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Enhancing Team Creativity Through Paradoxical Frames: Exploring the Role of Conflict and Integrative Complexity

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ABSTRACT

Using multilevel structural equation modeling (ML-SEM), this study examines how paradoxical frames enhance team creativity through the mediating roles of sense of conflict and integrative complexity. Although paradoxical frames are known to foster cognitive flexibility at the individual level, their impact on team creativity remains underexplored. We conducted a two-week design-thinking exercise with 235 undergraduate students (59 teams) assigned to high or low paradoxical frame conditions. Results indicate that paradoxical frames influence team creativity indirectly through their effects on sense of conflict and integrative complexity. Teams exposed to high paradoxical frames reported greater cognitive conflict, promoting deeper engagement with diverse perspectives. Additionally, paradoxical frames increased integrative complexity, enabling individuals to synthesize opposing viewpoints into creative solutions. Results confirmed a full mediation structure, whereby the effect of paradoxical framing on team creativity operated entirely through these two mediators. These findings extend paradox theory by demonstrating how paradoxical frames transform cognitive tensions into creative outputs at the team level. By identifying sense of conflict and integrative complexity as mediators, we contribute to research on paradox cognition in collaborative settings. Practically, these results provide insights for organizations aiming to leverage cognitive tensions to foster innovation in teams.

1 | Introduction

In today's interconnected and rapidly evolving landscape, team creativity is a critical asset for organizations striving to maintain a competitive edge. However, the collaborative nature of teams introduces complexities, as diverse perspectives and competing ideas often lead to tension and conflict, which, if unaddressed, may hinder creative outcomes. One approach that fosters creativity in teams is design thinking, a structured, user-centric methodology that encourages the exploration of divergent ideas and systematic refinement into practical solutions (Lee et al. 2019). Design thinking follows an iterative process of empathizing, defining, ideating, prototyping, and testing to address complex problems, making it a useful framework for structuring creative collaboration. Given its emphasis on integrating multiple perspectives, design thinking provides a suitable context for studying cognitive flexibility and creative problem-solving. Paradoxical frames—cognitive structures that encourage the simultaneous embrace of opposing ideas—offer a promising framework for transforming these conflicts into opportunities for innovation.

Theories of paradox management posit that engaging with, rather than resolving, contradictory demands fosters creativity by enhancing individuals' ability to manage tensions and integrate conflicting demands (Miron-Spektor et al. 2011; Röth et al. 2024). Paradoxical frames operate as cognitive tools, prompting team members to approach competing

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perspectives with a "both/and" mindset, fostering a productive sense of conflict that drives deeper exploration and synthesis of ideas (Lewis 2000; Schad et al. 2016). This approach is particularly effective in promoting creativity, as paradoxical thinking enables individuals to effectively navigate tensions and integrate contradictions, leading to enhanced adaptability and performance across various contexts (Leung et al. 2018; Zhang et al. 2021).

Within team settings, integrative complexity plays a crucial role by allowing individuals to recognize and reconcile diverse viewpoints, a capability essential for synthesizing complex information into innovative solutions (Brodbeck et al. 2021; Tetlock et al. 1993). Research has demonstrated that groups with integrative conflict management styles make more effective decisions than those using confrontation or avoidance (Kuhn and Poole 2000), suggesting that integrative complexity enhances decision-making and creative potential by promoting stakeholder consideration and reducing ideological biases (Solomon and Hall 2023; Wong et al. 2011). By fostering integrative complexity, paradoxical frames enable teams to manage cognitive conflict constructively, transforming diverse perspectives into coherent, creative outputs (Zhou et al. 2020).

In exploring how paradoxical frames enhance creativity, it is also essential to consider the broader literature on team creativity, which emphasizes the role of diverse cognitive frames and feedback dynamics in promoting innovative outcomes. Studies have shown that adopting paradoxical frames and encouraging perspective-taking within diverse teams unlocks creative potential by facilitating the elaboration, exchange, and integration of diverse viewpoints (Hoever et al. 2012; Miron-Spektor et al. 2022). Additionally, team cognitive frames that support paradoxical thinking—such as freefall or cohesive diversity—serve as mechanisms for developing shared understandings that lead to innovative solutions (Andriopoulos et al. 2018). Freefall in this context refers to a team dynamic where members feel secure enough to take intellectual risks without fear of negative repercussions, fostering an open exchange of radical ideas. Cohesive diversity, on the other hand, describes a team's ability to integrate varied perspectives and backgrounds into a unified approach that enhances creativity and problem-solving. The effective management of tensions, combined with diverse feedback, enhances team creativity by balancing systematic effort with flexible thinking, fostering an environment conducive to both exploration and synthesis (Hernandez Sibo et al. 2024; Hoever et al. 2018).

Although paradoxical frames are known to enhance individual creativity by fostering cognitive flexibility and integrative thinking, their impact on team creativity—particularly through the mediating roles of sense of conflict and integrative complexity—remains underexplored. This study addresses this gap by examining how paradoxical frames foster a sense of conflict and integrative complexity at the individual level within teams, thereby enhancing creative outcomes at the team level. We hypothesize that individuals within teams exposed to high paradoxical frames will experience a greater sense of conflict (Hypothesis 1a), promoting deeper engagement with diverse perspectives, and that these same individuals will exhibit greater integrative complexity (Hypothesis 2a) enabling them to synthesize conflicting ideas into cohesive solutions. Together, these hypotheses clarify the pathways through which paradoxical frames impact team creativity by fostering productive cognitive tension and integrative complexity at both individual and team levels.

This study contributes to paradox theory by illustrating how paradoxical frames convert cognitive tensions into creative outputs within teams. By identifying a sense of conflict and integrative complexity as mediators, we extend research on paradoxical frames beyond the individual level, offering new insights into collaborative innovation. Practically, these findings provide actionable guidance for managers seeking to cultivate creativity within teams. By fostering paradoxical frames and encouraging cognitive flexibility, organizations can leverage diverse perspectives to transform conflict into innovation.

2 | Paradoxical Frames and Creativity

Paradoxical frames are cognitive structures that encourage individuals and teams to engage with contradictory ideas through a "both/and" mindset, reframing tensions as opportunities for synthesis rather than obstacles (Lewis 2000; Schad et al. 2016). This approach enables teams to explore divergent perspectives in greater depth, supporting innovative problem-solving (Miron-Spektor et al. 2011). By fostering cognitive flexibility, paradoxical frames help individuals balance contrasting ideas, a process central to creativity (Amabile 2019).

Creativity in team-based settings requires solutions that are both novel and applicable (Baruah and Paulus 2019). Paradoxical frames, by introducing cognitive contradictions, require teams to generate solutions that are not only original but also viable. In this context, creativity is often conceptualized as a balance between two essential dimensions: novelty and feasibility. Novelty refers to the degree of originality and newness in the solution, while usefulness captures its feasibility and practical value to society (Chulvi et al. 2012; Nijstad et al. 2010). These dimensions reflect a dual framework of creativity as the intersection of originality and value (Amabile 1988; Sarkar and Chakrabarti 2011). However, in collaborative settings, balancing novelty and feasibility often introduces cognitive tension, as teams must reconcile diverse viewpoints and competing priorities (Jehn and Mannix 2001).

Traditionally, such conflict has been seen as a barrier to group cohesion and productivity. However, paradoxical frames transform this conflict into a constructive force, encouraging teams to embrace contradictions, enhancing creativity in collaborative settings (Smith and Tushman 2005). In multidisciplinary tasks, integrating diverse perspectives is essential for creativity (Gu et al. 2018), often bringing cognitive dissonance as team members reconcile differing perspectives. Paradoxical frames enable teams to engage directly with tensions, moving beyond surface compromises to deeper cognitive processing (Baruah et al. 2021). This promotes rigorous exploration and synthesis, enabling innovative outcomes. Cognitive flexibility fostered by paradoxical frames allows small academic teams to navigate the ambiguity of collaborative tasks, cultivating an environment where creativity thrives (Schad et al. 2016).

One-way paradoxical frames foster creativity by promoting cognitive conflict—task-related disagreements centered on ideas rather than interpersonal discord. In academic settings, paradoxical frames encourage students to engage with these conflicts, leading to new connections and innovative solutions (Miron-Spektor et al. 2011). Research suggests that cognitive conflict drives creativity by challenging assumptions and promoting divergent thinking (Edmondson 1999). In design-oriented tasks, paradoxical frames transform cognitive conflict into a productive part of the creative process, especially when team members view tensions as essential to achieving objectives (Calic et al. 2019). However, cognitive conflict requires proper structure and a shared purpose; without these, it may lead to friction, particularly in teams inexperienced with managing contradictory ideas (Jehn and Mannix 2001). When applied strategically, paradoxical frames provide a mechanism to channel conflict productively, ensuring that tensions contribute to creativity rather than disrupt it (Andriopoulos et al. 2018; Edmondson 1999; Wang and Liu 2023).

In tasks balancing creativity with practicality, paradoxical frames help academic teams pursue both originality and feasibility (Baruah et al. 2021). By maintaining competing demands in productive tension, paradoxical frames encourage solutions that are both innovative and applicable, crucial in design-oriented projects where ideas must meet practical requirements (Calic et al. 2019; Schad et al. 2016; Wang and Liu 2023). This balance supports academic teams in achieving impactful, feasible innovations through collaborative problem-solving.

Paradoxical frames do not directly trigger creativity but instead shape the psychological and cognitive conditions necessary for creative outcomes. Prior research suggests that paradoxical frames enhance team creativity through cognitive and affective mechanisms, rather than acting as a direct catalyst for idea generation (Miron-Spektor et al. 2011; Smith and Tushman 2005). Specifically, paradoxical frames promote a sense of conflict and integrative complexity, two cognitive processes essential for creativity. A sense of conflict reflects the experience of productive cognitive tension that stimulates deeper engagement with opposing ideas, while integrative complexity refers to the capacity to hold multiple perspectives simultaneously and synthesize them into novel solutions. These mechanisms drive idea generation, synthesis, and divergent thinking, which are necessary precursors to creativity (De Dreu 2006; Zhang et al. 2015). Therefore, paradoxical frames are expected to influence creativity not through a direct effect but through mediation by a sense of conflict and integrative complexity. This aligns with paradox cognition theory, which emphasizes that contradictions must first be processed cognitively before they can translate into creative outcomes (Smith and Lewis 2011).

Paradoxical frames encourage teams to engage with cognitive contradictions rather than avoid them, creating a structured form of cognitive conflict that fuels creative problem-solving. By prompting individuals to reconcile and synthesize opposing perspectives, paradoxical frames facilitate deep cognitive processing, which supports creativity in ambiguous problem-solving tasks. These pathways reflect the indirect nature of paradoxical framing's impact on creativity.

3 | Paradoxical Frames and Sense of Conflict

Paradoxical frames intensify contradictions by encouraging teams to engage with opposing ideas simultaneously (Lewis 2000; Smith and Tushman 2005). Rather than resolving tensions through compromise, paradoxical frames embrace contradictions, heightening the sense of conflict. This cognitive conflict emerges as team members confront competing ideas, prompting deeper engagement with the task (Leung et al. 2018; Miron-Spektor et al. 2011).

In team settings, conflict can be interpersonal or cognitive. Although interpersonal conflict arises from divergent viewpoints, cognitive conflict—centered on ideas and tasks—is constructive. Paradoxical frames stimulate task-related conflict, encouraging teams to analyze issues thoroughly rather than settling for consensus (De Dreu 2006; Jehn and Mannix 2001).

However, beyond fostering cognitive engagement, paradoxical frames also generate emotional ambivalence, where individuals simultaneously experience positive and negative emotions while processing contradictions. Emotional ambivalence captures the cognitive tension experienced when individuals face conflicting demands. This ambivalence—characterized by simultaneous positive and negative reactions—plays a key role in decision-making and creativity (Qahri-Saremi and Turel 2020; Raza-Ullah 2020). Research shows that ambivalence can enhance judgment accuracy (Rees et al. 2013) and improve negotiation outcomes (Rothman and Northcraft 2015), indicating that a sense of conflict signals the cognitive work needed to reconcile opposing perspectives. Furthermore, emotional ambivalence has been shown to drive deeper cognitive engagement, fostering the cognitive complexity essential for creative problem-solving (Fong 2006; Hernandez Sibo et al. 2024). In team settings, where diverse perspectives often generate tension, this ambivalence encourages deeper exploration of ideas, promoting innovation (De Dreu 2006).

To measure this emotional ambivalence, the Conflicting Reactions Model (CRM) (Kaplan 1972; Priester and Petty 1996) provides a structured approach to quantifying ambivalence and sense of conflict. This model assesses ambivalence or conflict toward an attitude object by evaluating both positive and negative affective responses. By using CRM to quantify sense of conflict, this study provides a structured and reliable measure of both cognitive and emotional tension. Higher sense of conflict scores, reflecting greater ambivalence, are expected to drive creativity by promoting in-depth exploration and synthesis of ideas.

The CRM model has been widely validated across various psychological and organizational contexts. For example, studies of parental conflict show that ambivalence plays a role in children's psychological resilience (Fosco and Grych 2008) while research on cognitive emotion regulation highlights

its importance in emotional adaptation (Sheppes et al. 2014). Additionally, in team settings, CRM has been used to assess emotional intelligence and trust-building mechanisms, key factors in collaborative creativity (Barczak et al. 2010). Furthermore, task conflict has been found to correlate positively with cognitive complexity and creativity (De Dreu 2006), reinforcing the idea that emotional ambivalence—when properly managed—can serve as a catalyst for deep thinking and innovation.

The conflict generated by paradoxical frames enhances team creativity. By confronting contradictions, team members engage in critical analysis, an essential process for creativity (Baruah et al. 2021; Miron-Spektor et al. 2022; Sharma and Mehta 2023). When managed effectively, conflict enriches dialog, leading to innovative solutions, particularly in complex tasks. Paradoxical frames provide a cognitive framework that encourages teams to actively engage with conflicting ideas, using tension as a catalyst for innovation rather than a barrier (Schruijer 2020). By fostering deeper cognitive engagement, paradoxical frames create an environment where conflicting ideas are actively explored rather than dismissed. Beyond its cognitive effects, paradoxical framing also triggers emotional responses, shaping how individuals experience and process contradictions. Alongside cognitive tension, paradoxical frames introduce an emotional component—emotional ambivalence—where individuals simultaneously experience positive and negative emotions while processing contradictions. This emotional complexity plays a significant role in cognitive flexibility and creative problem-solving.

In multidisciplinary teams, paradoxical frames are valuable for managing the cognitive and emotional tensions that arise in collaborative work. These teams often encounter conflicting goals, which create ambiguity (Jehn and Mannix 2001). Paradoxical frames allow teams to maintain these tensions without forcing resolution, enabling diverse ideas to coexist and combine into creative solutions (Calic et al. 2019; Edmondson 1999). Additionally, heightened conflict from paradoxical frames compels teams to critically evaluate ideas and conduct in-depth analyses of potential solutions (Miron-Spektor et al. 2011). This deeper processing is fundamental to creativity, promoting new connections between ideas (Schad et al. 2016).

Taken together, prior research suggests that paradoxical frames, by intensifying both cognitive and emotional tension, foster a deeper sense of conflict that compels individuals to engage critically with opposing perspectives. This deeper engagement is expected to be a key mechanism linking paradoxical frames to enhanced creativity. Therefore, we propose the following hypotheses:

Hypothesis 1a. *Individuals within teams exposed to high paradoxical frames will report a greater sense of cognitive conflict compared to teams exposed to low paradoxical frames, due to the engagement with and synthesis of opposing ideas.*

Hypothesis 1b. *The increased sense of cognitive conflict experienced by individuals within teams exposed to high paradoxical frames will mediate the relationship between the exposure to paradoxical frames at the team level and enhanced team creativity.*

4 | Paradoxical Frames and Integrative Complexity

Paradoxical frames encourage individuals to embrace contradictions, fostering deeper cognitive engagement and enhancing integrative complexity (Miron-Spektor et al. 2011; Smith and Tushman 2005). Integrative complexity is characterized by two key cognitive processes: (1) differentiation—the ability to recognize and accept multiple legitimate perspectives, and (2) integration—the capacity to reconcile these differing perspectives into a coherent understanding (Miron-Spektor et al. 2011; Tetlock et al. 1993). This construct is critical for navigating complex, multidisciplinary tasks where paradoxes are prevalent. By promoting a "both/and" mindset, paradoxical frames support cognitive differentiation—the recognition of diverse viewpoints—and integration, unifying these perspectives into cohesive solutions (Schad et al. 2016). This capacity to reconcile contradictions is fundamental to creativity, as it enhances cognitive flexibility, allowing individuals and teams to generate novel and practical solutions. Paradoxical frames encourage individuals to analyze competing demands rather than dismissing them, leading to greater cognitive differentiation and integration, which are essential for complex problem-solving (Smith and Tushman 2005).

Empirical evidence supports the role of paradoxical frames in enhancing integrative complexity. Miron-Spektor et al. (2011) found that individuals primed with paradoxical frames demonstrated higher cognitive complexity and creativity, reinforcing the link between contradiction processing and innovative thinking. In team contexts, integrative complexity enables groups to synthesize diverse perspectives into innovative solutions. Leung et al. (2018) further observed that paradoxical frames help individuals unfamiliar with contradictions develop more complex cognitive processing strategies. Beyond individual effects, paradoxical frames shape team and organizational-level cognition. Wilms et al. (2019) found that top managers' use of paradoxical frames enhanced cognitive differentiation and integration, supporting ambidextrous decision-making under competing demands. Similarly, dialectical thinking, which prioritizes integrating contradictory perspectives, fosters the paradoxical cognition required for innovation in complex environments (Gao et al. 2010).

As teams adopt paradoxical frames, the resulting increase in integrative complexity becomes a key driver of creativity. By encouraging deeper cognitive engagement, integrative complexity mediates the relationship between paradoxical frames and team creativity, allowing teams to leverage cognitive tensions as catalysts for innovation (Schad et al. 2016; Shao et al. 2019). Teams high in integrative complexity are better equipped to transform cognitive conflict into creative breakthroughs, effectively managing tensions inherent in diverse perspectives.

Hypothesis 2a. *Individuals within teams exposed to high paradoxical frames will exhibit greater integrative complexity, as measured by their ability to recognize and synthesize diverse perspectives, compared to individuals within teams exposed to low paradoxical frames.*

Hypothesis 2b. *Integrative complexity experienced by individuals within teams will mediate the relationship between exposure to high paradoxical frames at the team level and enhanced team creativity, leading to more innovative and practical solutions.*

5 | Method

This study employed a two-week online design-thinking exercise in which multidisciplinary groups of undergraduate students engaged in structured problem-solving to generate innovative ideas for enhancing the university library. The design-thinking exercise was divided into two sessions: the first session focused on identifying and defining specific challenges and goals within the library context, whereas the second emphasized the generation and refinement of creative solutions to address these challenges.

Using design thinking in a multidisciplinary context provides a rigorous framework for examining team creativity in a controlled yet realistic environment. The design-thinking methodology fosters empathy and collaborative engagement, encouraging team members from diverse academic backgrounds to explore multiple solutions, integrate opposing perspectives, and address inherent contradictions. The iterative, user-centric approach further ensures that solutions are both innovative and aligned with stakeholder needs. This study investigates the interactions between paradoxical frames, integrative complexity, sense of conflict, and team creativity within the context of design-thinking sessions. To explore these dynamics, we introduced an experimental manipulation presenting two conflicting objectives—social engagement and academic excellence. Furthermore, integrative complexity was examined as a potential mediating factor in the relationship between sense of conflict and team creativity.

5.1 | Participants and Design

Two hundred thirty-five undergraduate students from National Cheng Kung University in Taiwan (145 males, 90 females; $M_{age} = 19.70$; $SD_{age} = 1.36$) from seven different departments were organized into 59 groups and completed a group project during class time as part of their course requirements. We employed a between-participants design in which participants were randomly assigned to one of three conditions. The first was a paradoxical frame condition (High paradoxical frame: innovate the library by integrating academic excellence and social engagement perspectives simultaneously, 30 groups). The other two were neutral conditions focused solely on one aspect each: Low paradoxical frame A, which centered on innovating the library from an academic excellence perspective (15 groups), and Low paradoxical frame B, which concentrated on a social engagement perspective (14 groups). Most of the groups consisted of four students each, with fifty-eight 4-person groups and one 3-person group, a configuration designed to facilitate effective collaboration and ensure diverse interactions crucial for the project's objectives.

5.2 | Procedure

Participants received training in design-thinking principles before the two-week study began. This training included case studies and guided practice sessions to ensure a foundational understanding of the design-thinking process. After preparation, participants were introduced to the study and completed an initial survey to gather demographic information, baseline attitudes toward teamwork and creativity, and introduce the paradoxical frame conditions. These conditions, randomly assigned, encouraged participants to adopt a paradoxical mindset, balancing social and academic perspectives during the design-thinking project.

Participants received two sets of instructions for the project: general instructions and condition-specific instructions aligned with the assigned paradoxical frames. To maintain consistency, variations in word count and terminology were controlled, with instructions delivered through an online survey format that included a timer and comprehension questions to confirm understanding. The study spanned 2 weeks and involved a structured, team-based design-thinking project conducted across two classroom sessions. In these sessions, participants worked toward innovative solutions to a defined problem, with each session aligned to the paradoxical frames conditions. Teams were encouraged to balance demands, such as creativity and practicality, throughout. Trained facilitators assisted with logistics and provided materials as needed but refrained from offering guidance on content or problem-solving strategies, ensuring teams engaged independently with the paradoxical frames.

At the end of the second session, participants completed an individual online questionnaire to reflect on their experience of sense of conflict and integrative complexity during the design-thinking project. This final survey captured participants' subjective experiences with paradoxical frames, focusing on sense of conflict, integrative complexity, and perceived creativity outcomes. The data collected through these self-reports formed the basis for our analysis, which employed multilevel structural equation modeling (ML-SEM) to evaluate how paradoxical frames influenced team dynamics and creativity over the course of the two-week project.

5.3 | Manipulation of Paradoxical Frames

We manipulated paradoxical frames using different instructions where groups are presented with different perspectives or images of the university library that may appear to be contradictory or at odds with each other. These frames are designed to stimulate critical thinking and creative problem-solving among the participants.

The description all participants received read:

> Hello students:
>
> For this design-thinking exercise, we will focus on the innovative development of the Cheng Kung

> University Library as the main theme. Please read the following topic explanation.
>
> Topic Background:
>
> The traditional functions of university libraries include preserving academic knowledge, supporting teaching, providing research resources, and promoting and archiving academic research outcomes. Their collections include a wide range of materials such as books, journals, newspapers, images, government publications, theses, audiovisual materials, and various databases, to support teaching and research activities within the university.
>
> However, due to rapid advancements in international and industrial research and the swift development of digital environments, coupled with societal modernization, universities are expected to innovate. As a concrete representation of the university's intellectual soul, the library must innovate in response to technological advancements and societal transformations.
>
> Topic Content:
>
> The Cheng Kung University Library has been actively promoting innovation and has already made significant strides. However, it also faces challenges in determining future innovative directions. The library believes that each innovation shapes its public perception.

Next, the instructions outlined different approaches the university library has chosen for its innovative initiatives, varying across conditions. This procedure aimed to engage participants in diverse thinking styles and shape how they perceive, interpret, and prioritize information (Miron-Spektor et al. 2011; Smith and Tushman 2005).

In the academic frame condition, the emphasis was on academic excellence, focusing on digitization, academic collections, and multimedia research to support cutting-edge science and uphold the library's reputation as a center of excellence. This frame presents academic excellence as both a primary goal and an essential component of university education and innovation. In the social frame condition, the focus shifted to societal engagement, where the library promotes knowledge dissemination and community involvement as part of its social responsibility. This frame highlights active engagement with society and applying knowledge in practice as vital for future innovation. Finally, in the paradoxical frame condition, both academic excellence and societal engagement were highlighted as essential yet competing goals. This frame emphasized the importance of balancing these two priorities to drive innovation, acknowledging the trade-offs and input from various stakeholders needed to shape the library's future.

5.4 | Pilot Study

A pilot study with a separate sample of students ($N = 114$) validated the framing manipulation used in the main study. Participants were randomly assigned to one of three framing conditions: paradoxical frame, social frame, or academic frame. After reviewing their assigned framing instructions, they developed innovative proposals for the university library, then rated their agreement with six statements on a 7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree) to assess perceived conflict and complementarity between academic and social perspectives.

Three items measured perceived conflict between academic and social goals, including statements like "Focusing solely on academic research neglects the library's responsibility to engage with and serve the community effectively." Complementarity was measured by three additional items, such as "By actively engaging with the community, the university library can enrich academic research and foster a more inclusive learning environment." Conflict items were aggregated ($\alpha = 0.886$), as were complementarity items ($\alpha = 0.831$), to ensure reliability.

An analysis of variance (ANOVA) tested differences in conflict ratings across framing conditions, yielding significant variations, $F(2, 111) = 154.58, p < 0.001, \eta^2 = 0.736$. Conflict ratings were highest in the paradoxical frame condition ($M = 5.82, \text{SD} = 0.49$) compared to the social frame ($M = 3.76, \text{SD} = 0.72$) and academic frame ($M = 3.61, \text{SD} = 0.60$) conditions. No significant difference emerged between the social and academic frame conditions ($p = 0.503$). A second ANOVA examined complementarity ratings and indicated significant differences across conditions, $F(2, 111) = 92.15, p < 0.001, \eta^2 = 0.625$. Complementarity ratings were significantly higher in the paradoxical frame condition ($M = 5.62, \text{SD} = 0.51$) than in the social frame ($M = 3.71, \text{SD} = 0.71$) or academic frame ($M = 4.24, \text{SD} = 0.66$) conditions. These results confirm that perceptions of both conflict and complementarity were significantly elevated in the paradoxical frame condition, indicating that the priming procedure effectively manipulated paradoxical framing by increasing both dimensions.

5.5 | Sense of Conflict

The sense of conflict variable was operationalized using the CRM. This model assesses ambivalence or conflict toward an attitude object by evaluating both positive and negative affective responses. In this study, participants reported their levels of positive affect (PA) and negative affect (NA) in response to the team task and ideas discussed, with responses collected at the task's conclusion to capture the participants' overall emotional experience during group interactions.

To precisely measure these affective responses, the Positive and Negative Affect Schedule (PANAS) was employed, which includes well-validated sets of 10 items each for PA and NA. These items are specifically designed to capture the broad spectrum of emotional states that significantly impact cognitive processes and creative outputs. For instance, Positive Affect items like 'Enthusiastic,' 'Inspired,' and 'Alert' reflect

an emotional state conducive to cognitive flexibility and expansive thinking, essential for creative endeavors (Baas et al. 2008). Such states are known to enhance the generation of novel ideas and facilitate innovative problem-solving within teams. Conversely, Negative Affect items such as 'Distressed,' 'Nervous,' and 'Irritable' are critical in understanding how emotional tensions and stress influence cognitive evaluations and decision-making within teams (Davis 2009). Although often viewed as hindrances to creativity, these negative emotions can also deepen the cognitive processing required for complex problem-solving, thereby contributing constructively under certain contexts.

Positive and negative affect were each measured using multiple items, with Cronbach's alpha indicating high internal consistency for both the PA scale ($\alpha = 0.809$) and the NA scale ($\alpha = 0.841$). The total affect score ($PA + NA$) represented the overall intensity of affective responses, while the polarity score ($PA - NA$) captured alignment between positive and negative reactions. Sense of conflict was then calculated using the formula: $A = (PA + NA) - |PA - NA|$. This formula emphasizes that a high sense of conflict score reflects strong positive and negative affective responses combined with a low discrepancy between them, indicative of emotional tension or ambivalence. The CRM approach conceptualizes sense of conflict as emotional tension arising from mixed evaluations, differentiating between ambivalence (high sense of conflict) and indifference (low total effect).

By using CRM to quantify sense of conflict, this study provides a structured and reliable measure of cognitive and emotional tension.

5.6 | Integrative Complexity

To measure integrative complexity, we administered a 5-item subscale designed to assess the extent to which participants were able to engage in integrative thinking during the team task. This subscale was based on previously validated measures of integrative complexity and cognitive flexibility (Smith and Tushman 2005). Participants were asked to indicate their agreement with statements such as "I was able to appreciate my teammates' perspectives, even if they differed from mine," and "I found ways to combine different viewpoints into a unified solution." Responses were collected on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree), with higher scores indicating greater levels of integrative complexity. The internal consistency of the integrative complexity scale was evaluated using Cronbach's alpha, yielding a satisfactory reliability score ($\alpha = 0.720$). Additionally, item-total correlation analysis confirmed that each item contributed positively to the overall scale consistency, further validating its reliability. This level of reliability suggests that the scale items provided a coherent measure of participants' cognitive complexity in processing and integrating opposing ideas. A composite integrative complexity score was computed for each participant by averaging responses to the five items.

Participants were instructed to reflect specifically on their experiences during team discussions rather than on personal beliefs or cognitive styles. This distinction ensured that the integrative complexity score reflected cognitive processes unique to the collaborative task, where integrating diverse perspectives was essential. Thus, the measure of integrative complexity was directly linked to participants' engagement with and reconciliation of conflicting ideas during the team exercise.

5.7 | Team Creativity

Team creativity was assessed within the context of a design-thinking exercise. In this study, teams initially engaged in divergent thinking to explore a wide array of potential solutions, subsequently narrowing down their ideas through convergent thinking to select the single most viable solution. This chosen solution, deemed the best by each team to address the specific challenge posed, was then presented for evaluation.

The creativity of these teams' final solution was assessed using the Consensual Assessment Technique (CAT), a widely validated method for evaluating creativity through expert judgment (Amabile 1982). Four independent raters from the library's Knowledge Services Division, who were blind to the study's purpose, rated each group's solutions on two key creativity dimensions: novelty and usefulness (Runco and Jaeger 2012).

To assess novelty, raters used a single item: "The solution presented by the group is novel, unusual, and infrequent." This single-item measure was chosen to capture novelty as a singular construct, typically defined by the originality or newness of an idea (Chakrabarti and Khadilkar 2003). Usefulness, a more multidimensional construct, was measured with three items: (a) "The solution presented by the group can be realized and implemented under realistic conditions," (b) "The solution presented by the group effectively addresses the problem posed," and (c) "The solution presented by the group is useful." This multi-item approach allowed for a comprehensive assessment of usefulness, encompassing feasibility, effectiveness, and practical relevance (Sarkar and Chakrabarti 2011).

A composite creativity score was calculated by averaging the ratings for novelty and usefulness, treating both dimensions as equally important for assessing creative solutions. This method aligns with research conceptualizing creativity as the integration of novelty (originality) and usefulness (practical applicability) (Diedrich et al. 2015; Harvey and Berry 2023; Runco and Jaeger 2012). Combining these dimensions reflects the holistic nature of creativity, emphasizing that originality alone is insufficient without practical value (Chulvi et al. 2012; Nijstad et al. 2010). Sarkar and Chakrabarti (2011) further highlight that a comprehensive creativity evaluation requires the integration of both components. By considering both novelty and usefulness in the evaluation of creative ideas, this study aligns with established creativity models that prioritize both idea generation and feasibility.

Given the theoretical justification for integrating novelty and usefulness, it was essential to empirically validate whether these dimensions were sufficiently related yet distinct. A Pearson correlation analysis confirmed a moderate to strong positive relationship between novelty and usefulness ($r = 0.55, p < 0.05$). This indicates that while novelty and usefulness are related, they

remain distinct constructs, reinforcing the appropriateness of aggregating them into a single creativity measure. The observed correlation aligns with findings from prior research, which suggests that highly novel ideas often—but not always—possess practical value (Diedrich et al. 2015; Harvey and Berry 2023). The inter-rater reliability was high, with an intraclass correlation coefficient (ICC) of 0.80 for novelty and 0.84 for usefulness, further confirming the robustness of the assessments.

To address potential bias associated with the conditions assigned to each group, we employed a counterbalancing approach. Raters were randomly assigned to evaluate solutions across both types of conditions (paradoxical frames and single frames). Two raters began by evaluating solutions from groups exposed to paradoxical frames, followed by single-frame solutions, while the other two raters evaluated single-frame solutions first, followed by paradoxical frames. Raters remained blind to each group's specific condition, ensuring that their assessments were based solely on the creativity dimensions of novelty and usefulness. This counterbalancing strategy minimized the possibility that solutions integrating both academic and social frames would receive higher creativity ratings simply due to their dual-frame structure. To ensure reliable and valid ratings, raters were calibrated using an assessment criterion developed by the research team, following established recommendations in the creativity assessment literature. Sarkar and Chakrabarti (2011) emphasize the importance of iterative calibration to address common issues and disagreements, allowing raters to reach consensus on the evaluation standards. After training, the raters independently assessed each group's solutions, ensuring consistency in the creativity assessments.

5.8 | Multilevel Analysis

Given the nested structure of our data—individuals ($N = 235$) within groups ($N = 59$)—and the hypothesized cross-level mediating roles of sense of conflict and integrative complexity in linking paradoxical frames to team creativity, we employed ML-SEM. Analyses were conducted in R (v4.4.1, 2024-06-14) using the lavaan package (v0.6-19) for structural equation modeling and lme4 for computing intraclass correlations (ICCs). We used ML-SEM with manifest variables to directly test relationships between measured variables, avoiding assumptions about latent constructs. This path analysis approach allows us to model hypothesized causal pathways among variables, clarifying relationship structures while focusing on observed measures. ML-SEM is particularly suited to partitioning variance at both individual and group levels, enabling simultaneous estimation of within- and between-group effects and facilitating a precise analysis of interactions between individual- and group-level factors.

To rigorously examine these cross-level relationships, specifically for paradoxical frames (group-assigned), sense of conflict, and integrative complexity (individual-level), and team creativity (group-level outcome), ML-SEM separates variance into within-group (individual) and between-group (group) components. This separation reduces bias and enhances clarity, isolating the effect of paradoxical frames on individual sense of conflict and capturing group-level variation in sense of conflict. Unlike aggregation methods, which can obscure individual insights, ML-SEM preserves nuanced dynamics across levels, providing a comprehensive framework to explore interactions between individual and group phenomena. The multilevel modeling process involves two primary steps: an initial assessment to verify group-level effects, followed by structural model comparisons akin to SEM procedures. Following Hox et al. (2017), we first specified a baseline model to estimate within- and between-group variances and covariances, without imposing a theoretical framework. This model, evaluated using ICC, assesses the proportion of variance due to group membership. Moderate ICC is around 0.20, with values in the 0.30–0.40 range indicating strong group-level effects, justifying further group-level analysis. Although this baseline model typically shows poor fit, it provides essential insights into the distribution of variance, supporting the need for multilevel analysis (Figure 1).

In the second step, we tested a model incorporating theoretical structure only at the within-group level, which was expected to improve model fit over the baseline due to the added theoretical relationships. The key question for multilevel modeling, however, is whether model fit improves further when theoretical relationships are included at the group level. In step three, we adjusted the model to incorporate theoretical structure at the between-group level. An improvement in fit from step two to step three would suggest that both individual and group-level factors are essential to understanding the relationships among paradoxical frames and team creativity. Such an outcome would validate the use of multilevel modeling for this study. We then tested the main hypotheses using these refined models.

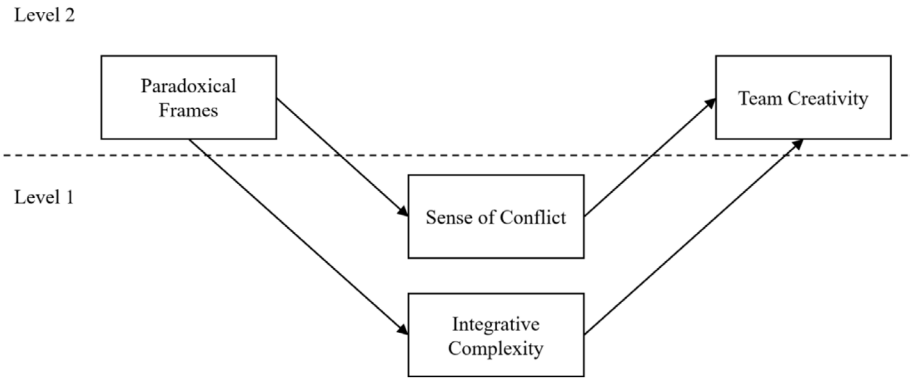

FIGURE 1 | Theoretical framework.

In our research, the individual effects of sense of conflict and integrative complexity capture the unique perceptions and cognitive processes of individuals within each group, reflecting how they personally experience paradoxical frames and engage in integrative thinking, independent of the group's tendencies. In contrast, the group effects of these variables represent shared experiences and collective cognitive orientations, encompassing both the overall level of conflict experienced as a group and the group's collective capacity for integrative thinking, influenced by the assigned group-level paradoxical frames. In ML-SEM, individual-level relationships are assessed through within-level effects, while between-level variance components capture group-level dynamics (Kline 2005). This approach clarifies the distinction between individual and group influences, allowing us to explore how paradoxical frames impact both personal and shared experiences of conflict and integrative complexity, ultimately informing our understanding of their roles in enhancing team creativity.

6 | Results

The first step of the study's analysis was to conduct a series of three different models to assess the appropriateness of group-level analyses. Prior to these analyses, it was essential to assess whether the two experimental conditions designed to prime low paradoxical frames—specifically, the academic and socially responsible perspectives—differed significantly on the study's two proposed mediators: sense of conflict and integrative complexity. This step was necessary to determine whether the conditions could be conceptually and statistically merged into a single low Paradoxical Frames condition for subsequent analysis. Statistical tests revealed no significant difference in sense of conflict between participants in the academic condition ($M = 48.47, \text{SD} = 4.66$) and those in the socially responsible condition ($M = 47.78, \text{SD} = 4.60$), $F(1,121) = 0.68, p = 0.411$. Similarly, no significant difference was found in integrative complexity between the academic ($M = 4.99, \text{SD} = 0.55$) and socially responsible conditions ($M = 5.04, \text{SD} = 0.51$), $F(1,121) = 0.29, p = 0.592$. Given the absence of statistically meaningful differences on both mediating variables, these conditions were conceptually and analytically merged into a single low Paradoxical Frames condition for all subsequent analyses (see Table 1).

The initial phase of our analysis involved estimating the covariance matrices for within-group and between-group levels to assess the appropriateness of group-level analyses and calculate ICCs. The null model did not incorporate any theoretical structures and thus performed poorly (RMSEA = 0.609), as shown in Table 2. This result underscores the complexity inherent in our data, suggesting that a more nuanced model is necessary. The ICCs indicated that approximately 64.4% of the variance in Sense of Conflict and 60% of the variance in Integrative Complexity could be attributed to group differences. This substantial group-level variance supports the relevance of exploring group effects further. Additionally, the calculation of median $r_{\text{GW}(j)}$ values, following Lindell et al. (1999), confirmed within-group agreement (see Table 3). In this model, the variance for the group-level predictor Paradoxical Frames was fixed at 1 for identification purposes, as is standard in ML-SEM when group-level predictors are binary, and variances for Sense of Conflict and Integrative Complexity were freely estimated. Coefficients are partially standardized, allowing interpretation as standardized mean differences while retaining the original metric for Paradoxical Frames.

In the second step, for the within-group structure specification we refined our model to include direct paths from the group-assigned condition, Paradoxical Frames, to the individual-level variables, Sense of Conflict and Integrative Complexity.

TABLE 1 | Descriptive statistics for main variables by condition.

Variable	PF	*N*	Mean	SD	Std. Error Mean
Sense of conflict	High	28	60.625	2.205	0.417
	Low	31	48.102	2.599	0.467
Integrative complexity	High	28	5.863	0.275	0.052
	Low	31	5.024	0.366	0.066
Team creativity	High	28	3.697	0.865	0.163
	Low	31	3.241	0.496	0.089

Abbreviations: *N*, number of teams; PF, paradoxical frames; SD, standard deviation; Std. Error Mean, standard error of the mean.

TABLE 2 | Preliminary models to test presence of individual and group effects.

Model	χ^2	df	CFI	TLI	SRMR	RMSEA
Null model	617.98	7			0.89	0.61
Within-level model	4.97	1	0.97	0.96	0.05	0.13
Within and between-level model	1.68	1	0.99	0.98	0.01	0.05

Abbreviations: CFI, Comparative Fit Index; df, degrees of freedom; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker–Lewis Index; χ^2, chi-square.

TABLE 3 | Descriptive statistics of main variables.

Variables	*M*(SD)	ICC	$r_{WG(j)}$	1	2
Individual level ($n = 235$)					
Integrative complexity	5.42 (0.63)	0.60	0.82	1	
Sense of conflict	54.08 (7.84)	0.64	0.88	0.57**	1
Team level ($n = 59$)					
Team creativity	3.41 (0.7)				

Abbreviations: ICC, intraclass correlation coefficient; *M*, mean; $r_{WG(j)}$, Within-Group Agreement Index; SD, standard deviation.
**$p < 0.001$.

TABLE 4 | Hypothesis tests and comparisons.

Model	χ^2	df	TLI	CFI	SRMR	RMSEA	$\Delta\chi^2$	Δdf
Model 1	4.967	1	0.948	0.991	0.49	0.130		
Model 1 vs. Model 2							2.355	0
Model 2	2.612	1	0.979	0.997	0.014	0.083		
Model 2 vs. Model 3							1.68	1
Model 3	4.292	2	0.985	0.995	0.017	0.070		

Abbreviations: CFI, Comparative Fit Index; df, degrees of freedom; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker–Lewis Index; Δdf, change in degrees of freedom; $\Delta\chi^2$, chi-square difference; χ^2, chi-square.

These paths were constrained to focus solely on the direct impacts, without accounting for potential between-group interactions. This model yielded a significant improvement in fit $\left(\Delta\chi^2 = 613.013, \Delta\text{df} = 6, p < 0.001\right)$, suggesting that our hypothesized relationships hold preliminary empirical support. Despite this improvement, the RMSEA stood at 0.130, still slightly above the ideal threshold but better than the null model's RMSEA. This indicates that while the within-group model fits better than the null model, it lacks group-level structural components necessary for a holistic understanding.

Finally, for the integration of within and between-group effects in the final analytic step, we expanded the model to integrate both within-group and between-group effects. This comprehensive model introduced paths from the group-level variables to both individual-level outcomes and the group-level outcome, Team Creativity. The addition of these paths led to a nonsignificant increase in model complexity $\left(\Delta\chi^2 = 3.287, \Delta\text{df} = 0, p < 0.526\right)$, without compromising model fit. This model exhibited improved fit statistics (RMSEA = 0.05), supporting the inclusion of between-group effects and substantiating our theoretical framework at both the individual and group levels. In this final model, the covariance between Sense of Conflict and Integrative Complexity was freely estimated, consistent with standard SEM practices when including multiple mediators. This approach acknowledges their theoretical interdependence and accounts for the substantial empirical correlation observed between them (see Table 3).

6.1 | Hypothesis Tests

A series of ML-SEM with a 5000 bootstrap procedure were employed to test the study's hypotheses, examining both individual- and group-level relationships among paradoxical frames, sense of conflict, integrative complexity, and team creativity. This hierarchical approach was essential to capture the direct and mediating effects across levels, given the multilevel nature of team dynamics. To enhance interpretability, we report partially standardized estimates using the *std.nox* method in lavaan, where only the endogenous variables are standardized, and the binary predictor (paradoxical framing) remains in its original metric. This approach yields effect sizes interpretable as standardized mean differences, akin to Cohen's d. Model 1 tested Hypotheses 1a and 2a by estimating the direct effects of paradoxical frames on individual-level sense of conflict and integrative complexity. This model included paths from paradoxical frames, assessed at the team level, to both sense of conflict and integrative complexity at the individual level, as well as a direct path to team creativity to assess any independent influence on the outcome variable. Bootstrap confidence intervals derived from 5000 replications were used to provide robust estimates of parameter uncertainty, a practice widely recommended for testing indirect effects in structural models (Preacher and Hayes 2008). The fit indices for Model 1 (see Table 4) indicated an adequate fit. The path from paradoxical framing to sense of conflict was positive and statistically significant ($b = 0.111$, $p < 0.001$, CI [0.078, 0.145]), supporting Hypothesis 1a by showing that individuals within teams exposed to high paradoxical frames experienced a greater sense of cognitive conflict. Similarly, the path from paradoxical frames to integrative complexity was positive and significant ($b = 1.328$, $p < 0.001$, CI [1.044, 1.612]), supporting Hypothesis 2a and indicating that individuals within teams exposed to high paradoxical frames experienced greater integrative complexity.

Model 2 was developed to test Hypotheses 1b and 2b by adding paths from sense of conflict and integrative complexity

to team creativity, alongside the direct paths from paradoxical frames to these mediators. This model assessed whether the direct influence of paradoxical frames on team creativity persisted when accounting for the mediating roles of sense of conflict and integrative complexity. As shown in Table 4, Model 2 demonstrated an improved fit over Model 1. In this model, the direct effect of paradoxical frames on team creativity was not statistically significant ($b = 0.257, p = 0.399, 95\%$ CI [− 0.340, 0.853]), indicating that the influence of paradoxical frames on team creativity was fully mediated by sense of conflict and integrative complexity. However, to comprehensively evaluate the overall impact of paradoxical framing, we examined the total effect of paradoxical framing on team creativity, which accounts for both direct and indirect pathways. The bootstrapped total effect of paradoxical framing on team creativity was statistically significant ($B = 0.701, p < 0.001, 95\%$ CI [0.383, 1.019]). This confirms that paradoxical frames enhance team creativity by activating underlying psychological and cognitive processes rather than exerting a direct influence. The path from sense of conflict to team creativity was positive and significant ($b = 0.318, p < 0.001, 95\%$ CI [0.158, 0.477]), while the path from integrative complexity to team creativity was smaller and marginally significant ($b = 0.187, p = 0.079, 95\%$ CI [− 0.022, 0.396]). These findings provide partial support for Hypotheses 1b and 2b, with sense of conflict emerging as the more robust mediator.

To test a full mediation structure, Model 3 omitted the direct path from paradoxical frames to team creativity. Removing the non-significant direct path led to a slight reduction in fit compared to Model 2, but the fit indices remained within acceptable ranges (see Table 4). This adjustment favors a more parsimonious model, affirming the concept of full mediation. Although the fit slightly declined, the indices remained within acceptable thresholds, supporting the use of a simpler model that explains the data without unnecessary complexity. This model configuration aligns with the theoretical expectations that the effects of paradoxical frames on team creativity operate primarily through the mediating roles of sense of conflict and integrative complexity. The path from sense of conflict to team creativity was positive and significant ($b = 0.398$, $p < 0.001$, 95% CI [0.266, 0.530]), whereas the path from integrative complexity to team creativity was also significant ($b = 0.227$, $p = 0.007$, 95% CI [0.063, 0.391]). These findings provided substantial support for Hypotheses 1b and 2b, with sense of conflict showing a stronger mediating effect.

These stepwise modeling results support Hypotheses 1a, 2a, 1b, and 2b, indicating that the effects of paradoxical frames on team creativity are fully mediated by sense of conflict and integrative complexity (see Table 4). Analysis of explained variance in Model 3 further underscores the substantial impact of paradoxical frames, accounting for 79.8% of the variance in sense of conflict and 66.6% in integrative complexity, thus highlighting paradoxical frames' influence on team members' psychological and cognitive states. With sense of conflict and integrative complexity included as mediators, approximately 69.4% of the variance in team creativity was explained. This high level of explained variance underscores the importance of these mediating mechanisms in translating paradoxical frames into enhanced team creativity.

7 | Discussion

Our study highlights the pivotal role of paradoxical frames in enhancing team creativity through the mediating mechanisms of sense of conflict and integrative complexity. Findings indicate that teams exposed to paradoxical frames experience a heightened sense of conflict and elevated integrative complexity, both of which contribute to improved creative outcomes. These results extend paradox theory by demonstrating how paradoxical frames not only tolerate but actively leverage contradictions, transforming cognitive tension into a catalyst for creativity in team settings.

This research advances paradox theory by showing that paradoxical frames do not directly enhance creativity but rather create the cognitive and psychological conditions necessary for it to emerge. Although prior studies have primarily explored paradoxical frames at the individual level (Miron-Spektor et al. 2011), this study extends those insights to team-based interactions, where reconciling diverse perspectives is essential for creative collaboration (Smith and Lewis 2011). By examining how paradoxical frames influence sense of conflict and integrative complexity, our findings deepen the understanding of paradoxical frames as a mechanism that promotes engagement with contradictions rather than avoidance. Specifically, sense of conflict emerges as a particularly strong mediator, transforming cognitive dissonance into a creative force. This supports previous findings that task-related conflict, when properly managed, enhances team creativity by fostering deeper engagement with ideas (De Dreu 2006; Jehn and Mannix 2001).

These findings align with prior studies on managing contradictions (Smith and Tushman 2005) and reinforce the role of integrative complexity as a driver of creative thinking (Schad et al. 2016). Our results suggest that while both mediators contribute to creativity, sense of conflict exerts a stronger influence ($b = 0.398$, $p < 0.001$, 95% CI [0.266, 0.530]), whereas the effect of integrative complexity is lower in magnitude but statistically significant ($b = 0.227$, $p = 0.007$, 95% CI [0.063, 0.391]). This indicates that while paradoxical frames encourage cognitive differentiation, additional factors may be needed to help teams translate complex reasoning into actionable creative outcomes. This aligns with previous research showing that integrative complexity enhances problem-solving but requires structured facilitation to translate into creativity(Chung and Meneely 2012).

The findings confirm that paradoxical frames enhance team creativity indirectly through cognitive and affective mechanisms. Although the direct effect of paradoxical framing on team creativity was not significant ($b = 0.257$, $p = 0.399$, 95% CI [−0.340, 0.853]), the total unstandardized effect was statistically significant ($B = 0.701$, $p < 0.001$, 95% CI [0.383, 1.019]). This pattern supports a full mediation structure in which the effect of paradoxical framing on team creativity operates entirely through sense of conflict and integrative complexity. This suggests that paradoxical frames do not immediately trigger creativity but rather establish the cognitive and psychological conditions necessary for it to emerge. Specifically, paradoxical frames significantly increased sense of conflict ($b = 1.599$, $p < 0.001$, 95% CI

[1.519, 1.679]) and integrative complexity ($b = 1.333$, $p < 0.001$, 95% CI [1.113, 1.552]), which in turn predicted creativity. The indirect effect via sense of conflict was particularly strong ($B = 0.351$, $p = 0.001$, 95% CI [0.146, 0.556]), reinforcing research on the role of task-related conflict in stimulating creative engagement (De Dreu 2006). In contrast, the indirect effect via integrative complexity was weaker and marginally significant ($B = 0.173$, $p = 0.069$, 95% CI [−0.014, 0.359]). This suggests that while paradoxical frames encourage cognitive differentiation, teams may require additional structural support or facilitation to effectively translate complex thinking into creative solutions.

These findings provide actionable insights for teams and organizations seeking to enhance collaborative creativity. Leaders and facilitators can cultivate a paradoxical mindset by structuring team tasks to incorporate conflicting objectives, as was done in this study's manipulation of academic and social goals. Encouraging task-related sense of conflict as a constructive force can create an environment where teams feel safe engaging with contradictory perspectives, ultimately strengthening creative problem-solving (Edmondson 1999). Additionally, organizations can enhance integrative complexity through training programs focused on cognitive flexibility and perspective-taking. Structured interventions—such as design-thinking workshops, role-reversal exercises, and strategic reframing—can equip teams with the tools needed to navigate cognitive tensions productively (Smith and Tushman 2005) Further, incorporating problem-solving tasks that require balancing competing demands (e.g., cost-efficiency vs. innovation) can reinforce paradoxical thinking as a productive cognitive framework.

By fostering cognitive engagement with contradictions, paradoxical frames help teams develop deeper, more flexible thinking, which ultimately leads to innovative problem-solving (Miron-Spektor et al. 2011; Smith and Tushman 2005). These findings contribute to paradox theory by demonstrating that paradoxical frames do not directly trigger creativity but rather activate cognitive and affective processes that support creativity over time.

7.1 | Implications and Directions for Future Research

The findings from this study suggest several promising avenues for further exploration, particularly regarding the interplay between paradoxical frames, sense of conflict, and integrative complexity in fostering team creativity. Our results highlight paradoxical frames as a valuable cognitive tool for leaders seeking to enhance team creativity by encouraging constructive conflict and promoting cognitive integration. Specifically, leaders who frame tasks to balance conflicting goals may foster a sense of conflict and integrative complexity, creating conditions conducive to higher creativity.

The mediating role of sense of conflict provides insights into managing team dynamics. By embracing task-related conflict as an opportunity for growth, leaders can encourage teams to view differences constructively, supporting research suggesting that well-managed sense of conflict enhances creative outcomes (Jehn and Mannix 2001). For leaders, understanding how to cultivate sense of conflict through paradoxical frames could be particularly useful in settings where team members hold diverse perspectives or work on complex, multidisciplinary tasks. Further research could explore how different configurations of goals—conflicting versus non-conflicting—impact team creativity, potentially broadening our understanding of how cognitive tension versus multiplicity of goals influences creative processes.

Future research could further elucidate the dynamic interactions between paradoxical frames, sense of conflict, and integrative complexity through process-based methodologies. Longitudinal studies, for instance, would capture the evolution of paradoxical frames' influence on team interactions over time, providing insights into how teams repeatedly engage with and resolve cognitive tensions. Process-based tools, such as the Conversational Argument Coding Scheme (CACS) and Lag Sequential Analysis employed by Hernandez Sibo et al. (2023), could track sequential patterns that indicate transitions from sense of conflict to integrative thinking, helping to identify moments when paradoxical frames convert cognitive tension into creative insights.

Individual differences, such as openness to experience and tolerance for ambiguity, may also affect how team members engage with paradoxical frames, sense of conflict, and integrative complexity. Leaders should consider these traits when assigning team roles or framing complex tasks, as they may influence individual responses to paradoxical frames and, by extension, the team's overall creative output. For instance, team members with high tolerance for ambiguity may be more willing to embrace paradoxical frames and engage in the integrative thinking required to balance sense of conflict, making them well suited to roles involving competing demands.

Lastly, cultural factors are likely to influence how paradoxical frames, sense of conflict, and integrative complexity function across different organizational contexts. Cultural norms around conflict and harmony can shape the effectiveness of paradoxical frames in fostering sense of conflict and integrative complexity. For example, in cultures that prioritize social harmony, framing conflict as constructive may require additional contextualization to avoid misinterpretation. Studies by Chao and Tian (2013) and Ma et al. (2010) illustrate how conflict management styles vary cross-culturally, with implications for the adaptability of paradoxical frames in diverse team settings. Understanding these cultural nuances would allow organizations to tailor paradoxical frames strategies to cultural contexts, fostering team creativity in ways that align with members' values and expectations.

7.2 | Limitations

Although this study offers valuable insights into the role of paradoxical frames in fostering team creativity through sense of conflict and integrative complexity, several limitations should be noted. First, the study's reliance on a controlled, student-based sample in a design-thinking exercise limits the generalizability of the findings. Although this setting allowed for a detailed examination of specific cognitive processes under controlled conditions, future research should aim to replicate these findings in professional environments where team dynamics and organizational cultures may differ significantly.

In this study, while the experimental design enables some causal inferences regarding the effects of paradoxical frames on variables such as sense of conflict and integrative complexity, it is important to acknowledge the correlational aspects of our analysis. Specifically, the links between integrative complexity, sense of conflict, and creativity are derived from correlational data. Although our experimental approach provides a robust framework for examining the immediate impacts of paradoxical frames, the relationships among integrative complexity, sense of conflict, and creativity should not be interpreted as causal. This study captures a snapshot of team interactions, which may not fully illustrate how these variables evolve over time or under different conditions. Longitudinal studies would be beneficial to comprehensively analyze the development of team dynamics and the enduring effects of paradoxical frames. Furthermore, our study did not account for individual differences such as openness to experience and tolerance for ambiguity, which are known to influence cognitive flexibility (McCrae and Costa Jr. 1997) and could modify team members' reactions to paradoxical frames and their consequent creative outputs.

Furthermore, the study's focus on the unique impact of conflicting goals within the high paradoxical frame condition, without a comparable control involving multiple non-conflicting goals, deliberately isolates the effects of cognitive tension from conflicting goals. This design choice, while intentional, restricts our understanding of whether simply having multiple goals, irrespective of conflict, might similarly enhance creativity. Future research incorporating such conditions could help disentangle these effects and provide a clearer picture of how multiple objectives influence team creativity.

Finally, cultural factors are likely to affect conflict management strategies, influencing the effectiveness of paradoxical frames in fostering a sense of conflict and integrative complexity. Studies show that norms around conflict resolution vary across cultures. For example, Chao and Tian (2013) found that Taiwanese leaders often adhere to traditional conflict norms, while American leaders adopt context-sensitive approaches. Similarly, Ma et al. (2010) demonstrated that collectivist values in Turkish culture favor collaborative conflict management. These findings underscore the need for further research on the adaptability of paradoxical frames across diverse cultural contexts.

8 | Conclusion

In summary, this study provides valuable insights into how paradoxical frames foster team creativity, highlighting sense of conflict and integrative complexity as essential mediating mechanisms. By demonstrating that paradoxical frames increase both sense of conflict and integrative complexity, we offer a nuanced perspective on how paradoxical thinking translates into creative outcomes within teams. These findings contribute to paradox theory and provide practical strategies for organizations aiming to enhance team creativity. By cultivating an environment that supports sense of conflict and integrative complexity, organizations can unlock creative potential within teams, enabling them to thrive in complex and dynamic environments. This study underscores the transformative potential of paradoxical frames, encouraging scholars and practitioners alike to consider contradictions as integral to, rather than incompatible with, innovation.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data of this study are available from the corresponding author, Shyhnan Liou, upon reasonable request.

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