

Abstract

Open innovation can support firms looking to deploy strategic agility through product innovations during periods of market and technological change. However, existing research lacks a comprehensive understanding of the microfoundations that underlie strategic agility in the context of open innovation. We address this gap using an in-depth analysis of a firm's open innovation activities in support of new product development (NPD). Our analysis reveals that open innovation can help leverage NPD processes to drive technological innovations in response to changing market conditions. Under such circumstances, open innovation enables firms to deploy strategic agility by continually developing the product portfolio. Our study reveals six mechanisms that enable three mutually complementary practices of agility: *knowledge-based agility* at the firm-environment interface, *behavioural agility* in the firm's decision-making process, and *organisational agility* in the internal NPD process. We theorise the interplay between the mechanisms that constitute each practice and, in doing so, shed light on how they contribute to firm-level strategic agility.

Introduction

Strategic agility is an organisational capability that aims to establish strategic commitments while maintaining the flexibility to change strategic direction in response to environmental change (Doz & Kosonen, 2008a; Weber & Tarba, 2014). Recently, the role of strategic agility has increasingly revolved around the organisation's ability to "adapt to changing external circumstances" (Girod, Birkinshaw, & Prange, 2023: 5) and align with "the demands of the external environment" (Heracleous et al., 2023: 64). Indeed, the external environment is non-

negligible for strategic agility since changes can be rapid, requiring greater cross-boundary exchange of knowledge and expertise within and between organisations (Heracleous et al., 2023; Morton, Stacey, & Mohn, 2018). One way to do so is through open innovation—“*a distributed innovation process based on purposively managed knowledge flows across organizational boundaries*” (Chesbrough & Bogers, 2014: 3). Open innovation, thus, has the potential to nurture strategic agility (Doz & Kosonen, 2008a, 2008b; Weiblen & Chesbrough, 2015).

While open innovation has the potential to alter a firm’s strategic agility by enhancing a firm’s innovation process, open innovation operates most effectively when transpiring at all levels and functions of the organisation (Zhang et al., 2023). For example, the interplay between individuals and teams determines the organisational processes critical to open innovation, such as new product development (Vanhaverbeke & Chesbrough, 2014). Such cross-level interactions help members of the organisation understand the need “to combine internal research with external ideas and... to deploy those ideas both within their own business and also through other companies’ businesses” (Chesbrough, 2003: 63). In so doing, individuals and teams can efficiently and effectively source external knowledge that can be leveraged to enhance innovation processes (Dahlander, O'Mahony, & Gann, 2016; Salter et al., 2015). However, open innovation in pursuit of new product development (NPD) can be a daunting task owing to the complexity of managing external relationships (Soetanto & Demir, 2023) and generating tangible outputs (Tsinopoulos, Yan, & Sousa, 2019). Hence, organisations that turn to open innovation require strategic agreement across levels of the firm and a supporting culture for managing open innovation outputs (Heracleous et al., 2023; Zhang et al., 2023). Consequently, benefits can be gained by developing an understanding of the conditions, actions and interactions that support the interplay between strategic agility and open innovation.

Some studies have examined strategic agility and open innovation at a more granular level by considering how individuals' actions lead to organisational outcomes (Doz, 2020; Doz & Kosonen, 2010; Lewis, Andriopoulos, & Smith, 2014; Morton, 2023; Renault & Tarakci, 2023). However, existing research does not capture the mechanisms explaining individuals' actions and how these actions, when combined, allow organisations to continually adapt to environmental changes. As it stands, the literature neither provides conceptual guidance on what those micro-level mechanisms are nor how the mechanisms interplay to explain the implications of lower-level actions on firm-level outcomes. An explanation of these micro-level mechanisms is not only crucial for understanding how firms engage in strategic agility but also for how microfoundational mechanisms support firms in leveraging external knowledge resources during NPD processes to align with the demands of the external environment (Xia et al., 2023). Such an understanding is important for clarifying the intricate link between strategic agility and open innovation and beginning to uncover the interplay between different levels and functions of the organisation to dynamically change the strategic course of the firm (Palmié, Rügger, & Parida, 2023). Consequently, we need a better understanding of how “lower level mechanisms or entities” (Felin et al., 2012: 1353) contribute to strategic agility through open innovation. One way to do so is to use a microfoundational lens to uncover the micro-level mechanisms that contribute to organisational outcomes (Felin, Foss, & Ployhart, 2015).

Therefore, the aim of this study is to examine the microfoundations of strategic agility in the context of open innovation. Specifically, we focus on those microfoundations underpinning the acquisition and integration of critical knowledge-based resources during open innovation in pursuit of NPD. To do so, this study is guided by the following research question, “What are the underlying microfoundations that support the interplay between strategic agility and open

innovation?”. In answering this question, we adopt an embedded, multiple-case study approach (Eisenhardt, 1989) where we trace the microfoundational mechanisms at play (Felin et al., 2012) during open innovation. Through our analysis of a UK-based specialist paint company’s strategic initiatives and open innovation activities during NPD, we developed a framework for understanding the microfoundations that support strategic agility in the context of open innovation. Our framework reveals six mechanisms constituting three interacting practices of agility in the context of open innovation: *knowledge-based agility*, *behavioural agility*, and *organisational agility*. In doing so, our study exposes the mechanisms that underlie strategic agility in the context of open innovation and contributes to the emerging microfoundational views of strategic agility and open innovation.

Theoretical Background

Strategic agility initially emerged as a firm-level concept to explain how firms could adapt and innovate in the face of market disruptions (Doz & Kosonen, 2008a; Teece, Peteraf, & Leih, 2016). This stream of research is rooted in the notion that organisations must be able to commit resources to long-term plans while retaining the flexibility to change course or direction in the face of unexpected change (Doz & Kosonen, 2008a, 2008b, 2010). Thus, strategic agility has been defined as the ability to “exploit, or create to one’s advantage changing patterns of resource deployment in a thoughtful and purposeful but also fast and nimble way rather than remain hostage to stable pre-set plans and existing business models” (Doz, 2020: 1).

While attempting to understand how firms can develop strategic agility, existing research has identified a number of practices that are critical for organisations. For instance, Doz and Kosonen (2007, 2008a, 2008b) established three organisational meta-capabilities: strategic

sensitivity, collective commitment, and resource fluidity. These meta-capabilities are required for firms to achieve alignment with market conditions by sensing new opportunities and implementing the appropriate actions. Other research has emphasised the impact of organisational design, suggesting that firms require a high level of flexibility to accommodate transformations required to exhibit strategic agility (Weber & Tarba, 2014). Yet others have taken these meta-capabilities and factors combined, or select parts of them, as the starting point of research on a variety of organisational phenomena, such as opportunity capture in emerging and established markets (Fourné, Jansen, & Mom, 2014), building market-oriented organisations (Sampath, Bhattacharyya, & Krishnamoorthy, 2021), and speeding up the internationalisation of multinational SMEs (Demir et al., 2021).

More recently, Prange and Hennig (2019) and Prange (2021) built on existing studies by considering how external conditions impact a firm's strategic agility. Depending on the speed of market change, their research grouped the environmental context into three clusters: resilient, versatile, and transformational. While transformational contexts are considerably more volatile, requiring more dynamic responses by firms, resilient contexts are impacted by slower rates of change and may include periods of active waiting (Prange, 2021). This research offers an alternative perspective of strategic agility associated with speed and flexibility to one of inclusion and reflection (Morton, 2023). One conclusion that can be drawn from this research is that the environmental context in which firms reside will determine the practices that underlie strategic agility.

While a great deal of research has focused on strategic agility at the firm level (Doz & Kosonen, 2007, 2008a, 2008b; Fourné et al., 2014), recent studies have turned their attention to more granular analyses of strategic agility by giving consideration to factors within the firm. For

instance, some studies have found that an *organisational culture* that embraces long-term, incremental change and experimentation (Heracleous et al., 2023) and builds organisational hyper-awareness of weak external signals (Shankar, Bettenmann, & Giones, 2023) can build long-term strategic agility. These studies provide a cultural foundation for strategic agility and firms' ability to navigate change. Other studies have found that careful development of *human resource practices* can foster improvisational capacities in organisations (Cunha et al., 2020) and continuous adaptation among leaders and executives (Doz, 2020). These studies provide contingency factors for human resource management (HRM) practices as foundations for strategic agility. Yet other studies have explored *leadership practices* that can foster strategic agility (Morton et al., 2018). These studies have found that paradoxical (Lewis et al., 2014), affective (Renault & Tarakci, 2023), "polyphonic" or inclusive (Morton, 2023) and change (Annosi & Lanzolla, 2023) leadership practices can enable strategic agility and business model renewal (Doz & Kosonen, 2010).

These recent studies provide a view of strategic agility below the firm level. Yet, contextual aspects that are influential to firms' strategic agility at a more 'foundational' level remain largely absent (Morton, 2023). This is specifically the case when considering firms that turn to open innovation to address market disruptions by using knowledge and innovations outside the firm (Dahlander & Gann, 2010). In pursuit of strategic agility, firms can use external knowledge to increase technology adoption (Petruzzelli, Murgia, & Parmentola, 2022) and enhance NPD activities (Chesbrough, 2003; Randhawa, Wilden, & Hohberger, 2016). Importantly, firms that turn to open innovation can also benefit from including multiple voices into their strategy process, which further heightens the organisation's strategic sensitivity (Morton, 2023). However, open innovation projects also come with risks pertaining to several

factors, such as problems of search (Lopez-Vega, Tell, & Vanhaverbeke, 2016), project unfamiliarity, and not-invented-here (NIH) and not-shared-here (NSH) attitudes among organisational members (Dabić et al., 2023). While these studies uncover some of the benefits and risks of open innovation, they only indirectly converge with strategic agility.

Despite a lack of focus on the interplay between strategic agility and *open innovation*, some studies have examined this link in more general terms. For example, Heracleous et al. (2023) showed how NASA became more agile over time by engaging external partners to identify new opportunities. Carmeli and Dothan (2017) examined generative work relationships across the organisation and found that only individual experiences of failure, as opposed to vicarious learning, facilitate innovation agility. Cai et al. (2019) found that knowledge management capability positively mediates the relationship between firms' IT capability and agility and that a positive innovation climate moderates these relationships. Similarly, Kohtamäki et al. (2020) identified three agile innovation practices (proactive idea generation, value-driven product development, and market-driven product commercialisation) that contribute to firm performance. Further, Franco and Landini (2022) found that workforce agility, especially task agility (measured as task rotation and collaborative work) boosts innovation by increasing employees' commitment and work motivation. Finally, Vrontis et al. (2023) examined the firm-level meta-capabilities of strategic agility (Doz & Kosonen, 2008a) and showed that firms embracing open collaboration and knowledge sharing enhance the benefits of strategic agility on firm performance.

While the literature is consistent in the view that openness to external knowledge sources is a vital element of a firm's strategic agility (Doz & Kosonen, 2008a, 2008b; Vrontis et al., 2023), existing research does not capture the micro-level mechanisms explaining the interplay

between strategic agility and open innovation. With only a few exceptions (Heracleous et al., 2023; Morton, 2023; Morton et al., 2018), the extant research focuses on either firm-level factors explaining the interplay between strategic agility and open innovation in achieving firm outcomes (Liao, Liu, & Ma, 2019) or examines the microfoundations of each in isolation (Ferraris et al., 2022; Xia et al., 2023). Therefore, scholars have recently called for more consideration to be given to the microfoundations of strategic agility (Girod et al., 2023) and open innovation (Bogers et al., 2017). The latter research stream has, for example, explored individual innovators' attention allocation (Dahlander et al., 2016), work history and experience (Bogers, Foss, & Lyngsie, 2018), as well as, how individuals impact open innovation through search activities (Salter et al., 2015).

Coined the 'human side' of open innovation, this research provides insight into how individuals impact open innovation performance at the firm level. While the open innovation literature has also considered microfoundations surrounding open innovation projects (Du, Leten, & Vanhaverbeke, 2014) and resource and capability creation (Hutton, Demir, & Eldridge, 2021), little consideration has been given to the interdependencies that underlie the relationship between a firm's strategic agility and open innovation. Hence, there remains a dearth of studies that have developed a comprehensive understanding of the microfoundational mechanisms explaining the relationship between the two concepts across levels and functions of the organisation. Consequently, the conditions, actions and interactions that facilitate the interplay between strategic agility and open innovation remain poorly understood. This can be addressed by developing a more complete understanding of the microfoundations that underlie strategic agility in the context of open innovation.

There are two conceptually distinct interpretations of microfoundations. One that considers the role of individuals, while the other considers microfoundations as levels (Felin et al., 2015). While individual-level studies have successfully identified discrete mechanisms that underlie firm-level concepts to develop an integrated view of strategic agility in the context of open innovation, consideration must also be given to the interactions between internal and external stakeholders, individuals and teams, and the context in which such interactions reside (Barney & Felin, 2013). Consequently, we adopt the latter, which refers to “locating (theoretically and empirically) the proximate causes of a phenomenon (or explanations of an outcome) at a level of analysis lower than that of the phenomenon itself” (Felin et al., 2015: 586). This perspective suggests that various micro-level factors within the firm aggregate to give rise to heterogeneity in a firm’s strategic agility (Teece et al., 2016). Using the microfoundations as an analytical lens has recently proven effective in studying both strategic agility (Ferraris et al., 2022) and open innovation (Xia et al., 2023). Although each concept has been studied independently thus far, we expect the microfoundational lens to be fruitful when studying the interplay between strategic agility and open innovation. Next, we turn to the research context and the methodological considerations to shed light on this less-developed theoretical aspect.

Method

Our research required an up-close and in-depth examination of the mechanisms that underlie the strategic agility-open innovation relationship in a real-world context. Consequently, we used an embedded multiple case design (Eisenhardt, 1989; Eisenhardt & Graebner, 2007) to examine how underlying mechanisms interplay between strategic agility and open innovation. These mechanisms enabled the firm to acquire critical knowledge-based resources from external actors

during open innovation and integrate those resources into the firm's typical NPD process. We studied this phenomenon at several levels, including the inter-organisational level (knowledge-based exchanges between the focal firm and external actors), executive level (strategic decisions about NPD), middle-management level (organisational activities and initiatives), and frontline employees (NPD activities) to examine the microfoundations and their links to organisational level strategic agility practices. We collected data from several sources over a four-year period, including NPD archives and activity logs of the organisation's internal NPD activities and between the NPD teams and their external collaborators, interviews across various levels of the organisation, questionnaires with executives, and observations of NPD activities.

Research Setting

Our research setting was an established UK small- and medium-sized enterprise (SME) paint manufacturer in the chemical industry. The UK chemical industry is continuously under legislative and regulative pressures owing to environmental conditions that require continual changes to products and manufacturing processes. The organisation central to our study demonstrated strategic agility and resilience by steering through four recessions over an 85-year period. Throughout this period, the organisation had consistently developed innovative and market-leading products. Prior to 1999, the organisation had developed a diverse customer and supplier network that were frequently involved in the development of new products. Between the years 2017 and 2020, the organisation's portfolio size ranged between 1041 and 1208 products that were sold to 37 different market segments which vary in size across different industry settings. This product portfolio served between 838 and 1210 customers each year that were managed through a national sales function that targeted new business by gathering information on external development opportunities and market movements.

During this period, the organisation had generated sales revenues that were directly attributed to the development of 517 new products, averaging more than 170 new products per year. However, the organisation's continually evolving product portfolio was underpinned by successful NPD processes that frequently leveraged open innovation. The organisation's broad customer base corresponded with a diverse supply network, which was used collaboratively to support the organisation's development activities. Consequently, most of the organisation's NPD processes had drawn on a wide variety of inputs from external actors, including, among others, customers, suppliers, industry groups and technology experts. Previous research provided evidence that successful open innovation-supported NPD projects required dynamic capabilities, enabling organisations to sense, seize and transform their resource base (Bogers et al., 2019) and that open innovation-supported NPD projects could also alter the firm's existing dynamic capabilities (Hutton et al., 2021). This research suggests that open innovation is fertile ground for agile deployment and development of dynamic capabilities. During fieldwork, such agility during open innovation-supported NPD became apparent in our informants' accounts, demonstrating the organisation had leveraged open innovation and exhibited strategic agility concurrently.

Although the history of the firm demonstrated an exceptional ability to navigate through recessions and other setbacks, our first-hand experience through in-depth conversations and observations of NPD projects alerted us to deep-seated microfoundational activities and behaviours supporting the organisation to continually develop and adapt during open innovation-supported NPD projects. This setting was, therefore, considered an ideal context for researching open innovation and strategic agility, both in terms of micro-level activities and the actors involved.

Data Collection

Our primary data collection was conducted by the lead author, a researcher-practitioner employed by the organisation in a senior role throughout the duration of the projects. This facilitated ease of access to unusually rich sources of data including company documentation, project data, the senior management team that played a key role in the implementation of strategic initiatives, and product developers that played a key role in the implementation of open innovation projects. Both co-authors were external researchers and were actively involved in the data collection and analysis to prevent bias and ensure accurate reporting. We took several measures to enhance the rigor of our findings. Firstly, we triangulated our data by comparing interview, project, and archival data for consistency. Further, we used researcher triangulation by comparing interpretations of themes and concepts that emerged from analysis of textual data (Miles, Huberman, & Saldaña, 2020).

Our selection criteria for informants involved in this research was driven by the need for extensive knowledge of the organisation and strategic decisions. Hence, we selected ‘elite informants’ who were considered “*key decision makers who have extensive and exclusive information and the ability to influence important firm outcomes, either alone or jointly with others*” (Aguinis & Solarino, 2019: 1293). Moreover, our research required deep knowledge of resulting open innovation projects and the technical and market related knowledge that influenced decisions. Hence, similar to Bingham and Eisenhardt (2011), we selected informants with the greatest insight into open innovation projects that included project leaders and sales representatives. We conducted our data collection and analysis in three phases (see Table 1) with data collection and analysis occurring concurrently. To provide a rich insight into our area of study, we combined grounded theory procedures (Gioia, Corley, & Hamilton, 2013) with case analysis (Eisenhardt, 1989).

Table 1 – Summary of Data Collection Methods and Data Sources

During phase one, we established an understanding of the industry context and the firm's strategic agility by initially collecting and analysing company documentation in the form of reports, archival data, press releases and product launches. This was followed by collecting survey data through a questionnaire consisting of 34 questions that were designed to understand how the organisation, through the perspective of management, were able to exhibit strategic agility by rapidly reconfiguring resources during times of crisis. The questionnaire was developed in several stages where initially, questions were designed to understand how the organisation recognised the need to change, followed by the activities that implemented change within the organisation. The open-ended questions were developed by one of the co-authors and piloted by the lead author where they were continually refined to aid comprehension. This cycle was performed five times until all authors agreed on the questions to be posed. The questionnaire was composed using the online survey tool Qualtrics and distributed to members of the organisation's senior management board that consisted of six directors and five senior managers—all of which answered the questionnaire.

During phase two, we collected data on the firm's product portfolio and open innovation knowledge network between the period 1999 to 2020 to determine how the firm continually developed products through open innovation and the links to strategic agility. Firstly, we collected data on the number of products manufactured and number of new products that were successfully developed throughout this period. Then, we collected data on the number of customers and suppliers that had actively engaged with the organisation throughout this period, to gain insight into the firm's prospective external knowledge network. During this phase, we obtained data of product batches to ensure new and existing product data was accurate, as well as

nominal codes to ensure customer and supplier data was accurate. This data provided insight into the firm's external knowledge network, depth of product offerings and how each had evolved throughout this period.

During phase three, we collected in-depth data on three recent open innovation projects that had contributed to the firm's strategic agility by enhancing the product portfolio through NPDs. Each project had been initiated in response to a new business opportunity or threat and had resulted in new sales revenues. During this phase, we obtained data including project emails, reports, press releases and meeting minutes to construct a chronological story of each development (Langley, 1999). To better understand the engagements that occurred during each project and how they influenced the overall direction and outcome of each project, we interviewed available project leaders, sales representatives and external actors that had been significant to the progression of the projects. Using this data, we were able to establish the frequency, duration and speed of open innovation engagements that occurred during the development process (Eisenhardt & Graebner, 2007). This helped to shed light on the intra-organisational engagements across several functions and hierarchical levels, as well as inter-organisational engagements that occurred during a typical open innovation project. We provide an overview of the open innovation-supported NPD projects in Table 2.

Table 2 – Overview of NPD Projects

As our understanding of the context, concepts and projects began to develop, we complemented our hard data with remotely conducted (owing to COVID-19 restrictions) semi-structured interviews to offer a rich understanding of the emergent concepts and the underlying activities that contributed to the evolution of the firm's product portfolio (Eisenhardt, 1989). Interviews were conducted with the Sales Director and R&D Manager in four cycles, with each

cycle building on and refining previous cycles. Both participants were selected due to their comprehensive insights into the firm's strategic initiatives and the NPD projects selected. During each cycle of the interview process, we posed questions to refine and develop the underlying concepts that had previously emerged until all parties were in agreement. As any uncertainty surrounding our data arose, we continually sought information from other organisational actors including product developers, sales representatives, senior managers, and company directors that were deemed key knowledge agents in the area (Gioia et al., 2013). In total, this resulted in 30 informal, subject specific discussions with informants, asking them follow-up questions and queries to refine our understanding of the open innovation-strategic agility interplay.

Data Analysis

Qualitative research on microfoundations in strategy research is preferably carried out with a focus on processes to help uncover content-related aspects and why they influence certain outcomes (Aguinis & Molina-Azorín, 2015). Therefore, we employed an iterative grounded data analysis approach, inspired by the basic principles of abductive reasoning (Sætre & Van De Ven, 2021) to uncover micro-level activities involved in open innovation and their relationship with strategic agility during NPD. Abductive reasoning helps making empirically *and* theoretically grounded judgments about 'matters of course' (Mantere & Ketokivi, 2013). As such, abduction involves the formulation of a number of possible interpretations of the data before one decides on the *most plausible* explanation of the relationship between two observed phenomena. For example, during data analysis, we identified certain resources used during open innovation and the relevant micro-level activities enacted by certain individuals or groups of people to variably or flexibly deploying those resources in NPD.

Making inferences between observed phenomena was supported by an iterative process throughout the study. As with most micro-level process studies (cf. Gioia et al., 2022), our data analysis followed many more steps than can be meaningfully and reasonably reported. However, we analysed our data in three overarching steps to capture the microfoundational explanations to the relationships between strategic agility and open innovation during NPD in our qualitative dataset. Firstly, we made a granular in-vivo coding in concert with data collection and the literature. This enabled us to continually refine our understanding based on emerging themes, the relevant literature, and increasingly targeted data collection (Gioia et al., 2013). To analyse our textual data including company documents, questionnaire responses and interview transcripts, we performed first-cycle coding using in-vivo codes (helping us to generate first-order codes), followed by another cycle of coding where we adopted researcher-centric terms (second-order themes) before grouping the codes into higher-level concepts (Saldaña, 2009). Our analysis initially focused on questionnaire data that provided insight into the firm's strategic initiatives and how the board had responded to crisis through open innovation-supported NPD projects. This provided the opportunity for follow-up interviews that focused on key insights associated with open innovation and strategic agility that were subsequently used to develop and refine the emerging data set (Figure 1).

Next, we began analysing data on the firm's product portfolio and NPD project data. We initially coded NPD project data by classifying each activity using an informant-centric scheme (how informant termed and interpreted activities), followed by a researcher-centric scheme (how the literature and the researchers termed certain activities). This allowed us to identify several possible reasons for engagements by our informants, knowledge types involved in those identified activities, specific internal and external actors involved, and the ensuing outcome. As

our understanding of the NPD projects developed, we continually refined our analysis by involving product developers and project leaders in refining and validating our interpretations. These actors' grounded understanding of the NDP projects helped us identify the most granular micro-level activities involved in NDP and saturated our data collection process.

Finally, following Demir and Lychnell (2015), we performed thematic analysis on our data by 'articulating' (exposing identifying and generative mechanisms of open innovation and strategic agility), 'relating' (continuously reconsidering connections within and between characterising open innovation and strategic agility), and 'conjugating' (pulling together the identifying and generative properties of the interplay of characterising open innovation and strategic agility as no further plausible options remained). During this process, we continually triangulated the data by cross-checking our informant data with project data.

This enabled us to infer the most plausible links between second-order themes and aggregate dimensions, or 'microfoundational mechanisms' (Felin et al., 2012; Felin, Kauffman, & Zenger, 2023). Microfoundational mechanisms (henceforth, mechanisms) refer to constellations of *organised entities and activities* such that they regularly bring about a particular type of outcome (Hedström & Ylikoski, 2010). Mechanisms are the building blocks that selectively *explain* the essential elements of a process "by abstracting away the irrelevant details" (Hedström & Ylikoski, 2010: 53). As such, mechanisms can powerfully explain different functions in organisation and innovation processes (Hedström & Wennberg, 2017), such as situational mechanisms (e.g., how open innovation shapes individual decisions, actions, beliefs and goals), action-formation mechanisms (e.g., how actors' decisions, actions, beliefs, goals, etc. influence their behaviour), and transformational mechanisms (i.e. how behaviours of groups of individuals bring about intended and unintended outcomes).

Hence, focusing on mechanisms helped us unpack the link between microfoundations and organisational-level outcomes (Felin et al., 2015). Specifically, our analyses helped us reveal six mechanisms (situational mechanisms) that we have further distinguished into three novel sub-types of strategic agility (action-formation mechanisms) in the context of open innovation: Knowledge-Based Agility (knowledge permeability and knowledge-base reappraisal), Behavioural Agility (cohesive judgement and decisional precision), Organisational Agility (organisational adaptability and product portfolio elasticity) and the resulting interrelationships (transformational mechanisms). Consistent with Schatzki (2006: 1864), we consider the action-formation mechanisms “as structured action manifolds” constituting practices. As such, these mechanisms helped us develop a processes-based understanding (Felin et al., 2012) of the links between open innovation and strategic agility.

Figure 1 – First-order codes, second-order themes, and aggregate mechanisms

Findings

Following, we discuss how the identified mechanisms constitute each sub-type of strategic agility: knowledge-based, behavioural, and organisational agility from open innovation-supported NPD activities. A summary of these mechanisms is found in Table 3. We present the findings by considering the situational mechanisms first and then the action-forming mechanisms. Throughout our study, we use a pseudonym (Alpha) to refer to the organisation.

Table 3 – Mechanisms and Corresponding Descriptions

Knowledge-Based Agility

Alpha adopted several approaches to assist with sensing early signs of new opportunities and threats. Our data revealed that the organisation deployed an outward facing sales team to gather information about customer needs and requirements, which frequently led to requests for new products. To gain knowledge about industry conditions, competitor activities and supplier innovations, board members regularly reviewed industry publications and attended conferences, trade shows and exhibitions. Board members and the sales team also combined market knowledge with current knowledge and resources to make sense of new and emerging opportunities. Collectively, these activities supported *knowledge inflow* during open innovation activities and increased Alpha's awareness of external conditions and market developments enabling Alpha to consider appropriate responses. This sometimes required quick and decisive activities such as during times of crisis, or more calculated responses where the board considered different options and approaches. In both cases, our analyses revealed a relationship between knowledge permeability (KP) and knowledge-base reappraisal (KBR), combining into what we term *knowledge-based agility*, defined as the organisation's ability to adapt to changes rapidly and effectively in its environment by leveraging, altering or reconsidering its knowledge-base. In this process, KP and KBR combine into the capacity to quickly acquire, process, and apply relevant information, insights, and expertise to make informed decisions and take appropriate actions.

Knowledge Permeability

During open innovation projects, KP helped historical facts and future expectations to permeate across epistemic boundaries within the firm. This made it possible for individuals who were involved in open innovation projects to find and exploit previously unknown technical and market knowledge in pursuit of their overall goals. KP required a good understanding by senior managers of their team members' knowledge and experience, which enabled more knowledgeable staff to anticipate and support less experienced developers during open innovation projects. For example, during one project, we observed a senior manager sourcing technical knowledge from outside the firm that was subsequently shared with a less-experienced product developer, *"Hi Darren, I hope you don't mind but I've been in contact with Deborah at [Supplier Name]. I know you've been struggling with aeration, and I've managed to obtain some additive samples and recommendations for levels etc. Give me a shout once they arrive.* (Manager, email). Historically, individuals had uniquely developed technical knowledge within a specific technological domain. However, the shared terminology and memory of past projects helped open innovation team members and departments to recall and fluently decontextualize the technical knowledge from its original source domain to prospective technical domains.

KP was also observed when product developers lacked technical knowledge or knowledge of a current issue, the developers knew who to ask internally to locate the required knowledge, *"The main point is knowledge – knowledge of suppliers and products and what is available... so one could argue that development chemists that are new to our industry may be limited to our current suppliers when looking for raw materials for a particular development... we talk to one another and there is usually someone within the team that may know the best suppliers to contact, again the key here is knowledge and ensuring the entire team knows who to*

contact.” (R&D Manager, *Interview*). This afforded an efficient search and application process during open innovation projects as product developers spent less time searching for knowledge and adopting trial-and-error approaches that would have otherwise consumed resources.

Our data also revealed KP allowed individuals within Alpha to effectively communicate and collaborate with external stakeholders to gain critical knowledge in support of open innovation projects. For instance, one board member reported, “*it was only through our good relationships and understanding of suppliers that we were able to obtain a [product formulation] and rapidly source the equipment and raw materials that could be produced in our production facilities*” (Sales Director, *Interview*). Subsequently, board members also shared knowledge of testing methods and product approvals that minimized the time required to gain product approval and begin the manufacturing process.

KP also played a role in supporting open innovation projects more broadly across the organisation. This was evident from the ease at which knowledge, information, or ideas spread between different individuals within the same department and across departments, sometimes with different cultures, and representing fundamentally different knowledge domains (e.g., R&D and Sales staff). In highly permeable knowledge domains (e.g., R&D), information diffused smoothly, enabling cross-pollination of ideas, innovation, and collaboration. In less permeable knowledge domains, notably across distinctive epistemic boundaries, individuals worked more deliberately to remove barriers, such as communication gaps, cultural differences, departmental silos, or technical limitations, that might hinder the exchange of knowledge between such entities. Knowledge diffusion was often effectuated through vertical and horizontal channels. In support of Cohesive Judgement (CJ), horizontal KP supported collaboration between board members by allowing new knowledge about opportunities and threats to easily transfer between

individuals. Thus, enabling the board to formulate plans and determine implementation activities, *“during the Covid pandemic, we were holding daily meetings and sometimes twice daily meetings where information was dissected, and plans drawn up.”* (Board member, Questionnaire).

Knowledge permeability also allowed information to be disseminated quickly during periods of market volatility that, in conjunction with CJ, was used to provide information, guidance and ideas. In addition, information about past experiences and best practices was shared. This was assisted by vertical KP, where board members communicated the vision to lower-level managers in support of open innovation activities, *“the board were feeding information and plans to senior managers on a daily basis so they could make proactive decisions involving formulating products, reconfiguring machinery and making modifications to our systems”* (Board Member 3, Questionnaire).

KP was assisted by a willingness to share information, good relationships, frequent communication and staff rotation, which provided individuals with information and understanding required to quickly diffuse information across the organisation required to implement a response to an opportunity or threat. Alpha also leveraged cross-functional roles to aid understanding and knowledge articulation in support of open innovation projects, *“our Technical Sales Reps are an important link between our laboratory and our customers. Their knowledge of our products, combined with their application experience, enables them to communicate customer requirements to our laboratory, which helps the laboratory to decide what product tweaks and adjustments are needed”* (Sales Director, Interview). By leveraging cross-functional roles, product developers were able to gain a deeper understanding of customer requirements and to overcome technical issues originating in customer domains. Additionally,

Alpha frequently rotated staff between departments to help individuals develop knowledge and experience of different roles within the firm.

Knowledge-Base Reappraisal

Our analysis of project data revealed that KBR also occurred during open innovation projects by helping to minimize the number of unproductive activities from occurring, reducing development resources and time to market. This was achieved by drawing on historical knowledge of past projects to make informed decisions, *“formulator knowledge and experience are invaluable for reducing our development time, as they use their past experience to avoid costly and avoidable mistakes”* (Business Development Director, *Informal Discussion*). Alpha’s product portfolio was helpful to KBR as it provided developers with past product knowledge and resources to draw from in support of current development activities, *“Our agility is helped by a varied product portfolio, as sometimes a stop-gap situation can occur whilst we develop a new product, or we have a start point with an existing product and a new product is developed following customer feedback from evaluation of the existing product.”* (R&D Manager, *Interview*). KBR required a great depth of historical knowledge and facts to draw from, ease of access to information and a good understanding of current-day issues. In support of KBR, Alpha demonstrated a well-developed knowledge-base consisting of archive formulations, past experiences, and the ability to retain long-term staff.

During open innovation projects, KBR also played a key role while engaging with external stakeholders. For example, our data revealed Alpha frequently leveraged technical knowledge and expertise from suppliers to transform historical facts and present knowledge in pursuit of new knowledge, *“I’m working on a project that requires a resin similar to [name]. It has quite a few properties that we are interested in like airless application and ease of*

incorporation. However, I'm looking for something with slightly higher solids and lower cost (if that's even possible). Can you help? (Product Developer, email). In response, the supplier recommended a product that was successfully adopted during the development. Additionally, developers frequently sought customer knowledge which they combined with historical knowledge to determine the appropriate adjustments and refine the development process, *"we usually have a good understanding of what the customers want and this might be based on what we have done in the past, but it doesn't always work out. More often than not, we turn to our customers to find out more about their usage or application methods, and this helps to get the product precisely where the customer needs it to be."* (Product Developer, Interview).

Under both circumstances, the product developer's familiarity with different customers and suppliers assisted KBR with direction on where to go for knowledge. This included supplier knowledge of chemistry types, testing methods, standards, and legislation, in addition to customer knowledge of requirements and application methods. Consequently, KBR played a critical role in open innovation projects and to obtain the relevant information, Alpha needed to have a good understanding of external knowledge sources and to have developed good working relationships to facilitate access.

KBR and Alpha's product portfolio were seen as mutually reinforcing since current product knowledge provided ideas and technical knowledge about potential functionality, which contributed to new products through an efficient development process. As one informant noted, *"[New Product] was developed directly from a project to create an alternative to [Historical Product] that was cancelled due to lack of customer interest over 3 years ago. Without prior knowledge of the work done, we could have reinvented the wheel and spent months developing the new product, instead we had a ready-made solution more or less ready to sample when the*

new development project was created.” (R&D Manager, *Interview*). Moreover, being able to appraise historical facts, such as those associated with what has previously worked or not worked, aided decisions that directly influence the portfolio size. In one of the open innovation projects, Alpha had decided to sell a range of products as a system to distributors as opposed to dealing directly with customers to enhance agility and efficiency.

Alpha leveraged KBR throughout the organisation to make sense of emerging opportunities. Empirically, our data reveals that KBR involves the process of reviewing, reassessing, and updating the existing body of knowledge or information, not only within a particular domain but in several domains simultaneously. Specifically, KBR involved revisiting established concepts, practices, and insights in the technical, market and the board domains to ensure that they remain accurate, relevant, and aligned with emergent trends and matters arising within and outside the organisation.

KBR was demonstrated by Alpha’s ability to effectively combine historical facts, present organisational experiences, and future expectations to assist strategic decision-making and take on board new open innovation projects. For example, the board used KBR to focus open innovation activities towards an emerging opportunity during a period of market volatility: *“I am immensely impressed with the quick formulating and huge-scale production of [new product]. No one could have predicted we would have been in this position a few weeks ago. This has been a phenomenal effort by all involved. I would like to put my profound thanks to all of my colleagues on record”* (Managing Director, *Archival data*). Additionally, the sales and technical teams frequently enacted KBR to allow them to accurately assess long-term strategic opportunities. This mechanism was assisted by KP, which helped board members and senior managers to combine knowledge of past crises and projects with knowledge of new and

emerging opportunities. Thus, allowing board members and senior managers to make sense of emerging opportunities and threats that could be addressed through open innovation.

KBR was further supported by Alpha's ability to retain staff combined with information archives, including recorded meeting minutes and product formulations that senior managers could easily access. This enabled Alpha to enhance the productivity of open innovation projects. Our data revealed that in support of strategic opportunities, board members would frequently share market and technical knowledge with senior managers and product developers: *"The situation with regard to the [market area] has been discussed across time, and the key issues have been very low prices in the marketplace which led to the exiting of great companies. We have a good range of formulations and technologies for the [market area] ... Expertise and good formulations have been obtained over the years by [Alpha]; for example, [collaborating firm] provided us with all of their [market area] formulations"* (Managing Director, email). This critical knowledge was provided via simple but easily maintained communication networks and subsequently leveraged in support of an open innovation project.

Alpha was also able to combine knowledge of new opportunities with knowledge from external stakeholders to enhance implementation activities. As one informant revealed, *"we worked on a similar product request a few years back that threw up some technical issues, but it never really took off. So, I thought, why reinvent the wheel. I gave Darren [Developer] the product formulations and the suppliers contact details and off he went"* (R&D Manager, Interview). Individuals within Alpha frequently used market and technical knowledge sourced through their inter-organisational and intra-organisational relationships. Further, individuals frequently shared knowledge about external contacts that had been leveraged during past open

innovation projects. This had the effect of assisting product developers in their pursuit of the external knowledge required during implementation activities.

Behavioural Agility

Executives and managers at Alpha commonly witnessed a shared understanding about when to act fast versus being more considerate and thoughtful, avoiding the need to force decisions. As such, our analyses revealed that such behaviours and actions were cohesive across both board members and departments, thus allowing contextually sensitive decisions in the technical and commercial domains. We termed these mechanisms behavioural agility to describe the ability of an individual or an organisational unit to adapt at various speeds depending on the internal and external contextual conditions experienced by the organisation. Alpha demonstrated behavioural agility by being able to navigate flexibly across all three open innovation NPD projects, despite their variations in their timeframe or project duration, volume of internal and external communications, number of activities involved, and numbers of external sources used (see Table 2). Alpha showed how flexibly it could act in terms of board members and departments' capacity to change their actions to match the different needs and goals of each situation, based on a wide range of behaviours and skills, through these clearly different projects.

Cohesive Judgement

Alpha frequently turned to open innovation projects in situations where individuals within the organisation identified a new opportunity or threat. Cohesive judgement (CJ) represents the ability of employees to easily take new viewpoints and make consistent judgments with information generated from and across several "epistemic boundaries" (Håkanson, 2010). Our analysis of NPD project data revealed CJ was important to open innovation projects when

individuals from different departments got together to discuss current issues and agree on the direction of the project, *“I would like to thank everyone for their input today regarding the current flocculation issues. As agreed, I will formulate some new samples using [ingredient name] to see if that works... I’ll be in touch once I have some results”* (Project Leader, email). CJ was built on effective inter-departmental communication since it helped individuals across different departments to communicate project requirements and implementation activities. Further, formal, and informal mechanisms were used to help develop and maintain intra-organisational relationships in support of CJ. Formal mechanisms included morning meetings that brought together a diverse range of senior managers and technical sales meetings that brought together employees from technical and sales roles to discuss and share technical and market knowledge. Informal mechanisms included frequent ‘snappy’ and impromptu meetings between smaller groups of individuals from marketing, sales, and R&D during open innovation projects.

Our data revealed that it was necessary for the board to adjust their decision-making process following changes to external conditions. As such, CJ was an influential factor at the board level when deciding whether to target new opportunities and counter threats using open innovation. In support of CJ, the board leveraged KBR by combining knowledge and experience of previous crises with present knowledge to accurately assess how opportunities and threats would impact the business overall: *“our combined experience means that during difficult periods, we have a good understanding of the financial and operational impacts to the business. We also use our technical expertise that we have built up over many years to determine whether to act on new opportunities and the appropriate course of action”* (Sales Director, Interview). Once the board had discussed a new opportunity or threat, CJ manifested alignment throughout

the board about the appropriate course of action prior to initiating a response, “*when we operate a decision, everyone gets behind it.... dissent is for the boardroom. Unity is crucial outside the boardroom...*” (Board Member 4). Consequently, CJ supported the open innovation-strategic agility relationship through effective group decision-making about whether to implement new projects and address threats during periods of market volatility. Further, CJ was helped by a clear and mutual understanding of how a new project would impact the business overall and the initial actions required by each board member.

During periods of decreased market volatility, CJ was also observed when senior managers collaborated to determine the feasibility of open innovation projects: “*The senior management team work closely together in deciding the strategy for the business. Decisions on new customers, products and equipment are discussed collectively between sales, marketing, and R&D*” (Board Member 1). These projects frequently followed the identification of new opportunities and included simple product enhancements, product modifications and strategic new product developments. All of which enabled Alpha to continually exhibit agility. New opportunities that occurred during periods of decreased market volatility posed less risk to the business and were frequently discussed and agreed on without board involvement: “*The board sometimes get involved in decisions about whether to take on board new projects, and this tends to be during difficult periods. However, most new projects are fed in through sales and marketing and come from customer queries or when we spot gaps in the market. We usually discuss whether these projects are feasible before taking them on*” (R&D Manager, Interview). Under these circumstances, CJ manifested alignment between Sales, Marketing and R&D about which open innovation projects to pursue. In summary, CJ represented understanding and agreement between departments and individuals about whether to take on board new open

innovation projects, and the direction of existing open innovation projects, enabling Alpha to maintain project momentum.

Decisional Precision

Alpha demonstrated an ability to make precise market and technical decisions in support of open innovation projects. We refer to this ability as decisional precision (DP). DP was expressed in Alpha's deeply rooted understanding of what can be achieved and what cannot be achieved by using their current resources (in different ways), including market and technical knowledge. As such, DP represented an efficient use of resources during open innovation projects and provided individuals with the confidence to decide whether to take on a new project in response to an opportunity or threat. DP was also supported by the Alpha's KP and KBR mechanisms.

In one of our example projects, Alpha demonstrated DP when a product developer turned to current formulations to assess similarities and differences between a newly identified opportunity, *"we looked into some of our existing [products] to see whether we had anything that would fit the bill. We didn't. This was like a more advanced requirement that needed better corrosion resistance... So, we contacted one of our suppliers, and we were able to eliminate certain raw materials from the get-go."* (Product Developer, *Interview*). This allowed the developer to eliminate initial discovery activities and focus on component technologies that were more likely to offer a solution to the requirement. Further, Alpha demonstrated that DP was enhanced when individuals leveraged the relevant external technical and market-related knowledge from suppliers and customers. One example of such DP occurred later during the same project, *"after we eliminated certain raw materials, we tried a few that were advised by our suppliers. We were then able to go back to our suppliers and explain to them what hadn't worked and why, allowing them to make better recommendations in the future."* (Product

Developer, *Interview*). The types of external knowledge that supported DP included technical start-point formulations as well as market-related knowledge of component technologies, *“the supplier may actually know the market far better than Alpha or the developer as they may have serviced the market for years if that is the case, then we tend to be guided by our suppliers that can often provide case studies, test results and start point formulations.”* (R&D Manager, *Interview*). However, customers were also important to DP by supplying product feedback and knowledge of product applications, *“customer feedback is critical in development for developing products that suit their needs within the timeframes required. Without it, we cannot see how closely our [products] match their specific situations, nor can we determine where we may improve that fit.”* (Product Developer, *Interview*). As a result, the product developer gains market knowledge and understanding that is used to guide future product development decisions.

To facilitate access to external knowledge in support of DP, Alpha developed strong relationships with customers and suppliers. By reducing the time taken to find knowledge and the need for ‘trial-and-error’ type development activities, technical and market knowledge gained through open innovation improved the efficiency of Alpha’s development process. Working in parallel with KBR, DP supported Alpha by eliminating avenues that had been tried during previous open innovation projects and by building on successful approaches of the past. As one informant noted, *“Knowledge again is the key, whether that is a developer’s knowledge of the technical attributes of raw materials, or historic formulations and also trusted suppliers that either have test data or a track record within a certain area.”* (R&D Manager, *Interview*), resulting in more precise decisions (higher efficiency). Thus, DP allowed Alpha to focus resources on a fewer number of more precise activities required in the response formulation.

Alpha also demonstrated an ability to make precise technical and market-related decisions in support of strategic opportunities. As such, DP assisted Alpha in developing new products using open innovation in response to market opportunities or threats. Executives and individuals engaged in open innovation often appeared to be meticulously involved in projects, hence giving them the information and insights needed to make accurate and specific decisions. Hence, DP emerged as an organisational mechanism that enabled Alpha to carefully analyse relevant information, consider various aspects of an open innovation project, and arrive at well-defined, informed decisions fitting the specific goals of the project.

KP and KBR were important subsidiary activities supporting DP in helping board members to, “*get a feel for the right course of action*” and the required implementation activities, “*as a business, we understand the very quickly moving business landscape. This allows us to protect our staff and our customers in the short, medium, and long term by avoiding knee-jerk decisions...it’s about harnessing the resource of all the people of [Alpha] to make the right decisions*” (Board Member 1). In support of open innovation activities, board members were able to combine supplier knowledge with customer knowledge and historical knowledge, to enhance DP. Under such circumstances, supplier knowledge was frequently used to obtain technical guidance and information about how to effectively develop product innovations: “*our suppliers play a pivotal role in deciding whether to take on new projects because they can provide us with guidance formulations and technical assistance, which helps us to achieve the end result by removing the need for us to develop the products from scratch*” (R&D Manager, Interview). Alternatively, customer knowledge was frequently used to accurately assess the customer’s needs and requirements.

Due to the combination of individuals' experience, information availability and knowledge from external stakeholders, DP assisted individuals by avoiding the need for experimentation and trial-and-error approaches. As such, DP provided Alpha with the ability to make more accurate assessments of opportunities and efficiently act on new opportunities when conditions were optimal. The speed and coordination of communication through horizontal and vertical channels as well as a good understanding by board members of the functional requirements to implement a decision contributed to DP. Overall, DP assisted the organisation in gauging risk, uncertainties and trade-offs involved in a specific decision, and in determining the appropriate implementation activities.

Organisational Agility

Open innovation NPD project activities often involved a complex infrastructure of systems, machinery and supporting processes, as well as specific resources, which, however, required some degree of flexibility. Further, resulting new products were sometimes added to the existing ones, hence expanding the overall product portfolio, while at other times, replacing one or several products, hence reducing the product portfolio. To do so, Alpha had continuously developed processes for elevating employees' competencies, enabling them to move across different departments swiftly and enthusiastically with minimal disruption, flexibly enabled by the autonomy given to frontline and middle managers to make requisite changes as needed. Combined, this degree of organisational adaptability and product portfolio elasticity contributed to organisational agility.

Product Portfolio Elasticity

Our analysis of the organisation's customer and supplier network and product portfolio (Table 4) revealed how both factors assisted the open innovation-strategic agility relationship. Alpha considered themselves to maintain a relatively large and varied product portfolio that covered multiple markets areas and sectors. This benefited Alpha since, in addition to competitor activity, market requirements were continually driven by changing standards, legislation and environmental regulations, all of which required new products. Alpha frequently combined knowledge from their existing portfolio with external knowledge to adapt to the changing needs and requirements of customers. As one informant noted, *"some developments can be completed quickly if a small alteration to an existing product is required. Other more sophisticated developments can require ingredients we are less familiar with. When this is the case, we usually turn to our suppliers for help"* (R&D Manager, Interview). As such, open innovation contributed significantly to NPD projects, enabling Alpha to respond to market changes through portfolio expansion and reduction. We refer to this ability as product portfolio elasticity (PPE).

Table 4 – Customer and Supplier Accounts, Products Sold and New Products Developed

PPE was observed during periods of market volatility where Alpha had actively targeted new business through open innovation product developments. Notably, Alpha demonstrated several instances of being capable of managing its PPE by, for example, adjusting and adapting the composition, range, and features of its products in response to changes in market conditions, customer preferences, and technological advancements. Specifically, Alpha demonstrated an ability to strategically expand *and* reduce its product offerings to align with shifting demands and seize new opportunities. As such, PPE was about maintaining a dynamic and adaptable range of products that aligned the organisation with an evolving business landscape.

Our analyses revealed that between 2008 and 2010, Alpha was affected by a loss of customers due to volatile market conditions. During this period, board members reported they had actively targeted open innovation NPD projects as a strategy to address the shortfall in business, which resulted in an increase of 39.8% of new products. Subsequently during another period of market volatility, between 2020 and 2021, Alpha initially focused a limited number of product developments to target market segments that were in high demand. This required the rapid development of two new products that Alpha achieved through open innovation, which generated an additional 11.73% of sales over a three-month period of significantly depressed business.

Alpha also leveraged PPE as a long-term strategy for coping with market changes. During the period spanning 1999-2020, Alpha had developed 2,727 new products. However, during the same period, Alpha's portfolio had only increased in size by 428 products. This was because Alpha used product rationalization as a value appropriation strategy to maintain agility and flexibility and protect their margins, *"The vast number of products produced at Alpha brings about a great deal of choice for our sales team and also our customers. However, this reduces the agility and flexibility across the business. An ongoing rationalization programme is improving our position. However, it is very much the desire of both the shareholders and management team to operate across a multitude of business areas to remain agile"* (Sales Director, *Interview*).

While our analyses revealed several strategies to control the size of the product portfolio, a key outcome of most measures was to improve customer service. Indeed, one of the most prolific strategies was to reduce the product portfolio by directing smaller customers to distribution partners, which also helped maintain, and in some instances, improve customer

service, *“the [system innovation] allowed us to pass some of our smaller customers across to our distribution partners... reducing the number of accounts by transferring the smaller accounts to distribution partners improves the service levels and turnaround time for those customers.”*

(Sales Director, *Interview*).

Alpha frequently combined knowledge of its existing portfolio with customer and supplier knowledge in support of open innovation activities. Between 1999 and 2017, Alpha actively reduced the number of customers by 37.79%, by directing most to distributors. Through the same period, Alpha increased the number of suppliers by 47.85%. More recently, between 2017 and 2020, Alpha had increased the number of customers by 29.59% while reducing suppliers by 42.08%. Our data revealed that balancing the size of Alpha’s portfolio was crucial for agility in support of open innovation NPD projects.

Although the organisation’s existing portfolio represented an important knowledge resource, maintaining many customer and supplier relationships was said to be resource intensive, as it required individuals to continually refresh relationships with external actors and build trust and loyalty. In contrast, maintaining relationships with fewer customers and suppliers required fewer resources and allowed Alpha to build a stronger relationship. As such, Alpha actively controlled the number of customers and suppliers to maintain service levels and open innovation effectiveness. As one of our informants noted, *“the obvious downside to fewer suppliers and customers is fewer sources to turn to during development projects. I think our firm recognized this and has tuned our customer-supplier relationships to the sweet spot that enables us to quickly access a wide range of knowledge without the huge overhead associated with managing a very high number of customer/supplier relationships.”*

PPE was important to Alpha as it served to enhance KBR and DP. This was a consequence of the quantity of knowledge reference points that could be drawn from when developing new products. In support of these relationships, Alpha frequently expanded their product portfolio by adding new products and reduced their portfolio by archiving historical formulations. However, this required a working memory of historical products and archive formulations that was helped by retaining experienced employee. As one informant noted, the role of both people and knowledge was essential in contributing to PPE, *“our range of products is down to our personnel and the knowledge we hold as a business. We have a good range of experience within our senior management and development teams, and strong relationships with our customers and suppliers from which we gain the knowledge to develop bespoke products and tailored solutions”*. In summary, PPE was influential to Alpha’s agility, and this was maintained by controlling the number of customer and supplier relationships while continually renewing and maintaining their portfolio.

Organisational Adaptability

Organisational adaptability (OA) represents the ability to respond to emerging situations due to the malleability of the organisation’s infrastructure. At Alpha, OA was demonstrated through its capacity to effectively respond to changes in its external environment and internal dynamics by modifying its strategies, structures and processes. Indeed, OA was a multifaceted capacity, supported by Alpha’s flexible infrastructure, multi-skilled employees, autonomous managers, and adaptive organisational culture. Combined, this dynamic and learning-focused environment helped Alpha to recognise shifts and adapt.

Our data revealed that while structural elements were unmodified, changes to the inner workings of the organisation such as people, machines, equipment, processes, and systems

supported open innovation project implementation by accommodating new opportunities, *“during Covid, the product balance across the business completely changed and we created temporary new production lines to support the areas where demand grew. With the flexibility of the company as a whole and our people, we managed to manufacture and supply all of our customers including those unknown to the business only a few weeks previously.”* (Board Member 2). In support of OA, Alpha developed multi-skilled employees with can-do mentalities. This, in conjunction with a willingness to accommodate change enabled individuals to be redeployed to new and/or developing areas of the organisation during periods of change, *“we aim to have multi-skilled people across the business which enables the management to move people around very easily to areas where the need is greatest ... two of our greatest strengths are our flexible systems and processes and the willingness of our people to move to different areas of the business”* (Sales Director, *Interview*). Alpha also leveraged cross-functional teams and afforded managers a high degree of autonomy as at the team level, individual and localised decisions engendered coordinated and consistent changes in activities in and across several departments, *“we have a very close management team that is characterised by a 'can-do' attitude, with a high degree of autonomy to make dynamic decisions. The team is cross-functional and coupled with our flexible systems allowed the process (of reconfiguration) to be conducted at speed”* (Board Member 5). In summary, OA helped Alpha to respond to market opportunities through open innovation projects, hence contributing to Alpha’s organisational agility.

Alpha’s ability to sense change preceded OA, and was helped by product developers, sales representatives and board members building and maintaining relationships with external actors. The board also built and maintained relationships with trade associations and industry

groups that were knowledgeable about suppliers and component technologies. As a result, open innovation was critical to OA, as it provided individuals with vital sources of market and technical knowledge that helped them to make sense of emerging opportunities. Our data demonstrated that during a period of market volatility, open innovation and OA allowed Alpha to develop and implement targeted product developments to take advantage of new opportunities, *“our existing business was struggling at the time. We spoke to our customers who showed interest in our [new product] offerings... our laboratory was able to obtain product formulations from one supplier while also obtaining machinery and equipment from another... we modified our machinery and redeployed personnel to produce [new product].”* (Sales Director, Interview).

To facilitate OA, Alpha developed in-house systems and maintained a high level of flexibility in their manufacturing processes. This allowed Alpha to accommodate new opportunities that differed from existing products in terms of new labelling, packaging, and volumes. OA also required a good understanding by managers and individuals about the impacts of change to avoid expending resources on unproductive activities. This was facilitated by knowledge-based agility, that enhanced behavioural agility. Knowledge-based agility formed the frames of reference through which managerial decisions about whether to act on a new opportunity occurred. Furthermore, Alpha encouraged KP and OA by rotating staff which gave rise to multi-skilled individuals and strong intra-organisational relationships. Having such a flexible workforce enabled employees to easily and quickly gain an understanding of distinct roles and perspectives within different departments. Thus, aiding the transfer of knowledge between employees and within intra-organisational knowledge domains.

Discussion

Our study set out to answer the research question, “What are the underlying microfoundations that support the interplay between strategic agility and open innovation?”. By answering our research question, we developed an integrated framework (Fig. 2) to explain the mechanisms of individuals’ actions and how these actions, when combined, allow organisations to continually adapt to environmental changes. We begin this section by explicating the key mechanisms of our framework and their relationships. Next, we discuss the implications of our framework on theory and practice.

Figure 2 – Microfoundational Framework for Understanding Open Innovation – Strategic Agility Interplay

Our analyses helped us reveal six situational mechanisms, which distinguish three action-formation mechanisms in support of strategic agility – open innovation interplay: Knowledge-Based Agility (knowledge permeability and knowledge-base reappraisal), Behavioural Agility (cohesive judgement and decisional precision), Organisational Agility (organisational adaptability and product portfolio elasticity) and the transformational mechanisms, that is their interrelationships. Open innovation is a key mechanism supporting the necessary knowledge inflow (a, in Figure 2) needed for members of the organisation to sense early signs of new opportunities and threats in the marketplace.

Knowledge-Based Agility

To effectively navigate both crises and periods of strategic deliberation, organisations should cultivate knowledge-based agility (b, in Figure 2). This agility is rooted in the interplay between knowledge permeability and knowledge-base reappraisal. *Knowledge permeability* is a

situational mechanism grounded in common knowledge that allows intuitive and unreflective judgments to permeate across epistemic boundaries, such as frontline employees and managers. Knowledge permeability is not only about shared terminology and memory of past events—it also entails staff rotation and leveraging cross-functional roles to remove barriers to understanding, communication, and domain expertise in different organisational units. As such, knowledge permeability is the mechanism that lowers knowledge stickiness and removes friction from organisational knowledge absorption, allowing employees to anticipate and address new opportunities and threats using open innovation.

Knowledge-base reappraisal is the mechanism by which employees across functions and hierarchical levels combine historical knowledge with present knowledge and open innovation-related knowledge inflows to create new knowledge. As such, knowledge-based reappraisal can be leveraged to streamline open innovation activities, reducing project time and resources. However, for knowledge-based agility to generate effective actions, it requires the constitutive situational mechanisms—knowledge permeability and knowledge-base reappraisal—to work in tandem to facilitate the ease of open innovation-related knowledge transfer within and between functions. As such, knowledge permeability and knowledge-base reappraisal are mutually constitutive by way of the former, allowing the functioning of the latter and the latter conditioning the effectiveness of the former. In other words, a precondition for individuals to reassess the knowledge-base and develop new knowledge is that they have access to it (i.e., knowledge is permeable). However, for knowledge to remain permeable, each reappraisal must ensure further permeability in subsequent iterations.

In conjunction with knowledge permeability, knowledge-based reappraisal allows the organisation to streamline interactions with external stakeholders during open innovation

projects by directing individuals to find knowledge effectively in different organisational domains. Thus, knowledge-base reappraisal and permeability contribute to knowledge accumulation, creativity and innovation at lower search costs when mutually constituted. Our analysis reveals how the combination of knowledge permeability and knowledge-base reappraisal can alleviate some of the costs associated with knowledge search (Salter et al., 2015). However, this requires organisations to develop an extensive knowledge-base through staff retention, information archives, and strong relationships with external stakeholders. As such, our study extends beyond the internal-external search cost divide and provides a microfoundational explanation of how both internal and external search become performative through *knowledge-based agility*—the mutual constitution of knowledge permeability and knowledge-base reappraisal triggered by external knowledge inflow from open innovation activities.

However, knowledge-based agility interacts with other situational mechanisms to effectuate synergy between the three action-formation mechanisms, as shown in the framework. Knowledge permeability supports behavioural agility (c, in Figure 2) as it promotes collective learning and the convergence of different epistemic viewpoints. Consequently, knowledge permeability and *cohesive judgement* work in tandem, with the former facilitating knowledge transfer across epistemic boundaries (Håkanson, 2010) and the latter allowing employees to make aligned judgements using such knowledge. This mechanism is underpinned by the mutual constitution of knowledge permeability and knowledge-base reappraisal. Hence, to be effective, knowledge-based agility requires employees to develop a willingness to share information, past experiences, and best practices from open innovation activities.

By allowing knowledge to move easily between epistemic boundaries, knowledge permeability and knowledge-base reappraisal also give rise to *decisional precision*. The ease at

which knowledge permeates epistemic boundaries and the ability to combine knowledge inflows with existing knowledge allows firms to make quick and accurate decisions concerning strategic opportunities, threats and project-related concerns. Collectively, in support of strategic agility – open innovation interplay, these situational mechanisms support the organisation to make intuitive and reflexive decisions about new opportunities and threats and implement efficient responses. As such, our analysis suggests that *knowledge-based agility* is critical for *behavioural agility* in the context of open innovation and thereby effectively supports the organisation's overall strategic agility.

Furthermore, in support of strategic agility – open innovation interplay, *knowledge-based agility*, and *organisational agility* (d, in Figure 2) form a complementary relationship via interactions between their underlying situational mechanisms. Knowledge permeability and knowledge-based reappraisal are essential for firms to enhance innovation and creativity among employees and teams and to implement new products and processes. Improved learning and development allow firms to redeploy individuals while fostering a mutual understanding of the implications of new products. Knowledge-base reappraisal enables product portfolio elasticity through two mechanisms. Firstly, by helping individuals identify new opportunities or make improvements to existing products based on new market knowledge gained through open innovation. Secondly, by providing individuals with knowledge about relevant, targeted products through simplification and rationalisation. As such, our analysis reveals a close relationship between knowledge-based agility and organisational agility, where both support each other through their underlying situational mechanisms.

Behavioural Agility

Strategic agility requires firms to adapt to different contexts and situations. Our analysis reveals that the strategic agility – open innovation interplay requires firms to develop *behavioural agility* to positively influence open innovation project performance. Behavioural agility requires a variety of behaviours and skills that support strategic and open innovation project-related decision-making and is underpinned by two situational mechanisms: cohesive judgement and decisional precision.

Cohesive judgement is required for key decision makers within the firm to leverage knowledge inflows during open innovation and take new perspectives. This mechanism works in conjunction with knowledge-based agility by contributing to the collective understanding of current issues in conjunction with new information derived from open innovation knowledge inflows. Thus, resulting in alignment and enabling decisive actions to be taken. Cohesive judgement enhances *organisational adaptability* by enabling new open innovation projects. This is accomplished when departmental managers have a good understanding of project requirements and receive clear direction from the board. As such, this helps key internal stakeholders conduct the necessary activities to implement open innovation projects. By fostering a collective understanding of open innovation projects, key internal stakeholders become aligned and therefore able to implement the necessary changes to people, systems, products, and processes. However, to develop cohesive judgement, organisations must cultivate an environment of trust, local empowerment, and collaboration in support of open innovation projects.

Our analysis also reveals that organisations require the situational mechanism of *decisional precision* in support of the strategic agility – open innovation interplay. Existing literature is clear about the benefit of agile decision-making for enabling firms to formulate

suitable strategic responses (Doz & Kosonen, 2008a, 2008b, 2010; Prange, 2021). During open innovation projects, decisional precision is necessary for efficient and effective technical and market-related decisions. Consequently, decisional precision requires firms to develop a good understanding of what can and cannot be accomplished to optimize resource efficiency and enhance the productivity of open innovation projects. When organisations engage in open innovation, they can benefit from external knowledge that can enhance decisional precision through technical and market-related knowledge inflows. However, this requires organisations to develop strong relationships with external stakeholders to facilitate access to external knowledge resources.

Decisional precision is supported by *knowledge-based agility* via knowledge-based assets used to derive productive knowledge-driven decisions. Aside from project-related activities, decisional precision also contributes to the efficiency and effectiveness of judgements concerning whether to pursue future open innovation projects (i.e., strategic decisions). Under these circumstances, previous project experience allows key decision-makers to assess the likelihood of project success or failure at an early stage (decisional precision). This allows for a strategic focus on promising projects while avoiding the allocation of resources to those with a high probability of failure. Open innovation is essential in this process, as it enriches the firm's existing knowledge-base with insights from external stakeholder engagement. This extensive knowledge base provides early indications of whether the firm has the requisite knowledge, expertise, and contacts (via open innovation) to address specific challenges effectively. Learning from past failures is a vital component of this approach (Carmeli & Dothan, 2017), as it enhances the cumulative learning process. As the knowledge base expands, the firm reduces its dependence on resource-intensive and unproductive experiments, leading to a more efficient and

streamlined open innovation process. This continuous improvement serves as the foundation for enhanced decisional precision.

Organisational Agility

Our analysis reveals that *organisational agility* is a key action-formation mechanism supported by two situational mechanisms: *organisational adaptability* and *product portfolio elasticity*.

Following open innovation-derived market knowledge inflows and subsequent open innovation projects, organisational adaptability enables the organisation to remain strategically agile. To implement new products developed through open innovation, the organisation must ensure project outputs can be manufactured efficiently and effectively. However, for this process to be effective, organisational adaptability is necessary and requires the firm to develop a flexible infrastructure through skill-based (multi-skilled, staff rotation) and behavioural mechanisms (autonomous managers, enthusiasm, willingness). Furthermore, open innovation-derived knowledge necessitates the organisation to maintain strong relationships with external stakeholders that are key knowledge inputs into open innovation related decisions. Strong knowledge-based agility supports organisational adaptability, as when taking on new open innovation projects, knowledge inflows are combined with existing knowledge to determine the appropriate implementation activities. However, organisation adaptability requires the organisation to develop multi-skilled employees who foster an environment of learning and understand distinct roles and perspectives. This contributes to knowledge permeability that enables knowledge about new projects and strategic initiatives to flow more freely within the organisation.

Product portfolio elasticity is also critical to strategic agility – open innovation interplay since it allows the organisation to expand and contract its product portfolio in response to

changing market conditions. Open innovation is a key activity in enabling product portfolio elasticity via portfolio expansion through successful open innovation projects. However, this requires the organisation to develop flexibility by continually refining the product portfolio whilst limiting exposure to external stakeholders. Our analysis also reveals that product portfolio elasticity contributes to organisational adaptability through *knowledge-base reappraisal*. In our case, knowledge of past products was frequently leveraged to address current issues, which allowed the organisation to optimise products and processes. Our study, therefore, suggests that when organisations turn to open innovation, the overhead associated with maintaining relationships with external stakeholders is a key consideration. However, external stakeholders are critical to *knowledge-based agility* as a key source of external knowledge. Product portfolio elasticity interplays with *knowledge-base agility* through knowledge inflows that enhance experimentation and creativity, allowing individuals to identify novel uses for new and existing products in response to market-related knowledge inflows.

Finally, as exposed in our study, product portfolio elasticity affects *behavioural agility* via the organisation's *decisional precision*. When firms add new products to their portfolio, they increase their flexibility and responsiveness to new opportunities. This is due to existing products and new innovations that can be deployed to address new and emerging market opportunities. However, by continuously rationalising the product portfolio, firms can efficiently maintain relationships with external stakeholders, granting access to external knowledge that can be leveraged to enhance the productivity of open innovation projects.

Implications for Strategic Agility Theory

The present study offers several implications for strategic agility theory. Our findings from the case of Alpha present a microfoundational perspective on organisational agility, composed of

product portfolio elasticity and organisational adaptability. This specific type of agility differs from the broader strategic agility literature by focusing on the interplay between product portfolio elasticity and organisational adaptability enacted in open innovation processes. For example, Doz and Kosonen (2008a, 2008b, 2010) conceptualised strategic agility as the meta-capabilities of strategic sensitivity, resource fluidity, and leadership unity, which are essential for navigating strategic disruptions. Our findings complement this line of research by uncovering some of the microfoundational mechanisms underlying resource fluidity, that is, *knowledge-base agility*, which is mutually constitutive of the underlying situational mechanisms of *knowledge permeability* and *knowledge-base reappraisal*. These microfoundational mechanisms are recurrently and situationally enacted differently by members of the organisation during open innovation projects. This is related to the inherent dynamics of open innovation-supported NPD initiatives, which continually present different challenges to innovators, managers and other members of the organisation and can be considered situational mechanisms.

Our findings relating to knowledge-based agility further contribute to earlier research that highlights the role of language and culture as facilitators of strategic agility (Brannen & Doz, 2012). Our analysis of Alpha shows how strategic agility is enhanced by knowledge permeability and knowledge-base reappraisal, which jointly enable the development of a shared language and collective understanding. As such, this is a refined understanding of how organisations build strategic sensitivity (Morton, 2023) and hyper-awareness (Shankar et al., 2023), which are paramount to strategic agility (Doz, 2020; Doz & Kosonen, 2007, 2008a, 2008b, 2010). The microfoundational perspective provided by our findings also complements research on the development of human capital and learning to foster strategic agility (Carmeli & Dothan, 2017; Franco & Landini, 2022). For example, by emphasising the importance of staff retention and

information archives, our study suggests that knowledge-based agility is critical for the development of a learning environment that supports strategic agility.

Further, Kohtamäki et al. (2020) present the interaction between a firm's entrepreneurial orientation and absorptive capacity in fostering strategic agility. Alpha's success in capitalising on open innovation for NPD echoes this sentiment, where both internal and external knowledge absorption plays a key role in shaping agility. Specifically, we reveal a close relationship between several mechanisms that jointly contribute to the firm's ability to reap the benefits of open innovation in a nimble way. Our findings show that firms enact a nexus of activities from three forms of agility: knowledge-based, behavioural, and organisational, to absorb knowledge from within and outside the organisation and to act entrepreneurially, that is, capturing opportunities arising in the market.

In summary, our findings contribute to and extend the existing literature on strategic agility by providing rich qualitative evidence of how open innovation and strategic agility reciprocally contribute to the firm's ability to align with changes in the marketplace. Our study of Alpha's open innovation-supported NPD initiatives shows how this can be achieved through an intricate web of mechanisms spanning knowledge-based agility, behavioural agility, and organisational agility. These findings underscore the importance of adaptability and flexibility at both the strategic and operational levels of an organisation. More so, our study contributes to the emerging interest in microfoundational aspects of strategic agility. In combination, our findings suggest a restatement of the concept of strategic agility. In contrast with earlier studies suggesting various categories of strategic agility being meta-capabilities (e.g., Doz, 2020; Doz & Kosonen, 2007; Fourné et al., 2014), our findings suggest that strategic agility itself should be conceived as a meta-capability as it inhabits several 'microfoundational agilities' that are

functionally, habitually and behaviourally induced (cf. Winter, 2013). Ours and other microfoundational studies of strategic agility demonstrate a granular difference between strategic agility as an ‘analytical multidimensional concept’ (Weber & Tarba, 2014). Thus, signifying strategic agility as a meta-capability and its microfoundational forms of agility, such as knowledge-based agility, behavioural agility, and organisational agility and their constitutive mechanisms that we have discussed here.

Implications for Open Innovation Theory

Our study also has implications for the open innovation literature. A significant body of open innovation literature considers open innovation antecedents and outcomes and has considered the organisation as the unit of analysis (Chesbrough & Bogers, 2014; Stanko, Fisher, & Bogers, 2017; West & Bogers, 2014). However, recently, scholars have emphasised the need to unpack the microfoundations of open innovation (Bogers et al., 2017). The microfoundations of open innovation is a growing body of research that has considered the relationship between individuals and open innovation outcomes (Majchrzak et al., 2023). This ‘human side’ of open innovation has contributed to our understanding of how individual-level factors such as knowledge and experience (Bogers et al., 2018), CEO characteristics (Ahn, Minshall, & Mortara, 2017; Xia et al., 2023) and leadership behaviours (Rangus & Černe, 2019) impact open innovation outcomes.

By adopting a microfoundations perspective to shed light on the mechanisms that underlie strategic agility in the context of open innovation, our study has implications for existing open innovation theory. For instance, our framework reveals the dynamics between internal and external stakeholders, as well as individual and group activities that shape and are shaped by the relationship between knowledge, individual behaviours, and the organisation. Our

study reveals the complex aggregating effects that shape organisational outcomes which are not captured by individual-level studies (Barney & Felin, 2013). An example of this is the collective decision-making that occurs prior to and during open innovation projects that embody the meta-capabilities of strategic agility, such as collective commitment and resource fluidity (Doz & Kosonen, 2008a, 2008b, 2010). Hence, our framework and its constitutive microfoundations shed light on the aggregating transformative mechanisms that underlie strategic agility. As such, these findings extend earlier research linking open innovation with dynamic capabilities (Bogers et al., 2019) through their microfoundations (Hutton et al., 2021).

While not central to our study, our findings also contribute to prior research that considers isolated mechanisms of open innovation. For example, studies of search activities have demonstrated that obtaining knowledge from a greater number of sources can benefit innovation outcomes (Leiponen & Helfat, 2010) and individual-level creativity (Salter et al., 2015). However, knowledge search is a double-edged sword because excessive exposure to external knowledge can consume resources and hinder innovation processes. Hence, to benefit from knowledge search, individuals must first refine their search activities (Lopez-Vega et al., 2016) and balance exposure to internal and external knowledge sources to integrate external knowledge during open innovation activities (Dahlander et al., 2016). Our findings extend this research by demonstrating a key mechanism, knowledge-based agility, that explains how organisations can improve the efficiency of search activities. For instance, it enables autonomous internal stakeholders to easily obtain knowledge in support of open innovation search activities. Additionally, our framework reveals how this mechanism interacts with other supporting and transformative mechanisms that, when combined, enhance the organisation's open innovation search activities.

Implications for Practice

Our research provides new insights into key considerations for organisations looking to combine strategic agility and open innovation. Firstly, we demonstrate the importance of knowledge sharing and retention facilitated through various horizontal and vertical communication channels. External knowledge and ideas are valuable resources for open innovation projects but, without a solid knowledge-base, firms might experience difficulties leveraging and diffusing external knowledge inside the firm. Secondly, our research reveals a number of behavioural considerations, such as leadership team alignment and departmental alignment, that can help firms overcome some of the challenges associated with open innovation adoption. Additionally, we shed light on the crucial role of informed decision-making and how it affects the efficiency of open innovation projects by influencing the selection and development process. Thirdly, we also demonstrate a number of factors that affect whether firms are able to reconfigure to accommodate new open innovation projects, such as the flexibility of the workforce, processes, systems and equipment. Finally, our research reveals that board members, departmental managers, and individuals working in departments make a critical contribution to the different forms of agility that arise from such considerations.

Conclusions and Limitations

At the start of our research, we set out to explore the microfoundations of strategic agility within the context of open innovation. Through careful examination of a firm's strategic and open innovation activities, we have identified six microfoundations that underlie the strategic agility-open innovation relationship. These microfoundations operate across multiple levels of analysis and give rise to a firm-level capability through three types of agility: knowledge-based agility,

behavioural agility, and organisational agility. However, our study has also demonstrated the explanatory power of adopting a microfoundations perspective (Felin et al., 2015) to shed light on the aggregating mechanisms that underlie strategic agility in the context of open innovation. By adopting a microfoundations lens, our study opens doors for future research that could examine strategic agility – open innovation microfoundations in different firms or environmental contexts. Thus, helping to shed light on the complexities associated with the heterogeneity of firm resources in the context of strategic agility.

While our case study offers a rich insight into the intra-organisational mechanisms that underlie the strategic agility – open innovation relationship, it is not without limitations, and these, however, may open some avenues for future research. For instance, the study was conducted at a small to medium sized UK manufacturing firm that represents a boundary condition of our research. Although our study was rigorous and theoretically underpinned, the organisation may have some unique characteristics that require additional explanatory factors. For example, while we have not explicitly theorised the ownership structure of our case company—a family-owned firm—recent research demonstrates vast opportunities to explore the implications of “openness” and the work across organisational boundaries among family businesses (Lambrechts et al., 2023). However, our more general approach allows future studies to build on our work by examining multi-level activities that relate to strategic agility and open innovation within a variety of organisations. This offers an opportunity to develop models and insights into the relationships between strategic agility and open innovation in firms that range in size and operate within different industry settings. Indeed, our focus on strategic agility in the context of open innovation could be refined further by exploring the microfoundations of other critical types of agility in relation to open innovation. A particularly promising area of research is

the interplay between artificial intelligence tools that support open innovation activities and strategic agility (Nambisan, Siegel, & Kenney, 2018). That said, our contributions to the strategic agility literature rest on a novel microfoundational approach that hopefully sets the direction for further studies at the interface of strategic agility and open innovation.

References

- Aguinis H, Molina-Azorín JF. 2015. Using multilevel modeling and mixed methods to make theoretical progress in microfoundations for strategy research. *Strategic Organization* **13**(4): 353-364
- Aguinis H, Solarino AM. 2019. Transparency and replicability in qualitative research: The case of interviews with elite informants. *Strategic Management Journal* **40**(8): 1291-1315
- Ahn JM, Minshall T, Mortara L. 2017. Understanding the human side of openness: the fit between open innovation modes and CEO characteristics. *R&D Management* **47**(5): 727-740
- Annosi MC, Lanzolla G. 2023. The Evolution of Line Managers during Agile Transformation: From Missionaries To Priests. *California Management Review* **65**(4): 116-136
- Barney JB, Felin T. 2013. What Are Microfoundations? *Academy of Management Perspectives* **27**(2): 138-155
- Bingham CB, Eisenhardt KM. 2011. Rational heuristics: the ‘simple rules’ that strategists learn from process experience. *Strategic Management Journal* **32**(13): 1437-1464
- Bogers M, Chesbrough H, Heaton S, Teece DJ. 2019. Strategic Management of Open Innovation: A Dynamic Capabilities Perspective. *California Management Review* **62**(1): 77-94
- Bogers M, Foss NJ, Lyngsie J. 2018. The “human side” of open innovation: The role of employee diversity in firm-level openness. *Research Policy* **47**(1): 218-231
- Bogers M, Zobel A-K, Afuah A, Almirall E, Brunswicker S, Dahlander L, Frederiksen L, Gawer A, Gruber M, Haefliger S, Hagedoorn J, Hilgers D, Laursen K, Magnusson MG, Majchrzak A, McCarthy IP, Moeslein KM, Nambisan S, Piller FT, Radziwon A, Rossi-Lamastra C, Sims J, Ter Wal ALJ. 2017. The open innovation research landscape: established perspectives and emerging themes across different levels of analysis. *Industry and Innovation* **24**(1): 8-40
- Brannen MY, Doz YL. 2012. Corporate Languages and Strategic Agility: Trapped in your Jargon or Lost in Translation? *California Management Review* **54**(3): 77-97
- Cai Z, Liu H, Huang Q, Liang L. 2019. Developing organizational agility in product innovation: the roles of IT capability, KM capability, and innovative climate. *R&D Management* **49**(4): 421-438
- Carmeli A, Dothan A. 2017. Generative work relationships as a source of direct and indirect learning from experiences of failure: Implications for innovation agility and product innovation. *Technological Forecasting and Social Change* **119**: 27-38
- Chesbrough HW. 2003. *Open Innovation: The New Imperative for Creating and Profiting From Technology*. Harvard Business School Press: Boston, MA

- Chesbrough HW, Bogers M. 2014. Explicating Open Innovation. In H Chesbrough, W Vanhaverbeke, J West (Eds.), *New Frontiers in Open Innovation*: 3-27. Oxford University Press: New York
- Cunha MPE, Gomes E, Mellahi K, Miner AS, Rego A. 2020. Strategic agility through improvisational capabilities: Implications for a paradox-sensitive HRM. *Human Resource Management Review* **30**(1): 100695
- Dabić M, Daim T, Bogers MLAM, Mention A-L. 2023. The limits of open innovation: Failures, risks, and costs in open innovation practice and theory. *Technovation* **126**: 102786
- Dahlander L, Gann DM. 2010. How open is innovation? *Research Policy* **39**(6): 699-709
- Dahlander L, O'Mahony S, Gann DM. 2016. One Foot In, One Foot Out: How Does Individuals' External Search Breadth Affect Innovation Outcomes? *Strategic Management Journal* **37**(2): 280-302
- Demir R, Campopiano G, Kruckenhauser C, Bauer F. 2021. Strategic agility, internationalisation speed and international success — The role of coordination mechanisms and growth modes. *Journal of International Management* **27**(1): 100838
- Demir R, Lychnell L-O. 2015. Mangling the process: A meta-theoretical account of process theorizing. *Qualitative Research* **15**(1): 85-104
- Doz YL. 2020. Fostering strategic agility: How individual executives and human resource practices contribute. *Human Resource Management Review* **30**(1): 100693
- Doz YL, Kosonen M. 2007. The new deal at the top. *Harvard Business Review* **85**(6): 98-104, 142
- Doz YL, Kosonen M. 2008a. The Dynamics of Strategic Agility: Nokia's Rollercoaster Experience. *California Management Review* **50**(3): 95-118
- Doz YL, Kosonen M. 2008b. *Fast Strategy: How Strategic Agility Will Help You Stay Ahead of the Game*. Pearson Education: Harlow
- Doz YL, Kosonen M. 2010. Embedding Strategic Agility: A Leadership Agenda for Accelerating Business Model Renewal. *Long Range Planning* **43**(2-3): 370-382
- Du J, Leten B, Vanhaverbeke W. 2014. Managing open innovation projects with science-based and market-based partners. *Research Policy* **43**(5): 828-840
- Eisenhardt KM. 1989. Building Theories from Case Study Research. *Academy of Management Review* **14**(4): 532-550
- Eisenhardt KM, Graebner ME. 2007. Theory Building from Cases: Opportunities and Challenges. *Academy of Management Journal* **50**(1): 25-32
- Felin T, Foss NJ, Heimeriks KH, Madsen TL. 2012. Microfoundations of Routines and Capabilities: Individuals, Processes, and Structure. *Journal of Management Studies* **49**(8): 1351-1374
- Felin T, Foss NJ, Ployhart RE. 2015. The Microfoundations Movement in Strategy and Organization Theory. *Academy of Management Annals* **9**(1): 575-632
- Felin T, Kauffman S, Zenger T. 2023. Resource origins and search. *Strategic Management Journal* **44**(6): 1514-1533
- Ferraris A, Degbey WY, Singh SK, Bresciani S, Castellano S, Fiano F, Couturier J. 2022. Microfoundations of Strategic Agility in Emerging Markets: Empirical Evidence of Italian MNEs in India. *Journal of World Business* **57**(2): 101272
- Fourné SPL, Jansen JJP, Mom TJM. 2014. Strategic Agility in MNEs: Managing Tensions to Capture Opportunities across Emerging and Established Markets. *California Management Review* **56**(3): 13-38

- Franco C, Landini F. 2022. Organizational drivers of innovation: The role of workforce agility. *Research Policy* **51**(2): 104423
- Gioia D, Corley K, Eisenhardt K, Feldman M, Langley A, Lê J, Golden-Biddle K, Locke K, Mees-Buss J, Piekkari R, Ravasi D, Rerup C, Schmid T, Silverman D, Welch C. 2022. A Curated Debate: On Using “Templates” in Qualitative Research. *Journal of Management Inquiry* **31**(3): 231-252
- Gioia DA, Corley KG, Hamilton AL. 2013. Seeking Qualitative Rigor in Inductive Research. *Organizational Research Methods* **16**(1): 15-31
- Girod SJG, Birkinshaw J, Prange C. 2023. Business Agility: Key Themes and Future Directions. *California Management Review* **65**(4): 5-21
- Håkanson L. 2010. The firm as an epistemic community: the knowledge-based view revisited. *Industrial and Corporate Change* **19**(6): 1801-1828
- Hedström P, Wennberg K. 2017. Causal mechanisms in organization and innovation studies. *Innovation* **19**(1): 91-102
- Hedström P, Ylikoski P. 2010. Causal Mechanisms in the Social Sciences. *Annual Review of Sociology* **36**(1): 49-67
- Heracleous L, Wawarta C, Papachroni A, Paroutis S. 2023. Logical Incrementalism as a Path to Strategic Agility: The Case of NASA. *California Management Review* **65**(4): 63-92
- Hutton S, Demir R, Eldridge S. 2021. How does open innovation contribute to the firm's dynamic capabilities? *Technovation* **106**: 102288
- Kohtamäki M, Heimonen J, Sjödin D, Heikkilä V. 2020. Strategic agility in innovation: Unpacking the interaction between entrepreneurial orientation and absorptive capacity by using practice theory. *Journal of Business Research* **118**: 12-25
- Lambrechts F, Huybrechts J, De Massis A, Lehmann EE. 2023. The “open family firm”: openness as boundary work in family enterprises. *Small Business Economics* **60**(4): 1307-1322
- Langley A. 1999. Strategies for Theorizing from Process Data. *Academy of Management Review* **24**(4): 691-710
- Leiponen A, Helfat CE. 2010. Innovation objectives, knowledge sources, and the benefits of breadth. *Strategic Management Journal* **31**(2): 224-236
- Lewis MW, Andriopoulos C, Smith WK. 2014. Paradoxical Leadership to Enable Strategic Agility. *California Management Review* **56**(3): 58-77
- Liao S, Liu Z, Ma C. 2019. Direct and configurational paths of open innovation and organisational agility to business model innovation in SMEs. *Technology Analysis & Strategic Management* **31**(10): 1213-1228
- Lopez-Vega H, Tell F, Vanhaverbeke W. 2016. Where and how to search? Search paths in open innovation. *Research Policy* **45**(1): 125-136
- Majchrzak A, Bogers MLAM, Chesbrough H, Holgersson M. 2023. Creating and Capturing Value from Open Innovation: Humans, Firms, Platforms, and Ecosystems. *California Management Review* **65**(2): 5-21
- Mantere S, Ketokivi M. 2013. Reasoning in Organization Science. *Academy of Management Review* **38**(1): 70-89
- Miles MB, Huberman AM, Saldaña J. 2020. *Qualitative Data Analysis: A Methods Sourcebook* (4 ed.). SAGE Publications: Thousand Oaks, CA
- Morton J. 2023. Strategy Making as Polyphony: How Managers Leverage Multiple Voices in Pursuing Agility. *California Management Review* **65**(4): 22-42

- Morton J, Stacey P, Mohn M. 2018. Building and Maintaining Strategic Agility: An Agenda and Framework for Executive IT leaders. *California Management Review* **61**(1): 94-113
- Nambisan S, Siegel D, Kenney M. 2018. On open innovation, platforms, and entrepreneurship. *Strategic Entrepreneurship Journal* **12**(3): 354-368
- Palmié M, Rüegger S, Parida V. 2023. Microfoundations in the strategic management of technology and innovation: Definitions, systematic literature review, integrative framework, and research agenda. *Journal of Business Research* **154**: 113351
- Petruzzelli AM, Murgia G, Parmentola A. 2022. How can open innovation support SMEs in the adoption of I4.0 technologies? An empirical analysis. *R&D Management* **52**(4): 615-632
- Prange C. 2021. Agility as the Discovery of Slowness. *California Management Review* **63**(4): 27-51
- Prange C, Hennig A. 2019. From Strategic Planning to Strategic Agility Patterns. *Journal of Creating Value* **5**(2): 111-123
- Randhawa K, Wilden R, Hohberger J. 2016. A Bibliometric Review of Open Innovation: Setting a Research Agenda. *Journal of Product Innovation Management* **33**(6): 750-772
- Rangus K, Černe M. 2019. The impact of leadership influence tactics and employee openness toward others on innovation performance. *R&D Management* **49**(2): 168-179
- Renault M-A, Tarakci M. 2023. Affective Leadership in Agile Teams. *California Management Review* **65**(4): 137-157
- Sætre AS, Van De Ven A. 2021. Generating Theory by Abduction. *Academy of Management Review* **46**(4): 684-701
- Saldaña J. 2009. *The coding manual for qualitative researchers*. Sage: London
- Salter A, Ter Wal AL, Criscuolo P, Alexy O. 2015. Open for ideation: Individual-level openness and idea generation in R&D. *Journal of Product Innovation Management* **32**(4): 488-504
- Sampath G, Bhattacharyya SS, Krishnamoorthy B. 2021. Microfoundations approach to strategic agility – Exploration to operationalization. *Journal of General Management* **46**(2): 103-128
- Schatzki TR. 2006. On Organizations as they Happen. *Organization Studies* **27**(12): 1863-1873
- Shankar RK, Bettenmann D, Giones F. 2023. Building Hyper-Awareness: How to Amplify Weak External Signals for Improved Strategic Agility. *California Management Review* **65**(4): 43-62
- Soetanto D, Demir R. 2023. The Impact of Networking With Knowledge-Intensive Professional Service Firms on Speed to Market and Product Innovativeness. *IEEE Transactions on Engineering Management* **Early Access**
- Stanko MA, Fisher GJ, Bogers M. 2017. Virtual issue editorial: Under the wide umbrella of open innovation. *Journal of Product Innovation Management* **34**(4): 543-558
- Teece DJ, Peteraf M, Leih S. 2016. Dynamic Capabilities and Organizational Agility: Risk, Uncertainty, and Strategy in the Innovation Economy. *California Management Review* **58**(4): 13-35
- Tsinopoulos C, Yan J, Sousa CMP. 2019. Abandoning innovation activities and performance: The moderating role of openness. *Research Policy* **48**(6): 1399-1411
- Vanhaverbeke W, Chesbrough H. 2014. A Classification of Open Innovation and Open Business Models. In H Chesbrough, W Vanhaverbeke, J West (Eds.), *New Frontiers in Open Innovation*, Vol. 6: 50-68. Oxford University Press: Oxford

- Vrontis D, Belas J, Thrassou A, Santoro G, Christofi M. 2023. Strategic agility, openness and performance: a mixed method comparative analysis of firms operating in developed and emerging markets. *Review of Managerial Science* **17**(4): 1365-1398
- Weber Y, Tarba SY. 2014. Strategic Agility: A State of the Art. *California Management Review* **56**(3): 5-12
- Weiblen T, Chesbrough HW. 2015. Engaging with Startups to Enhance Corporate Innovation. *California Management Review* **57**(2): 66-90
- West J, Bogers M. 2014. Leveraging External Sources of Innovation: A Review of Research on Open Innovation. *Journal of Product Innovation Management* **31**(4): 814-831
- Winter SG. 2013. Habit, Deliberation, and Action: Strengthening the Microfoundations of Routines and Capabilities. *Academy of Management Perspectives* **27**(2): 120-137
- Xia Q, Tan M, Cao Q, Li L. 2023. The microfoundations of open innovation: CEO overconfidence and innovation choices. *R&D Management* **53**(1): 43-57
- Zhang H, Ma Z, Liang X, Garrett TC. 2023. Antecedents and outcomes of open innovation over the past 20 years: A framework and meta-analysis. *Journal of Product Innovation Management* <https://doi.org/10.1111/jpim.12710>