JOURNAL OF MANAGEMENT STUDIES

Journal of Management Studies 60:7 November 2023
doi:10.1111/joms.12874

Selecting Innovation Projects: Do Middle and Senior Managers Differ When It Comes to Radical Innovation?

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ABSTRACT Drawing on the attention-based view, we theorize about the differences in middle and senior managers' choices to pursue innovation projects. We test our hypotheses in an experimental study examining the decision-making processes of 180 senior and middle managers in selecting, or not, 2880 innovation projects. We find that managers differ in how they select innovation projects in general, and this difference becomes even more salient when such selections involve radical innovation. Specifically, when considering a radical innovation project, middle managers place more value on innovation characteristics required to complete the project, such as social capital and internal knowledge resources. In comparison, senior managers are concerned only with external knowledge resources, which can benefit radical innovation. Our study highlights the need to understand the role of middle managers, who frequently lead the implementation of innovation projects, and provides a theoretical underpinning for the differences in middle and senior managers' decision-making.

Keywords: attention-based view, decision-making, experiment, middle managers, radical innovation, upper echelon

INTRODUCTION

Middle managers' decision-making influences how innovation strategies are shaped (Burgelman, 1994; Heyden et al., 2018; Reitzig and Sorenson, 2013) and, consequently, whether and how firms exploit entrepreneurial opportunities and innovation. The importance of middle managers in innovation is doubly relevant. First, increasing competitive

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pressures, tighter cost controls, and organizational restructuring have amplified the strategic role of middle managers (Floyd and Wooldridge, 1994; Gjerde and Alvesson, 2019; Heyden et al., 2017, 2020). Second, middle managers are known to differ from senior managers in their decision-making based on their structural rank in the organization (Burgelman, 1994; Kanter, 1982; Ren and Guo, 2011; Rouleau, 2005; Schubert and Tavassoli, 2020).

Despite the crucial and distinct role played by middle managers in firms' innovation selection and implementation (Reitzig and Sorenson, 2013), limited insights exist into *how* a manager's position within the firm affects their perspective and choice of innovation projects and, consequently, whether it differs between middle and senior managers (Behrens et al., 2014; Tarakci et al., 2018; Wilden et al., 2019). This is particularly true for projects related to radical innovation, for which, to our knowledge, no prior research exists. This is surprising, as research has long highlighted the importance of radical innovation for performance and survival (Burgelman, 1983a). This, for example, incudes the seminal work of Schumpeter (1934) and related work in evolutionary economics (Nelson and Winter, 1982) that has argued that radical innovation – defined as revolutionary change and breakthroughs in product, process, technologies, markets, or business models – are key to economic development and progress. This contrasts with incremental innovation, which refers to innovation that seeks to improve existing systems or products to make them better, cheaper, or faster. Related to this, strategy and management scholars have also emphasized the benefits of radical innovation for firm positioning and competitive advantage (Srivastava and Gnyawali, 2011) and the different roles of top and middle managers in initiating and implementing the underlying radical change initiatives (Burgelman, 1991; Heyden et al., 2017). However, research has also frequently stressed firms' ongoing difficulties in executing radical innovation (O'Connor and DeMartino, 2006), and a better a understanding of how radical innovation projects are chosen by middle managers should help to ultimately execute them successfully (Colombo et al., 2017; Tellis et al., 2009). This study seeks to address this gap by asking: How do top and middle managers differ in their emphases when selecting radical innovation projects?

To examine these questions, we draw on Ocasio's (1997, p. 188) attention-based view (ABV), which argues that 'what decision-makers do depends on what they focus their attention'. Managerial attention is also central for innovation as it shapes how managers identify and exploit opportunities (Eklund and Mannor, 2021). As Ren and Guo (2011, p. 1587) put it, 'An organization could miss the chance to exploit an [innovation] opportunity if that opportunity never appears on . . . managers' radar screens'. Thus, to facilitate radical innovation in firms, it is of practical importance to improve our understanding of the decision-making and characteristics by which middle and senior managers allocate their attention to radical innovation opportunities. Drawing on the ABV, we explain firm choice and behaviour as the outcome of managers' decisions that depend on four attention regulators: structural position, rules of the game, resources, and players (Ocasio, 1997). We use these attention regulators to frame key innovation characteristics – attributes of an innovation that influence its adoption and/or implementation by individuals and organizations (Downs and Mohr, 1976) – which explain variance in managers' selective attention to, and thus selection of, radical innovation projects (Ocasio, 1997; Ren and Guo, 2011).

Empirically, we conducted a discrete choice experiment with 180 managers (90 senior managers and 90 middle managers) who were asked to make 2880 innovation project selections. Each innovation project is characterized by six specific characteristics, which have been discussed in prior literature and represent the four attention regulators: radicalness, social capital, portfolio fit, external and internal knowledge resources, and intellectual property (IP) protection. The experimental data are analysed using a mixed logit model, which allows us to isolate and compare the importance of senior and middle managers' attention regulators within the context of innovation decisions.

Our findings make several distinct contributions to management and innovation research. First, by drawing on the ABV, we provide a theoretical underpinning for the differences in middle and senior managers' decision-making regarding radical innovation. Managerial attention is particularly important for radical innovation, as firms are primarily set up to focus on exploiting existing processes rather than paying attention to new opportunities (Eklund and Mannor, 2021; Kleinknecht et al., 2020; Van de Ven, 1986). An important step in better directing managerial attention towards radical innovation lies in understanding what characteristics of innovation projects affect such attention. The ABV, and its concept of attention regulators, allows us to shed light on how middle and senior managers allocate their attention to radical innovation opportunities, which is of theoretical and practical importance to better understand and facilitate radical innovation in firms. In particular, our findings imply that a singular focus on the upper echelons and their decision-making about radical innovations exposes firms to the risk of misattributing the consequences of firm attention and innovation decision-making, some of which are, at least partly, attributable to middle managers (Burgelman and Sayles, 1988; Heyden et al., 2020).

Second, we depart from previous research on innovation project selection, which examines general innovation choices (Behrens, 2016; West et al., 2020), by focusing on the distinction between radical versus incremental innovation. Thereby, our study highlights the unique role of middle managers, who frequently lead the implementation of innovation projects (Burgelman, 1983c, 1991), in selecting radical innovation projects and analyses their decision-making process and the innovation characteristics shaping their radical innovation choices (Randhawa et al., 2021a; Shaikh and O'Connor, 2020).

Third, we extend previous research on middle managers, which has been largely conceptual with some exceptions (e.g., Heyden et al., 2017; Tarakci et al., 2018), by utilizing an experimental method to examine the decision-making model of individual managers. In doing so, our experiment and data analysis not only contribute empirical evidence to the literature on middle management but also extend our understanding beyond the development of a generalized singular model of innovation decision-making to fine-grained individual decision models. By sampling and collecting data from middle and senior managers, we respond to calls to conduct systematic cross-level sampling and data gathering to advance insights into middle management research (Wooldridge et al., 2008), in particular regarding differences in managerial attention allocation while making radical innovation project decisions (Tarakci et al., 2018). Specifically, our experimental method helps uncover unique insights on middle managers' preferences and trade-offs they make when considering radical innovation. The findings extend our understanding of when and why radical innovation

choices are likely to be heterogeneous, based on how middle and senior managers differentially allocate their attention.

CONCEPTUAL BACKGROUND AND HYPOTHESES

How Attention Regulators Direct Managerial Attention towards Radical Innovation Projects

We draw on the ABV (Ocasio, 1997), which follows the behavioural view of the firm (Cyert and March, 1963) and has been used extensively in management and innovation research (e.g., Eklund and Mannor, 2021; Rhee and Leonardi, 2018). The ABV does not provide normative perspectives on superior or effective strategies but rather intends to explain strategic behaviour and decision-making. A core tenet of the ABV is that managerial attention, defined as focused awareness on a subset of accessible information (Helfat and Peteraf, 2015), is a scarce resource and represents a firm's key constraint. Thus, managers face trade-offs associated with their attention, and they need to make choices regarding where and how to direct their limited attention (Eklund and Mannor, 2021). For example, in the selection stage of an innovation project, managers pre-screen and select the innovation opportunities and decide which innovation project to exploit (i.e., select) (West et al., 2020); this decision, however, is usually done under time constraints and limited attentional and cognitive capacities (Acar et al., 2019). This mandates managers to be selective in their attention to possible innovation project opportunities.

The central issue of the ABV is how attention is regulated, or in other words, how managers select and focus their attention and which mechanisms govern this process. Ocasio (1997) and subsequent researchers (e.g., Hoffman and Ocasio, 2001) argue that attention regulation is based on three principles. First, due to limited cognitive capacity of a decision-maker (Cyert and March, 1963), there exists a limited 'focus of attention'. Second, the decision-maker has 'situational attention', which is embedded in the firm's procedural and communication channels. In other words, attention is based on the idiosyncratic organizational context of the decision-maker. Finally, attention is structurally distributed based on four attention regulators, which are closely linked to the situational attention.

By drawing on March and Olsen (1979), Ocasio (1997) defines four attention regulators: (1) structural position, (2) rules of the game, (3) resources, and (4) players (discussed in detail in the following sections). These four attention regulators build attention structures, which are 'set of rules that constrain how problems, solutions, and participants get linked' (p. 188) and are defined as 'the social, economic, and cultural structures that govern the allocation of time, effort, and attentional focus of organizational decision makers in their decision-making activities' (Ocasio, 1997, p. 195).

According to Ocasio (1997), attention regulators drive and direct the attention of decision-makers through three interconnected mechanisms. First, attention regulators define a set of values based on managers' legitimacy, relevant issues, and events. Thereby, like a compass, 'central guiding concepts' (p. 198) are given to managers to set their locus

of attention. This set of values is shared across the organization and helps to build a common understanding within the organization (Suzuki, 2017). In particular, the attention regulators of 'rules of the game' and 'structural positions' are closely aligned with this mechanism (Suzuki, 2017). Second, attention regulators distribute decision-making activities and responsibilities within a firm (Ocasio, 1997). Attention is frequently based on specific tasks and roles in organizations; thus, through the distribution of activities and responsibilities, attention is regulated to specific individuals and groups. Per definition, the attention regulator 'structural positions' are strongly associated with this mechanism. Third, attention regulators provide managers with normative frames, which are a 'structured set of interests and identities' that generate decision premises and help to motivate actions (Ocasio, 1997). This enables mangers to interpret organizational situations and drive action.

In line with the attention regulators framework, proponents of the ABV have argued that the uptake of particular problems and solutions varies with the role and function of individual decision-makers, including the distinction between senior and middle managers (Blettner et al., 2015; Joseph and Wilson, 2018). Traditionally, senior managers' main strategic role lies in paying attention to (innovation) strategy formulation, while middle managers focus on strategy implementation and, occasionally, are involved in strategy formulation (Floyd and Wooldridge, 1992; Raes et al., 2011). This logic is based on Chandler (1962), who highlighted change and innovation as a senior management task. This line of thinking is closely associated with influential theories and perspectives in strategic management, such as the upper echelons theory (Hambrick and Mason, 1984), which emphasizes the importance of senior managers (Wiersema and Bantel, 1992). In his context, it is important to highlight that Attention Regulator 1 (structural positions) focuses on the role and benefits of social relationships of individual managers, whereas Attention Regulator 3 (resources) focuses on firms' distinctive competencies and inimitable assets allowing them to perform activities (i.e., in our context, knowledge inputs to create the radical innovation, which may be sourced internally or externally).

However, this top-down view of innovation has been challenged in multiple studies, highlighting the importance of middle managers for entrepreneurial opportunity selection and implementation (Burgelman, 1983b; Ren and Guo, 2011; Schubert and Tavassoli, 2020) and strategic change initiation and implementation (Heyden et al., 2017; Heyden et al., 2020; Tarakci et al., 2018). To better understand this tension, our research draws on the concept of attention regulators of the ABV to develop a decision-making model of innovation project selection and examines how middle managers and senior managers make such decisions in the context of radical innovation projects. Drawing on the stages of innovation-enabled radical change proposed by Burgelman (1991) and recent work in managerial change role theory (Heyden et al., 2017), we conceptualize radical innovation projects as those in which managers pursue radical change initiatives through activities that generate diverse ideas for radical innovation, filter the most promising ideas for resource allocation, and then create supporting structures, systems, and processes to implement the most viable ideas for radical innovation.

Previous innovation research has shown how different innovation characteristics can influence directing managers' attention and their selection of innovation projects (Behrens et al., 2014; Downs and Mohr, 1976). Research on innovation characteristics

is aimed at explaining which attributes of an innovation influence its adoption and/or implementation by individuals and organizations (Jiao and Zhao, 2014). Consequently, a stream of research has emerged that focuses on innovation project selection by assessing 'its attractiveness for exploitation, and that assessment is influenced by attributes of the project [innovation characteristics]' (Behrens et al., 2014, p. 145). In the context of such assessment, a central innovation characteristic affecting managerial attention and decision-making is whether the innovation is radical or incremental (Gatignon et al., 2002). Prior research has linked several other important characteristics to such assessment: radicalness (O'Connor and McDermott, 2004), social capital (Gerpott, 1995; Pérez-Luño et al., 2011), portfolio fit (Behrens et al., 2014), external and internal knowledge resources (De Massis et al., 2013), and IP protection (Lahr and Mina, 2016). In the following subsections, we draw on the ABV and research on innovation characteristics to theorize on each of these attention regulators and their relationship with middle and senior managers' radical innovation project choice (as illustrated in Figure 1).

Attention Regulator 1: Social Capital

The ABV is built on the premise that the organizational context and social relationships direct individuals' attention, thus highlighting the important effect of *structural position* as one of the four attention regulators (Glaser et al., 2021; Ocasio, 1997; Rhee and Leonardi, 2018). Ocasio (1997, p. 197) defines structural positions as 'the roles and social identifications that specify (a) the functions and orientations of decision-makers, and (b) their interrelationships with other structural positions internal and external to the firm'. Furthermore, Ocasio argues that structural positions 'provide decision-makers with the interests, values, and identities that regulate how they think and act' and refer to both internal and external positions of decision-makers. Hence, the ABV suggests that besides the structural position of a decision-maker based on the role (middle vs. senior

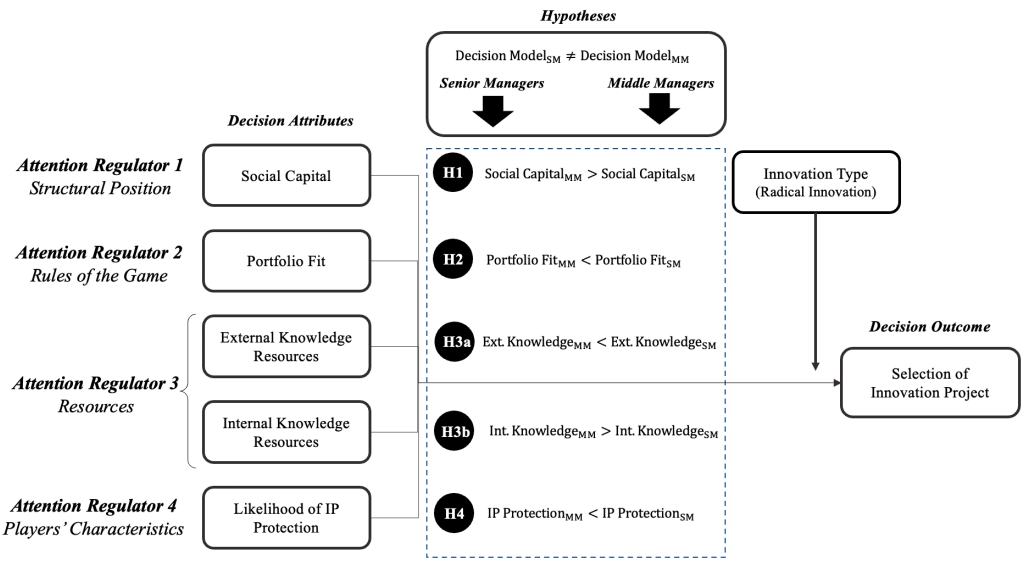

Figure 1. Conceptual framework [Colour figure can be viewed at wileyonlinelibrary.com]

manager), individuals' attention is also shaped by their social relationships with others. This is closely aligned with research on social capital, which argues that managerial action is shaped by societal factors and particularly structural relationships (Burt, 2000; Coleman, 1988; Lin, 2008). For example, for Coleman (1988, p. 98), social capital produces an advantage inherent 'in the structure of relations between and among actors'. Therefore, we argue that together with the role within an organizational hierarchy, the existence of social capital can regulate managers' attention when it comes to radical innovation project selection.

Research on social capital has shown that structural position plays an important role in driving innovation outcomes at individual and firm levels (Inkpen and Tsang, 2005; Payne et al., 2011). Social capital helps developing shared representations, interpretations, and systems of meaning among relevant stakeholders and, ultimately, creates shared knowledge structures that determine how managers allocate their attention (Nahapiet and Ghoshal, 1998). Social capital developed over time through repeated working relationships between managers and other individuals leads to establishing trust, a central mechanism (Inkpen and Tsang, 2005) allowing for the exchange of information without fear of opportunistic behaviour.

Driven by middle managers' focus on the implementation effort of strategic changes (Heyden et al., 2017), we argue that social capital is especially relevant to middle managers and plays a key role in shaping their choice of radical innovation projects. The absence of social capital may diminish mutual understanding and requires costly monitoring mechanisms (Molina-Morales and Martínez-Fernández, 2010). When middle managers need to devote significant time and attention to such transactional activities, they have less time and hence are less likely to engage in radical innovation (Landry et al., 2002). Therefore, we expect that, compared with senior managers, middle managers pay more attention to existing social capital (i.e., projects that require stakeholders with whom the middle manager has previously worked) when selecting a radical innovation project as it minimizes the need for extensive monitoring activities and thus facilitates successful implementation. In contrast, senior managers, who are less likely to be directly involved in implementing radical innovation projects, are less influenced by individual project implementation and success and, hence, less concerned with a project's need for existing or new stakeholders. Therefore, we suggest:

Hypothesis 1: As compared with senior managers, middle managers place greater emphasis on social capital when selecting radical innovation projects.

Attention Regulator 2: Innovation Portfolio Fit

The ABV highlights the importance of the *rules of the game*, which is defined as the set of businesses a firm should be in, and thus what innovation projects managers should attend to (Ren and Guo, 2011). In the context of innovation decision-making, we argue that a firm's *innovation portfolio fit* serves as one manifestation of the firm's rules of the game, influencing how managers allocate their attention towards specific radical innovation projects. Achieving portfolio fit involves the decision-making process to

evaluate, select, and prioritize innovation projects in line with other innovation projects within a firm's portfolio and its overall strategic objectives (Kester et al., 2011). Portfolio fit allows managers to optimize resource allocation and balance risks across projects, technology fields, and market segments (Röth et al., 2019). Consequently, managers achieve economies of scope and increase the value and success rate of the overall project portfolio as well as firm performance (Spieth and Lerch, 2014). Thus, we propose the baseline argument that regardless of the degree of radicalness, portfolio fit with an existing innovation portfolio makes an innovation project more likely to be selected (Behrens et al., 2014).

However, the focus on portfolio fit may lead managers to limit their attention to the radicalness of an innovation project because radical innovation, by definition, deviates from the norm and existing thinking, which may lead to significant changes in business processes and poor portfolio fit. This is of greater concern to middle managers, who are responsible for the actual implementation of innovation projects (Schubert and Tavassoli, 2020). Moreover, 'a portfolio-level perspective is recommended for its aggregate-level focus – in other words, its ability to divert attention from the success or failure of individual high risk [i.e., radical innovation] projects toward the performance of the overall portfolio' (Kelley, 2009, p. 495). We expect that middle managers pay less attention to fit with the firm's overall innovation portfolio when they consider radical innovation. They typically lack aggregate-level focus because their structural position does not enable a bird's-eye perspective on all current innovation projects within the firm. Also, since middle managers' performance measures are often connected to outcomes and success at the project level, they tend to pay more attention to individual innovation projects and are disincentivized to base their decisions on overall portfolio fit (Shaikh and Randhawa, 2022).

Senior managers, however, have more concern for this overall portfolio. Decisions regarding innovation portfolio fit are often considered a core senior management activity (Unger et al., 2012), and by nature of their responsibility and focus on the strategic and corporate level, senior managers are more likely to be incentivized for overall innovation project portfolio performance. Previous research has also shown that strategically significant projects tend to be given more attention and priority by top management (Bart, 1993). Thus, we expect senior managers, in comparison with middle managers, to place more attention on innovation portfolio fit. Thus:

Hypothesis 2: As compared with senior managers, middle managers place less emphasis on innovation portfolio fit when selecting radical innovation projects.

Attention Regulator 3: External and Internal Knowledge Resources

Proponents of the ABV further suggest that an organization's available *resources* constrain its capacity to engage in strategic changes and innovation (Eklund and Mannor, 2021; Kim et al., 2016). This is in line with innovation research, which has discussed how the access to resources, frequently in the form of knowledge, impact innovation performance and direction (Hohberger, 2017; March, 1991; Zhou and Li, 2012). Access to a large and diverse pool of knowledge resources enables more and

better knowledge recombination, ultimately leading to better and more radical innovations (Hohberger, 2017; Hohberger and Wilden, 2022; Katila and Ahuja, 2002; Laursen and Salter, 2006). This encourages managers to work with and draw knowledge from many actors inside and outside their firm to create radical innovation (Cano-Kollmann et al., 2016; Cantwell, 2005; Katila and Ahuja, 2002; Laursen and Salter, 2006).

Research has highlighted that *external knowledge resources* can drive radical innovations (Laursen and Salter, 2006; O'Connor and Rice, 2013), particularly where they help overcome internal resource constraints (Hohberger et al., 2015; Randhawa et al., 2016). Radical innovation often requires deep immersion with external knowledge resources to generate novel knowledge (Benner and Tushman, 2002), which requires managers to spend time on search activities (Shepherd et al., 2007), create and interpret entrepreneurial opportunities (Hornsby et al., 2009), develop new routines and systems (Glaser et al., 2015), and shape collaborative models with ecosystem stakeholders (Randhawa et al., 2022). However, despite the importance of external knowledge resources, internal diversity and dispersion of innovation activities provide the opportunity to incorporate *internal knowledge resources* from different functions or locations within the firm (Badir et al., 2020). Brunswicker and Chesbrough (2018) show that internal knowledge resources are the most relevant source, proven to be easy to disseminate and ready to use in innovation projects. However, attentional and other resource constraints tend to bias the firm towards exploiting internal knowledge resources and reinforcing existing routines rather than explore otherwise ignored external knowledge sources (Dahlander and Gann, 2010; Kim et al., 2016; March, 1991). Hence, relying on internal knowledge and exploiting such within the firm's established routines likely leads to only incremental innovation, which is proximate to its prior knowledge and innovation (Rosenkopf and Almeida, 2003; Stuart and Podolny, 1996).

Given their primary role as implementers and their responsibility to deliver successful innovation projects, middle managers can face role conflict when attempting to create radical changes. That is, while middle managers acknowledge the importance of external knowledge resources for radical innovation, sourcing knowledge internally may be perceived as safer and provide deeper knowledge in a specific domain (De Clercq and Dimov, 2008). Internal knowledge sourcing may also be considered less resource-intensive as external sourcing requires more managerial effort and time to find suitable partners, negotiate and agree on formal or relational contracts, coordinate joint efforts (Dyer and Singh, 1998), attain alignment across multiple stakeholder motives (Randhawa et al., 2021b), and monitor potentially opportunistic behaviour caused by information asymmetries in the relationship (Laursen and Salter, 2014). As a result, we argue that despite being aware of the benefits of external knowledge resources for radical innovation, middle managers tend to discount these benefits by the complexity and costs involved in accessing external knowledge resources. Further, generally middle managers are likely to respond to innovation problems in known ways, to conserve their efforts and resources and minimize risks, ultimately increasing the likelihood of success (Daft and Lengel, 1986). Consequently, we argue that middle managers are inclined to select innovation projects that draw on internal knowledge resources rather than those relying heavily on external knowledge resources,

even in the context of radical innovation projects. Comparatively, senior managers, who are more distant from the details and complexity of implementation, hold a stronger positive view on the value of external knowledge resources in the context of radical innovation and perceive these as novel access to knowledge (Pappas and Wooldridge, 2007). In summary, we expect:

Hypothesis 3a: As compared with senior managers, middle managers place less emphasis on external knowledge resources when selecting radical innovation projects.

Hypothesis 3b: As compared with senior managers, middle managers place more emphasis on internal knowledge resources when selecting radical innovation projects.

Attention Regulator 4: Temporal Orientation of Managers

The ABV suggests that *players'* (in our case managers')[1] characteristics, including their specific skills, beliefs, and values, are an important component of attention regulation (Ocasio, 1997), as they direct managerial attention (March and Olsen, 1979) and, consequently, in our study, innovation project selection. We extend prior research that aligns managers' strategic decision-making with their value systems (Carpenter et al., 2004; Hambrick and Mason, 1984; Lin et al., 2019) and, in particular, their temporal value system (Nadkarni and Herrmann, 2010; Souitaris and Maestro, 2010). Our focus on managers' temporal orientation is driven by previous research that has highlighted the importance of senior managers' temporal orientation in managerial attention (Das, 1987; Kleinknecht et al., 2020) and specifically in the context of innovation (Barreto et al., 2022). In our study, temporal orientation refers to a manager's relative preference towards the near versus distant future (e.g., Bluedorn and Martin, 2008; Lumpkin and Brigham, 2011). Previous innovation research has found that future-oriented managers are likely to pursue innovation (Flammer and Bansal, 2017) and prioritize distant-future benefits over near-future benefits (Bearden et al., 2006; Wang and Bansal, 2012). Radical innovation typically is a long-term endeavour (Stringer, 2000), involving higher risks and hence requiring more attention towards capturing the long-term value being created (Lin et al., 2016).

A central mechanism to protect and capture value of innovations is IP protection (James et al., 2013). IP protection, especially in the form of patents, provides organizations with a time-based advantage due to preventing imitation and thus is an important strategic tool to block competitors and deter legal attacks (Cohen et al., 2000; Hall and Ziedonis, 2001). It can also be used as a governance mechanism to align incentives for radical innovation across middle and senior managers (Shaikh and Randhawa, 2022). However, IP protection is often complex, time-consuming, and costly (Blind et al., 2018; Jaffe and Lerner, 2011), and a successful implementation requires attention at both the middle and senior management levels (Reitzig, 2007). Studies have indicated that the value managers put on IP protection mechanisms relate to their forward-looking behaviour (Gimenez-Fernandez et al., 2021) and, hence, temporal orientation.

Previous research has highlighted that middle managers differ from senior managers in how they value operational (i.e., short-term issues) compared with strategic (i.e., long-term) issues when making decisions (Floyd and Wooldridge, 1992; Schubert and Tavassoli, 2020). That is, the nature of their responsibility and performance measures lead middle managers to value the short-term outcomes of individual projects that they are responsible for (Schubert and Tavassoli, 2020) and overlook the holistic, long-term outcomes, such as value capture, at the corporate level. In comparison, senior managers perceive their role as overseeing the firm's long-term performance and value capture and are thereby less likely to attach themselves to specific projects or operations. Therefore, senior managers are likely to be more concerned with long-term planning and value capture, compared with middle managers (Floyd and Wooldridge, 1992).

Drawing on this line of argumentation, we argue that when selecting between radical innovation projects, senior managers are more likely to consider the long-term value capture possibility associated with the controllability of the innovation project's outcome. That is, they allocate more attention to the IP protection mechanism to ensure that value being created in a radical innovation project can be effectively captured and retained within the firm. Accordingly, we argue that compared with senior managers, middle managers pay less attention to IP protection as a value capture mechanism when selecting innovation projects that are radical. Thus:

Hypothesis 4: As compared with senior managers, middle managers place less emphasis on IP protection when selecting radical innovation projects.

METHODOLOGY

Sample

We conducted a discrete choice experiment (DCE; McFadden, 1973) comparing the decisions of middle and senior managers. Following prior research, we defined senior managers as managers with the responsibilities and authority to lead an organization and middle managers as operating managers within their organization who not only carry out higher-level orders but also have the liberty to decide on relevant strategic projects (Behrens et al., 2014; Floyd and Wooldridge, 1992). We drew the representative samples of senior and middle managers from the Qualtrics Online Panel, used in prior studies (Crilly et al., 2016; Dillon et al., 2016; Gardner et al., 2018; Lin et al., 2022). While all members on our Qualtrics Panel work in Australian companies, we focused on employees in middle or senior management roles. The panel comprised validated managers recruited through LinkedIn, business contact databases, and frequent flyer programs (including Qantas). The recruited managers' employers were asked to verify the manager's name, title, and organization. Further, a profile was prepared based on key attributes such as company size, decision-making and responsibility, industry, position, functional role, and demographic background. Study participants were then directed to an online screening assessment to ascertain their fit with our sampling criteria. We asked (1) whether they are a member of the senior

leadership team or have authority to make decisions about the future of relevant projects in their department (i.e., middle manager) and (2) whether they have been involved in decision-making about innovation projects during the past three years. The first screening question allowed us to classify respondents into senior versus middle-level managers. The second screening question helped us ensure that respondents were familiar with innovation decision-making. Only respondents who met both criteria were directed to the online experiment. We stopped the data collection once we reached a balanced sample of 90 senior and 90 middle-level managers, which is three times larger than the minimum sample size required for each sample group (middle vs. senior managers) based on the DCE design.

We also collected information on the characteristics of respondents and their current organization. Most respondents (78 per cent) had more than five years of overall work experience. On average, these managers had diverse experience working in two different industries. They represented a balanced cross-section of small (less than 500 employees) to medium (500 to 5000 employees) and large organizations (more than 5000 employees). Almost 60 per cent of respondents worked for an organization with sales revenue of over 10 million Australian dollars. Table I provides information on the characteristics of the respondents and their organizations.

Discrete Choice Experiment

The survey instrument included two main parts: (1) discrete choice tasks and (2) survey-style questions on demographics (e.g., work experience) and firmographics (e.g., industry). In the discrete choice tasks, each respondent was first put into a scenario in which we controlled the level of investment involved in each innovation project and the feasibility for firms to fund the projects by indicating in the overall decision scenario that 'all innovation projects are financially viable, and that sufficient capital is available to support either innovation project'. Then, individuals were asked to choose between two innovation projects with various degrees of innovation characteristics: radicalness, social capital, portfolio fit, external and internal knowledge resources, and IP protection (see Figure 2 for an example of two choice tasks).

In contrast to the classical Likert scale in which participants rate responses on a specific scale, DCE participants are asked to make a series of forced-choice decisions, meaning that they cannot rate all factors equally important/unimportant as in Likert-scale questions. Thus, the DCE allows us to elicit the importance (i.e., value) individuals place on each factor; thus, it is particularly useful and deployed when individuals are faced with difficult trade-offs (Behrens et al., 2014; Fischer and Henkel, 2013; Lin et al., 2016).

To avoid cognitive overload among participants, we followed Street and Burgess' (2007) design methodology and used a resolution 4 (i.e., ensuring no confounding main effect and two-way interaction effect) fractional factorial design of 2^6,[2] which allows us to achieve the design that maximizes the D-optimal efficiency. The benefit of a fractional factorial design is that it ensures orthogonal (i.e., uncorrelated) estimations of the effect of each innovation characteristic (which may potentially be correlated) without having respondents go through a much larger number of decisions (Street and Burgess, 2007).

Table I. Characteristics of respondents

Characteristics	*Percentage*
Firm Size: Number of Employees	
Small (Less than 500)	50%
Medium (500–5000)	39%
Large (More than 5000)	11%
Firm Size: Sales Revenue	
Less than 2 million AUD	27%
2 to 5 million AUD	8%
5 to 10 million AUD	8%
10 to 25 million AUD	15%
25 to 50 million AUD	13%
50 to 100 million AUD	9%
More than 100 million AUD	19%
Industry	
Accommodation and Food Services	2%
Agriculture, Forestry, and Fishing	8%
Arts and Recreation Services	4%
Construction	8%
Education and Training	1%
Other	6%
Electricity, Gas, Water, and Waste Services	10%
Financial and Insurance Services	2%
Health Care and Social Assistance	12%
Information Media and Telecommunications	13%
Manufacturing	2%
Mining	7%
Professional, Scientific, and Technical Services	1%
Public Administration and Safety	1%
Rental, Hiring, and Real Estate Services	7%
Retail Trade	9%
Transport, Postal, and Warehousing	3%
Wholesale Trade	6%
Years of Experience	
Less than 5 years	15%
5–10 years	29%
11–20 years	28%
More than 20 years	27%

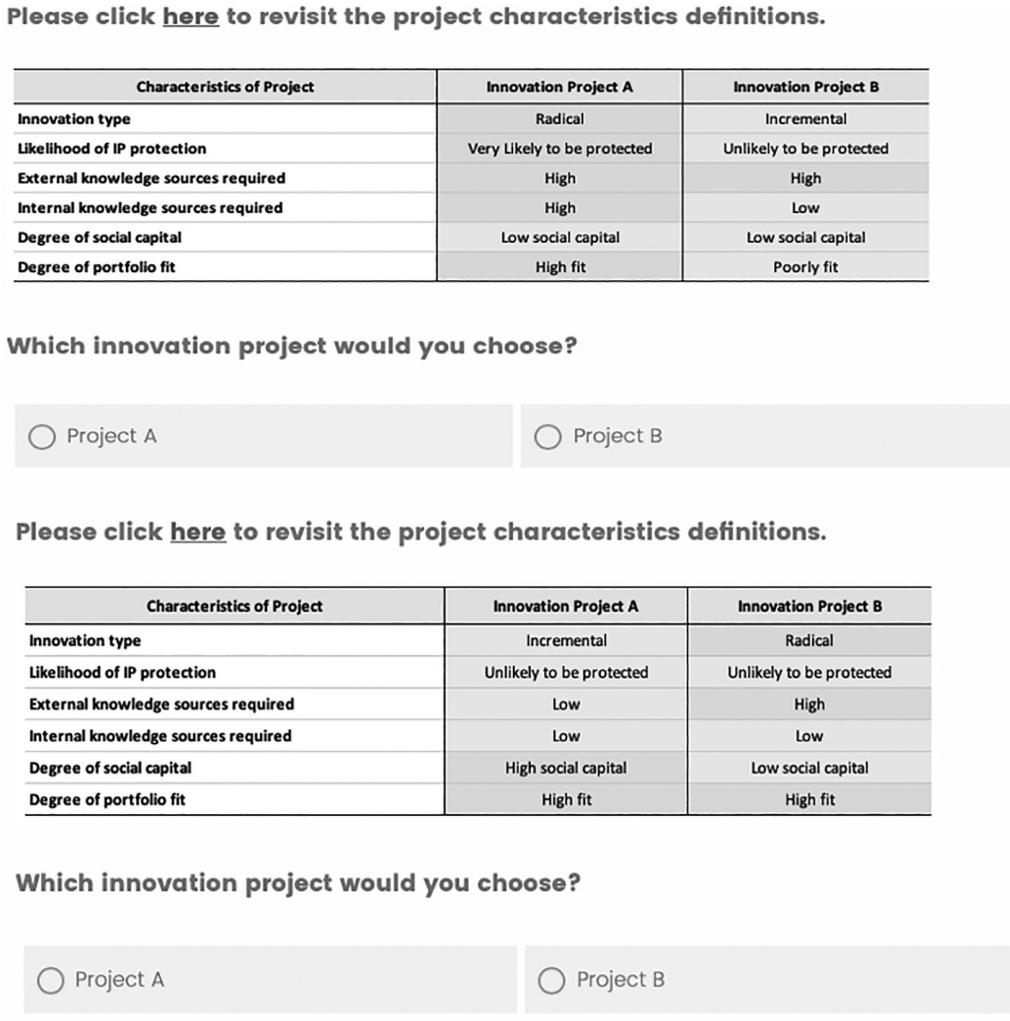

Figure 2. Examples of the discrete choice experiment

Altogether, we asked respondents to make 16 decisions on innovation project pairs. Figure 2 illustrates examples of two discrete choice tasks. We note that the level of innovation characteristics (e.g., incremental/radical innovation, high portfolio fit/poor portfolio fit) appearing in each choice task is determined by the fractional factorial design discussed earlier.

Measurement

Dependent variable. The dependent variable is the manager's choice between two innovation projects (see Figure 2). Following Lin et al. (2016), we asked respondents to make decisions by indicating which of the two innovation projects 'would be your most preferred innovation project', representing a 'forced-to-choose' question. An innovation

project being selected is coded as 1 and 0 otherwise.

Decision factors: innovation characteristics. The explanatory variables include the six decision factors, which are the characteristics of innovation projects aligned with the attention regulators discussed in the theoretical section (see Figure 1). To enable managers to complete the experimental task and accurately capture how they make innovation project selection decisions, we described the innovation characteristics in easily accessible language. We provided these descriptions before and throughout the experiment. Further, we tested the definitions in a pilot test and refined them based on the feedback received. Table II provides a summary of the six innovation characteristics, descriptions, measurement levels, and relevant references.

The first innovation characteristic is *innovation type*, which identifies the degree of newness of the project outcome: radical versus incremental innovation. The degree of radicalness of the innovation project has been shown to be highly relevant to firms' innovation project choices as it determines the level of discontinuity and resources required and is typically disaggregated into radical versus incremental (Colombo et al., 2017; Laursen and Salter, 2006).

The second characteristic concerns the role of the decision-makers' structural position, measured by the extent of *social capital* required to implement an innovation project successfully. Innovation is the result of interactions (Landry et al., 2002). Thus, social capital is considered the bedrock of innovation (Subramaniam and Youndt, 2005) and one of the key factors determining the successful implementation of innovation projects (Zheng, 2010), thereby affecting managers' choices of innovation projects.

The third innovation characteristic concerns the rules of the game as an attention regulator, measured through *portfolio fit*. We define innovation portfolio fit as the degree of alignment between an innovation project and a firm's strategic innovation portfolio. Given firms' limited resources, the choice of innovation projects constitutes an important strategic decision. Thus, when making such decisions, managers tend to consider new projects in the context of the fit into their firm's portfolio (Behrens et al., 2014).

Next, the third and fourth innovation characteristics capture the *resources* attention regulator, measuring the external and internal knowledge resources required to implement an innovation project successfully. Prior research has shown that both internal and external knowledge resources are critical ingredients for firm innovation, albeit their slightly different roles (Badir et al., 2020). High *external knowledge resources* suggest that a potential innovation project requires the involvement of a large number of external parties outside a focal firm (Badir et al., 2020; Hullova et al., 2019). In the same vein, high *internal knowledge resources* suggest that the implementation of a potential innovation project requires the involvement of a large number of distinct internal knowledge resources (Laursen and Salter, 2006).

The final attention regulator is associated with players (i.e., decision-makers/managers in the context of this study) and their characteristics as discussed earlier. While various managerial characteristics are shown to affect managerial decision-making, most factors are associated with individuals/managers and hence cannot be manipulated in

Table II. Innovation characteristics' definition and levels

Innovation Characteristics	*Definition*	*Levels*		*Relevant References*
Innovation type	*Degree of radicalness of the innovation project (radical vs. incremental). Radical innovation refers to major innovations focused on new technologies, markets, and business models, while incremental innovation refers to innovation that seeks to improve existing systems and products to make them better, cheaper, or faster.*	*Incremental*	*Radical*	*e.g., Laursen and Salter (2006); O'Connor and Rice (2013); Kyriakopoulos et al. (2016)*
Social capital	Extent to which you have worked previously with all relevant stakeholders, who are required to make this innovation project a success.	Low social capital	High social capital	e.g., Zheng (2010); Nahapiet and Ghoshal (1998); Inkpen and Tsang (2005); Van Doorn et al. (2015)
Portfolio fit	Extent to which the innovation project fits well with the overall innovation portfolio.	Poor fit	High fit	e.g., Behrens et al. (2014); Behrens (2016)
External knowledge resources	Number of distinct external knowledge (e.g., information, ideas, and solutions) resources (e.g., customer, supplier, or competitor) required to implement the innovation project.	Low	High	e.g., Laursen and Salter (2006); Monteiro (2015)
Internal knowledge resources	Number of distinct internal knowledge (e.g., information, ideas, and solutions) resources (e.g., such as colleagues, managers, and subordinates) required to implement the innovation project.	Low	High	e.g., Badir et al. (2020); Kim et al. (2016); Hullova et al. (2019)
Likelihood of IP protection	Likelihood of the intellectual property generated through this innovation project to be able to be protected.	Unlikely to be protected	Very likely to be protected	e.g., Fischer and Henkel (2013); Lahr and Mina (2016)

the experiment. We opted to focus on *IP protection* as a proxy for managers' temporal orientation for two key reasons. First, firms' and managers' short- versus long-term orientation directly influences their strategic direction towards innovation activities (Brown and Eisenhardt, 1997) and how managers make their innovation project choices (Zheng et al., 2020). Second, as outlined in our theory section, managers' forward-looking behaviour and temporal orientation can be assessed through IP protection (Gimenez-Fernandez et al., 2021), which fits well with our context of innovation project selection. Hence, we reveal managers' temporal orientation based on the actual choices they make. Most important, including managers' temporal orientation (i.e., IP protection) as an innovation characteristic in the experiment has the advantage that it allows us to investigate how managers' temporal orientation interacts with other innovation characteristics, which represents the core of our theorizing.

Control variables. In the DCE design, we directly controlled for (1) the level of investment required for an innovation project and (2) the feasibility for firms to fund the project through the presented decision scenario. This is important, as prior research (Behrens et al., 2014) has shown that innovation selection decisions are significantly affected by the size of financial commitment (i.e., budget required to implement the project) and the financial feasibility (i.e., a firm possesses sufficient capital to support the project). Additional managerial characteristics (e.g., years of work experience, number of industries worked for, and level of education) and firm-level factors (e.g., firm size and operating industry) may affect innovation project choices. We captured this information through demographic questions towards the end of experimental instrument and performed various covariate analyses on these variables to examine differences in middle and senior managers' decision-making models across these factors as a robustness test. These analyses showed no significant effect of these factors in explaining the differences in both middle and senior managers' innovation project choices.

Data Analysis and Estimation

Given that we have 90 middle managers and 90 senior managers in the sample, and each manager was asked to make 16 decisions, we have a total sample of 1440 decisions for middle managers and 1440 decisions for senior managers. We ran a mixed logit model (also called a random coefficient model; Train, 2003) on these two samples. The mixed logit model is an extension of the traditional logit models that can approximate random effects (i.e., individual estimated coefficient of each innovation characteristic), which addresses potential concerns regarding the nested data structure of the DCE (i.e., multiple decisions made by the same respondent). It was chosen over the traditional conditional logit and multinomial logit (MNL) models, as it is more flexible and acknowledges the differences across managers in their sensitivities to various innovation characteristics (see, for example, Fischer and Henkel, 2013). More specifically, mixed logit allows us to extract individual preference models (i.e., the estimated effects of innovation characteristic by each manager) and the attention (i.e., value) a manager puts on each innovation characteristic when selecting an innovation project. Furthermore, the mixed logit model

overcomes the unrealistic assumption of independence from irrelevant alternatives (IIA), which requires that the dependency between two alternatives is the same across alternatives in both the conditional logit and MNL model. To examine the differences in how middle and senior managers value various innovation characteristics proposed in the hypotheses, we ran the Wald chi-squared test to compare the coefficient estimates in their decision-making models.

RESULTS

Table III presents the findings of the mixed logit models of middle managers' (Models 1 and 3) and senior managers' (Models 2 and 4) choices of innovation projects. Models 1 and 2 are the base models, which include only the direct effects of all six innovation characteristics. While not specific to radical innovation, the differences between Models 1 and 2 already highlight that middle and senior managers differ in their decision-making, particularly in how they value portfolio fit, external knowledge resources, and likelihood of IP protection. This is also supported by the Wald chi-squared test, which formally examines the significant difference between coefficients across models and, thus, illustrates the differences in the decision-making models of middle and senior managers. Models 3 and 4 are the fully specified models, incorporating the interaction effects of radical innovation with the other five innovation characteristics, and are used to test the hypotheses.[3]

Subsequently, we focus our discussion on the full models as our research questions and hypotheses centre on the managerial choices regarding radical innovation. Thus, in the following sections, we first discuss the radical innovation-decision models of middle and senior managers separately before comparing them.

Radical Innovation Decision-Making of Middle and Senior Managers

The findings in Model 3 show that when it comes to selecting a project that involves radical innovation, middle managers value internal knowledge resources ($\beta = 0.626$, $p < 0.1$) and social capital ($\beta = 0.778$, $p < 0.01$), compared with when a project involves incremental innovation. In contrast, the results suggest that middle managers put less value on the likelihood of IP protection ($\beta = -0.352$, $p < 0.1$) and external knowledge resources ($\beta = -1.771$, $p < 0.01$) when a potential innovation project is radical. While the results are largely in line with our expectations, the negative effect of the interaction between radical innovation and the likelihood of IP protection in the middle managers' decision-making model is counterintuitive. Furthermore, the non-significant effect of the interaction term between radical innovation and portfolio fit indicates that the value middle managers place on portfolio fit does not seem to change, regardless of whether a project being considered is radical or involves incremental innovation.

In contrast to the decision model of middle managers (Model 3), the only significant interaction effect in the estimation for senior managers (Model 4) is the interaction between radical innovation and external knowledge resources ($\beta = 0.760$, $p < 0.01$). This suggests that when a potential innovation project involves radical innovation, senior

Table III. Middle versus senior managers' decision-making model to select innovation projects (Mixed Logit)

	Middle Managers		*Senior Managers*		*Wald Chi-Square*	*Middle Managers*		*Senior Managers*		*Wald Chi-Square*
Variables	*(1)*		*(2)*		*Model (1) vs. (2)*	*(3)*		*(4)*		*Model (3) vs. (4)*
Radical Innovation	−0.548***	(0.090)	−0.079	(0.087)	14.04	−0.353†	(0.214)	−0.644***	(0.212)	0.93
Social Capital	0.218**	(0.080)	0.050	(0.078)	0.96	−0.071	(0.137)	0.149	(0.135)	2.14
Portfolio Fit	−0.217*	(0.091)	0.21*	(0.089)	5.82*	0.179	(0.133)	−0.070	(0.131)	12.42***
External Knowledge Resources	−0.079	(0.081)	0.194*	(0.079)	18.31***	0.880***	(0.214)	−0.162	(0.204)	17.66***
Internal Knowledge Resources	−0.232***	(0.077)	0.234***	(0.077)	2.26	−1.04***	(0.242)	0.360	(0.229)	1.31
Likelihood of IP Protection	0.073	(0.123)	0.243*	(0.122)	11.25***	0.355*	(0.156)	0.035	(0.153)	1.78
Radical Innovation × Social Capital						0.778***	(0.260)	−0.228	(0.255)	7.63***
Radical Innovation × Portfolio Fit						0.060	(0.324)	0.348	(0.317)	0.40
Radical Innovation × External Knowledge Resources						−1.771***	(0.256)	0.76***	(0.228)	54.51***
Radical Innovation × Internal Knowledge Resources						0.626†	(0.357)	0.105	(0.353)	1.08
Radical Innovation × IP Protection						−0.352†	(0.201)	0.224	(0.198)	4.17*
Log Likelihood	−975.94		−960.82			−966.33		−925.973		
Chi-Square	0.06		0.04			0.11		0.61		
Number of Respondents	90		90			90		90		
Number of Choice Tasks	1440		1440			1440		1440		

Note: Standard errors in parentheses.
***p < 0.001; **p < 0.01; *p < 0.05; †p < 0.10.

managers value more external knowledge resources required to successfully implement such a project. This finding is consistent with the open innovation literature, suggesting that external knowledge resources contribute to the successful implementation of radical innovation (Zhou and Li, 2012). Interestingly, senior managers' attention towards other innovation characteristics does not seem to be significantly affected by the type of innovation being considered.

Comparing Radical Innovation Decision-Making Models of Senior and Middle Managers

To examine the differences between middle and senior managers, we ran the Wald chi-squared test to compare the estimated coefficients of each innovation characteristic from Models 3 and 4. Additionally, as the interpretation of the interaction effects, particularly across models, is complex and non-intuitive, we illustrate the difference in how middle and senior managers value each innovation characteristic when an innovation project involves radical versus incremental innovation in Figure 3a–e.

As shown in Figure 3a and indicated by the comparison of coefficients of social capital in Models 3 and 4, middle managers put significantly more value on social capital when an innovation project being selected involves radical innovation, compared with senior managers ($\chi^2 = 7.631$, $p < 0.01$). This finding provides support for Hypothesis 1, which proposes that middle managers place more value on existing social capital to leverage on trust and minimize the need to monitor against opportunistic behaviour. This is consistent with our argument that middle managers focus more on the implementation aspect of an innovation project than senior managers, who pay more attention to the overall strategic issues.

Although our findings suggest that middle managers strongly value external knowledge resources when selecting an innovation project in general, they seem to value external knowledge resources less, in comparison with senior managers ($\chi^2 = 54.509$, $p < 0.01$), when it comes to radical innovation (see a steep negative slope of middle

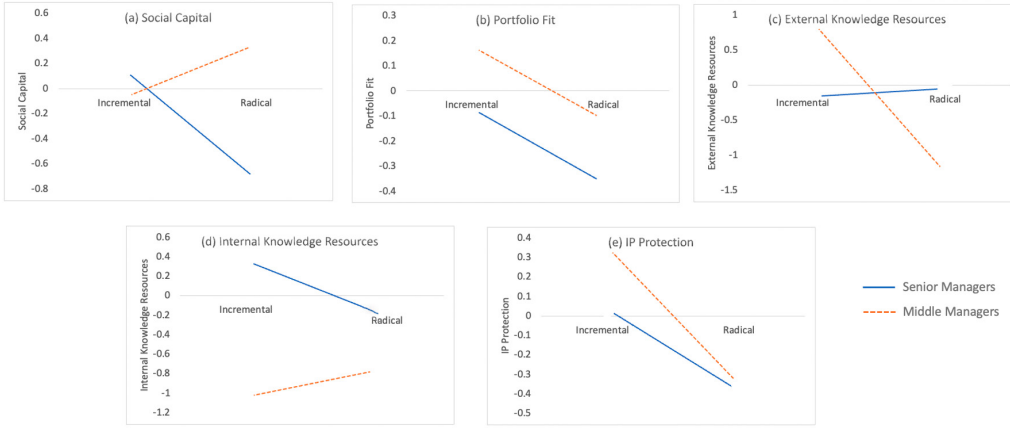

Figure 3. Interaction effects of radical innovation with (a) social capital, (b) portfolio fit, (c) external knowledge resources, (d) internal knowledge resources, and (e) IP protection [Colour figure can be viewed at wileyonlinelibrary.com]

managers' graph in Figure 3c). This is different from senior managers, whose preferences remain unchanged (see the almost flat line of senior managers in Figure 3c). This finding supports Hypothesis 3a, which proposes that middle managers put less value on external knowledge resources when selecting an innovation project that is radical.

We also find that middle managers put less value on the likelihood of IP protection compared with senior managers when a project involves radical innovation ($\chi^2 = 4.168$, $p < 0.05$), supporting Hypothesis 4 (see a significant negative coefficient in Model 3 and a steep negative slope converging to that of senior managers in Figure 3e). While middle managers place more importance on IP protection than senior managers in incremental innovation projects, this difference nearly disappears when an innovation project involves radical innovation. This finding confirms our argument that middle managers focus on the factors contributing directly to a successful project implementation (i.e., operational issues) and often overlook the broader picture, including a value capture mechanism to ensure that the value created in the project is captured and brought back to a firm. Meanwhile, senior managers, who are more distant from operational issues, are more concerned about value capture.

Finally, the results suggest that the value both middle and senior managers put on portfolio fit and internal knowledge resources when selecting a radical innovation project is not significantly different, thereby rejecting Hypotheses 2 and 3b. This is consistent with Figure 3b, which shows a fairly similar slope and gap between the relationship of portfolio fit and innovation type of both middle and senior managers. Further, Figure 3d also illustrates that the difference between the value middle and senior managers put on internal knowledge resources when considering a radical innovation project does not change much compared with an incremental innovation project. These findings imply that both middle and senior managers understand that radicalness, by its very nature, involves a major deviation from mainstream business and most likely requires knowledge and capabilities beyond a firm's core capabilities. Hence, radical innovation projects often benefit from knowledge sourced from various external sources rather than internal knowledge sources, which may be limited to or constrained by the existing core business (see, for example, Stringer, 2000).

To examine more broadly the effect of firms' and managers' characteristics on radical innovation choices, we also conducted a series of covariate analyses using weighted least squares (WLS) regression on other individual- and firm-level factors that have been shown to affect managerial choices of innovation projects. These include years of experience, number of industries worked for, level of education, firm size, and industry (service vs. manufacturing). The covariate analyses explain how these individual- and firm-level factors might explain the differences in how managers with different characteristics put emphasis on radical innovation when choosing innovation projects.

The results depicted in Table IV suggest that there is a minimal effect of managerial and firm characteristics on managers' decisions to select radical innovation projects. More specifically, only two managerial characteristics (experience and education) and one firm characteristic (firm size) show a significant effect. Senior managers from medium-size firms are more attracted to radical innovation compared with senior managers in large

Table IV. The effect of firm and managerial characteristics on middle and senior managers' radical innovation project selection

	(1) Middle Managers	*(2) Senior Managers*
	Radical Innovation	*Radical Innovation*
Years of experience	0.00096	−0.00001*
	(0.00159)	(0.00000)
Number of industries worked for	−0.00092	0.00000
	(0.00148)	(0.00000)
Firm size: small	−0.00525	0.00001
	(0.00653)	(0.00001)
Firm size: medium	−0.00245	0.00006***
	(0.00660)	(0.00001)
Service industry	−0.00717	−0.00000
	(0.00529)	(0.00001)
Education: undergraduate degree	−0.00314	0.00004**
	(0.00475)	(0.00001)
Education: postgraduate degree	−0.00673	0.00004*
	(0.00448)	(0.00002)
Constant	−0.24882***	−0.48855***
	(0.01095)	(0.00003)
Observations	90	90
R-squared	0.07303	0.32108

Note: Standard errors in parentheses.
***p < 0.001; **p < 0.01; *p < 0.05.

organizations (β = 0.0006, p < 0.001). Senior managers with undergraduate (β = 0.00004, p < 0.05) and postgraduate degrees (β = 0.00004, p < 0.01) put significantly more emphasis on radical innovation projects compared with senior managers without tertiary education. Interestingly, we found that senior managers with more years of experience seem to shy away from radical innovation compared with their peers with fewer years of experience (β = 0.00001, p < 0.05). We do not find any significant effect of these managerial and firm characteristics on middle managers' attention towards radical innovation projects. This highlights the robustness of our results as they are relatively stable across firm and managerial characteristics.

DISCUSSION

In this study, we examined how middle and senior managers differ in their selection of radical innovation projects. Building on the ABV, our study connects attention regulators (Bauer and Friesl, 2022; McCann and Shinkle, 2020; Ocasio, 1997) to specific innovation

characteristics (Behrens, 2016; Chao and Kavadias, 2008) in the context of radical innovation. In line with our expectations, middle and senior managers differ in their decision-making, and these differences become even more salient when innovation projects being selected are radical. Thus, our insights shed light on the key trade-offs at the core of the attention challenge facing managers when creating and capturing value from radical innovation opportunities.

We offer several important contributions towards developing a comprehensive understanding of middle and senior managers' roles in radical innovation and the differences in their decision-making process and the innovation characteristics they attend to. First, and perhaps most important, we extend the growing body of research on the strategic role of middle managers by relating it to managerial attention to radical innovation (Glaser et al., 2021; Heyden et al., 2020; Schubert and Tavassoli, 2020). Building on the concept of attention regulators in the ABV, we provide nuance to research on the differences between middle and senior managers' attention towards each innovation characteristic when selecting radical innovation projects. Our findings show that middle and senior managers vary in how they distribute their attention towards innovation characteristics: middle managers put more emphasis on characteristics that are directly related to successful project implementation (e.g., social capital, internal knowledge resources) while senior managers are concerned about value capture (e.g., IP protection). Thus, we extend previous research by showing that middle and senior managers' attention is directed by a specific set of characteristics (i.e., simple rules) used in their innovation decision-making (Eklund and Mannor, 2021; West et al., 2020). Specifically, we find that although managers on the two structural levels were provided with the same information, they attended to different sets of innovation characteristics and exhibited different decision-making models. These differences were amplified when a project involved radical innovation.

By showing that middle managers and senior managers have varying dispositions towards radical innovations, we extend previous research that has demonstrated their differential agency in performing organizational roles (Heyden et al., 2017; Mantere, 2008; Tarakci et al., 2018). Consequently, the implications of our theorizing and findings highlight the need for research to move away from focusing only on the upper echelons and their decision-making in radical innovation as it overlooks the role and influence of middle managers in this strategic decision-making (Schubert and Tavassoli, 2020). In other words, if firms want to increase, or decrease, the share of radical innovation projects in their portfolios, they need to appreciate that middle and senior managers differ in their selection of projects.

Second, we add important insights to the ABV and managerial decision-making. While prior research on ABV focuses almost exclusively on senior managers (Kleinknecht et al., 2020), we add to the limited research on middle managers by highlighting the importance of structural positions (middle vs. senior managers and their social capital) and players (manager's temporal orientation) in governing their attention and selecting radical innovation projects. These shed further light on a critical question of why managers do not always attend to what is more relevant and valuable for the firm. According to our results, when selecting radical innovation projects, middle managers as directed by their responsibility and performance measure appear to be less long-term orientated compared with senior managers and thus pay less attention to value

capture (in our case a project's IP protection). In contrast, senior managers are ambivalent about whether a radical innovation project can generate IP. Until now, innovation research has also largely focused on firm-level IP strategy, calling for firms to educate managers about how IP should fit into the firm's value capture strategy (Reitzig, 2007). By assessing the player characteristics in terms of managerial temporal orientation, our findings explain how IP protection and value capture strategy shape managers' choice of radical innovation projects. These insights, therefore, further contribute to previous innovation research, which has sparsely examined firm-internal drivers of patenting decisions, mostly limited to financial considerations (Chirico et al., 2018; Reitzig and Puranam, 2009).

Finally, our unique combination of experimental approach and data analysis contributes to and differs from previous research on the front end of innovation and innovation project selection (Behrens, 2016; West et al., 2020) by specifically focusing on the radical versus incremental innovation characteristic of innovation projects. Radical innovations have a strong impact on firm performance but require firms to continuously seek to understand how to successfully implement them (Colombo et al., 2017; Tellis et al., 2009). The decision on 'how to allocate resources across R&D [i.e., innovation] projects has tremendous implications for a firm's knowledge trajectory, performance, and even survival' (Criscuolo et al., 2021, p. 2). Our study thereby provides novel theoretical and practical insights on how firms can better organize for radical innovation. Firms are often set up to exploit existing practices (Wilden et al., 2018) because managers are inclined to pay attention to innovation projects that fit with their existing knowledge (Randhawa et al., 2021a; Van de Ven, 1986), rather than those that are uncertain and risky (Eklund and Mannor, 2021; Kleinknecht et al., 2020). However, radical innovations require a departure from existing strategic paths (Randhawa et al., 2021b) and the creation of new knowledge and business models (Hopp et al., 2018). Therefore, a first step in better directing attention towards radical innovation lies in understanding the characteristics of innovation projects that regulate managerial attention in exploring radical innovation opportunities. Our findings add insights to innovation research by shedding light on the underpinning innovation characteristics shaping the trade-offs faced by managers when choosing radical innovation projects (Eklund and Mannor, 2021) and thus influencing the selection from innovation project alternatives (Knudsen and Levinthal, 2007). Unlike previous research in this area, our study not only focuses on selections made by senior members of an organization (Criscuolo et al., 2021; West et al., 2020) but also complements Behrens et al. (2014) by highlighting the important role of middle managers in innovation project selection. One concerning finding is that middle managers are less likely to choose radical innovation projects that need to draw on external knowledge resources. This may lead to negative effects on the firm's innovation performance, as previous research has highlighted that '[e]xternal knowledge potentially provided by partners and users, therefore, is seen as especially important for performing "distant search" (as opposed to "local search"), thus potentially leading to more radically new solutions' (Mohammadi et al., 2017, p. 410).

FUTURE RESEARCH AVENUES AND LIMITATIONS

This study comes with several limitations, which may open opportunities for further research. First, while our study's experimental method allowed us to disentangle the value that middle and senior managers place on each innovation characteristic, we were constrained by the number of variables we could examine at a time. While we acknowledge that decisions about innovation project selection are complex and that many alternative factors may affect such choices, the experiment's size (i.e., the number of decisions each individual was asked to make) increased exponentially with the number of variables included. We consciously limited our study and experimental design to six innovation characteristics because our experience in running the DCE and pilot test suggested that respondents show signs of cognitive fatigue beyond 16 choice tasks. However, we did ensure that the most relevant innovation characteristics were included in the study and selected these based on an intensive review of prior research and a pilot test with both middle and senior managers. The key challenge lies in the fact that including additional innovation characteristics will increase the experiment's size and the number of choice tasks participants need to complete. Hence, we traded off the comprehensive set of innovation characteristics included in the experiment and the possibility of cognitive overload in our respondents, which has been shown to have a significant effect on managerial decision-making performance (Baron, 1998). The amount of variation within this small sample encourages future research to overcome this limitation by improving or complementing our empirical approach. We also note the need to simplify the uncertainty associated with innovation in the real world. In our experimental design, we hence had to clearly define whether an innovation project involves radical or incremental innovation. We acknowledge that while firms and managers can plan for a radical and incremental innovation project, the (radical or incremental) outcome and success of the project are beyond their control.

Second, and related to the point just mentioned, we abstracted our analysis from investigating firm and industry effects. While our study hints at the importance of individual-level managerial heterogeneity, we did not investigate the effects directly. Understanding what may be driving such heterogeneity would require a study designed specifically to decompose such heterogeneity, involving the sampling method designed to recruit a balanced number of managers with specific characteristics (e.g., from particular industries, firm sizes, firm ages).

Third, the idiosyncratic aspect of our data collection might impact the generalizability of our findings. For example, we recruited our sample of managers based in Australia from the Qualtrics Online Panel. While single-country samples are common and do not a priori limit our findings' generalizability, the application to different contexts should be made with care. Similarly, we acknowledge that the use of online panels and its sampling strategy may be of concern to some scholars. However, studies have shown that data collected from online panels yield comparable data and substantively similar effect size to other data sources (Porter et al., 2019; Walter et al., 2019).

Finally, we acknowledge that research on middle managers has highlighted that middle managers can differ in the strategic role they take. That is, some research perceives middle managers' main role as implementing strategic decisions by conveying information

flows from senior managers to operating-level managers (Heyden et al., 2020). Others see middle managers as crucial in the strategy formation process with autonomy in strategic activities (Burgelman, 1983a; Wooldridge et al., 2008), with middle managers playing a significant role in both implementing and creating change (e.g., Heyden et al., 2017; Mantere, 2008). This also links to Floyd and Wooldridge's (Floyd and Lane, 2000; Floyd and Wooldridge, 1992, 1994; Wooldridge and Floyd, 1990) framework on middle managers' roles and influence on strategic initiatives. While we acknowledge the importance of differences in the strategic role of middle managers, the design of our study does not allow us to capture this effect. Thus, we encourage future research to investigate whether these strategic roles lead to differences in decision-making regarding radical innovation, which would extend our findings.

Despite these limitations, the present study allows scholars and managers to better understand the differential value middle and senior managers put on attention regulators when selecting between radical innovation projects as well as the sources of the differences in their decision-making models. Our findings suggest that in many cases the heterogeneity emerges from structural positions (e.g., middle vs. senior manager and social capital) as well as the use of external knowledge resources and managers' temporal orientation. However, based on the importance and idiosyncratic nature of radical innovation, we propose that more empirical research is needed to validate and extend our understanding of factors characterizing the variance in radical innovation preference models of both middle and senior managers. Given the heterogeneity in these decision-making models, we advise future research on radical innovation decisions to include individual-level decision-making models to help explain strategic attention to radical innovation.

ACKNOWLEDGEMENT

Open access publishing facilitated by Macquarie University, as part of the Wiley - Macquarie University agreement via the Council of Australian University Librarians.

NOTE

[1] The ABV differentiates between players and decision-makers. Players include both the decision-maker and other relevant parties affecting the firm's attention and decision-making. Thus, in the context of our study we use the term *player*, as one can argue that either (a) the middle and/or senior managers make the final decision about which projects to follow or (b) the managers' support for a project influences the final firm decision (Ocasio, 1997).

[2] A full factorial design would require each respondent to make $2^6 = 64$ decisions.

[3] We note that as a robustness test, we estimated both a direct effects only model and full model using MNL. The results are in line with the findings of the mixed logit models presented in Table III, supporting the robustness of our analysis.

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