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Navigating through learning tensions at the front end: How firms can motivate paradoxical thinking when screening the creativity of ideas

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Idea screening is crucial as it must select the most promising ideas that are best suited to increase front-end success. Although paradox theory indicates that learning tensions characterize the evaluation and screening of idea creativity, we know little about how idea screeners navigate through the associated competing demands. In response, we investigate the effects of idea screeners' paradoxical thinking on the assessment of the creativity of ideas as well as its motivational antecedents of paradoxical thinking. By analyzing a survey ($N=326$) and an experiment ($N=292$), we show that paradoxical thinking increases front-end success and both dimensions of idea creativity (encompassing meaningfulness and novelty). In turn, by creating a motivational context (comprising decision autonomy, encouragement to take risks, and tolerance for mistakes), firms can provide the antecedents to adopt paradoxical thinking. Our study contributes to and extends the literature on screening idea creativity and paradox theory.

1. Introduction

Idea screeners have a crucial task as they select the ‘right’ to lay the foundation for success at the front-end (de Oliveira et al., 2015; Kornish and Jones, 2021; Schweisfurth et al., 2023). Since the creativity of ideas is a sufficient requirement for innovation (Amabile, 1988; Schweisfurth and

Greul, 2023; Ghosh and Wu, 2023), idea screeners assess idea creativity, describing the degree to which ideas are “perceived as representing unique differences from competitors’ products and programs in ways that are meaningful to target customers” (Im and Workman, 2004, p. 115). In particular, they evaluate two, distinct but complementary dimensions of creativity — meaningfulness (e.g., usefulness

for customers) and novelty (e.g., originality) (Im et al., 2013). Nevertheless, this assessment is challenging as both dimensions of creativity have different implications. For instance, ideas' incremental improvements often add value for customers and are, therefore, meaningful to the customer in the short term. But, despite being technically feasible, these improvements often lack the novelty required to provide a competitive advantage (Nakata et al., 2018; Acar et al., 2019).

Screening idea creativity is challenging as it is characterized by learning paradoxes. According to the paradox theory, learning paradoxes describe inter-related but often conflicting demands between the established and new, stability and change, or exploration and exploitation (Andriopoulos et al., 2018; Moschko et al., 2023). Meaningfulness promotes ideas building on established and well-known customer preferences to drive the exploitation of established competencies. In contrast, novelty seeks to address and create new customer needs, requires changing internal competencies and external market logic, and drives explorative innovations. These competing demands of learning paradoxes cause the experience of tensions between meaningfulness and novelty, inducing anxiety, discomfort, and stress in judging ideas (Gurtner and Reinhardt, 2016; Miron-Spektor et al., 2018). To avoid these tensions, idea screeners often focus on a demand for exclusion, making sub-optimal decisions by preferring meaningful ideas over novel ones (Criscuolo et al., 2017; Ghosh and Wu, 2023). This tendency is highly problematic as idea screeners have to navigate through learning paradoxes by selecting ideas that build upon as well as destroy the past to ensure a steady and balanced flow of different meaningful and novel innovations (Andriopoulos et al., 2018).

However, although scholars developed the theoretical and methodological means to investigate the microfoundation of paradox theory – the paradoxical thinking of individuals (Miron-Spektor et al., 2018; Lewis and Smith, 2022) – we know little about how idea screeners cope with the learning tensions inherent to their task. Paradoxical thinking describes a situation-specific thinking mode “to effectively embrace, rather than avoid, contradictions” (Smith and Tushman, 2005, p. 533). Therefore, it reflects the extent to which idea screeners accept and are energized by learning tensions (Miron-Spektor et al., 2018). In particular, the literature on paradoxical thinking studies its relationship with creativity behaviors (Miron-Spektor et al., 2011; Leung et al., 2018), idea generation (Gurtner and Reinhardt, 2016; Randhawa et al., 2021), and coping mechanisms with learning tensions at the front-end

(Andriopoulos et al., 2018). Thus, research focuses on generating creative ideas and tends to neglect the task of idea screening.

This research gap is problematic as idea screeners differ in their coping with learning tensions, determining whether their decisions fuel innovation and learning or trigger counterproductive and ineffective responses (Andriopoulos et al., 2018; Lewis and Smith, 2022). Whereas idea screeners often prefer meaningful ideas, other research demonstrates they can also select highly novel ideas (Criscuolo et al., 2017; Schweitzer et al., 2020; Ghosh and Wu, 2023). To reveal this heterogeneity of insights, research has to unpack potential reasons explaining how idea screeners can balance competing demands of novelty and meaningfulness. This microfoundation contributes to ongoing calls for understanding the individual level, shaping the simultaneous pursuit of explorative and exploitative ideas (Sukhov et al., 2021; Bertello et al., 2022).

In response, we explore the following research questions by conducting multi-method research: What is the effect of paradoxical thinking on assessing the creativity of ideas and front-end success? How can firms motivate the paradoxical thinking of idea screeners? Following the paradox theory, we focus on the paradoxical thinking of idea screeners, suggesting that they can become comfortable with persistent learning tensions (Smith and Tushman, 2005; Smith and Lewis, 2011). Instead of focusing on one demand, e.g., idea meaningfulness, at the expense of the other, e.g., idea novelty, paradoxical thinking enables idea screeners to work themselves through the contradicting demands of learning tensions leading to more innovative, effective, and efficient behaviors than the focus on one demand in isolation (Andriopoulos et al., 2018; Liu et al., 2019). We support our hypothesis by investigating 326 idea screeners showing that paradoxical thinking increases idea meaningfulness, idea novelty, and front-end success. The results also suggest that firms motivate paradoxical thinking by providing an organizational context characterized by decision autonomy, encouragement to take risks, and tolerance for mistakes. Second, an experimental study ($N=292$) supports the antecedents of paradoxical thinking and reveals that product complexity increases each antecedent's effect on paradoxical thinking.

These insights contribute to research on idea screening focusing on creativity (Verworn et al., 2007; Schweisfurth et al., 2023) and paradox theory in the context of learning tensions (Smith and Lewis, 2011; Andriopoulos et al., 2018). First, we extend the literature on front-end success by complementing insights on the effects of

organizational characteristics, such as formalization, strategic considerations, and criteria usage (Kock et al., 2015; Nakata et al., 2018), with the relevance of adopting paradoxical thinking and acknowledging meaningfulness as well as novelty when screening the creativity of ideas. Second, by synthesizing paradox research characterizing the front-end (Gurtner and Reinhardt, 2016; Randhawa et al., 2021) and creativity (Miron-Spektor et al., 2011, 2018; Leung et al., 2018), we demonstrate paradoxical thinking enables the synthesis of the competing demands of meaningfulness and novelty when screening ideas. On this foundation, we reveal that paradoxical thinking enables idea screeners to balance the competing demands of meaningfulness and novelty. Thereby, we extend our understanding of screening ideas' creativity (Zhou et al., 2019; Schweisfurth et al., 2023) and offer new insights into how idea screeners can overcome their tendency to favor meaningfulness at the expense of novelty (Criscuolo et al., 2017; Ghosh and Wu, 2023). Furthermore, we extend the literature on managing idea screening and steering paradoxical thinking (Andriopoulos et al., 2018; Miron-Spektor et al., 2018) by exploring three motivational antecedents of paradoxical thinking.

This study is organized as follows. We develop the hypotheses after reviewing the literature and unfolding our theoretical grounding. Thereafter, the study explains both study's methodology and results. Finally, this research discusses the results, theoretical and practical implications, and limitations as well as future research avenues.

2. Literature review

Creativity is subject to idea screening since it is necessary for innovations, laying the foundation for their superiority over competing offerings (Amabile, 1988; Acar et al., 2019). Yet, paradox theory indicates that the two dimensions of creativity – idea novelty and meaningfulness – challenge idea screening, as they are characterized by the competing demands of learning tensions (Gurtner and Reinhardt, 2016; Andriopoulos et al., 2018). While idea meaningfulness demands ideas exploiting well-known customer needs, idea novelty requires idea screeners to acknowledge the exploration of new competencies and knowledge. In this study, we argue that idea screeners can become comfortable with learning tensions' persistent and unsolvable nature by adopting paradoxical thinking (Smith and Tushman, 2005; Smith and Lewis, 2011). Instead of focusing on one pole of

the demand at the expense of the other, paradoxical thinking enables idea screeners to search for novel ways to steadily manage learning tensions by synthesizing learning and flexibly maneuvering between competing demands.

2.1. Screening the creativity of ideas

Idea screening is the first review point in the innovation process that results in substantial investment decisions on selected ideas for subsequent development (Verworn et al., 2007; de Oliveira et al., 2015; G. Schweisfurth and Greul, 2023). It is a crucial front-end task that lays the foundation for innovation. Since creativity can predict success at the front-end and subsequent innovation process (Nakata et al., 2018; Huang et al., 2021), it is crucial that idea screeners assess and select the most promising ideas based on their creativity for further development. To research creativity, scholars apply an outcome-focused conceptualization differentiating between two dimensions (Im et al., 2013; Nakata et al., 2018). First, meaningfulness describes the extent to which an idea is useful, valuable, and helpful to the targeted group, e.g., the customers, compared to other solutions on the market. Second, novelty refers to the extent to which an idea is unique, novel, and original within a specific domain of interest (Amabile, 1988; Im and Workman, 2004).

Research acknowledges the crucial role of idea creativity by typically focusing on its antecedents (Gurtner and Reinhardt, 2016; Asplund et al., 2022; Boënné et al., 2023). For instance, the geographic distance between partners has a u-shaped relationship with creativity, which is positively moderated by high IT usage, trust, and shared goals (Zhang et al., 2022). This insight is complemented by research showing that the physical (e.g., facilities and other material systems) and non-physical environment (e.g., space atmosphere) of maker-spaces positively affect creativity via individual and team behaviors, e.g., exchanging opinions (Huang et al., 2021). In turn, exchanging opinions is essential as it shapes how ideas are further developed and affects innovation performance (Ter Wal et al., 2023). Furthermore, customer orientation, cross-functional integration, design thinking, and top management integration can also enhance creativity in innovation processes (Nakata et al., 2018; Roth et al., 2023).

Other scholars explore the creation of ideas in crowdsourcing and idea contests. For instance, Asplund et al. (2022) show that the frequency of employees' participation in idea contests and their

domain-specific knowledge shape their favoritism of exploitive ideas. Yet, the exposure to others' ideas in idea generation depends on the characteristics of ideas (Deichmann et al., 2021). Whereas exposure to novel ideas results in more novel subsequent ideas, low degrees of novelty are positively associated with the number of subsequent ideas (Chen and Althuizen, 2022). However, idea quality depends on social dynamics (Gamber et al., 2022), as the positive effect of feedback on idea quality is stronger when individuals provide it with higher hierarchical ranks (Boënné et al., 2023).

This status quo of the literature demonstrates our profound knowledge of generating and advancing highly creative ideas. Nevertheless, research provides only first insights into how idea screeners – namely experts with the relevant domain expertise – conduct their task. Recent studies show that idea screeners combine intuition, analysis, and sensemaking to complement their tasks (Sukhov et al., 2021). This combination enables them to combine different criteria and complex thinking to cope with their task's inherent uncertainty and efficiency constraints (Dziallas, 2018). Yet, the hierarchical similarity between idea screeners and ideators biases idea screening as idea screeners overestimate hierarchically similar ideas of others (Schweisfurth et al., 2023). Nevertheless, these scant insights on idea screening lack insights into how idea screeners cope with the learning tensions inherent to new ideas (Gurtner and Reinhardt, 2016).

2.2. Exploring idea screening through a paradox theory lens

However, paradox theory implies that the focus on a specific demand in isolation in sub-optimal outcomes (Lewis and Smith, 2022). This theory is particularly suited to investigate the screening of idea creativity. When assessing novelty, idea screeners deal with demands calling for flexibility, risk-seeking, and experimentation, spurring explorative and radical innovation (Guilford, 1967; Smith and Tushman, 2005). In contrast, evaluating meaningfulness requires idea screeners to rely on their knowledge and experience when judging ideas against established standards, criteria, and logic (Im et al., 2013; Berg, 2016). These demands are associated with avoiding risks, harnessing established competencies, and focusing on exploitive innovations.

Although meaningfulness and novelty are associated with conflicting demands, idea screeners must account for both to navigate learning tensions (Gurtner and Reinhardt, 2016; Randhawa

et al., 2021). Recent theoretical advancement in paradox theory indicates that idea screeners can adopt paradoxical thinking and deal with learning tensions (Miron-Spektor et al., 2018). Since paradoxical thinking enables idea screeners to make latent learning tensions comprehensive, they can continuously integrate the contradictory poles of learning tensions while acknowledging and leveraging their differences (Smith and Tushman, 2005; Andriopoulos and Lewis, 2009). In other words, they can consider conflicting demands (Bertello et al., 2022), differentiate between more and less creative ideas, and assess their potential to drive innovation (Andriopoulos et al., 2018).

Despite this relevance, prior research provides limited insights into idea screeners' paradoxical thinking and the organizational context motivating adopting paradoxical thinking. Rather than exploring paradoxical thinking's effects on idea screening, the research explores how related constructs, such as paradoxical frames, enable individuals to develop an inclusive mindset to accept and thrive in learning tensions (Miron-Spektor et al., 2011; Leung et al., 2018). Besides these valuable insights, the literature on paradoxical frames tends to focus on the content of frames (Spieth et al., 2021). Moreover, although idea screeners are situated in their organizational context, shaping their perception of and behaviors in coping with learning tensions, research tends to lack the exploration of the conditions shaping the effect of paradoxical thinking on idea screening (Zhou et al., 2019).

3. Hypotheses development

3.1. Paradox thinking's influence on the evaluation of ideas and front-end success

We develop our hypotheses framework based on paradox theory (Smith and Lewis, 2011; Lewis and Smith, 2022) and focus on assessing idea creativity when screening ideas (see Figure 1). The literature indicates that paradoxical thinking affects idea meaningfulness and novelty shaping front-end success (Miron-Spektor et al., 2011; Andriopoulos et al., 2018). Accordingly, we propose that idea meaningfulness and idea novelty mediate the relationship between paradoxical thinking and front-end success.

First, paradoxical thinking is likely to affect front-end success for the following reasons positively. Adopting paradoxical thinking enables idea screeners to respond to learning tensions in productive and

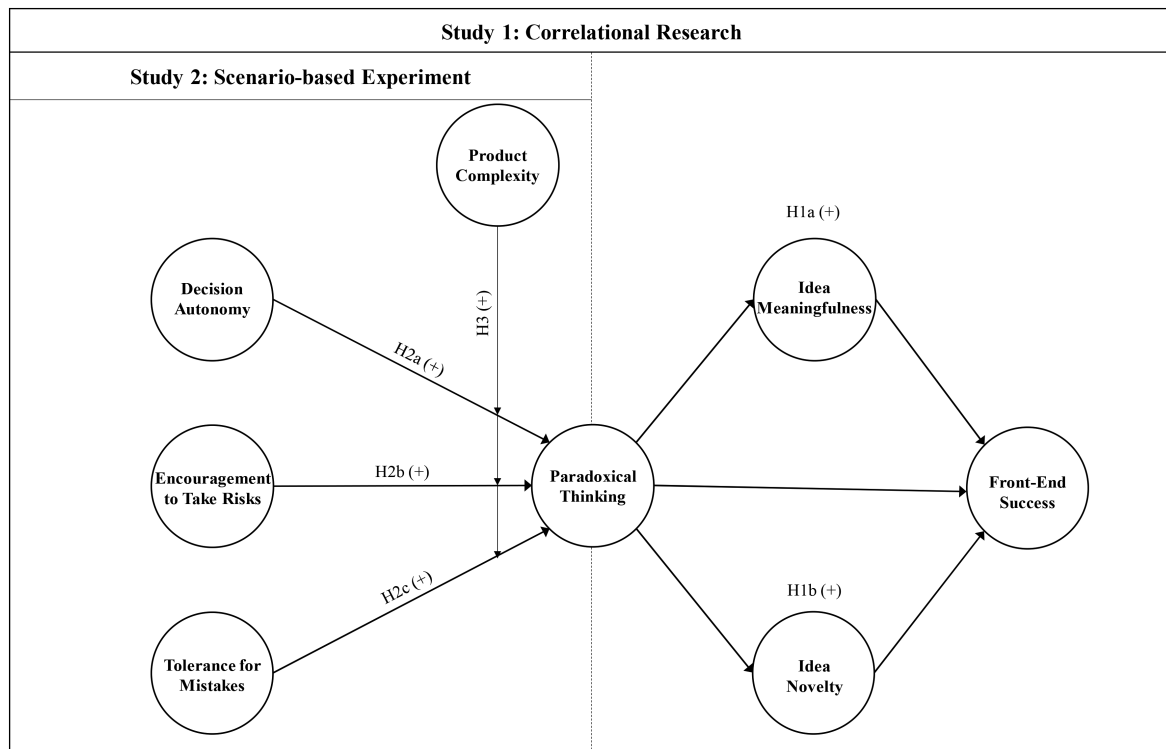


Figure 1. Research model.

original ways that simultaneously foster innovative, effective, and efficient behaviors (Andriopoulos et al., 2018; Liu et al., 2019). Consequently, paradoxical thinking ensures a focus on effectiveness-related goals, such as ideas' overall quality, and the potential to improve the firm's competitive position and future revenues. In addition, it increases efficiency by contributing to productivity and the pace of idea screening (Kock et al., 2015; Gurtner and Reinhardt, 2016). In contrast, a lack of paradoxical thinking can result in the avoidance of negative perceptions that are associated with learning tensions at the front-end. Idea screeners decide between the tensions' conflicting options (Festinger, 1957). For instance, if they emphasize exploitative ideas, they avoid substantial learning efforts and risks, but they can drive the efficiency at the front-end and focus on short-term goals. Although this behavior results in quick successes, such as emphasizing exploitative goals only, it cannot be sustained in the long-run without diminishing exploitative learning and innovation (Lewis and Smith, 2022).

Thus, paradoxical thinking can affect front-end success, as it enables idea screeners to continuously integrate, acknowledge, and utilize the contradictory demands of meaningfulness and novelty (Smith and Tushman, 2005; Miron-Spektor et al., 2018). Such a "both/and" mindset can support idea screeners in generating new frameworks and

ideas in evaluating and selecting ideas (Smith and Tushman, 2005; Gurtner and Reinhardt, 2016). For instance, paradoxical thinking is associated with greater levels of exploration, sensitivity to uncommon associations, and the development of novel combinations driving creativity (Miron-Spektor et al., 2011). By synthesizing competing demands of the front-end, idea screeners can differentiate between more or less promising ideas, balance the differences between ideas, and assess their potential to create an advantage for the firm (Andriopoulos et al., 2018). This drives a rigorous and balanced idea selection, enhances the quality of the selected ideas, and improves the efficiency of the idea selection process (Gurtner and Reinhardt, 2016).

Second, we argue that paradoxical thinking enables idea screeners to value both dimensions of creativity equally. Paradoxical thinking supports idea screeners to identify linkages between learning tensions (Smith and Lewis, 2011), as they are sensitive to, willing to, and capable of tolerating the contradicting elements of novelty and meaningfulness (Lewis and Smith, 2022). By activating these contradicting elements mentally, idea screeners can thoroughly examine each element, form new linkages, and explore synergies between opposing elements to improve their understanding of each element. Paradoxical thinking improves, therefore, idea screeners' integrative complexity, sense of conflicting demands, and tolerance

for inconsistencies in others' motives and actions (Miron-Spektor et al., 2011). Thereby, idea screeners work through learning tensions to balance the different focuses of novelty and meaningfulness and, therefore, understand their complementary character (Andriopoulos et al., 2018). Moreover, by adopting paradoxical thinking, idea screeners can counteract their tendency toward promoting meaningfulness at the expense of novelty (Berg, 2016). On the one hand, paradoxical thinking is associated with increased exploration, sensitivity to uncommon and novel associations, and the pursuit of new combinations (Smith and Lewis, 2011; Miron-Spektor et al., 2018). On the other hand, it can also drive meaningfulness by reducing the ambiguity and uncertainty of ideas. Thereby, paradoxical thinking enables idea screeners to take different perspectives to integrate and exploit well-known, proven knowledge while acknowledging novelty (Miron-Spektor et al., 2011).

Third, both dimensions of creativity are likely to affect front-end success positively for the following reasons. Since meaningfulness and novelty are complementary dimensions of ideas' creativity, their combination creates synergies that enhance front-end success. Exceptionally novel ideas enable firms to create a technological advantage that potentially differentiates them from their competitors (Reid et al., 2015). When these ideas are also meaningful, they can provide valuable concepts for the customers, enabling superior innovations. These innovations also drive competitive advantages (Im and Workman, 2004; Nakata et al., 2018). Moreover, balancing learning tensions enables firms to select the 'right' mix of meaningful and novel ideas. Thereby, idea screeners can lay the foundation for a balanced portfolio of exploitative and explorative innovations driving front-end performance (Gurtner and Reinhardt, 2016). Furthermore, synthesizing both dimensions of creativity is essential as it compensates for the isolated downsides of either novelty or meaningfulness. As the novelty of ideas increases, it can become so unfamiliar that the solution is perceived as very risky in terms of technological and market-related uncertainty (Criscuolo et al., 2017). Yet, when customers perceive the same idea as meaningful and novel, this perception reduces the possibility of innovation failure, improves the effective use of resources at the front-end, and lays the foundation for a high market potential (Nakata et al., 2018). Thus, more promising ideas are selected in a timely way, increasing the efficiency of the front-end (Kock et al., 2015). Thus, we argue that:

H1a The positive influence of paradoxical thinking on front-end success is partially mediated via ideas meaningfulness.

H1b The positive influence of paradoxical thinking on front-end success is partially mediated via ideas novelty.

3.2. Organizational context motivating paradoxical thinking

To understand how firms can motivate idea screeners to adopt paradoxical thinking, we draw on paradox theory (Andriopoulos et al., 2018; Lewis and Smith, 2022) and creativity research in innovation management (Amabile, 1988; Im and Workman, 2004). In particular, we explore characteristics of the organizational climate as it shapes individual behavior in situations characterized by learning paradoxes (Gibson and Birkinshaw, 2004; Schad et al., 2016). This organizational context can stimulate typical antecedents of paradoxical behaviors, such as taking risks, breaking away from established paradigms, and striving for autonomy (Andriopoulos et al., 2018). For these reasons, we focus on the organizational context, specifically decision autonomy, encouragement to take risks, and tolerance for mistakes.

3.2.1. Decision autonomy

To create a supportive organizational climate that motivates idea screeners to embrace learning tensions and pursue creative ideas, the top management can provide them with decision autonomy (Kock et al., 2015). Decision autonomy refers to the freedom of an idea screener to make decisions within given organizational constraints (Schweitzer et al., 2020; Arregle et al., 2023). In doing so, idea screeners obtain the necessary access to resources and are encouraged to take the initiative and balance competing demands. Autonomy enhances idea screeners' feeling of responsibility, ownership, and control of evaluated ideas (Greven et al., 2023). For instance, individuals do not only generate more creative ideas when they work in an environment that creates the perception that they have a choice on how to accomplish their tasks. They also become more open to others' arguments, interests, and points of view. These integrative mechanisms enable idea screeners to connect the contradicting demands of learning tensions, thus driving their beliefs to bring about change (Miron-Spektor et al., 2018). The counterpart of decision autonomy is highly centralized decision-making, where the top management approves screening decisions (Röth et al., 2023). A low level of decision autonomy constrains the creative process of idea screening, resulting in idea screeners who instead rely on routines and unilateral thinking that reduce their integrative capacity (Acar et al., 2019). Therefore,

we argue that decision autonomy increases the hypothesized direct effect of paradoxical thinking on meaningfulness and novelty.

H2a Autonomy enhances the paradoxical thinking of idea screeners.

3.2.2. *Encouragement to take risks*

The support of top management for risk-taking encourages idea screeners to engage in paradoxical thinking. Encouragement to take risks describes the extent to which the top management comprehends the uncertainty and risks associated with ideas and encourages idea screeners to take risks when evaluating ideas (Amabile, 1988). This support is necessary as the front-end is characterized by limitations of resources and time, causing learning tensions (Gurtner and Reinhardt, 2016; Andriopoulos et al., 2018). These tensions constrain cognitive processes that, in turn, increase idea screeners' preference for less risky and less novel ideas (Criscuolo et al., 2017). To counterbalance this tendency, top management can create a work environment where risk-taking is normal. In such a situation, idea screeners tend to think tangentially and outside the box (Im et al., 2013). Moreover, they will feel psychologically safe to experiment and pivot with different perspectives when assessing the creativity of ideas (Schweitzer et al., 2020; Röth et al., 2023). Thereby, they increase their willingness and capacity to tolerate multiple perspectives and integrate them by identifying connections between them (Miron-Spektor et al., 2011). In contrast, if the top management promotes a risk-averse climate, idea screeners are less likely to engage in divergent and integrative thinking. Instead, they are more likely to focus on a specific contradicting demand, such as exploitative ideas, at the expense of other demands (Miron-Spektor et al., 2018). For these reasons, we hypothesize the following.

H2b Encouragement to take risks enhances the paradoxical thinking of idea screeners.

3.2.3. *Tolerance for mistakes*

To spur learning, the top management can create tolerance for mistakes – namely, the extent to which the top management steers a culture where errors and failure are accepted and understood as learning opportunities (Kucharska and Bedford, 2020) – as an organizational context. This context tolerates mistakes and accepts occasional failures (Amabile, 1988; Im et al., 2013). Acknowledging the potential of failure drives the combination of convergence, where idea screeners refine their current understandings of learning tensions and divergence in terms of

exploring and experimenting with new representations of the respective demand. This acknowledgment can induce a learning spiral and trial-and-error learning where idea screeners gradually work themselves through, explore, and make sense of learning tensions (Miron-Spektor et al., 2018; Röth et al., 2023). This understanding encourages the deliberation of different ideas and rigorous idea-screening decisions under time and resource constraints (Andriopoulos et al., 2018). Since effective coping with learning tensions requires learning to gain comfort and confidence in embracing tensions, tolerance for mistakes supports individuals by developing a paradoxical thinking style. In contrast, an organizational context that does not tolerate failure inhibits learning and causes an avoidance of learning tensions. Therefore, we hypothesize:

H2c Tolerance for mistakes enhances the paradoxical thinking of idea screeners.

3.2.4. *Product complexity*

Since firms differ in the variability of their product program, we also investigate product complexity, describing the number of interdependencies between different products (Teller et al., 2012; Korhonen et al., 2014). High complexity is characterized by a multilayered product configuration that relies on various technologies, resources, and manufacturing processes required for the firm's product offerings. We focus on this central condition of the motivational context since greater interdependencies between products present challenges to the manageability of the front-end (Korhonen et al., 2014). In particular, since several products compete over limited resources, stronger interdependencies increase the coordination effort to allocate resources within a complex product (Teller et al., 2012). The management of this issue requires trade-off decisions that aggravate resource scarcity at the front-end and, thereby, intensify learning tensions (Andriopoulos et al., 2018; Miron-Spektor et al., 2018). As the experience of learning tensions intensifies, the motivational context will increase the incentive for idea screeners to adopt paradoxical thinking.

H3a Product complexity will increase the positive effect of decision autonomy on paradoxical thinking.

H3b Product complexity will increase the positive effect of encouragement to take risks on paradoxical thinking.

H3c Product complexity will increase the positive effect of tolerance for mistakes on paradoxical thinking.

4. Methodology

This study applied a mixed-method approach combining scenario-based experiments with cross-sectional survey. First, we sampled and analyzed a survey that tested the antecedents (organizational context) and consequences (idea creativity and front-end success) of paradoxical thinking. Thereby, we effectively and precisely assess managerial behavior within its authentic context to improve our insights' external validity and generalizability (Turner et al., 2017). Second, we conducted a scenario-based experiment to test whether the organizational context can motivate paradoxical thinking or not (Hsu et al., 2017; Ritala et al., 2020). By isolating this organizational context, we can exclude the interference of alternative explanations, such as structural separation, determining individual paradoxical behaviors. We designed manipulations of each organizational context to observe idea screening in an abstract environment and assign the participants randomly to establish causality between the organizational context and paradoxical thinking.

To gather the data for each sample of the two studies, we cooperated with a marketing research institute that distributed a self-administered online questionnaire to a representative panel (German-speaking country panel of Bilendi & Respondi) in November 2021. The questionnaire design of both studies accounts for the perceptual and behavioral nature of our focal constructs – creativity and paradoxical thinking – (Im et al., 2013; Miron-Spektor et al., 2018) and, therefore, enables new insights into the behavioral characteristics of idea screening and its consequences on front-end success (de Oliveira et al., 2015; Asplund et al., 2022).

Each data set was sampled in a single wave. We sampled Germany because of the substantial investments of German firms in research and development (BMBF, 2021). Thereby, we ruled out different cultural settings determining paradoxical thinking (Leung et al., 2018) and controlled for country differences regarding the organizational context of idea screening (Markham and Lee, 2013; Knudsen et al., 2023). We followed established recommendations to ensure that the respondents are responsible for and experienced in idea screening (Hammedi et al., 2013; Sukhov et al., 2021). In particular, we sampled CEOs, managers, department heads, or other employees responsible for innovation, research & development, digitization, and digital transformation and therefore are experienced in screening ideas. Furthermore, we did not consider micro-firms (less than 50 employees)

since their decision-making, such as idea screening, follows different patterns than in larger firms, and they often lack structured innovation processes with clearly stated responsibilities (Lieberman-Yaconi et al., 2010).

5. Study 1

5.1. Method

The market research institute contacted 824 potential idea screeners, of whom 329 persons from different firms completed the survey (response rate: 39.93%). Appendix A provides further information on the sample. We adapted our measures from established measurement inventories (see Table 1) and used a seven-point Likert scale (from 1 = strongly disagree to 7 = strongly agree). In line with the literature, we included several control variables (Schweitzer et al., 2020; Schweisfurth et al., 2023): age of respondent (in years), gender, education, tenure (in years), experience (in years), hierarchical level, age of company (in years), and company size (number of employees). We also included openness to experience from the BIG5 personality traits measurement inventory (Lang et al., 2011) as an additional control to assess idea screeners' creative inclinations.

5.2. Statistical analysis

We applied partial least squares structural equation modeling (PLS-SEM). This variance-based approach is especially suitable for the explorative identification of relationships, which is the main focus of our research (Hair et al., 2017). Furthermore, it is able to (i) simultaneously assess interrelationships between different constructs, (ii) employ a bootstrapping approach for testing the mediation hypothesis, and (iii) provide higher levels of statistical power – compared to covariance-based approaches – especially of small sample sizes. We employed SmartPLS 3.2.8, applied a path weighting scheme with 300 iterations and a stop criterion of 10^{-7} , used non-parametric bootstrapping procedure (no sign changes) with 5000 subsamples to assess significance levels, and tested the mediation effects (Hair et al., 2017). Appendix A provides further robustness checks.

5.3. Results

5.3.1. Measurement model results

Initially, we assessed all reflective constructs with respect to internal consistency, indicator and

Table 1. Measurement model results – Study 1

Construct label	Item	Loadings	Significance (bootstrapping; $n = 5.000$)
Decision Autonomy (Beehr, 1976)			
Mean=4.82	I have a lot of say over what happens in the early innovation process	0.879	54.357
SD=1.38	I have enough authority to do my best during assessment and selection of new product ideas	0.913	83.054
CR=0.945	My job allows me to make a lot of decisions on my own in the early innovation process	0.916	85.157
AVE=0.810	I have enough freedom as to how I do the assessment and selection of new product ideas	0.891	54.975
Encouragement to Take Risks (Im et al., 2013)			
Mean=4.61			
SD=1.24	Top management expects employees to take risks when they propose new ideas for new products	0.861	44.228
CR=0.909	Top management believes that the higher financial risks involved in new product projects are worth taking for higher rewards	0.900	72.465
AVE=0.769	Top management encourages the development of innovative ideas, knowing well that some will fail	0.870	38.507
Tolerance for Mistakes (Kucharska and Bedford, 2020)			
Mean=4.88	During new product idea evaluation, people know that mistakes are learning consequence and tolerate it	0.826	38.325
SD=1.18	Most people freely declare mistakes in the early innovation process	0.837	42.081
CR=0.916	In the early innovation process, we discuss problems openly without blaming	0.891	57.400
AVE=0.733	Mistakes are tolerated and treated as learning opportunities during new product idea evaluation	0.868	30.345
Idea Meaningfulness (Im and Workman, 2004)			
Mean=5.41	Compared to your competitors, the new product ideas you have selected in the past...		
SD=1.09	Is relevant to customers' needs and expectations	0.910	72.978
CR=0.953	Is considered suitable for customers' desires	0.912	73.722
AVE=0.831	Is appropriate for customers' needs and expectations	0.918	78.228
	Is useful for customers	0.906	73.651
Idea Novelty (Im and Workman, 2004)			
Mean=4.56	Compared to your competitors, the new product ideas you have selected in the past...		
SD=1.16	Is really "out of the ordinary"	0.813	31.566
CR=0.906	Can be considered as revolutionary	0.837	39.048
AVE=0.707	Is stimulating	0.848	49.435
	Shows an unconventional way of solving problems	0.864	52.218
Paradoxical Thinking (Miron-Spektor et al., 2018)			
Mean=5.07	When I consider conflicting perspectives during new product development projects, I gain a better understanding of an issue	0.761	25.411
SD=0.95	During new product development projects, I am comfortable dealing with conflicting demands at the same time	0.787	27.126
CR=0.930	Accepting contradictions during new product development projects is essential for my success	0.768	31.300
AVE=0.595	Tension between ideas during new product development projects energizes me	0.812	35.318
	During new product development projects, I enjoy it when I manage to pursue contradictory goals	0.780	29.197
	I often experience myself as simultaneously embracing conflicting demands during new product development projects	0.793	37.250

(Continues)

Table 1. (Continued)

Construct label	Item	Loadings	Significance (bootstrapping; $n=5.000$)
Front-End Success (Im and Workman, 2004) Mean=5.04 SD=1.07 CR=0.949 AVE=0.788	I am comfortable working on tasks that contradict each other during new product development projects	0.731	20.590
	During new product development projects, I feel uplifted when I realize that two opposites can be true during new product development projects	0.798	29.579
	I feel energized during new product development projects when I manage to address contradictory issues	0.720	17.565
	The front-end results of new product projects I have led have been really good	0.878	55.279
	Front-end idea screening of new product projects I have led is considered a strength here	0.879	55.819
	Front-end concept development processes in new product projects I have led are considered a strength here	0.879	57.187
	When I think about new-product development processes I have led, the front-end activities were excellent	0.909	79.926
	In the front-end processes I have led, we excel at producing solid product concepts for future development	0.892	69.937

construct reliability, as well as convergent and discriminant validity. All item standardized outer loadings were above 0.7 and turned out significant. Since all of the constructs' composite reliabilities were above 0.7, internal consistency should be given (Bagozzi and Yi, 1988).

Furthermore, all the constructs' AVEs were above 0.5, confirming convergent validity (Fornell and Larcker, 1981). The AVE of each construct was greater than the squared intercorrelations of corresponding constructs. Thus, discriminant validity is also given. The results of Table 2 suggest that the model is suitable for further evaluation.

5.3.2. Structural model results

The structural model results confirmed a good fit of the estimations with the data since the R^2 values for the endogenous construct turned out to be 0.45 for paradoxical thinking, 0.42 for idea meaningfulness, 0.39 for idea novelty, and 0.73 for front-end success (see Figure 2). Since the highest VIF value across the constructs was 4.198, multicollinearity should be no concern.

To verify the first mediation hypotheses, we confirm the positive effects of paradoxical thinking on front-end success ($\beta=0.172$, $p<0.01$) and on idea novelty ($\beta=0.447$, $p<0.01$). In turn, we can also support the direct effects of idea meaningfulness ($\beta=0.455$, $p<0.01$) on front-end success. Our results also show that paradoxical thinking positively affects idea novelty ($\beta=0.447$, $p<0.01$) and idea novelty's positive effect on front-end success ($\beta=0.312$, $p<0.01$). Thereafter, we assessed the mediation effects by applying bootstrapping method

(Hair et al., 2017). The indirect effects of paradoxical thinking on front-end success via meaningfulness ($\beta=0.475$, $p<0.01$) and novelty ($\beta=0.140$, $p<0.01$) were positive and highly significant. These insights support the partial mediation hypotheses H1a and H1b.

Furthermore, we could also confirm the hypothesized antecedents of paradoxical thinking. Decision autonomy (H2a: $\beta=0.279$, $p<0.01$), encouragement to take risks (H2b: $\beta=0.185$, $p<0.05$), as well as tolerance for mistakes (H2c: $\beta=0.306$, $p<0.01$) all exhibited a positive and significant effect on paradoxical thinking. Table 3 shows the effects of the control variables.

6. Study 2

6.1. Sample, procedure, and stimuli

For study 2, we applied a scenario-based experiment with a 4×2 between-subjects design (conditions: control group, decision autonomy, encouragement to take risks and tolerance for mistakes \times complexity: low and high). Participants were asked to envision themselves being employed as innovation managers in a firm responsible for idea screening.

To provide effective and realistic experimental manipulations, this study adapted manipulations from prior studies (see Appendix B). We developed the manipulation for decision autonomy (Beehr, 1976), encouragement to take risks (Im et al., 2013), and tolerance for mistakes (Kucharska and Bedford, 2020) based on the employed

Table 2. Inter-construct correlations – Study 1

Construct	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16.
1. Decision autonomy	1															
2. Encouragement t.t. risks	0.608**	1														
3. Tolerance to mistakes	0.582**	0.701**	1													
4. Paradoxical thinking	0.569**	0.569**	0.598**	1												
5. Idea meaningfulness	0.486**	0.368**	0.481**	0.605**	1											
6. Idea novelty	0.490**	0.523**	0.528**	0.579**	0.557**	1										
7. Front-end success	0.514**	0.470**	0.532**	0.665**	0.767**	0.697**	1									
8. Age of respondent	−0.035	−0.062	−0.022	0.083	0.147**	0.020	0.066	1								
9. Education	0.040	0.151*	0.081	0.084	0.017	0.029	0.015	−0.138*	1							
10. Gender	0.102	0.112*	0.061	0.065	0.030	0.029	0.087	0.108	0.050	1						
11. Tenure	−0.034	−0.014	−0.010	−0.022	−0.064	−0.048	−0.038	0.032	0.021	−0.068	1					
12. Experience	−0.084	−0.083	−0.050	0.047	0.126*	−0.010	0.039	0.862**	−0.204**	0.102	−0.019	1				
13. Hierarchical level	0.495**	0.277**	0.172**	0.283**	0.232**	0.331**	0.272**	−0.017	0.076	0.105	0.029	−0.015	1			
14. Company size	−0.135*	0.125*	−0.098	−0.051	0.009	−0.058	0.033	0.159**	0.038	0.074	−0.045	0.207**	−0.014	1		
15. Age of company	−0.089	−0.052	−0.050	−0.033	−0.021	−0.043	−0.035	0.067	−0.149**	0.000	0.209**	0.117*	−0.122*	0.039	1	
16. Openness to exp.	0.394**	0.290**	0.352**	0.507**	0.487**	0.441**	0.532**	0.107	0.024	0.015	−0.018	0.117*	0.283**	0.066	−0.09	1

* = significant at $p < 0.05$, ** = significant at $p < 0.01$.

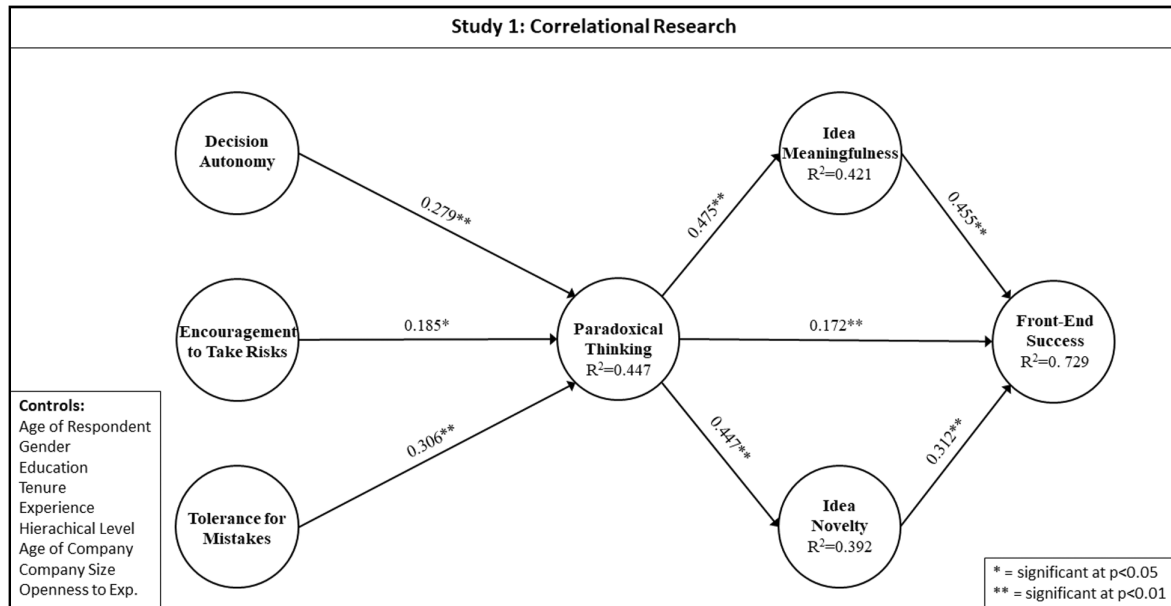


Figure 2. Structural model results.

Table 3. Effects of the control variables – Study 1

Effect on β (t-value)	Idea meaningfulness	Idea novelty	Front-end success
Age of respondent	0.073 (0.745)	0.042 (0.424)	−0.010 (0.180)
Gender	−0.031 (0.706)	−0.023 (0.503)	0.055 (1.838)
Education	−0.019 (0.375)	−0.034 (0.768)	−0.037 (1.260)
Tenure	−0.057 (0.760)	−0.047 (0.796)	0.022 (0.804)
Experience	0.029 (0.287)	−0.071 (0.684)	−0.044 (0.692)
Hierarchical level	0.077 (1.699)	0.189 (4.344)	−0.006 (0.172)
Age of company	0.008 (0.146)	0.009 (0.158)	−0.012 (0.575)
Company size	0.022 (0.480)	−0.020 (0.451)	0.067 (2.623)
Openness to experience	0.224 (3.807)	0.174 (2.709)	0.093 (1.979)

operationalization of study 1. Furthermore, we developed the manipulation for complexity based on a measurement inventory of Martinsuo and Poskela (2011). After reading the manipulations, participants were asked to screen the ideas. Finally, several control variables were assessed (age of respondent (in years), gender, education, tenure (in years), experience (in years), and hierarchical level). Out of 719 targeted informants in different firms, we received 292 fully answered questionnaires (response rate: 40.61%). Appendix B provides further information on the sample.

6.2. Results

6.2.1. Manipulation checks

To ensure that the manipulations work effectively, we included manipulation checks by relying on two items from the established measurement inventories

that we already used in study 1. For evaluation purposes, the two respective items belonging to each manipulation were merged, a mean value was calculated, and the mean values were compared, confirming the effectiveness of all manipulations (Table 4).

Furthermore, we applied three checks for realism and comprehensibility of the scenarios on a 7-point Likert scale ranging from “1 = strongly disagree” to “7 = strongly agree”. The study’s participants confirmed the scenarios to be comprehensible (“The described situation is easy for me to comprehend”: $M=5.06$, $SD=1.42$ & “I can easily put myself in the described situation”: $M=5.11$, $SD=1.41$) as well as realistic (“The described situation is realistic”: $M=4.61$, $SD=1.41$).

6.2.2. Hypotheses testing

We run ANOVAs to test the proposed main effects in H2a–c and the interaction effects in H3. In line

with H2, the effects of decision autonomy ($F(3, 121)=73.56, p<0.01$), encouragement to take risks ($F(3, 130)=35.69, p<0.01$), and tolerance for mistakes ($F(3, 114)=28.94, p<0.01$) on paradoxical thinking were significant. Participants in the decision autonomy condition ($M=4.05, SD=1.40$), the encouragement to take risks condition ($M=4.43, SD=1.09$), as well as the tolerance for mistakes condition ($M=4.44, SD=1.23$), exhibited higher levels of paradoxical thinking than participants in the control group ($M=3.29, SD=1.89$). In line with H3a–c, the interaction effects of decision autonomy ($F(3, 121)=12.49, p<0.01$), encouragement to take risks ($F(3, 130)=5.51, p<0.05$), and tolerance for mistakes ($F(3, 114)=9.11, p<0.01$) on paradoxical thinking were significant. Thus, the effect of each antecedent gets strengthened with rising levels of complexity (see Figures 3–5).

7. Discussion

Although a growing body of research investigates how idea screeners evaluate ideas, we know little about the assessment of idea creativity (Zhou

et al., 2019). In response, the aim of this study is (i) to extend our understanding of paradoxical thinking's effects on the screening of creative ideas and (ii) to explore motivational antecedents supporting idea screeners to adopt paradoxical thinking.

First, study one revealed that when idea screeners adopt paradoxical thinking, they drive front-end success. This insight can be explained by the characteristics of paradoxical thinking that enable idea screeners to deal with the competing demands of learning tensions (Lewis and Smith, 2022). Following microfoundation research, such as perspective-taking (Bertello et al., 2022), paradoxical thinking is related to high-level cognitive complexities, accepting ambiguity and uncertainty, and being open to novel experiences (Miron-Spektor et al., 2018). Instead of focusing on one demand in isolation, idea screeners can attempt effectiveness-related and efficiency-related goals while simultaneously driving learning and innovation, leading to higher front-end performance (de Oliveira et al., 2015; Andriopoulos et al., 2018).

Second, this relationship is also partially mediated by novelty and meaningfulness. This insight is in line with established research indicating that

Table 4. Manipulation checks – Study 2

Manipulation	Mean _{high}	SD _{high}	Mean _{low}	SD _{low}	Significance of mean difference
Decision autonomy	4.82	1.66	2.00	1.22	$p<0.01$
Encouragement to take risks	5.79	1.28	1.96	1.43	$p<0.01$
Tolerance for mistakes	5.84	1.15	1.79	1.22	$p<0.01$
Complexity	5.66	1.26	2.15	1.57	$p<0.01$

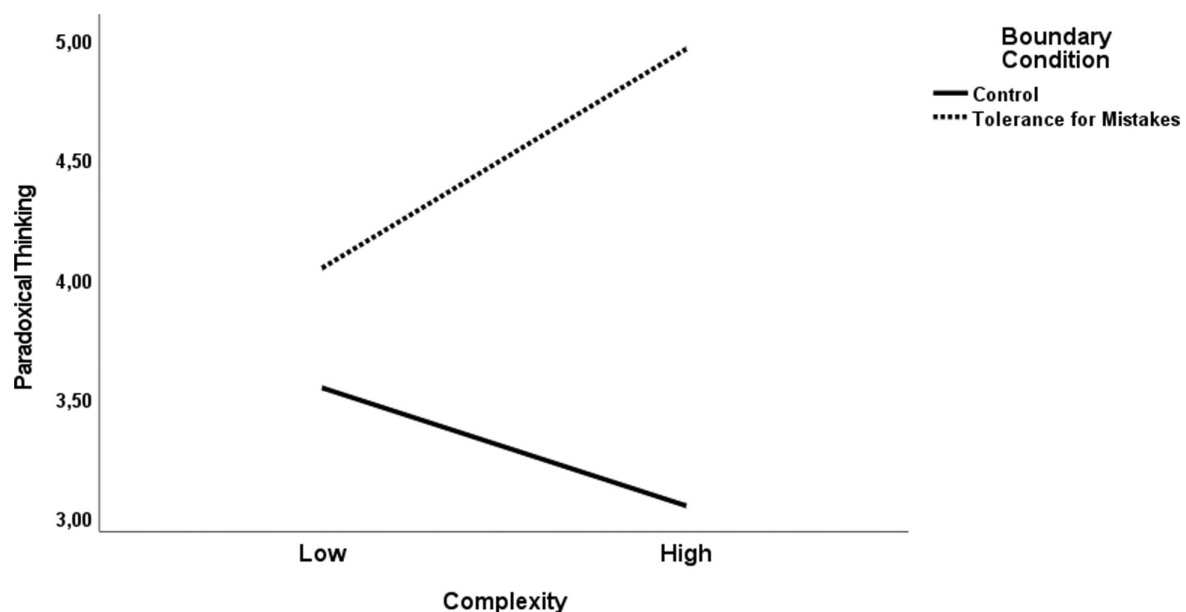


Figure 3. Interaction of tolerance for mistakes and complexity.

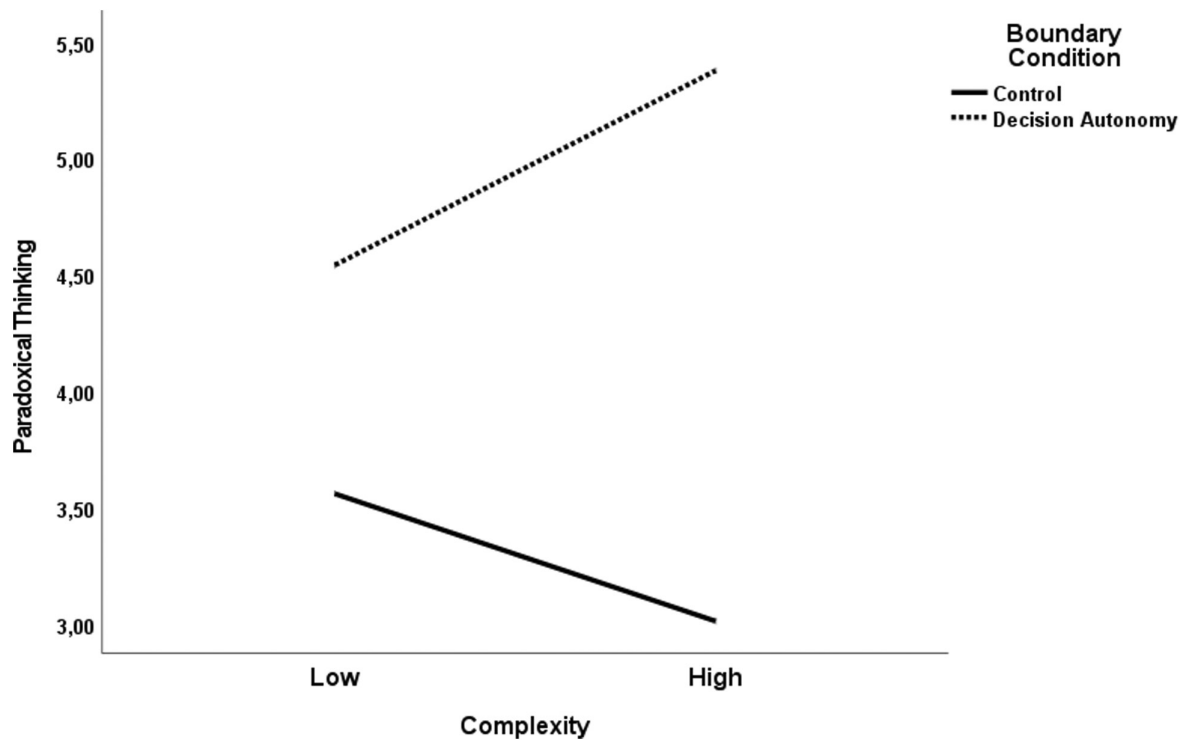


Figure 4. Interaction of decision autonomy and complexity.

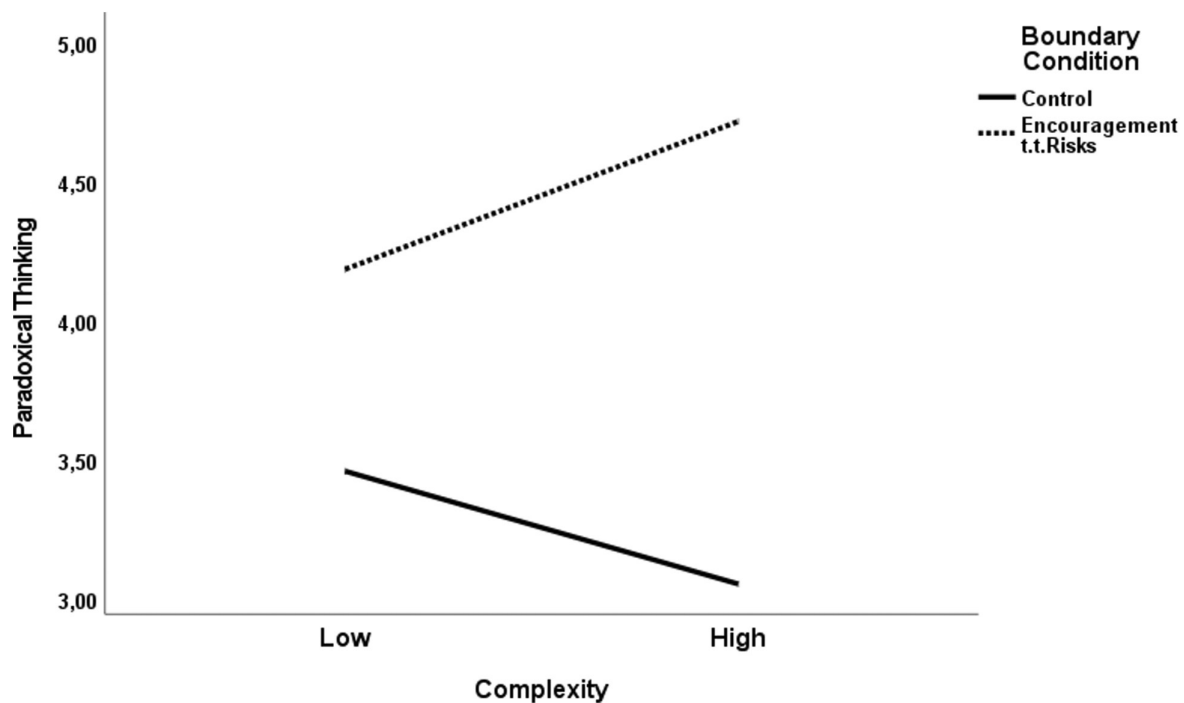


Figure 5. Interaction of encouragement to take risks and complexity.

paradoxical thinking enables the balance of the contradicting demands of novelty and meaningfulness (Leung et al., 2018; Miron-Spektor et al., 2018; Lewis and Smith, 2022). In particular, due to

paradoxical thinking's integrative function, idea screeners can acknowledge the need for meaningfulness to the customer while striving for technological novelty (Miron-Spektor et al., 2011). Furthermore,

our results confirm that both creativity dimensions increase front-end success. This insight is in line with the notion that creativity lays the foundation for innovation (Amabile, 1988; Schweisfurth and Greul, 2023) and is associated with new product performance (Im and Workman, 2004; Im et al., 2013; Nakata et al., 2018).

Third, both studies emphasize the relevance of the antecedents – decision autonomy, encouragement to take risks, and tolerance for mistakes – that drive the adoption of paradoxical thinking, creating a motivating environment. In line with the literature, we show that these antecedents enable idea screeners to feel psychologically safe to experiment, engage in trial-and-error learning, and integrate competing points of view (Im et al., 2013; Schweitzer et al., 2020). This learning process is supported by paradox theory as it is associated with individuals working themselves through the competing demands of learning paradoxes (Miron-Spektor et al., 2018).

Fourth, experimental study 2 also reveals that increasing product complexity reinforces the effect of each antecedent on paradoxical thinking. This insight can be explained as follows. When the product complexity increases, idea screeners have to cope with trade-off decisions and an increasing number of product configurations based on limited resources (Shenhar, 2001; Teller et al., 2012). This intensifies the tensions that idea screeners have to cope with (Miron-Spektor et al., 2018; Lewis and Smith, 2022), amplifying the relevance of the motivational context.

7.1. Theoretical implications

Our results contribute to and extend research on (i) idea screening focusing on creativity and (ii) paradox theory in the context of learning tensions. First, we extend research on idea screening by offering novel insights on its relevance for front-end success (Verworn et al., 2007; de Oliveira et al., 2015; Sukhov et al., 2021; Schweisfurth et al., 2023). Whereas research tends to explain front-end success by drawing on organizational characteristics, such as formalization, strategic considerations, and criteria usage (Martinsuo and Poskela, 2011; Nakata et al., 2018), we draw attention to the individual level. On the one hand, we extend these higher-level insights by revealing the positive effect of idea screeners' paradoxical thinking on front-end success. Thereby, we complement microfoundation research in the context of paradox theory (Miron-Spektor et al., 2018) and open innovation (Bertello et al., 2022). On the other hand, we extend the insight that meaningfulness and novelty are drivers of innovation performance (Im and Workman, 2004; Im et al., 2013; Nakata et al., 2018)

as we show that both dimensions of creativity also improve front-end performance. Thus, we contribute to the notion that assessing the meaningfulness and novelty of ideas is crucial, as both dimensions lay the foundation for successful innovation (Kock et al., 2015; Acar et al., 2019).

Second, we further extend our understanding of paradox theory and learning tensions by showing how idea screeners differ in coping with learning tensions when assessing idea creativity. Research consistently indicates that learning tensions characterize innovation (Lewis and Smith, 2022) and the front-end of innovation (Gurtner and Reinhardt, 2016; Andriopoulos et al., 2018; Randhawa et al., 2021). We extend these insights by synthesizing the paradox nature of creativity (Miron-Spektor et al., 2011, 2018; Leung et al., 2018) to reveal that paradoxical thinking enables idea screeners to synthesize the competing demands of meaningfulness and novelty. Thereby, the paradox lens offers novel insights into how idea screeners can overcome their tendency to favor meaningful but incremental ideas at the expense of novel ideas (Criscuolo et al., 2017; Ghosh and Wu, 2023). This new insight is crucial as focusing on a specific competing demand of creativity in isolation results in idea screeners' ineffective and underperforming responses (Lewis and Smith, 2022). Thus, this study extends our understanding of how idea screeners can value both dimensions of creativity and, thereby, drive front-end success (Andriopoulos et al., 2018; Sukhov et al., 2021).

Furthermore, we also improve the knowledge of how firms can motivate the adoption of paradoxical thinking. Instead of understanding the consequences of adopting paradoxical thinking (Miron-Spektor et al., 2011; Liu et al., 2019), we extend these insights by revealing its antecedents: decision autonomy, encouragement to take risks, and tolerance for mistakes. These antecedents reveal how motivational factors shape idea screeners' (in)ability to recognize and balance meaningfulness and novelty. Therefore, this study complements research on organizational climate by offering further insights into how firms can create a supportive and creative work environment necessary to cope with learning tensions (Gurtner and Reinhardt, 2016; Smith and Beretta, 2021).

7.2. Practical implications

Our research offers several implications for management practice. First, as we shift the attention toward the idea screener, our insights demonstrate how the individual can contribute to front-end success. By adopting a paradoxical thinking style, idea screeners

can value the meaningfulness and creativity of ideas in a balanced way, thereby overcoming typical tendencies to favor one dimension over the other. Doing so is essential as our empirical insights indicate that paradoxical thinking and both dimensions of creativity drive front-end success and lay the foundation for subsequent innovation. Second, given this impact on front-end success, we suggest that firms should steer paradoxical thinking by granting idea screeners the necessary leeway to undertake their tasks, encouraging them to take risks, and tolerating failure.

7.3. Limitations and further research

This study also has limitations. First, we applied a microfoundation perspective to reveal the cognitive underpinnings of idea screeners. Further research could extend our insights by adopting a group perspective on idea screening to explore different group characteristics and interactions. This lens can inform calls for further research at the intersection of open innovation and ecosystems (Ferrigno et al., 2023) by exploring research questions such as: ‘How does paradoxical thinking shape the interaction, such as inbound and outbound open innovation, and outcomes between different actors?’ Second, we emphasized idea screening by focusing on the creativity of ideas. Further studies could use alternative conceptualizations, such as ideas’ digital nature and sustainability, to explore how paradoxical thinking can deal with other tensions. Thereby, scholars could explore research questions, such as: ‘How does paradoxical thinking enable idea screeners to value, select, and realize ideas for their firms’ sustainable transformation (e.g., circular business models and sustainable new products)?’ Third, our research unfolds the underlying cause-effect relationships of paradoxical thinking in the context of idea screening. It would also be interesting to explore how firms can use specific digital technologies, such as big data analytics, to support paradoxical thinking when gathering data on ideas and assessing them.

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Data availability statement

We prefer to make no use of the optional data sharing option and data peer reviewing of R&D management.

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APPENDIX A. Study 1

A.1 SAMPLE CHARACTERISTICS

The firms have an average of 1011 employees, a 4.38 billion euros gross margin, and are from diverse industry sectors (18.4% information technology, 12.26% machinery and plant engineering, 9.81% financial services, 8.89% transportation, 7.67% retailing, 5.82% chemical industry, 4.90% electronics, 4.60% automotive, 2.76% telecommunication, 2.45% food industry, 2.14% energy and water supply, and 19.93% other industries). The sampled informants have an average work experience in their firm of 18.35 years. The sample consisted of 10.43% CEOs, 48.77% department heads, 6.13% assistants to the CEO, and 34.40% employees that held other positions.

A.2 ROBUSTNESS CHECKS

Since our data is based on responses from single informants, we combined procedural and statistical remedies to control for common method bias (Podsakoff et al., 2003). We separated all independent and dependent variables in the online questionnaire concerning procedural remedies. Furthermore, we kept all included questions as simple as possible to reduce the potential ambiguity of each item. For statistical remedies, we employed Harman's single-factor test. No single factor emerged that could explain more than half of the variance. In addition, we also performed the full collinearity assessment approach to test for pathological collinearity as an indication of common method bias (Kock, 2015). Of all the constructs, the highest variance inflation factor (VIFs) was 4.287 and thus well below the conservative threshold of 5. Based on the two statistical tests, we can conclude that common method bias should not have affected our results.

APPENDIX B. Study 2

B.1 MANIPULATIONS

Participants in the control group were told that (i) in the selection process for new product ideas, there are clear formal requirements for the execution of tasks and individual employees have little freedom (decision autonomy: low), (ii) during the selection process for new product ideas, employees are encouraged by top management to play it safe and not to pursue ideas that are too risky (encouragement to take risks: low), and (iii) errors in new product development projects are not tolerated in this company, and personal fault in this context is sanctioned (tolerance for mistakes: low). Furthermore, participants in the high complexity condition were told that the firm's products differ only slightly from each other and are made from only a few individual parts. In contrast, participants in the high complexity condition were told the opposite. Please find the details on the manipulations below.

B.2 TOLERANCE FOR MISTAKES

This firm is characterized by a (low) high tolerance for mistakes. In particular, this firm (does not tolerate) tolerates mistakes in new product development projects and understands failures of their employees (as a personal mistake) as a chance for learning.

B.3 DECISION AUTONOMY

This firm is characterized by high (low) decision autonomy. In particular, the screening process for new product ideas includes no (clear) formal standards and procedures for conducting this task and individual idea screeners have a lot of (only limited) freedom to fulfill their task.

B.4 ENCOURAGEMENT TO TAKE RISKS

This firm is characterized by a high (low) risk-taking propensity. In particular, during the screening process for new product ideas, the top management encourages idea screeners to take risks (play it safe) and pursue risky ideas (not pursue risky ideas).

B.5 COMPLEXITY

This firm is characterized by great (low) internal complexity. In particular, the products of the firm substantially (marginally) differ from each other and are manufactured by a large (small) number of single components.

B.6 SAMPLE CHARACTERISTICS

The firms have, on average, 1669 employees and 806 million euros gross margin, and are from diverse industry sectors (13.11% information technology, 9.01% financial services, 7.37% retailing, 5.73% transportation, 4.91% automotive, 4.09% chemical industry, 3.68% food industry, 3.68% electronics, 3.28% machinery and plant engineering, 1.64% energy and water supply, 1.63% telecommunication, and 41.39% from others). Furthermore, the sample consisted of 6.97% CEOs, 16.80% department heads, 9.01% assistants to the CEO, and 67.21% employees that held other positions. The average work experience in their company was 13.00 years.