure experience (hypothesis 1). However, we did not find that accumulated failure experience moderates the relationship between portfolio balance and managers' likelihood of project termination (hypothesis 2). Therefore, it appears that the accumulation of failure experiences over time draws managers' attention to portfolio-related attributes but to a different extent for different attributes. These findings contribute to the literature on corporate entrepreneurship, which typically views failures as one-time events, but provides little insight into how multiple failures affect managers and project team members. Our results support Shepherd et al.'s (2013) recent theorizing on the impact of multiple project failures on employees' emotions and turnover intentions, and we extend this focus to the context of corporate entrepreneurship managers.

Fourth, our findings that the negative relationships between (1) a project's contribution to strategic fit and the likelihood of project termination and (2) a project's contribution to portfolio balance and the likelihood of project termination are stronger for top managers than for middle managers (hypotheses 5 and 6) help us understand "divergent thinking" between hierarchical managerial levels in corporate entrepreneurship and innovation contexts (Floyd & Wooldridge, 1997; Hornsby et al., 2009; Kuratko et al., 2005). While recent work has shown that experienced top managers emphasize the strategic context less than middle managers when they decide on the *start* of new projects (Behrens et al., 2014), our results show that when it comes to the *termination* of projects, they tend to emphasize strategic context (i.e., strategic fit and portfolio balance) more than middle managers. It appears that top managers are more willing to invest resources in starting new projects that explore strategically unrelated areas than in the continuance of active projects in these areas. Perhaps when starting a new project, top managers account for the possibility that if the project is successful and other future developments are appropriate (e.g., the competitive situation and profits, economic conditions), the project will become part of the firm's core strategy. If the project has been active for some time and this has not happened, however, termination based on strategic considerations becomes likely.

Additionally, we found that managers tend to attend less to a project's fit with the desired portfolio strategy and its contribution to portfolio balance with respect to incremental and radical projects when their firms grow quickly than when they grow slowly (hypotheses 3 and 4). Since growth processes include resource adaptations over time, these findings provide a dynamic view of managing corporate portfolios as well as managing a firm's resources dedicated to entrepreneurial projects. Under conditions of uncertainty, timely project termination is an important task for successful portfolio management (Barnett, 2008; McGrath, 1999), yet appropriate is difficult to achieve because uncertainty tends to trigger escalation of commitment (Staw, 1976). Our findings suggest that a firm's current situation (i.e., growth rate) greatly influences corporate entrepreneurship managers' allocation of attention to portfolio management, with them dedicating less attention in situations of substantial organizational change (cf. Yu et al., 2005).

Finally, our finding that managers' focus of attention, situated attention, and structural distribution of attention explain project terminations informs ABV research. ABV studies have typically focused on explaining firm-level outcomes, including growth (Greve,

2008), chief executive officer succession (Thornton & Ocasio, 1999), and technology commercialization (Eggers & Kaplan, 2009). While these outcomes implicitly capture attentional effects on managerial decision making, they do not acknowledge that multiple decisions have to be made to craft the firm's strategy and reactions to environmental stimuli. That is, they do not provide insights (because it is not their purpose) into how different attention types (i.e., focused, situated, structurally distributed) influence different decisions or whether multiple types can affect the same decision. Our study provides evidence that all attention types can impact the same strategic decision, although differently for different decision cues. While both situation attention (hypotheses 3 and 4) and structural distribution of attention (hypotheses 5 and 6) explain variance in corporate entrepreneurship managers' considerations of strategic fit and portfolio balance in project terminations, focus of attention only explains variance for strategic fit (hypothesis 1) but not for portfolio balance (hypothesis 2). These findings emphasize the usefulness of ABV not only to explain strategic behavior at the firm level by aggregating multiple decisions but also to explain how managers draw specific decisions based on multiple environmental stimuli (i.e., decision cues).

### **Managerial Implications**

This study provides corporate entrepreneurship managers with an improved understanding of the consequences of their own assessment policies as it analyzed specific project attributes' impact on portfolio composition. Judgment and decision biases are frequent when managers have to terminate projects (Staw & Ross, 1987), and due to these biases, managers often do not understand their own evaluation processes. To corporate entrepreneurship managers, this study demonstrates that they tend to prefer projects that show high strategic fit and contribute to a balanced portfolio but that specific individual-level attributes affect the judgment process, portfolio composition, and—ultimately—the firm's strategy. More precisely, this study indicates that managers with more failure experience value portfolio attributes more than managers with less failure experience, and that managers within top management positions value portfolio attributes more than managers in middle management positions. Being aware of these findings can help managers make better termination decisions if they consider their experiences and position. Similarly, the finding that it is especially challenging for high-growth firm managers to focus on portfolio attributes to continuously improve their overall portfolio composition can help the managers of those firms consciously pay more attention to those attributes when terminating projects.

### **Limitations, Future Research, and Conclusion**

There are some limitations of our study. First, despite the advantages of conjoint analysis for our research purpose, the most frequent criticism of this method relates to external validity. We simplified a more complex business world based on five decision criteria; thus, there is the possibility that respondents could attach importance to attributes just as they were presented in the experiment. However, studies have shown assessments that are based on three to seven attributes are still consistent with real-life decisions (Stewart, 1988). Further, studies have shown that conjoint experiments reproduce individuals' real-world judgments even in the most complex decision situations (e.g., Riquelme & Rickards, 1992). Moreover, the decision attributes of our model were theoretically justified, which increases their external validity (Shepherd & Zacharakis, 1997).

Finally, after the experimental task, participants rated on a 7-point Likert-type scale (1 = “not important,” 7 = “very important”) the perceived impact of the portfolio attributes when terminating projects. Average ratings were 5.03 for strategic fit and 3.30 for portfolio balance. While these values indicate that the decision attributes had at least some self-assessed importance for managers’ termination decisions, testing our findings in a real-world setting using nonexperimental methodology might further enhance validity.

Second, there are limitations associated with the construction of hypothetical conjoint profiles. First, by construction, we ensured our independent variables representing the decision cues were orthogonal (i.e., there was zero correlation between the variables) in order to enhance the robustness of the results obtained (Huber, 2005). Specifically, assuming orthogonality in conjoint experiments is important because correlated decision attributes can lead to misspecifications of results and biased estimates. This is because respondents may consider only one of two correlated attributes relevant for their decisions, but in the estimations, the unimportant attribute is found to be important because of the correlation (Huber). Therefore, in conjoint profiles, decision attributes are described as single items based on their definitions. Future research can draw on questionnaire-based designs and multi-item measures to further corroborate our results. Finally, it is important to note that (consistent with the cognitive psychology perspective) the conjoint scenarios described managers’ perceptions of portfolio attributes, but future research is needed to investigate how these perceptions are formed based on objective portfolio characteristics and (perhaps) available numbers as well as whether perceptions are correct or incorrect compared with objective information.

Other limitations of our study might also provide important avenues for further research. Our measure of failure experience is, as with all measures, not perfect: It captures the percentage of managers’ failed projects as a single item on a self-report basis. Other measures of failure experience (e.g., total number of failed projects provided by firm records) could be valuable to provide further support for our hypotheses. Second, while our dataset provides us with a number of control variables for the statistical models, as for all studies, this set is incomplete. For example, while we controlled for the growth of a firm’s profitability, we did not know absolute levels nor the amount of liquidity firms had at hand. Given that financial slack can influence innovation decisions (Bradley et al., 2011; George, 2005), future studies should collect data on firms’ profitability and liquidity.

Over and above addressing its limitations, future research can extend our study in several ways. For example, there are future research opportunities related to our control variable “technological uncertainty.” Our results presented in Table 2 suggest that technologically more uncertain projects are less likely to be terminated, suggesting that managers have considerable hope that technological problems can be solved in the end, which might lead to escalation of commitment. Going forward, studies can explore the role of technological uncertainty in portfolio decisions in more detail. Further, while we explore antecedents of project termination decisions, we do not investigate the impact of these decisions on firm outcomes. Do firms whose managers emphasize strategic fit and portfolio balance more in their project terminations perform better (financially or with respect to innovative output)? Perhaps the performance effects of managerial emphasis on portfolio characteristics depend on the nature of the industry or the characteristics of the underlying technology (e.g., time-to-market). Finally, there are research opportunities to explore how experiencing multiple project failures impact managerial decision making. For example, given our finding that multiple failure experiences impact project termination, how does such experience impact the decision to start a particular project in the first place? Since failure can be normalized (see earlier), perhaps those with more failures in

the past tend to start projects that carry higher risks. Exploring this hypothesis can provide important insights into innovation portfolio compositions and, as a consequence, firm performance.

To conclude, drawing on a cognitive psychology perspective and the ABV, this study analyzed how attributes at different levels of analysis moderate the impact of strategic portfolio fit and portfolio balance on managers' assessments of whether to terminate an entrepreneurial project from the corporate innovation portfolio. The results show that multiple cross-level effects influence termination decisions. These results provide new insights in the corporate entrepreneurship and innovation literatures studying project portfolios, managerial failure experience, firm growth, and divergent thinking across managerial levels. Our findings have important theoretical and practical implications, and we hope they inspire further work into innovation portfolio management and project termination, both of which constitute key strategic activities in entrepreneurially acting firms.

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