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Creativity ambidexterity and sustainable business: Taking advantage of creative thinking techniques

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ABSTRACT

This study proposes the importance of creative ambidexterity, a concept that comprises two central components: *appropriate* creativity and *original* creativity. We examine the link between self-assessed creative behaviours and creative thinking techniques (convergent and divergent thinking) as these links relate to creative ambidexterity. Using exploratory and confirmatory analyses, we show that while creative behaviours lead to *appropriate* creativity, the relationship among creative behaviours, convergent thinking, and appropriate creativity is stronger. Moreover, while creative behaviours can also lead to *original* creativity, the relationship among creative behaviours, divergent thinking, and original creativity, enhanced by a positive social environment, is stronger. Our analyses also suggest that convergent thinking has an intervening role in creative ambidexterity, providing the antecedent to both appropriate creativity and original creativity. By incorporating creative thinking techniques in leadership, job training, and skills development, managers can leverage creative behaviours for either appropriate or original solutions or both to benefit their organisations.

1. Introduction

Organisational creativity is essential in the production of useful and novel ideas (Amabile, 2012), capable of simultaneously addressing operating issues and ensuring continuous innovation for a sustainable business into the future. To show how this occurs, we explore a new concept, 'creative ambidexterity'. We propose the creative ambidexterity concept as a subset and application of organisational ambidexterity theory (He and Wong, 2004; Lee and Gaudioso, 2020; March, 1991; Stettner and Lavie, 2014; Tushman and O'Reilly III, 1996; Uotila et al., 2009). Organisational ambidexterity requires continuous adjustments to thinking and organisational structures to improve efficiency and flexibility by striving to balance routine and repetitive tasks with non-routine creative tasks (Adler et al., 1999). With adaptive systems, organisations must 'exploit' old certainties and 'explore' new possibilities, leading to the most recognised balancing act: exploitation and exploration (March, 1991; O'Reilly III and Tushman, 2013; Simsek et al., 2009).

Creativity is implicit in supporting organisational ambidexterity; yet an established research stream on organisational creativity, as one of the many available elements and employee resources that contribute to overall organisational ambidexterity, is missing. A handful of recent studies examines the relationship between creativity and organisational ambidexterity but does not explicitly consider how the creative thinking process and creativity outcomes can lead to organisational ambidexterity (Dixit et al., 2022; Şimşek et al., 2022; Zhang et al., 2023). Theoretically, creative ambidexterity comprises two central components: appropriate creativity and original creativity (Clapham, 1997; Goldenberg et al., 1999; Lemons, 2005). Appropriate creativity provides 'on-strategy' or 'within-scope' solutions to problems as a means to solve every day organisational operating issues (Kilgour and Koslow, 2009), while original creativity offers completely new ways of achieving existing operating objectives. In creative ambidexterity, exploitation and exploration activities of organisational ambidexterity (March, 1991) are associated with convergent thinking and divergent thinking. When the two forms of thinking are undertaken in conjunction with employee self-assessed creative behaviours, they can lead to creative ambidexterity by way of appropriate creativity and original creativity. Therefore, creative ambidexterity enables employees to simultaneously address organisational operating issues in the short run and safeguard

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continuous innovation for competitive and business sustainability in the long run.

Our definition of business sustainability is based on organisational ambidexterity theory and its focus on financial performance. Ambidextrous firms are capable of refining and improving existing operating activities (exploitation) to be low-cost leaders, while developing completely new and innovative activities (exploration) that will provide future sources of revenues and earnings (March, 1991; Raisch and Birkinshaw, 2008; Tushman and O'Reilly III, 1996). Firms that are unable to adapt and balance this trade-off face a downward spiral and risk becoming financially unsustainable (Hughes, 2018).

Motivated employees (Kilgour and Koslow, 2009; Krishen, 2022; Lee and Raschke, 2016, 2018; Lee et al., 2016) typically believe that their self-assessed creative behaviours can contribute to organisational pursuits of creative ambidexterity because "all humans with normal capabilities are able to produce at least moderately creative work … and the social environment can influence both the level and the frequency of creative behavior" (Amabile, 1996, p. 1). Yet research into understanding the link between self-assessed creative behaviours (Kaufman, 2006, 2012) and creative ambidexterity is sparse. The few studies exploring this topic suggest using two creative-relevant skills in the form of convergent thinking and divergent thinking techniques to bring about appropriate creativity and original creativity, respectively (Koslow et al., 2003; Runco and Charles, 1993). Convergent thinking reflects "the reorganization and integration of ideas within a domain to make a coherent whole" (Kilgour and Koslow, 2009, p. 299) and can lead to appropriate creativity. By contrast, divergent thinking, which involves "opening unusual memory categories to use as the basis for idea development" (Kilgour and Koslow, 2009, p. 299), supports original creativity. Still, self-assessed creative behaviours, creative thinking techniques, and creative ambidexterity cannot exist in a vacuum. These techniques are likely to be enhanced by a social environment that emphasises organisational creativity objectives with access to supportive strategic and physical resources (Amabile, 1996; Koslow et al., 2006; Sutherland et al., 2004). Workplaces that champion innovation with a clear creativity vision, collaborative idea-sharing teams, and the recognition of creative work can all provide a basis for achieving creative ambidexterity.

Therefore, this study examines the link between self-assessed creative behaviours and creative thinking techniques as it relates to appropriate and original creativity by asking the following research question: *To what extent do the relationships among self-assessed creative behaviours, convergent and divergent thinking, and the social environment give rise to the creative ambidexterity desired for sustainable businesses?* While research on organisational ambidexterity theory has proliferated, a small subset of studies alludes to the role of creativity in exploitation and exploration (Dixit et al., 2022; Şimşek et al., 2022; Zhang et al., 2023). The present study therefore examines how the creative thinking process and creativity outcomes (i.e., appropriate and original creativity as creative ambidexterity) can support organisational ambidexterity.

Guided by organisational ambidexterity theory and the limited number of research studies, we apply exploratory and confirmatory methodologies to survey data in search of answers that can substantiate the creative ambidexterity concept. We collect survey data from 540 respondents who engage in 59 possible self-assessed creative behaviours based on Kaufman's (2006) classifications. We then cluster these self-assessed creative behaviours into seven creative behaviour groups using principal components analysis before the exploratory and confirmatory analyses.

To build new theory, we apply fuzzy-set qualitative comparative analysis (fsQCA) to unpack the patterns or configurations among the constructs (Pappas and Woodside, 2021). We run this exploratory analysis on the components of self-assessed creative behaviours, convergent thinking, and divergent thinking, in relation to the creativity outcomes of appropriate and original creativity. We then assess these configurations using structural equation modelling (SEM) to determine the causes and effects between components, providing a richer understanding and theoretical confirmation of how self-assessed creative behaviours and creative thinking techniques may lead to either appropriate or original creativity or both and, in turn, creative ambidexterity.

This study shows that self-assessed creative behaviours lead to *appropriate* creativity. However, the relationship among creative behaviours, convergent thinking, and appropriate creativity is stronger. Creative behaviours also lead to *original* creativity. However, there is a stronger relationship among creative behaviours, divergent thinking, and original creativity, that suggests partial intervention by convergent thinking and enhancement by a positive social environment. These findings confirm that creative ambidexterity can contribute to principal organisational ambidexterity. By incorporating creative thinking techniques in leadership, job training, and skills development, managers can leverage creative behaviours for either of both appropriate and original solutions to benefit their organisation.

This study proceeds as follows: in section 2, we draw on organisational ambidexterity theory to develop the creative ambidexterity concept and corresponding theoretical propositions. Section 3 details the study's exploratory and confirmatory analyses using fsQCA and SEM. This section also explains the context, data, and constructs used in the methodologies. Section 4 presents the results. In section 5, we discuss the theoretical insights and managerial implications stemming from our results, deliberate on the study's limitations, and provide directions for future research.

2. Theory development and propositions

2.1. Creative ambidexterity

In prior research, organisational ambidexterity theory seems to implicitly assume that creativity is part of the exploitation and exploration activities within organisations' adaptive systems. In this vein, research has examined the relationship between creativity and organisational ambidexterity (Dixit et al., 2022; Şimşek et al., 2022; Zhang et al., 2023). For example, Dixit et al. (2022) examined manufacturing firms to provide evidence that 'innovative ambidexterity', defined as exploitative and explorative innovative capabilities, has become crucial to reducing carbon emissions, saving costs, and achieving overall sustainability goals. In a case study of a global technology company that transformed its tradition technology business model into a cloud-based digital platform model, Şimşek et al. (2022) developed a process framework showing how the company implemented 'creative business model' ambidexterity with an organisational structure that supported exploitation and exploration simultaneously in separate business units. Zhang et al. (2023) examined high-technology enterprises and showed that open innovation and ambidextrous organisational learning can lead to sustainable competitive advantage. In their study, knowledge management also played a role in moderating the relationship between open innovation and ambidextrous organisational learning.

Despite their explanations based on organisational ambidexterity concepts, these studies do not explicitly consider how the creative thinking process and creativity outcomes ultimately lead to organisational ambidexterity. This is because creativity outcomes require an integrative and process approach (Lee and Suh, 2022). Analogous to the exploitation and exploration components in organisational ambidexterity is widespread agreement that creativity involves two foundational elements: appropriate creativity and original creativity (Amabile, 1996; Ford, 1996; Guilford, 1950; Kasof, 1995; Mumford and Simonton, 1997; Runco, 2004; Runco and Charles, 1993). Appropriate creativity refers to how 'on-strategy' or 'within-scope' the idea is in reference to solving everyday organisational operating issues (Koslow et al., 2003). Original creativity offers new ways of doing old things (March, 1991), implying that continuous innovation is required for a sustainable business in the future. Business sustainability is based on the notion in organisational

ambidexterity theory that ambidextrous firms are ongoing concerns that successfully sustain long-term financial performance. Ambidextrous organisations are continuously searching for appropriate and original solutions to business problems. The precursor to these solutions lies in convergent and divergent creative thinking techniques applied in self-assessed creative behaviours (Kaufman, 2006; Kilgour and Koslow, 2009). At the same time, the social environment in the workplace likely influences creativity because an environment characterised by explicit use of creative thinking techniques enhances creativity (Amabile, 1996). Such an environment gives employees the freedom to create and to take pride in their work, and this, in turn, helps produce creativity (Turnipseed, 1994).

We illustrate the creative ambidexterity concept in Figs. 1 and 2. Fig. 1 shows the theoretical predictions for appropriate creativity based on organisational ambidexterity theory. Self-assessed creative behaviours and the influence of convergent thinking techniques can lead to appropriate creativity, and this may be enhanced by the social environment. Fig. 2 shows the theoretical predictions for original creativity based on organisational ambidexterity theory. Self-assessed creative behaviours and divergent thinking can lead to original creativity, and this may also be enhanced by the social environment. The following subsections discuss self-assessed creative behaviours and develop propositions for the roles of convergent thinking and divergent thinking relating to appropriate creativity and original creativity, respectively, including the effects of the social environment.

2.2. Self-assessed creative behaviours

The origins of self-assessed creative behaviours arguably date back to the ancient Greeks and their efforts to understand how creativity can exist across different domains or muses such as poetry, history, tragedy, dance, and astronomy (D'Aulaire and D'Aulaire, 1992; Kaufman, 2012). In recent decades, these domains have undergone significant evolution, and self-assessed creative behaviours have anchored around those specified by Holland (1997), Feist (2004), and Kaufman (2006). Holland's (1997) self-assessed creative behaviour domains represent six vocational interests: realistic, investigative, artistic, social, enterprising, and conventional. Feist (2004) focused on domains representing the mind and proposed seven: psychology, physics, biology, linguistics, math, art, and music.

Using hierarchical theory with the amusement park theoretical model, Kaufman (2006, 2012) applied basic levels of intelligence, motivation, and domain-specific outcomes to suggest general thematic areas, such as mathematics, problem-solving, and writing, and domain-specific knowledge, such as computer science, economics, history, and poetry, to generate 59 possible self-assessed creative behaviours exhibited by employees. Because of the large number of self-assessed creative behaviours, Kaufman (2006, 2009, 2012) reduced the 59 self-assessed creative behaviours to seven groups: artistic-verbal, artistic-visual, entrepreneur, interpersonal, math/science, performance, and problem-solving. These groups provide a more manageable set of self-assessed creative profiles in which to examine and understand cognitive patterns that lead to optimal creativity (Kaufman, 2012). Consistent with Kaufman (2006, 2009, 2012), the present study undertakes a similar dimension reduction approach before exploratory and confirmatory analyses.

2.3. Creative behaviours, convergent thinking, and appropriate creativity

Prior research prescribes two creative thinking techniques to support appropriate and original creativity. According to Kilgour and Koslow (2009), creativity techniques vary between convergent and divergent thinking processes. These thinking processes are not mutually exclusive; rather, employee thinking is dominated by one over the other. Convergent thinking focuses employees on the problem domain and encourages new connections between designs within that domain. By contrast, divergent thinking encourages employees to connect previously unrelated memory nodes with distant domains.

The convergent thinking technique aids in improving appropriate creativity (Stewart et al., 2008). Schilling (2005) explained that employees develop schemata and reorganise information together with developed processes within a creativity domain to implement missing links that solve everyday organisational operating issues. Because creativity domain knowledge is a critical antecedent to this technique, priming a person's creativity domain knowledge is essential to generate creative ideas (Simonton, 2003; Wiley, 1998). However, this causes significant creativity domain knowledge effects; for example, if employees are primed with 'within-scope' examples, they will use these even when explicitly instructed not to (Marsh et al., 1996; Marsh et al., 1999). Similar to structured imagination, employees have a strong tendency to use the related creativity domain as the basis for their own creativity, leading to a powerful conformity effect and reduced emphasis on originality (Smith et al., 1993).

While creativity domain knowledge yields creativity, once creative ideas have been developed, employees' abilities to come up with original ideas can decrease (Kilgour and Koslow, 2009). Primed information in creative idea generation means that the information acts to trigger creative domain-specific knowledge that sets cognitive boundaries, limiting the search space for any original ideas (Hecht and Proffitt, 1995). Therefore, we offer the following proposition:

P1. Self-assessed creative behaviours and convergent thinking are ingredients for appropriate creativity.

2.4. Creative behaviours, divergent thinking, and original creativity

Unlike convergent thinking, divergent thinking combines distantly associated ideas from different creativity domains (de Bono, 1967; Gordon, 1961). Schilling (2005) suggested that employees make unexpected connections between concepts when developing schemata and reorganising information together with developed processes through the random recombination of thinking across different creativity domains. This random recombination of different creativity domains is crucial for

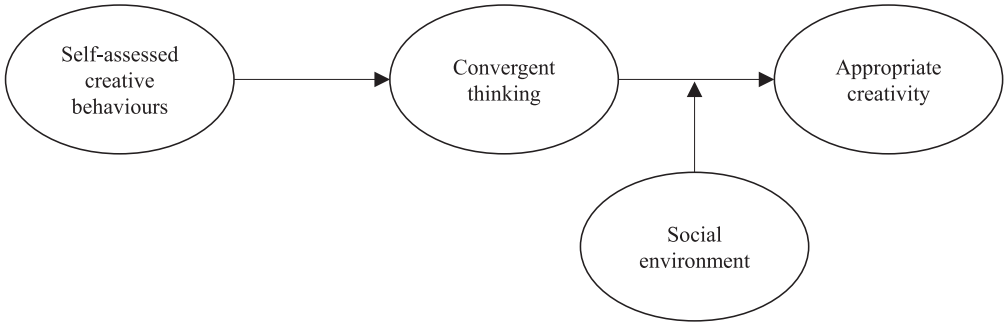

Fig. 1. The self-assessed creative behaviours and appropriate creativity conceptual model.

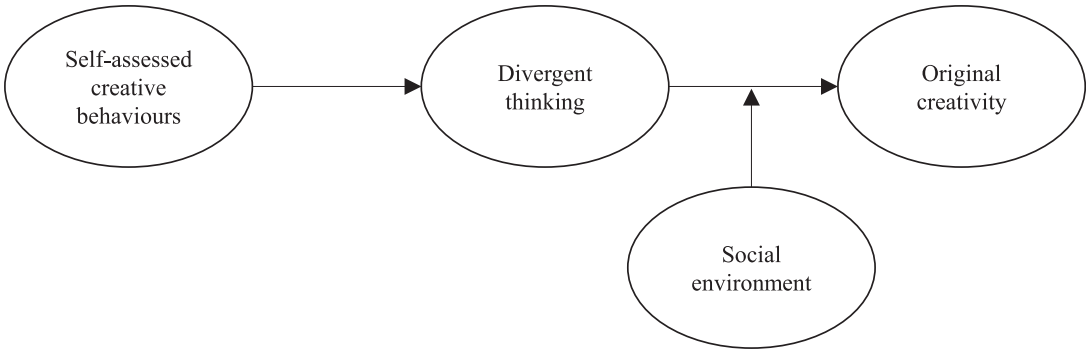

Fig. 2. The self-assessed creative behaviours and original creativity conceptual model.

priming creative thinking with divergent thinking and distinguishes divergent thinking from convergent thinking. Employees are primed with non-domain information and forced to think across creativity domains to come up with more original solutions (McFadzean, 2000). Simonton (2003) demonstrated how random combinations and cross-creativity domain combination processes have led to many major scientific breakthroughs. At the same time, divergent thinking ignores problem-solving associated with the appropriateness aspect of creativity, at least in the short run (Scott et al., 2005). Therefore, we offer the following proposition:

P2. Self-assessed creative behaviours and divergent thinking are ingredients for original creativity.

2.5. Social environment

Prior research indicates significant linkages between an organisation's social environment and its creative climate (Rhodes, 1961). Since Rhodes (1961), creativity has increasingly been viewed as having a social component. While a popular belief is of a lone creative genius, research suggests that a great deal of creativity takes place in interpersonal settings (Simonton, 2000). Csikszentmihalyi (1998, p. 315) stated that "original thought does not exist in a vacuum." The "social agreement", as well as the surrounding society, is "one of the constitutive elements of creativity, without which the phenomenon would not exist" (Csikszentmihalyi, 1988, p. 327).

Amabile (1996, p. 8) asserted that "the social environment (the work environment) influences creativity by influencing the individual components". For example, a social environment characterised by explicit use of creative thinking techniques enhances creativity (Amabile, 2012; Amabile et al., 1996). Formally stated organisational creativity objectives, access to strategic and physical resources, and accountability are three dimensions that can also affect employee creativity, mostly positively but also depending on the emphasis and setting that organisations impose on their employees (Koslow et al., 2006).

Schepers and Van Den Berg (2007) showed that adhocracy-culture perceptions, cooperative team perceptions, and procedural justice, mediated by knowledge sharing, improve work environment creativity. Overall, creativity is enhanced when (1) employees have a sense of positive challenge in the workplace; (2) teams are collaborative, diversely skilled, and idea-focused; and (3) employees have the freedom to carry out the work with active idea-sharing (Amabile, 2012; Meusburger, 2009). Managers and supervisors who encourage new idea development, support innovation through a clearly articulated creativity vision, offer appropriate recognition for creative work, and present rewards for developing new ideas also help heighten creativity (Amabile, 2012).

However, environmental factors can reduce creativity as well. According to Chua (2013), ambient cultural disharmony decreases employee effectiveness at connecting ideas from disparate cultures, which results in the belief that ideas from different cultures are incompatible, leading to a workplace that discourages creativity. Amabile (2012) also suggested that the existence of norms that criticise new ideas, organisational political problems, an emphasis on the status quo, a conservative and low-risk attitude among top management, and excessive time pressures reduce creativity.

Despite this limited evidence, creativity requires a positive social environment, a workplace that fosters idea-sharing, and innovative collaboration with diversely skilled employees who can make the most of creative thinking techniques. Otherwise, creativity becomes scarce. This leads to the following proposition:

P3. A positive social environment enhances creative thinking techniques in relation to creative ambidexterity.

3. Methods

3.1. Context

This study examines a student marketing research group project that involves significant technology use. Each group was required to research a product, develop a consumer profile, and create consumer decision process documents with user experience–inspired designs (also known as UX) used to produce a marketing website. Prior research (e.g., Byron et al., 2023; Kees et al., 2017; Lu, 2024; Mathieu and Rapp, 2009; Trafimow et al., 2020) suggests that student sampling is justifiable as a relevant means to understand the relationships among self-assessed creative behaviours, creative thinking techniques, the social environment, and creativity outcomes for three reasons.

First, student groups serve as a suitable comparative frame, much like employees working in teams in organisations. Mathieu and Rapp (2009) studied organisational project teamwork with a student sample in a classroom to explore team charters and performance strategies in organisations. Because organisations function in managed teams to accomplish projects and meet organisational goals, university courses provide a comparable environment in which student groups work towards a collective goal under the supervision of their professor. Other studies have also used university students to examine team goal orientation, planning, performance (Mehta et al., 2009), and collective efficacy (Tasa et al., 2007). Second, prior research argues that all studies should originate from a set of homogeneous subjects, such as students in a classroom, employees in a corporation, or managers in hotels (Nicholson et al., 2014). According to Trafimow et al. (2020), homogeneity-induced precision is an acceptable sampling frame when testing theory.

Third, an important consideration for the use of student teams is the substantive context of our study, which is creativity. In addition to representing organisational groups, student teams are also goal-driven, work under the leadership of a professor, and are expected to be creative in their assignments. The nature of the topic of creativity in teams is therefore an appropriate context for utilising student groups. As such, extant research on creativity and innovation in teams often proposes

frameworks with student teams. For example, Lee and Farh (2019) employ student teams to study leadership emergence and innovation in project teams. In a similar way, Lu (2024) studies creativity as an individual factor by employing classroom teams for his ethnicity-based research question. Fourth, team tenure is an important factor in studies regarding teamwork, collaboration, and creativity (Byron et al., 2022). Because using organisational groups can have varying degrees of an externality in team tenure and seniority among team members, hierarchical relationships between team members would likely occur. However, in studies with student teams as a unit of measure in a course, such hierarchies are less likely to occur because the students are approximately at the same education level and they were formed for the specific course. Finally, student-based data collection in this study included attention checks and a controlled data collection environment, which reduced unnecessary bias in data quality (Kees et al., 2017).

Table 1
Factor analysis: Principal components (> 0.4 shown) and varimax normalised rotation.

Factors	visualarts	science	social	verbalarts	thinking	sports	enterprise
fashion	0.8160						
crafts	0.7806						
photography	0.7804						
movement	0.7755						
painting	0.7273						
graphicsdes~n	0.7201						
intdesign	0.7151						
dance	0.7130						
textiles	0.7120						
film	0.7085						
vocal	0.6872						
music	0.6822						
woodmetal	0.6690						
architecture	0.6367						
poetry	0.6176			0.5398			
playmusic	0.5984						
horticulture	0.5473	0.4644					
actingperf	0.5456			0.4308			
cooking	0.4517						
teaching	0.4157						
biology		0.8710					
physics		0.8273					
chemistry		0.8127					
natscience		0.8016					
geometry		0.7907					
medicine		0.7465					
earthsci		0.7405					
algebratrig		0.7210					
politics		0.6554					
history		0.6536					
mechanic		0.6402					
legal		0.6381					
computers		0.5874					
logic		0.5805					
psychother~y		0.4983					
accounting~y		0.4922					
commfriend~m			0.8050				
commchildren			0.7080				
commstrang~s			0.7069				
emotions			0.5417				
humor			0.4958				
travelcult~s			0.4882				
personnel			0.4795				
management			0.4110				
animals							
writing	0.4775			0.6722			
fiction	0.5483			0.6085			
nonfiction				0.5350			
english	0.4135			0.5283			
problemsolve					0.6956		
solvingper~l					0.6892		
spatiovisual					0.6721		
speech					0.4916		
socialscie~s		0.4237			0.4549		
spirituality					0.4403		
sportsstrat						0.8995	
sportsperf						0.8903	
businessen~e							0.7141
advertisin~s							0.5904

Note: Eigenvalue/Cronbach's alpha/variance explained: visualarts = 21.2291/0.9420/0.3598; science = 5.8769/0.9177/0.0996; social = 3.8/0.7738/0.0855; verbalarts = 2.1794/0.8331/0.0369; thinking = 1.8798/0.7977/0.0319; sports = 1.5112/0.8836/0.0256; enterprise = 1.3454/0.6239/0.0228. Overall Cronbach's alpha (scale reliability coefficient) = 0.9535. Total variance explained = 0.6621.

3.2. Sample

A sample of 540 university students responded to the 59 self-assessed creativity domains in the survey, based on Kaufman (2006, 2012), including demographic questions. The Appendix provides the survey and demographic questions. In addition to the creativity behaviours, the respondents answered construct questions related to divergent thinking and convergent thinking (Kilgour and Koslow, 2009), social environment influences, and appropriate creativity and original creativity (Curran and Rosen, 2006).

Sample demographics indicate a diverse sample, including 40 (7.4 %) African Americans, 114 (21.2 %) Asians, 244 (45.3 %) Caucasians, 104 (19.3 %) Hispanics/Latin Americans, 1 (0.2 %) Native American, and 36 (6.7 %) other ethnicities. In addition, 263 (48.8 %) were men and 276 (51.2 %) women. The ages ranged between 21 and 29 years.

3.3. Analysis

We use two analytical approaches to evaluate the research propositions (Lee et al., 2023; Rodrigo et al., 2022). First, we use fsQCA to identify configurations of creative behaviours and creative thinking techniques as ingredients in the outcome conditions of appropriate and original creativity. This method is ideal for understanding patterns and building theory (Kumar et al., 2022; Lee and Raschke, 2016; Ragin, 2008; Woodside, 2013). Furthermore, fsQCA uses the antecedent conditions (i.e., creative behaviours and creative thinking techniques) for each of the outcome conditions (i.e., appropriate creativity and original creativity) and is an elegant way to evaluate the configurational patterns of our data (Fiss, 2007). Second, we then use SEM based on the fsQCA configurations as confirmatory analysis to unpack the deterministic relationships among the antecedent and outcome conditions.

3.4. Antecedent and outcome conditions

To answer our research question, we include several antecedent conditions in our fsQCA with appropriate creativity and original creativity: self-assessed creative behaviours, convergent and divergent thinking techniques, social environment, and appropriate and original creativity. We discuss these constructs next.

3.4.1. Self-assessed creative behaviours

We adapt self-assessed creative behaviours from Kaufman's (2006, 2012) creativity domains. To identify meaningful creative behaviour group clusters for this construct, we use principal components analysis and the commonly used varimax normalised rotation with an eigenvalue of 1.0 to minimise the number of variables with extreme loadings (high or low) on a factor. Our cutoff for loadings is values >0.4, to include all self-assessed creative behaviours in the group clusters. Table 1 shows the 59 creative behaviours reduced to seven creative behaviour clusters. We label these seven clusters based on overall behavioural characteristics as visual arts, science, social, verbal arts, thinking, sports, and enterprise. Our results augment those of Kaufman (2006) with two new self-assessed creative behaviour constructs: thinking and enterprise. Thinking creative behaviour, comprising problem-solving, social science, solving personal problems, spatial visual, speech, and spirituality, is now a separate cluster. Enterprise creative behaviour, comprising advertising and business entrepreneurship, is also now a separate cluster, reflecting the importance of entrepreneurship in today's business environment. Similar to Kaufman (2006), we average the factor scores for each survey respondent within each self-assessed creative behaviour cluster.

3.4.2. Creative thinking techniques

According to Kilgour and Koslow (2009), creativity in a marketing context is enhanced by creative thinking techniques, which include both convergent and divergent thinking. Convergent thinking techniques help improve appropriate creativity (Stewart et al., 2008). Convergent thinking ($\alpha = 0.89$) consists of three items ('I understand the project'; 'I understand the strategy to be used for the project'; and 'I understand marketing strategy in general') adapted from Kilgour and Koslow (2009) on a 9-point Likert scale with endpoints 'strongly disagree/strongly agree' (see Appendix).

Divergent thinking helps improve the originality of ideas (Kilgour and Koslow, 2009; Schilling, 2005). Divergent thinking ($\alpha = 0.92$) consists of four items ('I develop original ideas no one else thinks of'; 'I develop many alternative ideas, not just one'; 'I think up a large number of ideas'; and 'I am a good divergent thinker') adapted from Kilgour and Koslow (2009) on a 9-point Likert scale with endpoints 'strongly disagree/strongly agree' (see Appendix).

3.4.3. Social environment

The social (work) environment also influences creativity through its impact on creative thinking techniques (Amabile, 1996; Kilgour and Koslow, 2009). Social environment ($\alpha = 0.92$) consists of four items ('I enjoy discussing the diverse opinions offered by others'; 'The others enhance my learning experience'; 'Being involved with others helps me learn'; and 'I found the others supportive') adopted from Curran and Rosen (2006) on a 9-point Likert scale with endpoints 'strongly disagree/strongly agree' (see Appendix). Responses are to the prompt: 'Please answer the following questions with regards to *your* beliefs about the other students in the marketing research class'. The items pertain to how students perceive their interactions within groups, and we therefore adapted this scale to our study as the social environment construct. The construct items go beyond students' experience and include their perceptions of others on their teams (Benckendorff et al., 2009).

3.4.4. Appropriate creativity and original creativity

Creative ambidexterity proposes that ideas must be both appropriate and original (Runco and Charles, 1993). From a marketing perspective, appropriateness refers to "how on strategy an idea is" (Koslow et al., 2003, p. 93). As an outcome condition, appropriate creativity ($\alpha = 0.94$) consists of five items (Curran and Rosen, 2006) on a 9-point Likert scale. Another outcome condition is original creativity ($\alpha = 0.89$), which consists of seven items (Homer, 1995; Krishen, 2022) on a 9-point Likert scale. The Appendix shows the appropriate creativity and original creativity construct items.

4. Results

4.1. Exploratory analysis

The fsQCA identifies configurational patterns of self-assessed creative behaviours and creative thinking techniques on creative ambidexterity. All antecedent and outcome conditions must be calibrated into fuzzy-set scores ranging from 0 to 1. For the self-assessed creative behaviours, we use the indirect calibration method to determine the three thresholds of set membership with calibration depicted in Table 2 (Ragin, 2008). For all other conditions and outcomes, we use multiplicative item scores to transform the data into a fuzzy score (see Table 3).

Table 2
Construct calibrations: Self-assessed creative behaviours.

Construct	Range of construct score	Threshold for full non-membership	Maximum point of ambiguity	Threshold for full membership
visualarts	2.15–7	3.15	4.73	6.6
science	2–7	2.45	3.63	5.25
social	2.25–7	4	5.25	6.5
verbalarts	2–7	2.5	5	6.5
thinking	2–7	3.2	4.83	6.2
sports	2–7	2.5	5	6.5
enterprise	2–7	3.5	5.5	6.5

Table 3
Construct calibrations: All other conditions and outcomes.

Construct	Number of measures	Scale	Range of construct score	Threshold for full non-membership	Maximum point of ambiguity	Threshold for full membership
Convergent thinking	4	9	1–6561	524.88	2058	6036.12
Divergent thinking	3	9	1–729	58.32	448	670.68
Social environment	4	9	1–6561	524.88	3024	6036.12
Appropriate creativity	5	9	1–59,049	4723.92	24,892	54,325.08
Original creativity	7	9	1–4,782,969	382,637.52	665,420	4,400,331.48

For the three thresholds, we use 0.95 as the full membership that represents 92 % of the distribution of the product score and a 0.05 threshold as the full non-membership that represents 8 % of the distribution of the product score with the median as the crossover point (Krishen et al., 2016; Lee and Raschke, 2018, 2020; Lee et al., 2022; Xu et al., 2016).

As our research goal is to identify configurational patterns for use in confirmatory analysis, we create seven models using each of the seven clusters of self-assessed creative behaviours on the outcome conditions of appropriate creativity and original creativity alongside antecedent conditions of convergent thinking, divergent thinking, and social environment. With the broad purpose of configurational patterns in mind, we do not focus on a minimum value of consistency threshold for original creativity and appropriate creativity (Schneider and Wagemann, 2010). Instead, we examine the truth table and select the gap between high and low values as an appropriate choice (Schneider and Wagemann, 2010). Table 4 and Table 5 show the intermediate solutions of the configurational pattern results for appropriate creativity and original creativity, respectively.

For the configurations in Table 4, the patterns show consistency for appropriate creativity. Specifically, convergent thinking is present in each of the seven clusters of the self-assessed creative behaviours. This pattern is reasonable considering that, as mentioned previously, convergent thinking improves appropriate creativity (Stewart et al., 2008). The configurational patterns for appropriate creativity also show that the presence of social environment with creative thinking techniques is consistent.

For the configurations for original creativity in Table 5, patterns emerge across the seven clusters of self-assessed creative behaviours. Specifically, creative thinking techniques (either convergent thinking or divergent thinking or both) are (1) present with the self-assessed creative behaviour (e.g., social), (2) present as a configuration alone, (3) present without certain self-assessed creative behaviours (e.g., science, verbal arts, thinking, sports, enterprise), or (4) present with a certain self-assessed creative behaviour (e.g., visual arts). In addition, we observe a consistent configuration with each of the self-assessed creative behaviours with the presence of critical thinking techniques and social environment.

4.2. Confirmatory analysis

We use components-based SEM (Warp-PLS 8.0) to simultaneously examine the construct measures and structural relationships for two models: appropriate creativity and original creativity (Kock, 2021). PLS-based SEM does not assume distributional data properties (Goodhue et al., 2012) so is an ideal method for theory development (Hair et al., 2019). The self-assessed creative behaviours are considered a composite construct (Schuberth et al., 2023), as each measure is perceived to be an explanatory combination (Fornell and Bookstein, 1982). Furthermore, dropping one of the formative measures could alter the meaning of the construct, and there is no expectation that the measures correlate (Jarvis et al., 2003). The variance inflation factors (VIFs) for the formative measures are well below the threshold of 3.3, indicating that collinearity is not an issue (Kock and Lynn, 2012). Table 6 provides weights and VIF information for the self-assessed creative behaviour composite construct. Table 7 provides factor loadings, composite reliabilities (CRs), and average variances extracted (AVEs) for the reflective constructs, with all factor loadings, CRs, and AVEs within an acceptable range (Hair et al., 2006).

We test two SEM models for explanatory purposes relating to our propositions. The first model supports P1, as self-assessed creative behaviours and convergent thinking are positively related to appropriate creativity. Fig. 3 shows a significant, positive relationship between self-assessed creative behaviours and appropriate creativity ($\beta = 0.09$, $p = 0.02$) and a significant, positive relationship to convergent thinking ($\beta = 0.10$, $p = 0.01$). Consistent with P1, we find that the path from convergent thinking to appropriate creativity is significantly positive ($\beta = 0.46$, $p < 0.01$), suggesting that convergent thinking techniques enhance the effect of self-assessed creative behaviours on appropriate creativity. Therefore, creativity domain knowledge is critical for generating 'within-scope' creative ideas that are appropriate in a creativity domain. Social environment has a negative effect on appropriate creativity ($\beta = -0.11$, $p < 0.01$). As such, the social environment might encourage diverse ideas and opinions that stray from the creativity domain, reducing appropriate creativity. We explore this possibility in the second SEM model because we expect the social environment to

Table 4
Intermediate solutions for outcome condition *appropriate* creativity by self-assessed behaviours.

	Visualarts		Science		Social		Verbalarts		Thinking		Sports		Enterprise	
	sol. 1	sol. 2	sol. 1	sol. 2	sol. 1	sol. 2	sol. 1	sol. 2	sol. 1	sol. 2	sol. 1	sol. 2	sol. 1	sol. 2
*Models: ac = f(*s-acb,diverg,converg,socenv)*														
Self-assessed creative behaviour	●		●		●		●		●		●		●	
Convergent thinking	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Divergent thinking	⊗	●		●		●		●		●		●		●
Social environment		●	●	●	●	●	●	●	●	●	●	●	●	●
Raw coverage	0.133	0.502	0.216	0.502	0.358	0.502	0.337	0.502	0.335	0.502	0.350	0.502	0.472	0.502
Unique coverage	0.035	0.404	0.017	0.303	0.032	0.177	0.031	0.196	0.034	0.201	0.033	0.186	0.052	0.083
Consistency	0.784	0.842	0.841	0.842	0.817	0.842	0.841	0.842	0.835	0.842	0.840	0.842	0.830	0.842
Overall solution coverage	*0.537*		*0.519*		*0.535*		*0.533*		*0.536*		*0.536*		*0.555*	
Overall solution consistency	*0.821*		*0.836*		*0.828*		*0.827*		*0.831*		*0.827*		*0.823*	

Note: *ac* = appropriate creativity;
* *s-acb* = column label (e.g., Visualarts, Science, etc.), diverg = divergent thinking, converg = convergent thinking, socenv = social environment, sol. = solution, ● = presence of a condition, ⊗ = absence of a condition.

Table 5
Intermediate solutions for outcome condition *original* creativity by self-assessed behaviours.

	Visualarts				Science			Social			Verbalarts			
	Sol. 1	Sol. 2	Sol. 3	Sol. 4	Sol. 1	Sol. 2	Sol. 3	Sol. 1	Sol. 2	Sol. 3	Sol. 1	Sol. 2	Sol. 3	***cont.***
*Models: oc = f(*s-acb,diverg,converg,socenv)*														
Self-assessed creative behaviour	●						⊗			●				
Convergent thinking	●	●		●		●	●		●	●	●		●	
Divergent thinking		●	●		●		●	●		●	●	●		
Social environment			●	●	●	●		●	●			●	●	
Raw coverage	0.241	0.624	0.549	0.567	0.549	0.567	0.517	0.549	0.567	0.383	0.624	0.549	0.567	
Unique coverage	0.007	0.092	0.051	0.053	0.051	0.069	0.113	0.051	0.069	0.062	0.126	0.051	0.069	
Consistency	0.613	0.629	0.650	0.639	0.650	0.639	0.638	0.650	0.639	0.643	0.629	0.650	0.639	
Overall solution coverage	*0.751*				*0.731*			*0.680*			*0.744*			
Overall solution consistency	*0.591*				*0.602*			*0.612*			*0.595*			

Note: *oc* = orginal creativity;
* *s-acb* = Column label (e.g., Visualarts, Science, etc.), diverg = divergent thinking, converg = convergent thinking, socenv = social environment, sol. = solution, ● = presence of a condition, ⊗ = absence of a condition.

Table 5
cont. Intermediate solutions for outcome condition *original* creativity by self-assessed behaviours.

		Thinking				Sports			Enterprise		
	cont.	Sol. 1	Sol. 2	Sol. 3	Sol. 4	Sol. 1	Sol. 2	Sol. 3	Sol. 1	Sol. 2	Sol. 3
*Models: oc = f(*s-acb,diverg,converg,socenv)*											
Self-assessed creative behaviour		●			⊗			⊗			●
Convergent thinking				●	●		●	●	●		
Divergent thinking			●		●	●		●	●	●	
Social environment		●	●	●		●	●			●	●
Raw coverage		0.368	0.549	0.567	0.441	0.549	0.567	0.418	0.624	0.549	0.567
Unique coverage		0.021	0.027	0.040	0.092	0.051	0.069	0.085	0.126	0.051	0.069
Consistency		0.610	0.650	0.639	0.651	0.650	0.639	0.645	0.629	0.650	0.639
Overall solution coverage		*0.731*				*0.703*			*0.744*		
Overall solution consistency		*0.597*				*0.609*			*0.595*		

Note: *oc* = orginal creativity;
* *s-acb* = Column label (e.g., Visualarts, Science, etc.), diverg = divergent thinking, converg = convergent thinking, socenv = social environment, sol. = solution, ● = presence of a condition, ⊗ = absence of a condition.

Table 6
Formative construct: Self-assessed creative behaviour composite factor.

Measures	VIFs	Outer weights
visualarts	1.949	0.222
science	1.885	0.216
social	1.542	0.203
verbalarts	1.578	0.211
thinking	1.818	0.229
sports	1.289	0.174
enterprise	1.312	0.169

Table 7
Reflective constructs: Factor loadings, CRs, AVEs.

Constructs	CRs	AVEs	Indicators	Factor loadings
Convergent thinking	0.93	0.82	converg1	0.929
			converg2	0.933
			converg3	0.847
Divergent thinking	0.94	0.81	diverg1	0.872
			diverg2	0.921
			diverg3	0.930
			diverg4	0.873
Social environment	0.94	0.80	socenv1	0.915
			socenv2	0.897
			socenv3	0.907
			socenv4	0.865
Appropriate creativity	0.95	0.80	appropcr1	0.942
			appropcr2	0.937
			appropcr3	0.947
			appropcr4	0.796
			appropcr5	0.852
Original creativity	0.92	0.63	origincr1	0.807
			origincr2	0.788
			origincr3	0.613
			origincr4	0.871
			origincr5	0.836
			origincr6	0.860
			origincr7	0.772

have an opposite (positive) relationship to divergent thinking techniques and, in turn, original creativity.

The second SEM model, which analyses the impact of self-assessment creative behaviours and divergent thinking techniques on original creativity, provides support for P2. Fig. 4 shows a significant, positive impact of self-assessed creative behaviours on original creativity ($\beta = 0.08$, $p = 0.03$) and divergent thinking ($\beta = 0.09$, $p = 0.02$). Furthermore, we find a significant, positive relationship between divergent thinking and original creativity ($\beta = 0.16$, $p < 0.01$). Also consistent with P2, we find no significant relationship between self-assessed creative behaviours and convergent thinking in the original creativity setting.

Our findings reveal that divergent thinking is associated with convergent thinking ($\beta = 0.54$, $p < 0.01$), which in turn is associated with original thinking ($\beta = 0.31$, $p < 0.01$). This suggests that divergent thinking in employees' self-assessed creative behaviours also influence them to engage in convergent thinking as a natural part of wanting to contextualise their original ideas. With regard to original creativity, this second SEM model shows that creative behaviours are linked with divergent thinking and that divergent thinking is also associated with convergent thinking for relevance and scope in thinking. Our findings also suggest an intervening role of convergent thinking in creative ambidexterity, providing the antecedent to both appropriate creativity and original creativity.

The model also shows that social environment enhances divergent

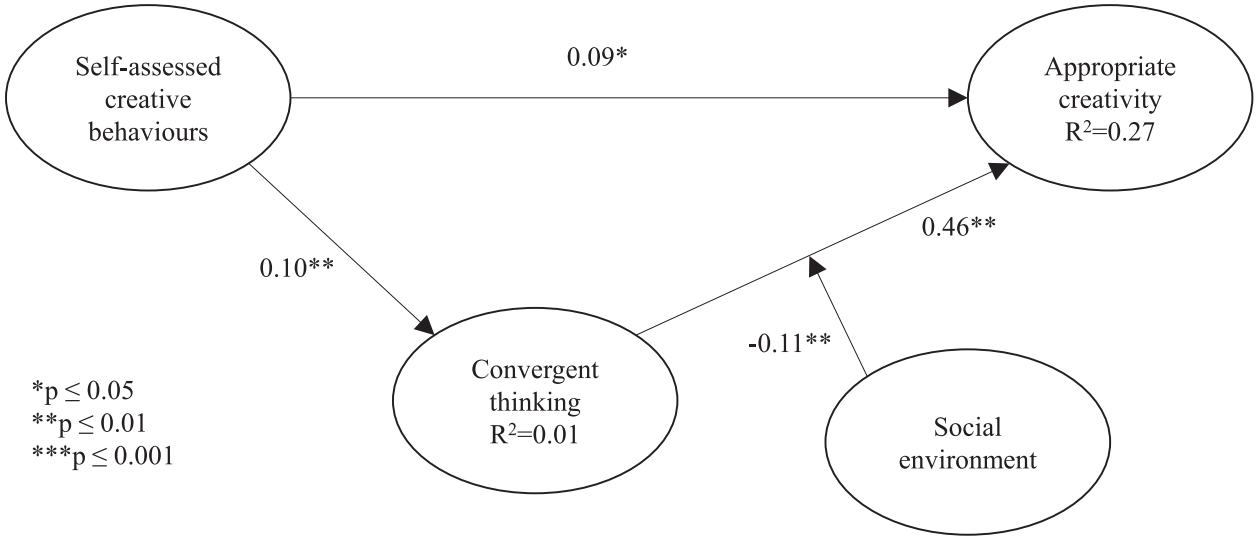

Fig. 3. Self-assessed creative behaviours and appropriate creativity.

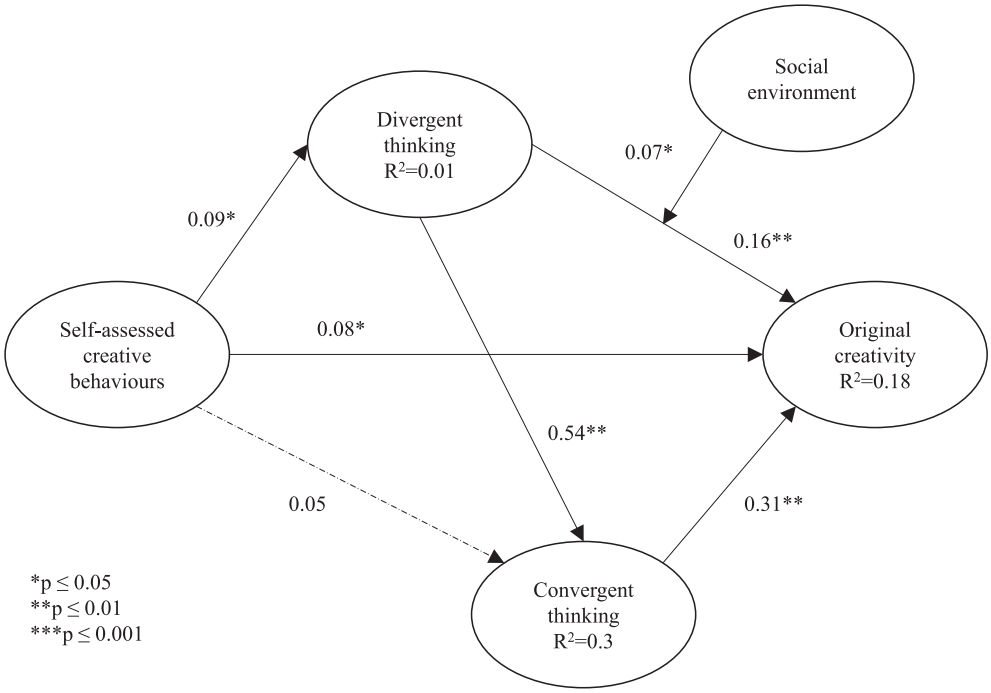

Fig. 4. Self-assessed creative behaviours and original creativity.

thinking and original creativity (β = 0.07, $p < 0.05$), as employees welcome active idea-sharing and diverse opinions in a supportive social environment. Table 8 reports the correlations between the constructs in the Fig. 3 and Fig. 4 SEM models. The models have discriminant validity, as the square roots of the AVEs are higher than the construct correlations.

The results shown in Fig. 3 and Fig. 4 indicate no support for P3. On the one hand, the social environment reduces convergent thinking and appropriate creativity. A social environment might encourage diverse creative ideas and opinions that diverge from a creativity domain. On the other hand, a dynamic social environment enhances divergent thinking and original creativity through the freedom to share ideas among diversely skilled employees. Therefore, the model results suggest that the social environment diminishes appropriate creativity and encourages original creativity. Because both appropriate creativity and original creativity are required for creative ambidexterity, the social environment could negate the effects of both types of creative thinking techniques.

5. Discussion

5.1. Theoretical insights and managerial implications

According to LinkedIn, businesses cite creativity as the most valuable skill in potential hires (Krishen, 2022). Individually driven creativity can drive efforts to find efficient and optimal solutions in both the short and long run, with opportunities to invent, launch, and lead cutting-edge and trail-blazing ideas (Petrone, 2019). Guided by prior research on organisational ambidexterity theory, our study suggests that organisations can develop creative ambidexterity by taking advantage of

Table 8
Discriminant validity.

Appropriate creativity model: fig. 3 construct correlations				
	Self-assessed creative behaviours	Convergent thinking	Social environment	Appropriate creativity
Self-assessed creative behaviours	0.698			
Convergent thinking	0.091	0.904		
Social environment	0.103	0.280	0.896	
Appropriate creativity	0.096	0.504	0.402	0.897

Original creativity model: fig. 4 construct correlations					
	Self-assessed creative behaviours	Convergent thinking	Divergent thinking	Social environment	Original creativity
Self-assessed creative behaviours	0.698				
Convergent thinking	0.091	0.904			
Divergent thinking	0.084	0.540	0.900		
Social environment	0.103	0.280	0.328	0.896	
Original creativity	0.114	0.395	0.324	0.377	0.797

Note: The square roots of the AVEs are on the diagonal.

employees' self-assessed creative behaviours and employing convergent and divergent creative thinking techniques. Creative ambidexterity enables organisations to resolve short-term operating issues with appropriate creativity and to ensure continuous innovation for long-term sustainable practices with original creativity.

Our research augments a handful of recent organisational ambidexterity studies that include creativity but does not methodically consider how the creative thinking process and its outcomes contributes to organisational ambidexterity (Dixit et al., 2022; Şimşek et al., 2022; Zhang et al., 2023). The creative ambidexterity concept that we develop illustrates how creative thinking techniques provide a means to leverage creative ambidexterity outcomes, and our findings advocate two novel and key creativity strategies. First, organisational managers can blend employees' self-assessed creative behaviours with convergent thinking for appropriate creativity without having to employ divergent thinking techniques. A positive social environment introduces 'out-of-scope' thinking and distracts employees, negatively affecting appropriate creativity. Second, managers can take employees' self-assessed creative behaviours and couple them with divergent thinking and a positive social environment for original creativity without convergent thinking. Divergent thinking may also lead to convergent thinking and original creativity, because employees may contextualise their original ideas. These findings have theoretical and managerial implications as follows.

From a theoretical perspective, our novel approach shows that firms can leverage organisational creativity and creative ambidexterity in their pursuit of organisational ambidexterity. A facet of exploitation and exploration activities can include convergent thinking and divergent thinking, as when these two forms of thinking are coupled with self-assessed creative behaviours, they lead to appropriate and original creativity, thereby resulting in creative ambidexterity. Creative ambidexterity enables employees to tackle organisational operating issues, while ensuring innovation for competitive advantage, ongoing financial performance, and business sustainability into the future.

Our research also has implications for organisational managers because they have the power to implement creative ambidexterity through their employees' self-assessed creative behaviours. Leadership, training, and developing employee creative behaviours with creative thinking techniques are vital practices managers can exploit and explore, turning them into either appropriate or original solutions or both to benefit their organisation. Managers can allocate operational projects and cluster employees around solutions using appropriate creativity, as well as research-and-development projects that orient employees towards original solutions for a sustainable business. Moreover, managers can design and implement creatively ambidextrous structures by separating employees into convergent and divergent thinking roles across operational business units or research-and-development-focused business units. To close creative gaps in their organisation, managers can hire convergent and/or divergent thinkers, optimise allocations, and/or pursue external alliances with supplementary partners guided by their creative behaviours.

5.2. Limitations and future research

Despite the compelling findings for achieving creative ambidexterity, this study has several limitations. First, we limited the study to the self-assessment of creativity behaviours because we did not administer creativity tests. Second, our results are limited to the contextual setting used in our data collection. While we provide justification for our student sample selection, the setting is only a proxy for employees in an organisational setting. Third, as "creative thinking techniques are not a one-size-fits-all proposition" (Kilgour and Koslow, 2009, p. 307), our results may apply for some groups and contexts but not for others. Our findings and limitations provide guidance for future research.

First, future research could explore contextual boundaries of conditions to determine whether differences exist between creative and non-creative industries and their creative/non-creative tasks, as specified by our seven self-assessed creativity behaviour clusters in Table 1 (visual arts, science, social, verbal arts, thinking, sports, and enterprise). Future research could examine these differences using the categories Dittrich (1976) specified: (1) creative industries engaging in creative tasks (e.g., actors, architects, artists in verbal and visual arts), (2) non-creative industries engaging in routine or repetitive tasks (e.g., accountants, bankers, finance professionals), and (3) non-creative industries engaging in creative tasks (e.g., auditors and bankers conducting fraud risk assessment [Brazel et al., 2010], finance professionals developing new financial products). This approach would likely overcome any perceived limitations of using a student sample and also shed further light on industry effects.

Second, our findings also raise the deeper question of how organisations can employ self-assessed creative behaviours and creative thinking techniques to balance appropriate creativity and original creativity for creative ambidexterity, given that we highlight the complementary benefits of convergent thinking and divergent thinking for appropriate creativity and original creativity. Future research could test whether there is an optimal equilibrium that balances both types of creativity. Balancing convergent thinking and divergent thinking on a continuum is not an easy feat because these two types of thinking are contradictory; yet an organisation cannot achieve creative ambidexterity without potentially harmonising its engagement in both creative thinking techniques. Future research should also examine the intervening role of convergent thinking to better understand the potential mediating relationship between creative behaviours and original

creativity. Given this social paradox, future research might also examine organisational resource allocation strategies and their impact on creative ambidexterity performance.

Third, because our findings suggest parallels between creative and organisational ambidexterity, we can draw on organisational theory to provide some guidance to a future creative ambidexterity research stream. For example, do strategies that maintain both types of creative thinking techniques simultaneously or those that divide these techniques into distinct organisational units achieve optimal creative ambidexterity? The former relies on leadership and inter-personal coordination, while the latter requires spatial separation and inter-divisional connectivity. This suggests potential investigation into organisational antecedents to creative ambidexterity, such as organisational structure, social culture, identity, and managerial characteristics.

Last, environmental antecedents can also trigger sequential creative thinking rather than simultaneous creative thinking. Sequential creative thinking requires that organisations focus on either convergent or divergent thinking in a sequence to overcome environmental influences. For example, environmental dynamism in the form of changes in customer preferences or new technologies may lend itself to sequential creative thinking by way of full organisational efforts in divergent thinking before convergent thinking. Exogenous shocks and unforeseen events, such as technology breakthroughs (e.g., artificial intelligence), can also trigger a focus on divergent thinking before convergent thinking. Research opportunities abound to examine how environmental antecedents, perhaps in sequence, can affect the implementation of creative ambidexterity.

CRediT authorship contribution statement

Michael T. Lee: Writing – review & editing, Writing – original draft, Validation, Project administration, Methodology, Formal analysis, Conceptualization. **Sheen Kachen:** Writing – review & editing, Validation, Resources, Data curation. **Anjala S. Krishen:** Writing – review & editing, Validation, Resources, Data curation. **Robyn L. Raschke:** Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis.

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Appendix A. Survey (construct headings were not disclosed)

Self-assessed creativity behaviours

Please rate your creativity in the following domains. Some of these domains may seem to overlap. Do not worry about this; rather, try to think about your creativity in each specific domain as you understand it without worrying about how it may overlap with other domains listed. For domains that you are not personally familiar with, feel free to check [Not Applicable]. Thank you! How creative are you in:

Scale: Not Applicable, Not at all creative, Not very creative, A little creative, Somewhat creative, Very creative, Extremely creative.

Accounting/money management	Mechanical abilities
Acting/performance	Medicine
Advertising/sales	Music composition
Algebra/trigonometry	Naturalistic science/resource
Architecture/design	Management
Ballet/dance/gymnastics/	Painting/drawing
Creative movement	Personnel management/leadership
Business/entrepreneurial abilities	Photography
Chemistry	Physics
Computers/computer science	Playing a musical instrument
Cooking	Political sciences (inc. economics)
Crafts/sculpture/'folk' art	Problem-solving
Earth sciences	Psychotherapy/psychiatry
Emotions	Social sciences (psychology, anthropology, sociology)
English literature	Solving personal problems
Fashion/working with clothing	Spatial-visual abilities
Film and/or theatrical	Speech/debate/verbal abilities
Writing/direction	Spirituality/religious thought
Geometry	Sports performance
Graphic design/multimedia	Sports strategy
History/historical analysis	Teaching/education
Horticulture/gardening	Textiles/fabrics
Humor/comedy	Travel/interacting with different cultures
Interacting/communicating with children	Vocal performance
Interacting/communicating with friends and family	Wood/metal working
Interacting/communicating with strangers	Working with animals/animal training and management
Interior design/decorating	Writing fiction/prose
Law/legal skills	Writing non-fiction/journalism
Life sciences/biology	Writing poetry
Logic/puzzles/'everyday math'	

Creative thinking techniques

Please answer the following questions with regards to ***your*** **beliefs about yourself and the class**.

Scale: 9-point Likert scale with endpoints "strongly disagree" and "strongly agree".

Divergent thinking	*Convergent thinking*
• I develop original ideas no one else thinks of. • I develop many alternative ideas, not just one. • I think up a large number of ideas. • I am a good divergent thinker.	• I understand the project. • I understand the strategy to be used for the project. • I understand marketing strategy in general.

Social environment

Please answer the following questions with regards to ***your*** **beliefs about the other students** in the marketing research class.
Scale: 9-point Likert scale with endpoints "strongly disagree" and "strongly agree".

- The other students enhance my learning experience.
- I found the other students supportive.
- Being involved with other students helps me learn.
- I enjoy discussing the diverse opinions offered by other students.

Creativity outcomes

What are ***your attitudes*** towards the project you completed in the marketing research class?
Scale: 9-point Likert scale with the following endpoints.

Appropriate creativity	*Original creativity*
• Bad/Good • Dislike/Like • Unfavourable/Favourable • Not useful/Useful • Not fair/Fair	• Overused/Fresh • Predictable/Novel • Usual/Unusual • Not unique/Unique • Unoriginal/Original • Uncreative/Creative • Dull/Exciting

Demographic questions

- What year were you born?
- What is your major of study?
- When do you expect to graduate (semester and year)?
- Your gender: female, male
- What is your ethnicity? African American, Asian, Caucasian, Hispanic/Latin American, Native American, Other
- Your marital status: single, married, divorced
- Are a: student, non-student
- Are you currently: employed, unemployed

Data availability

The authors do not have permission to share data.

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