A Firm's Absorptive Capacity: The Role of Management Controls

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Chapter 1

General Introduction

About 90% of all businesses are Medium and small-sized enterprises (SMEs). SMEs contribute 70% of the global GDP and 70% of worldwide employment, announced by the world economic forum report on the role of SMEs in 2023 (World Economic Forum, 2023). In Europe, according to the European union in 2018, 99.98% of all firms are SMEs responsible for 63% of employement in Europe (European union, 2022). Therefore, it is pertinent to question how SMEs, as the backbone of global economic growth, encounter environmental turbulence when the world changes faster than ever. While technological advancement alters the status quo of any industry with no exception, SMEs seek strategies and pathways to address environmental challenges and optimally leverage upcoming opportunities. Therefore, SMEs are encouraged and even required to engage with topics related to keeping their business relevant, given the pace and direction of their changing environment. Rapidly changing environments make it necessary, also for SMEs, to change. A capability that helps SMEs to change is absorptive capacity (AC). Zahra and George (2002, p. 186) define a firm's AC as "a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability." An SME's AC will help it to cope with environmental changes. Therefore, I will study the antecedents of AC development in SMEs throughout this dissertation.

This dissertation aims to delve further into two main antecedents of AC at the organizational level, being prior knowledge and internal mechanisms. AC is defined as innovation ability; moreover, AC is rooted in organizational learning processes, which entail capabilities to identify new external knowledge and benefit from it (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998). AC is an umbrella term comprising four distinct capabilities of acquisition, assimilation, transformation, and exploitation of new external knowledge (Zahra and George, 2002). These capabilities are sequential and interrelated since capabilities to transform new external knowledge and implement changes to exploit new knowledge commercially (referring to realized AC) depend on developing abilities to acquire and assimilate new external knowledge (referring to

potential AC) (Zahra and George, 2002). Given the enabling nature of AC for firms, especially in changing environments, the literature discuss the importance and relevancy of developing AC for strategic changes, innovation, performance, and the development of competitive advantages (Lewin, Massini, and Peeters, 2011; Zahra and George, 2002). Consequently, the emergence of AC's importance encourages scholars to question what makes a difference in firms' innovation ability. Therefore, in this dissertation, we answer the calls to study AC's antecedents by an inward-looking approach to the role of prior knowledge and internal organizational mechanisms in AC development (Bedford et al., 2022a; Volberda et al., 2010).

Prior knowledge is the most crucial antecedents of AC in organizations (Cohen and Levinthal, 1990). However, what do we know empirically about the role of different types of internal knowledge (e.g., tacit and explicit) concerning AC development at the organizational level? This is a pertinent question since SMEs are apt for the accumulation of a more tacit type of knowledge (Ngah and Jusoff, 2009). In this dissertation and in line with Nonaka and Von Krogh (2009), we define tacit knowledge as unarticulated knowledge. Tacit knowledge relationship with AC is worth attention since a considerable proportion of knowledge accumulated internally in SMEs is tacit, which is expected to influence SMEs' organizational learning and knowledge creation (Nonaka and Von Krogh, 2009).

In contrast to tacit knowledge, explicit knowledge is the type of knowledge that is written down (Smith, 2001). Since performance measurement systems (PMS) are functional information provision tools that formally record control information, we focus on PMS to capture the extent of explicit knowledge (Guenther and Heinicke, 2019). Specifically, this study delves into the role of performance measurement systems (PMS) design, boundary, and belief controls, and utilizing control information in a diagnostic or interactive manner. These factors are crucial components of management control that significantly impact firms' pursuit of objectives, such as organizational learning, knowledge creation, and innovation (Bisbe and Malagueno, 2015; Chenhall, 2005; Henri, 2006a; Henri and Wouters, 2020).

This dissertation begins by elaborating on the motivation behind the research conducted in the first section. The second section explains why tacit knowledge and PMS deserve increased attention as potential antecedents of organizational AC. Furthermore,

the third section discusses the theoretical lens applied to this research endeavor. The next section offers an overview of the methods applied throughout this dissertation. Lastly, the fourth section serves as a summary of the forthcoming chapters.

Research motivation

Firms in the 21st century face far-reaching environmental changes like globalization, new technologies, increasing demand for environmental responsibility, unprecedented customer expectations, and increasing complexity in the dynamics of value-creating systems (Gunasekaran, Subramanian, and Ngai, 2019; Lips-Wiersma, 2019). These changes can stimulate the perceived importance of innovation and, consequently, innovativeness in SMEs for short-term survival and long-term growth (Bodlaj and Cater, 2019). However, SMEs' rate of innovation compared to their larger counterparts is significantly less (European Union, 2022). Given that AC is one of the antecedents of innovation in SMEs, focusing on AC[1], I study potential factors influencing AC development (Muller, Buliga, and Voigt, 2020). Studying AC's antecedents can clarify why SMEs fail to recognize external knowledge's value. Moreover, I expect unraveling the antecedents of AC improve our understanding of why some SMEs can recognize the value of external knowledge but fail to benefit from it commercially. All in all, studying AC antecedents in SMEs facilitates SMEs' understanding of what are the pertinent factors helping them to stay relevant.

I disentangle prior knowledge and organizational internal mechanisms as the most critical antecedents of AC at the organizational level. Tacit knowledge and PMS design address the urge to differentiate two types of prior knowledge accumulated in SMEs concerning AC development. Moreover, the levers of boundary and belief controls, diagnostic and interactive use of control information captures organizational internal mechanism closely aligned with how managers use performance information to conduct strategic changes. Therefore, I study whether and how these levers of control relate to developing AC capabilities. Finally, I extend whether the lever of control relationship with AC capabilities is the same for SMEs with abundant resources. Thus, I delve into

[1] First, we focused on strategic change and innovation as the main variables of interest. However, due to a lack of promising results, we decided to focus on absorptive capacity and highlight the relevance of our findings to our primary research goal through the literature discussing the linkage between absorptive capacity, strategic change, and innovation (e.g., Lewin, Massini, and Peeters, 2011; Zahra and George, 2002).

the potential moderating influence of HR and financial slack resources in the LOC-AC relationship.

Overall, first, by focusing on the different types of prior knowledge, we test the relationship between tacit and explicit knowledge captured by PMS design. Moreover, I also study how managers use performance information concerning AC through the LOC framework. In the end, I also study whether the relationship managers use levers of control with AC is the same for SMEs with abundant levels of resources. In the following parts, I introduce the key variables of this dissertation, including absorptive capacity, tacit knowledge, performance information systems in terms of design and use, levers of control, and tacit knowledge.

Absorptive capacity

In this part, I highlight the importance of AC, define each capability incorporated into AC, and introduce how AC is measured. AC can improve SMEs' performance and facilitates strategic change, innovation, and competitive advantage (Flatten, Greve, and Brettel, 2011; Lewin, Massini, and Peeters, 2011; Zahra and George, 2002). By emphasizing external knowledge, AC enables firms to outperform rivals through continuous innovation; thus, making firms more dynamic and evolution-prone (Todorova and Durisin, 2007; Lane et al., 2006). In this way, valuing potentially beneficial external knowledge increases internal flexibility and adaptation to changing circumstances (Zahra and George, 2002). The emphasis on external knowledge advocates an entrepreneurial mindset where AC facilitates opportunity recognition and implementation of changes optimally in such a harmonized way that a firm commercially benefits the most (Saemundsson and Candi, 2017; Lewin et al., 2011). Therefore, AC compromises dimensions that are sequential, path-dependent, and accumulative (Cohen and Levinthal, 1990).

Zahra and George (2002) introduce absorptive capacity as a dynamic capability that compromises the acquisition and assimilation of new external knowledge, which they label potential AC. In the next step, known as realized AC, knowledge transformation converts the new knowledge into a doable profitable change, and in the end, exploitation of new external knowledge occurs. Since then, there has been a consensus that AC is a multi-dimensional construct (Song et al., 2018). Therefore, each capability compromises

one dimension of AC, incorporating into the whole process in which capabilities are interconnected and sequential. First, the acquisition dimension refers to the capability that identifies and gains external knowledge (Flatten et al., 2011a). Zahra and George (2002, p 189) define the acquisition dimension as "a firm's capability to identify and acquire externally generated knowledge that is critical to its operations." The new knowledge can originate from various external sources, including suppliers, customers, technology-related domains, industry, and so forth (Ben-Oz and Greve, 2012).

Acquisition capability is a latent (unobserved) variable that is measured by three indicators. The first indicator measures the search for relevant information concerning the industry (the firm operating in) regularly. The second indicator measures how much managers motivate employees to use information sources within the industry. The third indicators measure how much managers expect employees to deal with information beyond the firm's industry. Flatten et al. (2011a) introduced these three questions as elements reflecting AC's acquisition capability.

Second, in the assimilation dimension, firms develop a capability to communicate new knowledge throughout an organization and it is focused on a shared understanding and interpretation (Flatten et al., 2011a). In this dimension, the idiosyncratic characteristics of firms influence how they understand, comprehend, and interpret new knowledge through internal dissemination and knowledge communication (Flatten et al., 2011a; Szulanski, 1996). The assimilation dimension explains why some firms overlook potentially valuable external knowledge and lack the capability to appreciate it (Patterson and Ambrosini, 2015).

The assimilation capability of AC is a latent variable measured by four indicators. The first indicator measures the extent of information and idea communication across departments. The second indicator focuses on management support for solving problems through cross-department collaboration. The third indicator measures how quickly information spreads internally. Moreover, the last indicator measures how often there are cross-department meetings to exchange ideas and problems. The four indicators together reflect AC's assimilation capability (Flatten et al., 2011a).

Third, in the transformation dimension, firms internalize new knowledge and convert it via synergy, recodification of prior knowledge based on new knowledge, and

bisociation (Zahra and George, 2002). In transformation, the focus on generating modified knowledge has similarities with knowledge integration, knowledge creation, and idea generation, while a vital difference lies in the emphasis on converting knowledge into a usable and beneficial form (Flatten et al., 2011a).

The transformation capability is a latent variable measured by five reflective indicators (Flatten et al., 2011a). The first indicator measures how much employees can structure and use self-collected knowledge. The second indicator focuses on how much is common for employees to absorb new knowledge. The third indicator measures the extent employees process new knowledge to apply it. The fourth indicator measures employees' successful linkages between new knowledge and their insight. In the last indicator, the focus is on the ability of employees to apply new knowledge in their practical work setting. These five questions reflect the transformation capability of AC in organizations (Flatten et al., 2011a).

Fourth, in the exploitation dimension, the commercial use of knowledge, like product or process development, has a central emphasis (Cohen and Levinthal, 1990; Todorova and Durisin, 2007). Exploitation applies the transformed knowledge to expand the firm's routines, competencies, processes, and technologies to create something new (Zahra and George, 2002).

To measure the exploitation capability of organizations, in this dissertation, I used three indicators focusing on the application of new knowledge. The first indicator measures management's support for the prototype's development. The second indicator is how closely the company follows new technology trends and adapts accordingly. The last indicator measures how much a company can work more effectively by adapting new technology. The three indicators mentioned above measure exploitation capability as a latent variable (Flatten et al., 2011a). Exploitation is closely linked to changes in the company, often strategic changes.

The capabilities of acquisition and assimilation of new external knowledge, referring to potential AC, explore potentially relevant and valuable knowledge, which in terms of outcome, enhances flexibility and renews the internal knowledge base (Zahra and George, 2002). Potential AC perceives and anticipates upcoming changes, capitalizes on emerging opportunities, and involves continuous environment scanning and search; thus,

while it takes time and investment, it associates with firms' memory (Ben-Menahem et al., 2013; Ben-Oz and Greve, 2012; Zahra and George, 2002). The second two capabilities of transformation and exploitation, referring to realized AC, render immediate returns since realized AC involves changing how a business functions (Ben-Menahem et al., 2013; Ben-Oz and Greve, 2012). Potential AC sustains competitive advantage by helping firms stay alert and flexible to learn while realized AC enhances short-term return (Volberda, Foss, and Lyles, 2010; Zahra and George, 2002). There is a consensus in the literature that potential AC determines realized AC while AC without a full picture of the four capabilities makes less if not no sense (Todorova and Durisin, 2007; Zahra and George, 2002).

Since the importance of AC is evident, questioning what drives AC is pertinent and has the utmost value. Prior research has studied AC's antecedents, including prior related knowledge as a prerequisite for learning (Lane, Salk, and Lyles, 2001), managerial information provision and behavior (Lenox and King, 2004), performance feedback (Ben-Oz and Greve, 2015), organizational structure (Volberda et al., 2010), coordination and socialization capabilities (Jansen, Van Den Bosch, and Volberda, 2005; Van den Bosch, Volberda, and de Boer, 1999), and performance measurement design choices (Bedford, Bisbe, and Sweeney, 2022a). Moreover, there have been numerous studies about the relevancy of PMS design and use for innovation (e.g., Bisbe and Malagueno, 2015; Muller-Stewens et al., 2020; Henri and Wouters, 2020), development of organizational dynamic capabilities (e.g., Bellora-Bienengraber, Derfuss, and Endrikat, 2022; Henri, 2006a; Mundy, 2010), and organizational learning (Chenhall, 2005; Widener, 2007). However, there is still much to discover about the PMS-AC relationship at the organizational level (Bedford et al., 2022a). In addition to studying *what* drives AC at the organizational level, it is worth noting *how* these antecedents relate to AC. Thus, it is relevant, practical, and enriching to study AC with a broader understanding of *what* and *how* antecedents influence AC development in organizations, particularly by focusing on SMEs (Bouguerra et al., 2021; McKelvie, Wiklund, and Brattstrom, 2018).

After introducing AC, we focus on prior knowledge (tacit knowledge and PMS diversity). After that, the way managers can use control information is introduced. Ultimately, we introduce slack resources as a contextual element in our research. Additionally, I briefly indicate how the variables are measured.

Tacit knowledge

Tacit knowledge. Most of the existing knowledge is tacit, meaning it is intuitive, unarticulated, subjective, contextual, and manifested implicitly (Polany, 1962; Nonaka and Takeuchi, 1995). In organizations, tacit knowledge which is gained through experience or observation is embedded in the coordination mechanism and can affect the acquisition and assimilation of new knowledge, learning, and innovation activities (Chuang, Jackson, and Jiang, 2016; Kucharska and Erickson, 2023; Lam, 2000). Moreover, given the idiosyncratic and often tacit nature of prior related knowledge in organizations and the fact that prior knowledge is the most vital antecedent of AC, it is surprising that there is much to be studied on the relationship between tacit knowledge and AC (Volberda et al., 2010). To illustrate, as far as our knowledge extends, there hasn't been an empirical exploration of the connection between tacit knowledge and AC.

In this dissertation, tacit knowledge refers to unarticulated knowledge measured as a latent variable. The latent variable is reflective with four indicators. The first indicator focuses on whether the description of usual tasks is entirely specified. The second indicator measures whether the procedures of acting in positions can be written down. The third indicator measures the extent of manuals for job tasks that exist in an organization. The last indicator focuses on the documentation of critical parts of an organization's productivity. These four indicators reflect the extent of unwritten (equivalent to tacit) knowledge that exists in an organization (Garcia-Morales, Llorens-Montes, and Verdu-Jover, 2008).

Performance Measurement Systems and related constructs

PMS design. PMS exists if "financial and non-financial performance measures are used to operationalize strategic objectives" (Franco-Santos, Lucianetti, and Bourne, 2012, p.80). PMS design choices include various characteristics of diversity, integration, aggregation, and timeliness (Bedford et al., 2022a; Chenhall and Morris, 1986). Since diversity renders a richer internal information setting (Dekker, Groot, and Schoute, 2013; Franco-Santos, Lucianetti, and Bourne, 2012), here in this dissertation, we focus on PMS diversity. Therefore, in this dissertation, PMS design refers to a firm's decision to measure a diverse array of performance measures (Ittner, Larcker, and Randall, 2003). In this aspect, firms with higher PMS diversity, implying diverse financial and non-financial

measures, can better navigate goal achievement than firms with narrower PMS designs when, for example, only a few financial indicators are measured (Kerr and Franco-Santos, 2023).

PMS design, which is focused on diversity, is measured by sixteen performance measures suggested by Dekker et al. (2013). The elements include operating income, sales growth, return on investment, net cash flow, cost per unit produced or service added, market share, customer response time, number of customer complaints, the survey of customer satisfaction, material efficiency variance, on-time delivery, labor efficiency variance, number of new products launches, time to market for new products, employee satisfaction, and employee turnover. The PMS information encompasses a comprehensive spectrum of performance data, including aspects such as financial metrics, customer-related statistics, internal business processes, as well as innovation and learning indicators.

To assess the diversity of the PMS, a Herfindahl–Hirschman index (HHI) is employed. The HHI, a widely accepted metric in applied economics (Patil and Taillie, 1982), serves as a standardized gauge of diversity, representing the level of dispersion versus concentration within the PMS information. This index considers the number of performance indicators and the corresponding significance assigned to each of these metrics (Rhoades, 1993).

Levers of Control (LOC). The levers are how formal control systems can be used for strategic change and renewal (Simons, 1994a). Top managers formalize beliefs, define boundaries to distinguish acceptable behavior, monitor performance compared to predefined goals, and motivate debate to mitigate uncertainty during strategic renewal (Simons, 1994a). Therefore, LOC consists of boundary and belief controls as well as diagnostic and interactive use of control information, which managers apply to influence strategic variables including risks to be avoided, core values, critical performance variables, and strategic uncertainties (Simons, 1994a). It is evident that LOC drives innovation and provides a basis for a competitive advantage (Bedford, 2015; Bisbe and Otley, 2004; Curtis, Lillis, and Sweeney, 2017); however, the literature lacks sufficient evidence of whether and how LOC associates with dynamic capabilities (Bellora-Bienengraber et al., 2022) and specifically AC.

Boundary is a latent variable measured by four indicators suggested by Bedford and Malmi (2015). The first indicator focuses on an organization's reliance on a code of business conduct for defining proper behavior. The second indicator emphasizes whether there are guidelines and manuals to inform off-limit behavior. The third indicator measures whether an organization communicates to the employees the risks that must be avoided. In the last indicator, I measure whether there are sanctions for employees who conduct off-limits behavior regardless of the results of their off-limits actions. These measures form the extent of reliance of an organization on boundary controls (Bedford and Malmi, 2015).

Belief is a latent variable formed by four indicators (Bedford and Malmi, 2015). The first indicator focuses on whether there is formal and clear communication of core values. The second indicator emphasizes the management's communication of core values to the staff. The third element measures the communication of core values to create a long-term commitment to the organization's strategy. The last indicator measures whether there is written-down communication to guide and motivate employees to search for new opportunities. The measures mentioned above are the variables forming the latent variable of belief in this dissertation.

The diagnostic use of control information is also a latent variable measured reflectively by five indicators suggested by Bedford, Malmi, and Sandelin (2016) and Bedford and Malmi (2015). The indicators focus on the reliance of top management on key performance indicators to (1) identify critical variables, (2) to target objectives, (3) to assess the achievement of the targets, (4) to obtain information for correction purposes, and (5) to evaluate critical performance areas.

The interactive use of control information is also a latent variable measured by five reflective indicators (Kruis, Spekle´, and Widener, 2016). The interactive use of control information focuses on the use of performance measures (1) to enable discussion in meetings among staff, (2) to provide a shared view of the organization, (3) to tie the organization together, (4) to enable the organization to focus on issues, and (5) to develop a common vocabulary in the organization.

LOC is a variable that captures the commonality between the four levers of control introduced above. The LOC measures simultaneously increase(or decrease) in all the

control levers. Given that managers often use control tools in combination with each other and rarely (if not never) alone in isolation, I believe LOC can be a valid variable to show how the simultaneous use of levers of control relates to AC (Bellora-Bienengraber et al., 2022). LOC is measured as the mean score of boundary and belief controls as well as diagnostic and interactive use of control information. Thus, the average LOC score gauges the degree of focus on the collective use of the levers, irrespective of whether managers are highlighting any specific lever.

Slack resources

Slack resources. To pursue new knowledge absorption, slack resources can provide a stimulating contextual condition where lower competition for resources reinforces the entrepreneurial mindset and mitigates inertia (de Araujo Burcharth, Lettl, and Ulhoi, 2015; Cyert and March, 1963; Kuusela, Keil, and Maula, 2017). Therefore, slack provides a context where risk-taking and experimentation are more probable (Lungeanu, Stern, and Zajac, 2016). Given that two types of slack resources, human resource (HR) and financial slack, affiliate closely with knowledge in organizations (Wang et al., 2016), we further delve into their potential contextual influence and question whether LOC's relationship with AC is moderated by HR and financial slack resources.

HR slack is measured by focusing on the time of all people working in the firm. The measurement of HR slack is calculated after taking into account the extent of the changes in output if 10% of the staff time is occupied by an unrelated task. The higher estimation of the changes in output by managers shows that less HR slack exists. The measurement of financial slack focuses on the changes in the annual operating budget of the firm. Given the assumption that 10% of the annual operating budget is reduced, the expected changes by the managers in the output show the amount of financial slack. The measurement of HR slack and financial slack in this dissertation follows the suggestion of Nohria and Gulati (1996).

Theoretical lens

The theoretical framework in this dissertation is resource-based theory and organizational learning theory. Resource-based theory claims that superior resources and knowledge position relate to organizational success, while organizational learning theory

explains how organizations apply knowledge for better actions (Barney, 1991; Barney, Ketchen, and Wright, 2011; Fiol and Lyles, 1985; Levitt and March, 1988). AC at the organizational level has two streams of antecedents, including prior related knowledge and internal mechanisms (Cohen and Levinthal, 1990; van den Bosch, van Wijk, Volberda, 2005). By applying resource-based theory and organizational learning theory, we delve further into the antecedents of AC, and their interaction with each other. Both explicit as well as tacit knowledge can be considered unique resources of a firm, the use of performance information and the LOC support a firm's organizational learning.

This dissertation applies resource-based theory to explain how tacit knowledge, PMS, and LOC cooperate in developing AC capabilities (Bedford et al., 2022a; Volberda et al., 2010; Widener, 2007). According to Barney et al. (2021a, 1991), the resource-based theory encounters firms as a bundle of heterogeneous resources and capabilities which is long-lasting and not easily mobile across firms to explain the difference between the performance of firms. In addition to the focus of resource-based theory on possessing resources, the resource-based framework also informs the influence of managerial actions on internal resources through resource orchestration in the "strategic resource–firm performance" relationship (D'Oria et al., 2021; Sirmon et al., 2011). Thus, through the resource-based theoretical lens, tacit knowledge, and PMS are involved in the internal knowledge pool which can link the capabilities (e.g., AC capabilities) to new product development (Grant, 1996). Therefore, we study the heterogeneity in AC development and retention through an inward-looking approach to firms' organizational resources and capabilities (Cohen and Levinthal, 1990; Volberda et al., 2010). From a theoretical standpoint, absorptive capacity encompasses organizational routines and strategic processes that acquire, assimilate, transform, and exploit knowledge driven by the diversity of internal expertise (Cohen and Levinthal, 1990; Zahra and George, 2002). In this way, the richer the internal knowledge base (e.g., a more diverse PMS) and the more investment in internal resources (e.g., designing a more diverse and detailed PMS), the higher probability that an organization develops AC (Cohen and Levinthal, 1990). This aligns with the resource-based focus on internal resource heterogeneity and the accumulation of internal resources to explain how the diversity and characteristics of the current internal knowledge base lead to a favorable asymmetry to compete and win new resources (Maritan and Peteraf, 2011; Wernerfelt, 2011). Thus, we apply resource-based theory, and we consider tacit knowledge, and PMS as firm resources which are valuable,

idiosyncratic, and non-substitutable, enabling firms to build new capabilities, implement strategy, improve efficiency and effectiveness (Barney, 1991; Neely et al., 1995; Simons, 1994a).

AC is rooted in organizational learning theory, where organizational actions are path-dependent, goal-oriented, and based on routines (Volberda et al., 2010; Levitt and March, 1988). Fiol and Lyles (1985, p 803) define organizational learning as "the process of improving actions through better knowledge and understanding." I argue organizational learning theory is a relevant framework to make a linkage between LOC and AC. Based on organizational learning theory, firms are the users of knowledge in which diagnostic and interactive use of control information and LOC are the means to learn from the past and improve the forthcoming actions (Naranjo-Gil and Hartmann, 2007; Spender, 1992). Accordingly, diagnostic and interactive use of performance information are related to types of organizational learning (Chenhall, 2003).

Method: survey

We utilize a cross-sectional survey where data are collected through an online questionnaire, aligning with our research objectives focused on higher-level managers (Guenther and Heinicke, 2019; Bedford and Spekle', 2018). We focus on higher-level managers since top managers are more likely to have adequate knowledge to answer our survey questions. Furthermore, surveys have proven to be an effective approach for examining control information in the context of capability development and, more broadly, enhancing the literature on management control (Bellora-Bienengraber et al., 2022). Our research population encompasses active privately held Belgian firms across various industries, except for finance, insurance, and government organizations. We used the Bel-first database of Bureau Van Dijk to select our companies. The database includes the financial statements for all Belgian companies. Reporting requirements imposed by the Belgian government require all limited liability firms—irrespective of their size and age—to file detailed financial statements annually with the Belgian National Bank. Thereafter, we randomly sample the population of firms that have at least a minimum of 10 full-time employees. We used this sample selection criterion since it is commonly observed that companies of this size are more inclined to employ management controls (Davila, 2005). Furthermore, concerning the survey respondents, we rely on the

respondents' job titles and a minimum tenure of one year at the firm to confirm the adequacy of respondents' knowledge relating to managerial decisions[2].

Our random sample to which our survey was mailed, comprises 4,531 companies from the total population of 26,279 active Belgian companies in 2020. Subsequently, we acquired the email addresses of the CEOs of the selected firms in our sample from Trends, a reputable Belgian commercial mailing list provider. The survey was sent in mid-October 2020, followed by two reminders. The first reminder occurred at the end of October 2020, and the second was in mid-November. There were 4,531 email addresses in our sample. However, we reached 4,102 respondents by email because some CEOs in our sample were retired or the submitted emails failed to be delivered. In January 2021, telephone calls were held with respondents started the survey but did not complete it, to convince them to respond to all items. Following the suggestion of DeLeeuw (2018) to offer different response modes, we called 1,216 respondents who answered the survey to some extent. This study yields a 13.55% response rate[3] after acquiring 556 filled-in questionnaires comparable to research targeting top managers in the management accounting literature (e.g., Guenther and Heinicke, 2019; Bedford, Bisbe, and Sweeney, 2019).

After considering only SMEs[4], regarding the analysis of each chapter, we have considered observations from respondents who answered at least 80% of the questions pertaining to each respective chapter. The missing values are considered as random since the pattern of missingness is more due to the length of the survey rather than the value of other variables in the study (Bennett, 2001). Therefore missing values in the dataset cannot influence inferences about the population (Bennett, 2001). Following replacing missing values with the hot-deck imputation method, paper one resulted in 202 observations, paper two comprised 215 observations, and paper three encompassed 211 observations[5]. The difference between the number of observations in the chapters relates

[2] Considering the questionnaire's content (e.g., strategic decisions related to PMS design, quality of managerial application of control systems, and strategic changes), we believe top managers are more likely to be aware of organizational wide-reaching decisions.

[3] The response rate equals 556/4102.

[4] In this thesis, SME refers to firms with less than 500 full-time employees. Moreover, we also analyzed the robustness of our findings in each chapter after defining SMEs as firms with less than 250 full-time employees.

[5] The hot-deck imputation method is one of the single imputation techniques based on replacing missing values when missingness is random (for more information see Bennett, 2001).

to the fact that each chapter contains various questions. Therefore, calculating the number of observations who answered at least 80% of each unique set of questions per chapter ended with slightly different sample sizes[6]. In order to assess the impact of missing values on the findings, we conducted analyses on two additional datasets for each chapter. The first dataset contained maximum 10% missing values, while the second dataset had no missing values (listwise deletion). By undertaking these supplementary analyses, we aimed to evaluate the sensitivity of the conclusions to the cut-off point (i.e., 20% missing value) and the method (single-imputation) used for treating observations with missing values in the primary analyses. However, I acknowledge that the hot deck imputation technique had the drawback of involving arbitrary decisions regarding choosing a similar unit. I confirm our results are trustworthy since supplementary analyses are conducted to monitor how the hot deck imputation technique affected the results. However, I suggest future research consider more recent and less biased methods to handle missing values like multiple imputation and maximum likelihood estimation (Baraldi and Enders, 2010). In contrast to single imputation methods, multiple imputation or maximum likelihood estimation allows for generating the missing value concerning the distribution of the observed data (Baraldi and Enders, 2010). However, we shall notice that every imputation method suffers shortcomings, leaving it to the scholar to decide which technique better serves the research.

Overview of the chapters

The first chapter, co-authored with Martine Cools, Ann Jorissen, Ine Paeleman, and Michiel Van Roy, examines whether and how tacit knowledge relates to AC. In this chapter, we focus on the most important antecedent of AC, which is prior knowledge accumulated internally, and the most predominant type of knowledge, which is tacit (Cohen and Levinthal, 1990; Volberda et al., 2010). Our first aim is to empirically examine how tacit knowledge impacts the different dimensions of AC, as we do not expect an unambiguously positive effect. Next, we wonder whether a firm's explicit formal information base, captured by PMS diversity and representing prior knowledge (PMS diversity) acts as a moderator for the relationship between tacit knowledge and AC,

[6] The cut-off of the 20% missing value is comparable to Rubin (1988).

as providing a diverse set of performance measures might help the firm to develop routines that overcome the potentially paralyzing effects of its tacit knowledge on AC.

While previous research in this field considered knowledge as a general concept (Volberda et al., 2010), first, we focus on the role of two particular types of prior knowledge already present in the firm as antecedents of AC: the extent of tacit knowledge and the diversity of performance measures captured by the formal PMS of the firm. Second, we argue that examining tacit knowledge as an antecedent of AC without considering the moderating role of PMS diversity leads to inconclusive results. Our results show that various types of prior knowledge can have different implications on AC capabilities and potentially interrelational effects on each other. Therefore, for firms aiming to develop AC capabilities should be crucial to understand the structure of knowledge accumulated internally to manage its attempts throughout AC development.

The second chapter, co-authored with Ann Jorissen, Martine Cools, and Ine Paeleman, focuses on PMS design and how control information can be used, particularly diagnostic and interactive use of control information. The results of the previous chapter signal the importance of studying PMS concerning AC capabilities. Consequently, we study whether the diversity of a firm's PMS is associated directly with AC or whether this relationship is mediated by a diagnostic and/or interactive use of control information, another internal organization mechanism. The second chapter contributes to the management accounting literature by providing empirical evidence on the different implications of PMS design and use choices at each dimension of AC.

The third chapter is a solo-authored study that draws on Simons' levers of control (LOC) framework to investigate the relationship between the levers of control with a firm's AC at the organizational level (Simons, 1994a). First, this study examines the relationships between the individual elements of the LOC framework with AC capabilities. After that, we delve into the LOC relationship with AC considering the simultaneous use of the four control levers. In addition, we also explain how a firm's context moderates the relationship between LOC and AC by investigating whether a firm's human resource (HR) and financial slack have a moderating role.

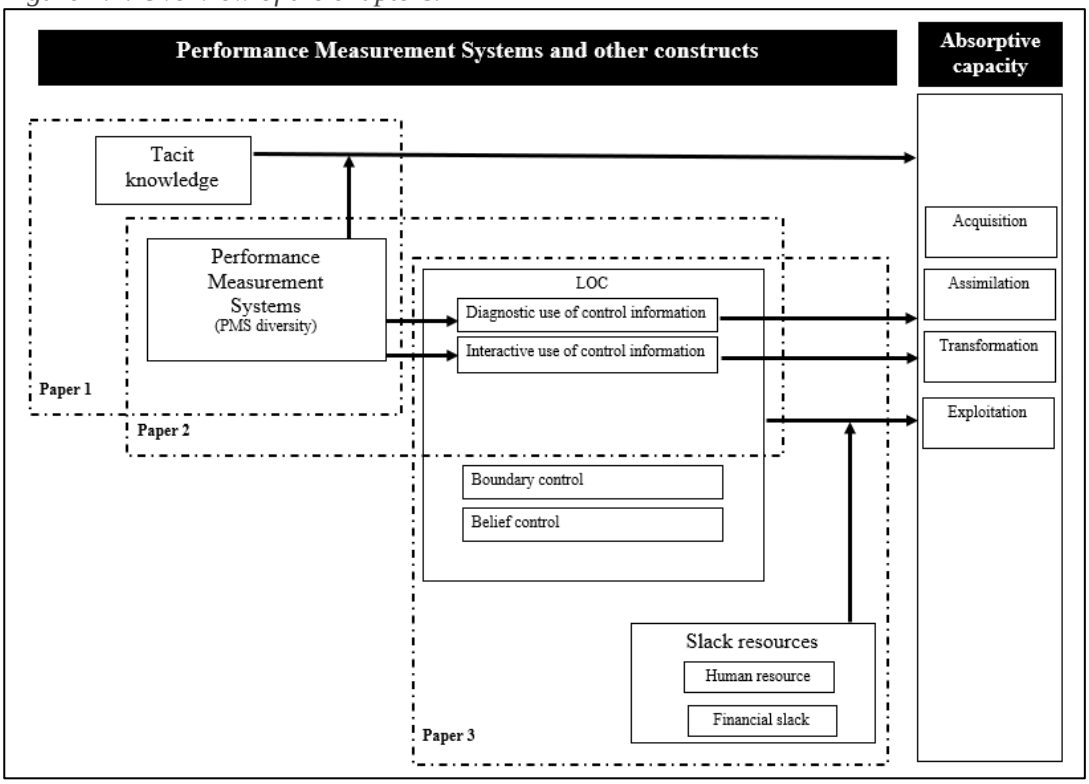
Our examination of the antecedents of AC contributes to the existing body of literature on the relevance of LOC in the development of new capabilities (Albertini, 2019; Henri,

2006a; Mundy, 2010). We respond to the call to investigate LOC's individual and combined effects in the context of new capability building (Bellora-Bienengraber et al., 2022). Furthermore, by exploring the link between LOC and AC, our study adds to the literature that explains why firms face challenges in effectively managing AC (e.g., Bedford et al., 2022a; Jansen et al., 2005).

In conclusion, it is important to exercise caution when interpreting results on a chapter-by-chapter basis, as each model only captures a limited set of variables. This limitation is inherent due to sample size and model complexity. For example, chapter two focuses solely on the interaction between tacit knowledge and PMS diversity without considering how managers utilize performance information to enhance AC capabilities. Chapter three examines PMS diversity use and design, neglecting the level of tacit knowledge and potential interplay among different knowledge types within SMEs. The fourth chapter encompasses various forms of control implementation in firms striving for strategic changes yet overlooks the performance measurement design aspect. Consequently, none of the models estimated in each chapter contains all influencing variables. Nonetheless, despite these limitations, I argue that studying the individual parts of the overall model is both informative and practical.

Figure 1.1 presents an overview of the connections between the chapters presented in this dissertation. The subsequent sections are structured as follows: Chapters 2, 3, and 4 offer detailed examinations of the conducted research, delving into specific aspects and findings. Chapter 5 serves as a general conclusion where I discuss my research endeavor's theoretical and practical contributions, acknowledge its limitations, and propose areas for future research.

Figure 1.1. Overview of the chapters.



Chapter 2

Tacit knowledge and firm's Absorptive Capacity: The moderating role of Performance Measurement Systems Diversity

Abstract

Enhancing absorptive capacity (AC) is crucial for small and medium-sized enterprises (SMEs) to effectively acquire and utilize external knowledge, thereby gaining a competitive advantage. AC consists of four complementary organizational capabilities: acquisition, assimilation, transformation, and exploitation of external knowledge. This paper examines whether or not different types of existing prior knowledge are antecedents to a firm's AC. The literature describes tacit knowledge as an important antecedent of AC. Our first aim is to empirically examine how tacit knowledge impacts the different dimensions of AC, as we do not expect an unambiguously positive effect. Next, we wonder whether a firm's explicit formal information base, captured by PMS diversity and representing formal written firm specific information leading to prior knowledge acts as a moderator for the relationship between tacit knowledge and AC. Providing a diverse set of performance measures might help the firm to develop routines that overcome the potentially paralyzing effects of its tacit knowledge on AC. Our results, based on survey responses collected from 202 privately-held Belgian SMEs, reveal that a higher amount of tacit knowledge is far from being always beneficial for AC development. We also find that firms characterized by a higher amount of tacit knowledge score worse in terms of acquiring new knowledge when having a diversified PMS in place.

Keywords: Absorptive capacity; Tacit knowledge; Performance Measurement Systems.

2.1 Introduction

This paper investigates the importance of organizational tacit knowledge in combination with explicit knowledge as captured by the diversity of the firm's performance measurement system (PMS diversity) representing formal firm-specific information for developing absorptive capacity (AC) in small and medium-sized enterprises (SMEs). Given the speed of change in business today, AC is receiving increasing attention as it can be linked to various organizational outcomes such as strategic flexibility and firm performance (Patel et al.,2015; Zahra and George, 2002), innovation (Carlo, Lyytinen, and Rose, 2012; Fores and Camison, 2016; Moilanen, Ostbye, Woll, 2014; Muller et al., 2020), competitive advantage (Chang et al. 2013; Kotlar et al., 2020; Liao, Welsch, and Stoica, 2003) and interfirm learning (Fredrich, Bouncken, and Kraus, 2019; Schildt, Keil, and Maula, 2012). AC is particularly vital to compensate internal resource constraints for firms like SMEs (Corredoira and McDermott, 2014; Saad, Kumar, and Bradford, 2017). AC allows firms to search for external knowledge, acquire it when valuable, and combine it with their internal knowledge to benefit commercially (Cohen and Levinthal, 1990). The literature conceptually distinguishes between 'potential AC', that entails the acquisition and assimilation of new external information, and 'realized AC', which refers to the transformation and exploitation of new knowledge (Zahra and George, 2002). Studying antecedents of AC in SMEs is important, since AC is an important source of competitive advantage in SMEs (Flatten et al., 2011b). SMEs possess fewer internal resources in general and rely more on tacit knowledge in comparison to larger companies, often they have less capability to innovate, so that overall they are more vulnerable to rapidly changing circumstances (Agostini and Nosella, 2019; Knoppen, Saenz, and Johnston, 2011; Nooteboom, 1994; Valentim, Lisboa, and Franco, 2016). We build on resource-based theory to debate how SMEs can develop its absorptive capacity (Ferreras-Mendez et al., 2021; Franzo et al., 2023). While new knowledge is "out there", the question is why some firms are capable of comprehending the value of new knowledge and benefit from it, while many others fail (Distel, 2019; Saad et al., 2017; Zobel, 2017).

To respond to this question of why there is so much heterogeneity in firms' ability to develop AC, various authors are calling for research delving into the antecedents of AC (Ben-Oz and Greve, 2015; Chang et al., 2013; Distel, 2019; Jansen et al., 2005; Saad, Kumar, and Bradford, 2017; Volberda et al., 2010). Jansen et al. (2005) find that organizational mechanisms associated with coordination and socialization capabilities have a distinct effect on potential and realized AC. Coordination mechanisms like cross-functional interfaces, participation in decision-making, and job rotation increase potential AC, while tacitly understood rules, such as mechanisms facilitating knowledge exchange and socialization enhance realized AC (Jansen et al., 2005). There remains an explicit need to investigate the effect of the type of prior knowledge, as a primary antecedent of AC, in terms of its nature, breadth, and diversity (Valentim et al., 2016; Volberda et al., 2010). As Jansen et al. (2005) and Volberda et al. (2010) call for more attention to tacit knowledge, we investigate the role of organizational tacit knowledge as an antecedent of AC. We define tacit knowledge as the implicit, non-codified accumulation of skills that results from learning by doing. In this study, we leave it open whether the knowledge is tacit because it is non-codifiable, imperfectly codifiable, or is awaiting to be converted into an explicit form[7] (Boiral, 2002; García-Morales, Llorens-Montes and Verdu-Jover, 2008; Hadjimichael and Tsoukas, 2019; Nonaka and Takeuchi, 1995; Reed and De Fillippi 1990).

While Cohen and Levinthal (1990) describe prior knowledge, and especially tacit knowledge, as the main antecedent of AC, we expect that tacit knowledge hinders the acquisition of external information: when firms rely heavily on tacit knowledge, they might stick to their traditional ways of problem-solving, in contrast to seeking new external information. Tacit knowledge becomes a lens that renders internal consistency even though the competitive landscape demands change (Prahalad, 2004). Thus, in this vein, tacit knowledge is one of the blinders for an organization to see new opportunities, recognize the new logic in their industry, or consider beyond industry trends (Prahalad, 2004). This might make SMEs more rigid and reluctant to search for new, unfamiliar, and distant information (Posen and Chen, 2013; Prandelli, Pasquini and Verona, 2016). Moreover, given the highly contextual and ambiguous characteristics of tacit knowledge, the extent of tacit knowledge could be a barrier to information sharing within firms. In

[7] Tacit knowledge in this research focuses on knowledge that is not yet codified, regardless of whether tacit knowledge can be codified entirely or not.

other words, tacit knowledge could be negatively associated with potential AC. Firms characterized by a higher amount of tacit knowledge tend to be more susceptible to a phenomenon known as collective blindness. This can lead them to rely heavily on their conventional problem-solving methods, resulting in a limited range of perspectives and potential rigidity in adapting to new external knowledge (Prandelli, Pasquini, and Verona, 2016; Ahuja and Lampert, 2001; Srivastava and Gnyawali, 2011; Posen and Chen, 2013). In the context of realized AC, relying on resource-based theory, we expect tacit knowledge to be useful for firms to transform and exploit new knowledge, so here, we expect a positive association. Firms with more tacit knowledge often exhibit a propensity for swift decision-making, characterized by reduced costs and enhanced efficiency (Acquaah, 2012). Such traits can be advantageous in facilitating the transformation and exploitation of knowledge (Acquaah, 2012). Our first aim is, therefore, to empirically examine how tacit knowledge impacts the different dimensions of AC, as we do not expect an unambiguously positive effect.

To investigate whether combining tacit knowledge with another sort of internal knowledge matters in developing AC capabilities, therefore we incorporate PMS diversity as a moderator in the relationship between tacit knowledge and AC, as it provides an essential source of organizational firm specific information that represents prior internal knowledge. PMS is an instrumental device that accumulates information related to firm-specific key performance indicators used for evaluation and for feeding organizational learning (Chenhall, 2005; Micheli and Mari, 2014). We capture PMS diversity as the set of indicators that are used for performance measurement and evaluation of the firm, ranging from financial, customer, and internal business processes, to innovation and learning (Dekker et al., 2013). Since knowledge creation in an organization consists of a dialectical process and synthesis between tacit and explicit types of knowledge, PMS diversity might inform the routines that firms apply to develop AC (Lewin et al., 2011; Nonaka and Toyama, 2015). We, therefore, investigate whether combining organizational tacit knowledge with a diverse PMS is helpful to leverage the potentially beneficial effect of tacit knowledge on AC.

Using a cross-sectional survey, we obtained information on 202 privately-held Belgian firms of different sizes and industries. Focusing on four dimensions of AC, acquisition, assimilation, transformation, and exploitation, we examine the role of tacit knowledge

for each dimension of AC development. Our empirical findings reveal that a higher amount of tacit knowledge is far from being always beneficial for AC development. Looking at the moderating role of PMS diversity, we find that firms with a higher amount of tacit knowledge score worse when acquiring external knowledge when having a diversified PMS in place. Therefore, tacit knowledge and PMS diversity substitute each other in SMEs developing acquisition capability.

Our contributions to the literature are two-fold. First, we participate in the debate on the antecedents of AC. While previous research in this field considered knowledge as a general concept (Volberda et al., 2010), we focus on the role of two particular types of prior knowledge already present in the firm as antecedents of AC: the extent of tacit knowledge and the diversity of performance measures captured by the formal PMS of the firm. Tacit and explicit knowledge can have different relationships with AC development in organizations. Second, we contribute to the management control literature by investigating the role of the knowledge generated by the PMS in relation to a firm's AC. In a related study, Bedford et al. (2022a) evaluate how PMS design choices affect the AC of the top management team under different conditions of environmental dynamism. Their observations, based on survey data in the innovative industry, reveal that PMS scope and integration are differently associated with potential AC, but that they are both positively associated with realized AC. Our study focuses on the interplay between tacit knowledge and existing explicit knowledge toward developing AC. We investigate whether tacit knowledge directly relates to AC or whether PMS diversity moderates the tacit knowledge relationship with AC capabilities. Given the high extent of tacit knowledge in SMEs, we focus on smaller firms to argue that examining tacit knowledge as an antecedent of AC without considering the moderating role of PMS diversity leads to inconclusive results. Performance measures help managers to reduce uncertainty in their decision-making process, whereby the role of the firm's PMS for AC should be studied in the context of its potentially complementary effect with tacit knowledge (Hall, 2010).

The remaining structure of our paper is as follows. Part 2 provides the theoretical background and development of the hypotheses. The research method and results are represented in Part 3 and Part 4 respectively. In Part 5, we discuss the results, and we conclude our study in Part 6.

2.2 Theoretical background and development of hypotheses

2.2.1 Absorptive capacity in SMEs

Cohen and Levinthal (1990, p.128) introduce the concept of AC as "the ability of a firm to recognize the value of new external information, assimilate it, and apply it to commercial ends". AC has since been recognized as the most influential capability for firms to manage their external knowledge in such a way that it creates value, and ideally gains, and sustains competitive advantage (Camison and Fores, 2010). AC incorporates knowledge-based capabilities where the capability of acquiring external information provides a basis for the capability to adjust prior knowledge and, consequently, the capability to benefit from this endorsement (Lane, Koka, and Pathak, 2006). Along with unraveling the effects of AC on organizational outcomes, the measurement of AC has faced fundamental changes. In the past, the emphasis was on technological information, and AC was measured by R&D expenditure to highlight the organizational learning attempts (Cohen and Levinthal, 1990). Nowadays the construct has been advanced to a multidimensional construct consisting of acquisition, assimilation, transformation, and exploitation processes or phases (Camison and Fores, 2010). In a first phase of AC, firms acquire new information: environmental monitoring, market scanning and access to external sources with potentially useful knowledge for the firm's operations are influential here. In the second phase, the assimilation of new information entails processes and routines that allow the newly acquired information to be rated, valued, and shared (Zobel, 2017). In a third phase, there is the transformation dimension, whereby new knowledge is integrated with prior knowledge, meaning that novel adaptations, combinations, or even elimination across what a firm knows, might occur. And in the fourth phase, there is an exploitation dimension, covering the company's ability to build new capabilities: it concludes the AC process with the firm implementing the changes and updating its operations (Fores and Camison, 2016).

In the literature on the antecedents of AC, Jansen et al. (2005) were the first authors to recognize the importance to distinguish between the different dimensions of AC. They argued that if an organization fails to see the value and opportunities in the newly identified information, it does not invest in its diffusion, in other words, this new information does not lead to any improvement in the firm. During the primary phases of acquisition and assimilation (i.e. potential AC), organizational members identify new

information and encourage analyzing, reactivating, interpreting, and understanding it. During the later phases of transformation and exploitation (i.e. realized AC), the new knowledge is already rated and integrated to ideally become operationalized. Therefore, approaching AC as a multidimensional construct consisting of four capabilities (acquisition, assimilation, transformation, and exploitation) is encouraged, especially when studying its organizational antecedents (Bedford et al., 2022a Todorova and Durisin, 2007; Volberda et al., 2010; Zobel, 2017).

Attempts to understand why some firms are more successful in developing AC, particularly in SMEs, remain limited (Alhusen and Bennat, 2021; Distel, 2019; Jansen et al., 2005; Thoma and Zimmermann, 2020; Valentim et al., 2016; Volberda et al., 2010). The following studies provide relevant insights, and we build on them in our paper to contribute to this research domain. Jansen et al. (2005) argue that organizations might vary in their ability to enhance potential and realized AC because of the presence of particular organizational mechanisms. Their study includes coordination mechanisms that help to stimulate knowledge exchange across disciplinary and hierarchical boundaries. They also study the role of mechanisms associated with systems capabilities, that are meant to program behaviors and establish patterns of organizational action, like formalization and routinization. Also, socialization mechanisms are included, like connectedness (the density of linkages) and socialization tactics structuring shared socialization experiences. Fosfuri and Tribo (2008) introduce 'experience with information search' as a key antecedent of acquisition and assimilation. Particularly SMEs rely on experience-based knowledge as well as informal and interactive internal processes to develop AC (Alhusen and Bennat, 2021; Thoma and Zimmermann, 2020). Distel (2019) tests the direct influence of integration mechanisms on the four dimensions of AC. He finds that formal and informal integration mechanisms (used by the firm to coordinate its activities within and across organizational units) enhance firm-level AC directly and that perspective-taking and creative behavior by knowledge workers play a mediating role. Moreover, in an attempt to find what drives AC in SMEs, Valentim et al. (2016) provide empirical evidence that knowledge management practices like facilitating learning processes through experience, collaboration with business partners, and knowledge transformation among employees are important AC antecedents since they compensate for resource-constrain characteristics of SMEs.

SMEs are characterized by possessing limited resources but more tacit knowledge and being less bureaucratic but more flexible (Agostini and Nosella, 2019; Eggers, 2020; Ortega-Argiles, Nooteboom, 1994; Vivarelli, and Voigt, 2009; Valentim et al., 2016). The smaller an organization, the fewer resources are under control. This is referred to as liabilities of smallness (Freeman, Carroll, and Hannan, 1983). Therefore, SMEs are incentivized to rely on external knowledge since they lack abundant financial assets, possess weaker competencies, and have less willingness to bear the cost and risk of in-house R&D activities (Ortega-Argiles et al., 2009; Nooteboom, 1994). Moreover, smaller firms continuously conduct interactive learning practices, leading to the regular accumulation of tacit knowledge internally (Thoma and Zimmermann, 2020). Thoma and Zimmermann (2020) emphasize the effectiveness of internal mechanisms and managerial decisions in SMEs to foster learning and innovation. They rely on the work of Jansen et al. (2007) to emphasize explicit and tacit knowledge can have complementary roles in learning and innovation endeavors of SMEs (Thoma and Zimmermann, 2020). In this line, in studying knowledge integration mechanisms in SMEs, Alhusen and Bennat (2021) acknowledge the complexity of the role of codified knowledge[8] in SMEs pursuing innovation and call for further research on the interaction between tacit and codified knowledge in this context. Mariano (2023) conducts a literature review to show how and why SMEs apply changes in structure, policies, procedures, and resources to gain a higher level of professionalism. She concludes that more formal systems accumulate more explicit knowledge (Mariano, 2023).

The elevated level of flexibility inherent to SMEs enables agility, thereby facilitating the development of AC. SME's smallness relates to a prompt response to evolving demands, thereby capitalizing on the advantages of agile customization or specialization, especially when managers understand the value of knowledge as a strategic resource (Eggers, 2020; Pertusa-Ortega, Zaragoza-Saez, and Claver-Cortes, 2010). Eggers (2020) argues that the smallness of enterprises is no longer considered a liability if managers in SMEs can benefit from their close interaction with customers and stakeholders and the valuable information they encounter. Consequently, smallness and flexibility are associated with on-time exploitation of opportunities (Eggers, 2020).

[8] In the course of this thesis, the terms "explicit knowledge" and "codified knowledge" are used interchangeably.

2.2.2 Prior knowledge

Cohen and Levinthal (1990) stressed that prior knowledge is the most important antecedent of AC, and thereby focused on tacit knowledge. Volberda et al. (2010), however, noted that distinct types of knowledge (e.g., tacit versus explicit or depth versus breadth) can have potentially different influences on AC, and suggest to study them in terms of their different implications on the individual components of AC. Besides tacit knowledge, firms possess explicit knowledge, and organizational knowledge is created through the dialectical process and synthesis between the tacit and explicit types: tacit and explicit knowledge are interlinked in a spiral in the form of sharing, articulating, systemizing, applying, learning, and acquiring (Nonaka and Toyama, 2015; Spender 1993). Hadjimichael and Tsoukas (2019) focus on the relationship between the types of knowledge, and they identified three perspectives on the connection between tacit and explicit knowledge. From the 'conversation perspective', tacit and explicit knowledge are distinct types of knowledge, each convertible into the other. From the 'interactional perspective', tacit and explicit knowledge are complementary and should be viewed as a tandem. The most important feature of this perspective is that it assumes that action in an organization requires the tacit and explicit types of knowledge jointly. The 'practice perspective' considers all knowledge as a whole, without distinguishing between tacit and explicit knowledge.

AC is understood to depend on the cumulative nature of prior organizational knowledge (Reus et al., 2009): firms with a richer stock of prior knowledge keep better track of organizational memory, and thus are prone to enjoy a higher AC. Firms use routines as tools to accumulate knowledge via tasks in an idiosyncratic, firm-specific, and highly contextual way. Routines are a source of learning, stability, and change, while in the meantime, they store organizational memory (Lewin et al., 2011; Zahra, Neubaum, and Hayton, 2020). Moreover, routines can help organizations to understand their performance. In this study on AC, routines are involved with tacit and explicit knowledge. Routines refer to procedures, patterns of actions, interactions, and behavior that can be tacit like the interpretation of procedures, and also explicit in formal or written down rules (Cepeda and Vera, 2007; Pertusa-Ortega et al., 2010).

2.2.3 Tacit knowledge as an antecedent of Absorptive Capacity

Cohen and Levinthal (1990) highlight the role of - primarily tacit - prior knowledge as a facilitator of AC. The significance and relevance of this aspect in the advancement of AC in SMEs cannot be overstated, as a tacit form of knowledge is a substantial component of SMEs' knowledge repositories (Mariano, 2023; Valentim et al., 2016).

Managers often rely on their tacit knowledge when they judge whether new knowledge is relevant or potentially beneficial to be acquired (Hall, 2010; Nag and Gioia, 2012). Tacitness is the most important characteristic of knowledge when studying its transformation (Zahra et al., 2020). Lewin et al. (2011) argue that sociocultural values, which are primarily tacit, connect people in an organization and provide a basis for social mechanisms driving AC. They mention that a considerable part of organizational memory consists of tacit, informal, and idiosyncratic knowledge. At the same time, tacit knowledge is more difficult and time-consuming to transfer or express than explicit knowledge, as it can be deployed exclusively by its holder. Tacit knowledge is highly contextual, personal, interpretive, and non-linear (Nonaka and Takeuchi, 1995; Schulz, 2001). Jansen et al. (2005) suggest that firms intending to enhance AC should invest in codifying knowledge through formalization rather than keeping it tacit in the routinization of established behavior. However, they do not directly test the exact influence of tacit knowledge on organizational AC. Accordingly, the literature lacks empirical evidence on the relationship between tacit knowledge and AC.

Organizational tacit knowledge facilitates the generation of a common code of conduct and dominant values. Tacit knowledge can increase the extent of commonly agreed interpretation concerning whether newly acquired knowledge is valuable (Kor and Mesko, 2013; Mintzberg, 2009; Nonaka and Toyama, 2015; Schulz, 2001). Idiosyncratic characteristics of tacit knowledge develop a distinct internal common language, which can be beneficial in the assimilation of new knowledge. Tacit knowledge can be acquired through direct experience over time. These direct and historical experiences configure schemas, dominant logic, beliefs, and mental models, which are sticky and long-lasting (Nonaka and Toyama, 2015; Tripsas and Gavetti, 2017). Schemas have the role to interpret a given situation, analyze a problem, and suggest a potential solution (Nag and Gioia, 2012). Managers facing overwhelming challenges might apply tacit knowledge to understand what additional data they need to seek and also make decisions on what stimuli have higher priorities (Nonaka and Toyama, 2015; Mintzberg, 2009). The

informally shared understanding that a dominant logic creates, can filter unwanted and unnecessary knowledge (Kor and Mesko, 2013).

However, based on the studies described below, we argue that firms characterized by a higher amount of tacit knowledge depend more on their traditional means of problem-solving rather than on seeking external new information. Therefore, firms with more tacit knowledge experience less tension when faced with conflicting perspectives, which can hinder the acquisition and assimilation of new information (Leonard and Sensiper, 2011; Posen and Chen, 2013); they become rather rigid when it comes down to acquiring new, unfamiliar, or distant information (Prandelli, Pasquini, and Verona, 2016). This develops information redundancy while diminishing the diversity of acceptable perspectives, which is labeled as "collective blindness" (Jansen et al., 2005). The resulting complacent and dismissive attitude toward new knowledge is similar to the concept of the "competency trap" (Ahuja and Lampert, 2001; Srivastava and Gnyawali, 2011). Moreover, we argue that organizational tacit knowledge opposes divergent thinking and, in this way, diminishes the probability of information sharing. While different perspectives trigger communication and information exchange, tacit knowledge creates a higher level of uniformity, which inherent less intellectual diversity among viewpoints (Leonard and Sensiper, 2011). Also, Jansen et al. (2005) hypothesize that connectedness, as might be created by a high amount of tacit knowledge, is negatively related to potential AC. Connectedness is presented as a socialization capability, that provides 'tacitly understood rules for appropriate action' (Jansen et al., 2005, p.1003). These insights strengthen us to hypothesize that:

H1(a): A higher extent of tacit knowledge is negatively associated with acquiring more new external information.

H1(b): A higher extent of tacit knowledge is negatively associated with higher assimilation of new external information.

The resource-based theory suggests that there is a causal link between tacit knowledge accumulation (e.g., learning from experience) and the exploitation of opportunities (Acquaah, 2012). Managers with higher tacit knowledge are better able to make quick decisions, as they benefit from their better understanding of the firm's organizational routines, physical and human resources, and capabilities. They can leverage them more efficiently and effectively (Acquaah, 2012). Within organizations characterized by a

substantial amount of tacit knowledge, managers are more inclined to possess a deeper understanding of how to apply new knowledge at a reduced cost. This propensity arises from accumulating tacit expertise, enabling managers to acquire enhanced insights into managing operational routines more effectively. (Zahar and George, 2002). Acquaah (2012) discusses the constructive role of firm-specific managerial experience to apply external knowledge obtained from networking relationships with community leaders to create value. In line with this positive role of tacit knowledge for knowledge application, Jansen et al. (2005) hypothesize and find that connectedness, as a socialization capability guiding action in terms of tacitly understood rules, increases realized AC. We conclude that a higher amount of tacit knowledge equips an organization with shared experiences, beneficial for the transformation and exploitation of new knowledge:

H1(c): A higher extent of tacit knowledge is positively associated with transforming knowledge.

H1(d): A higher extent of tacit knowledge is positively associated with exploiting knowledge.

2.2.4 Performance Measurement Systems diversity and its moderating role to AC

Overall, research points to a significant relationship between firm-specific knowledge, like the information provided by the PMS, and improving a firm's actions through learning from better understanding (Endrikat et al., 2020; Widener, 2007). We consider the PMS as a generator of firm-specific knowledge since it includes firm-specific information on the attainment of firm-specific targets. It can be considered an antecedent of AC, as it is a mechanism that supports knowledge creation on firm-specific aspects. A PMS includes the metrics of performance and influences employees' behavior by quantifying the effectiveness and efficiency of actions (Guenther and Heinicke, 2019; Franco-Santos and Otley, 2018). Codifying knowledge is the basic tenet of organizational learning, whereby experiences reflect in routines to guide behavior (Schulz, 2001). The inclusion of various performance perspectives, like financial and non-financial measurements, is based on the interpretation and cognitive schema of the PMS designer concerning what needs to be done and how to coordinate activities in line with the goals of the firm (Franco-Santos and Otley, 2018). Performance measures accumulate performance information, participate in organizational learning, and signal the need for correction (Grafton, Lillis, and Widener, 2010; Henri, 2006a). Naranjo-Gil and Hartman

(2007) argue that the amount and heterogeneity of the information provided by accounting tools affect managers' decisions making, interpretation, and search behavior. Therefore, PMS belong to the organization's means that encode historical experiences, enrich organizational memory, and support the accumulation of knowledge internally.

In a related study, Bedford et al. (2022a) focus on PMS design choices as potential antecedents of AC. They particularly study the effect of the scope and integration of PMS design on the potential and realized AC of top management teams in innovative firms. They investigate the scope of the PMS in terms of the focus, quantification, time horizon and orientation of the performance measures used, and the integration of the PMS, which measures the extent to which the PMS captures the causal link between activities across the firm's value chain and how these activities allow the firm to reach its strategic objectives. They conclude that PMS scope and integration are differently associated with potential AC in more dynamic environments, but that they are both positively associated with realized AC, independently of environmental dynamism. The role of the PMS can also be linked to the organizational mechanisms studied by Jansen et al. (2005). Amongst their antecedents of AC, they include mechanisms associated with systems capabilities, like formalization and routinization, that influence the programming of behaviors and establish patterns of organizational action. Yet, there is much to understand about the degree to which PMS is detrimental or beneficial in developing AC. On the one hand, activities facilitating knowledge exchange across disciplines and hierarchical boundaries act as organizational antecedents of potential AC. On the other hand, mechanisms that constitute what behavior is acceptable relate more to realized AC.

Studies in the AC literature typically consider the role of prior knowledge without distinguishing the different types of prior knowledge, while tacit knowledge and firm-specific explicit knowledge coexist in a continuum with progressive interaction with one another (Nonaka and Toyama, 2015; Volberda et al., 2010). We argue that tacit and firm-specific explicit knowledge can interact with each other (see Hall, 2010; Venkitachalam and Busch, 2012). Relying on resource-based theory, the interplay with a diverse PMS adds to the amount of prior knowledge and provides a richer resource base for developing AC capabilities.

The absence of well-structured and formalized systems within SMEs has a detrimental impact on their ability to effectively search for external information and understand and

share unfamiliar information, primarily due to the persistent nature of tacit knowledge (Szulanski, 1996). Szulanski (1996) discusses internal persistency with the term "stickiness," where tacit knowledge incorporates such stickiness and internally creates an ingrained knowledge structure. In our contention, relying on resource-based theory, PMS diversity within SMEs is a foundation for alleviating the inclination to adhere strictly to traditional knowledge, thus creating opportunities for exploring novel, particularly external, knowledge resources. Tacit knowledge develops innovation capabilities if it is used simultaneously with explicit and structured knowledge since structured knowledge facilitates unraveling the relational factors that must be recognized during knowledge-sharing (Ganguly, Talukdar, and Chatterjee, 2019). Similarly, relying on Szulanski's discussion of the "internal stickiness of knowledge transfer," Seidler-de Alwis and Hartmann, (2008) argue that ambiguity of tacit knowledge is reduced when structured explicit knowledge exists, consequently, knowledge sharing and transformation is enhanced (Seidler-de Alwis and Hartmann, 2008; Szulanski, 1996).

Moreover, consideration of tacit and explicit knowledge enhances the complexity of internal prior knowledge. This complexity is vital since diverse expertise in the organizational knowledge base enhances the likelihood of identifying more complex problems, identification of potentially valuable solutions, and new knowledge generation and implementation (Pertusa-Ortega et al., 2010). This is particularly relevant since smaller firms have a higher likelihood of customization and specialization in their innovation activities and, consequently, a narrower firm perspective (Baldwin and Gellatly, 2003; Jong de and Marsili, 2006; Seidler-de Alwis and Hartmann, 2008). In implementing knowledge, Kilfoyle et al. (2013) introduce the concept of "information mosaic", whereby the formal specific knowledge and the tacit knowledge present in a firm are underlying antecedents of actions. They show that the characteristics of PMS design interact with prior knowledge while they influence both the decision to share and apply knowledge (Kilfoyle et al., 2013). This view is in line with the interactional perspective of Hadjimichael and Tsoukas (2019), stressing that the joint influence of tacit and explicit knowledge is the precondition for conducting actions. It means that PMS diversity might inform the routines firms apply to use tacit knowledge to develop AC (Lewin et al., 2011; Nonaka and Toyama, 2015). We consider the PMS as formal processes, which evolve into routines by implementing actions. This is how the PMS supports the creation of firm-specific knowledge useful for building AC: the PMS forms

and reforms routines by representing actions in the past and guiding actions now and in the future (Pavlov and Bourne, 2011). We, therefore, argue that the effect of tacit knowledge on AC will be moderated by the effect of PMS diversity, which would allow us to transcend the tacitness and develop the necessary routines for developing AC. Combining organizational tacit knowledge with a diverse PMS seems helpful to leverage the potentially beneficial effect of tacit knowledge on AC. We, therefore, hypothesize that:

H2(a): In firms with high PMS diversity, the negative association between tacit knowledge and the acquisition of new external information will be mitigated, compared to firms with low PMS diversity.

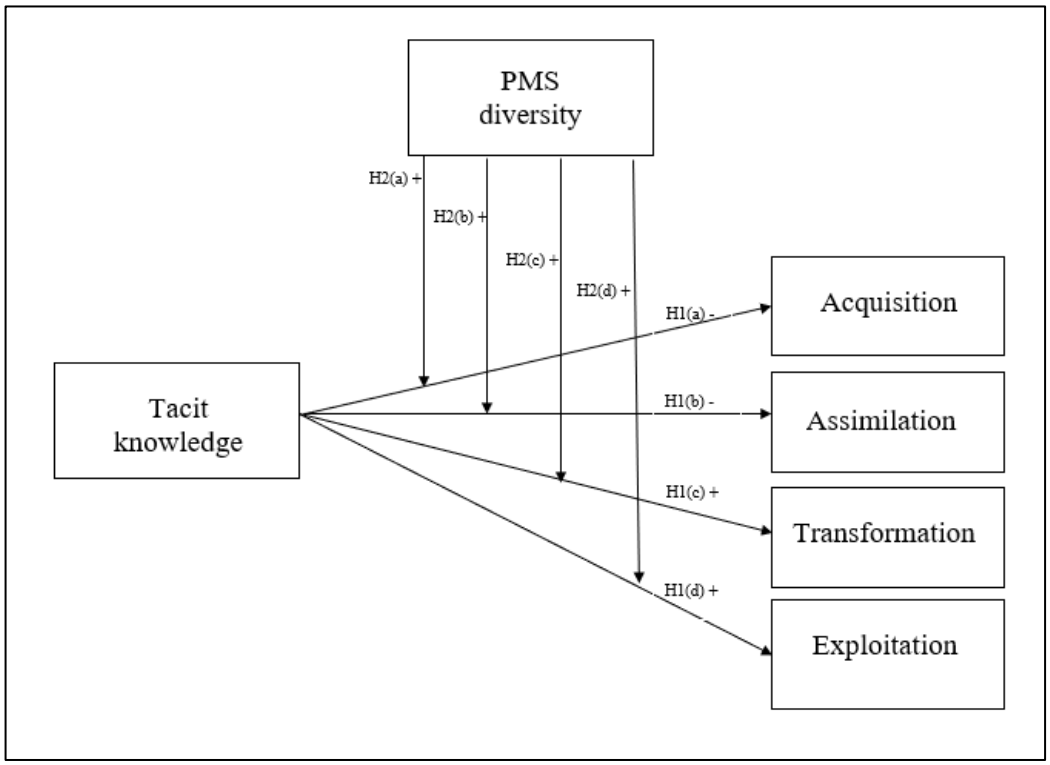
H2(b): In firms with high PMS diversity, the negative association between tacit knowledge and the assimilation of new external information will be mitigated, compared to firms with low PMS diversity.

H2(c): In firms with high PMS diversity, the positive association between PMS diversity and the transformation of knowledge will be stronger compared to firms with low PMS diversity.

H2(d): In firms with high PMS diversity, the positive association between PMS diversity and the exploitation of knowledge will be stronger compared to firms with low PMS diversity.

Figure 2.1 provides an overview of the different hypotheses, investigated in this paper.

Figure 2.1. Model of hypothesized relationships.



2.3 Research method

2.3.1 Sample selection

The hypotheses were examined through a survey conducted via an online questionnaire, which gathered responses from top managers of SMEs. In a first step, we consider all active Belgian (privately held) firms from all industries except finance, insurance, and government organizations. We used the Belfirst database of Bureau Van Dijk. The database includes a balance sheet, income statement, and social balance sheet data for all Belgian companies. Reporting requirements imposed by the Belgian government request all limited liability firms—irrespective of their size and age—to file detailed financial statements annually with the Belgian National Bank. In total, we randomly selected 4,531 companies out of the 26,279 Belgian active companies in the population in 2020 to determine the sample. Next, we used the database Trends, a Belgian commercial mailing list provider, to obtain the email addresses of CEOs of the SMEs in the sample.

2.3.2 Survey implementation

After borrowing all the measures from the literature (e.g., Dekker et al., 2013; Flatten et al., 2011a; Garcia-Morales et al., 2008), we translated the survey into Dutch and French. Then we translated it back into English to compare with the original survey items and validate the similarity between information content across languages. With the help of five practitioners and two academics, we conducted a pilot test to ensure face validity and readability (Collins, 2003).

The survey was sent in mid-October 2020 followed by two reminders. We submitted the first reminder at the end of October 2020 and the second reminder in mid-November. There were 4,531 email addresses in the sample. However, we reached 4,102 respondents by email because some CEOs were retired or the submitted emails failed to be delivered. In January 2021, telephone calls were held with respondents that started the survey but did not complete it, to convince them to respond to all items. Following the suggestion of Millar and Dillman (2011) to offer different response modes sequentially, we called 1,216 respondents who answered the survey to some extent. A sample of 202 observations was selected from a total of 556, based on the criterion that they responded to over 80% of the questions related to the variables under consideration. The remaining observations were excluded from the analysis owing to a significant amount of missing data.

We also control for non-response bias by comparing the late respondents with others (Goyder, 2019). We define who is late based on the last 30% of the respondents (the last 62) and also based on those who answered the survey after the first reminder (the last 148). We found no meaningful difference in means[9]. We carefully designed the survey to mitigate the potential bias related to self-administrated modes of data collection like surveys (see Brenner and DeLamater, 2016). Paying close attention to wording, confidentiality, reverse coding, the possibility of choosing a mid-point in questions with a Likert-scale and offering various response formats are the applied techniques. We also test for common method bias by running Harman's one-factor test for all items of the research constructs. Since the unrotated factor solution reveals that the first factor only covers 14.32% of the total variance, we conclude there is little evidence of concern for single-source bias (Podsakoff et al., 2003).

[9] On the last two items of Exploitation, the means persist to be different. However, the composite measure of Exploitation shows no sign of difference.

2.3.3 Variable measurement

By applying measurement instruments validated in the literature for all the variables, we reutilize their clear construct definition and the specified items that closely match those definitions. The list of questions in the survey is represented in the Appendix. They are all measured for 2020.

Dependent variables

Acquisition (*Acquisition*), Assimilation (*Assimilation*), Transformation (*Transformation*), and Exploitation (*Exploitation*) are measured by 18 questions from Flatten et al. (2011a). Acquisition asks for the search for information and the use of information sources. Assimilation focuses on the internal communication of information. Transformation surveys the internal creation of knowledge, while exploitation asks for the adaption of new technologies. The different items develop and validate a reflective multidimensional construct of AC. We assess AC on a scale from (1) strongly disagree to (7) strongly agree with three items of acquisition, four items for assimilation, five items of transformation, and three items of exploitation.

Explanatory factor analysis with oblique rotation is conducted to validate our dependent variables. As shown in Table 2.1, there are four factors with eigenvalues larger than one related to absorptive capacity. The first factor consists of the first three items of acquisition, which explains 6,64% of the variations in the first factor. The second factor includes four items of assimilation. The four assimilation items explain 5,95% of the variation in the second factor[10]. The third factor, transformation, consists of five items, explaining 34,82% of the variation in the third factor. The items of the factor named Exploitation (labeled as exp 1 to 3) explain 10,03% of the variation in factor four. Moreover, the Cronbach alpha values evaluate the internal consistency. In the next part, we elaborate on the last factor, tacit knowledge, as an independent variable.

[10] The last item of Assimilation (Ass4) loads 0,508 on Assimilation and 0,423 on Transformation. To ensure the validity of our results, we repeat the analysis after dropping the last indicator of Assimilation. We find similar findings since the moderation of Tacit knowledge and PMS diversity with Acquisition capability is significant (β=-1,045, p<0,1). Thus, the cross-loading cannot be a concern for the validity of our fining.

Table 2.1. Exploratory factor analysis.

Label	Items	Oblique rotation				
		Factor 1: acquisition	Factor 2: Assimilation	Factor 3: Transformation	Factor 4: Exploitation	Factor 5: Tacit knowledge
Acq1	The search for relevant information concerning our industry is everyday business in our company.	**0,668**	0,137	-0,245	0,159	0,042
Acq2	Our management motivates the employees to use information sources within our industry.	**0,825**	-0,049	0,143	-0,094	-0,046
Acq3	Our management expects that the employees deal with information beyond our industry.	**0,649**	-0,110	0,278	-0,061	0,010
Ass1	In our company ideas and concepts are communicated cross-departmental.	0,213	**0,484**	0,394	0,014	-0,068
Ass2	Our management emphasizes cross-departmental support to solve problems.	0,081	**0,625**	0,292	0,050	-0,050
Ass3	In our company there is a quick information flow, e_g_, if a business unit obtains important information it communicates this information.	0,002	**0,775**	0,148	-0,060	-0,007
Ass4	Our management demands periodical cross-departmental meetings to interchange new developments, problems, and achievements.	0,002	**0,508**	0,423	0,142	0,098
Tra1	Our employees have the opportunity to structure and use self-collected knowledge.	0,007	0,060	**0,767**	0,107	0,093
Tra2	Our employees are used to absorbing new knowledge.	0,137	0,047	**0,800**	0,078	-0,080
Tran3	Our employees process new knowledge and make it available for further purposes.	0,096	0,075	**0,808**	0,029	-0,032
Tran4	Our employees successfully link existing knowledge to new insights.	0,015	0,067	**0,878**	0,033	-0,023
Tran5	Our employees are able to apply new knowledge in their practical work	-0,022	0,140	**0,865**	-0,004	-0,071
Exp1	Our management supports the development of prototypes.	0,042	-0,115	-0,028	**0,889**	0,055
Exp2	Our company regularly reconsiders technologies and adapts them accordant to new knowledge.	0,044	0,019	0,012	**0,881**	-0,107
Exp3	Our company has the ability to work more effectively by adopting new technologies.	-0,098	0,015	0,123	**0,804**	-0,005
Tac1	The usual tasks for jobs in the organization are **not** completely specified.	0,082	0,222	-0,178	-0,003	**0,761**
Tac2	The procedures for how to act in a specific position in the organization **cannot** be easily written	-0,047	0,197	-0,127	-0,020	**0,780**
Tac3	There are **no** manuals on how to develop on-the-job tasks in the organization.	-0,026	-0,199	0,148	0,003	**0,839**
Tac4	There is **no** documentation to describe the critical parts of the organization's productive process	0,002	-0,339	0,161	-0,067	**0,693**
Variance explained by each factor		6,642%	5,958%	34,820%	0,037%	12,746%
Cronbach alpha		0,559	0,834	0,939	0,833	0,779

Notes: The oblique-rotated loadings are in bold, respectful to the expected factors. N=202.

Independent variables

Tacit knowledge (*Tacit_know*) reflects the perception of executive-level managers on the amount of tacit knowledge, i.e. the extent to which procedures in the firm are not specified, on a four-item scale borrowed from García-Morales et al. (2008). Given the difficulty of analyzing the amount of tacit knowledge in a firm and the lack of commonly accepted instruments to do so (Venkitachalam and Busch, 2012), we follow Garcia-Morales et al. (2008) to apply respondents' perceptions as a proxy for the extent of tacit knowledge. Therefore, respondents' perception of the level of tacit knowledge is used as a proxy for the actual amount of tacit knowledge in firms. Consistent with Garcia-Morales et al. (2008), the explanatory factor analysis by oblique rotation validated the one-dimensionality of the instrument. Table 2.1 shows that the four items of tacit knowledge load on one factor, explaining 12,74% of the variation in that factor.

PMS diversity (*PMS*) refers to the range of indicators that are considered for evaluating employee performance in firms (Dekker et al., 2013). A comprehensive notion of performance indicators examines employee performance more specifically and accumulates more detailed information (Hall, 2010). The notion of diversity encompasses a more expansive spectrum of measures (Daowadueng et al., 2023). We expect that firms with more diverse performance indicators are better equipped with information to address the complexity of managerial decision-making. Moreover, in this study, storing more detailed performance information is expected to support simultaneous persuasion of organizational capability development. The questionnaire asks for the particular indicators (income, sales, market share, etc.) used for performance evaluation by the firm based on the questions from Dekker et al. (2013). The information covers a broad range of performance information, including financial, customer, internal business process, and innovation and learning. A Herfindahl–Hirschman index (HHI) is calculated to measure PMS diversity. The HHI index is a standard measure of diversity (i.e., an average rarity) in applied economics (Patil and Taillie, 1982), which shows how scattered versus concentrated PMS information is. HHI considers the number of all the performance indicators as well as the relative importance given to each of the performance indicators (Rhoades, 1993). Therefore, we can measure PMS diversity relative to the number of performance indicators that exist and how much emphasis is given to each particular item. We believe the HHI index is a better measure of how scattered PMS information is

compared to the average score, which reflects the central tendency and is not the best measure to show the relative magnitude of each performance indicator. Therefore, since we are interested in measuring diversity as the disparity of information sorted via PMS, we apply the HHI index rather than the average score used by Dekker et al. (2013). The higher the score of PMS diversity, the more disparity among the importance of each performance measure, thus the more diverse its collected information. It is important to acknowledge that we have conducted an additional analysis using the method proposed by Dekker et al. (2013) to measure PMS diversity and verify our findings' robustness (see Table 2.B in the appendix for more details).

Control variables

We control for environment, age, size, industry, family firms, and strategic priorities including, low price, differentiation, and delivery and service. In terms of environmental unpredictability (*Environment*), we asked respondents to assess and rate five changes in various environmental aspects (in terms of customers, suppliers, competitors, technological changes, and regulation) on an increasing 7-point Likert scale (Bedford and Malmi, 2015). Environment is measured as the sum score (Bedford and Malmi (2015). Firm age (*Age*) refers to the number of years since the firm was incorporated till 2020. The firm size (*Size*) is measured as the natural log of the total number of full-time employees. We applied the log-transformed measure in the analyses. Concerning industry effect, we broadly categorize industry by applying 2-digit NACE codes to make 3 cohorts of manufacturers (*Manufacturing*), retail (*Retail*), and service. We use service as the reference industry. We also control for family firms (*Family*) since the internal stability and social capital of family firms can enhance AC (Andersen, 2015; Brinkerink, 2018). We defined family as the people who are linked by blood or marriage. Then, we asked respondents to consider the following statements (1) More than 50% of the ownership is in the control of one family; (2) The company is considered a family business; and (3) None of the above answers apply. No respondent claimed contradictory statements. The respondents who chose option 1 and (/or) option 2 are denoted as family firms. Those who chose none of the above are considered non-family firms. Moreover, we control business strategy since it is relevant to absorptive capacity (Zahra and George, 2002). Our approach employs the strategic priorities measurement developed by Kruis et al. (2015), which is grounded on the work of Chenhall (2005) and designed to capture the

emphasis placed on cost leadership (*Low price*), product differentiation (*Differentiation*), or customization and after-sale service (*Delivery & service*).

2.3.4 Statistical methods

In order to test our hypotheses, we used a cross-sectional survey and analyzed the data of our final sample of 202 privately-held Belgian SMEs. SEM allows us to evaluate our theoretical model after accounting for the unobserved variables and draw regression analysis among the variables of interest (Byrne, 2016). In the following part, we report the data and results.

2.4 Results

2.4.1 Descriptive statistics

First, we discuss the descriptive statistics. Table 2.2 shows an overview of descriptive statistics where the latent variables are measured by their mean score. On average, the firms in our sample are 41 years old (SD = 30.57) with 89 full-time employees (SD = 105.55).

Table 2.2. Firm demographics and descriptive statistics.

Items							Percentiles	
	N		%	Mean	Median	SD	25%	75%
Acquisition	202			4,60	4,66	0,97	4,00	5,33
Assimilation	202			5,51	5,50	0,91	5,00	6,25
Transformation	202			5,22	5,20	0,98	4,60	6,00
Exploitation	202			5,91	6,0	1,02	5,33	6,66
Tacit_know	202			3,27	3,25	1,20	2,50	4,00
PMS diversity	202			5,45	5,60	0,89	5,13	6,00
Environment	202			4,16	4,20	0,91	3,80	4,80
Age	202			41,12	34,00	30,57	22,00	46,25
Size	202			88,94	43,50	105,55	27,00	100,00
10>49		114	56,4%					
50>99		36	17,8%					
100>199		29	14,4%					
200>299		5	2,5%					
300>399		10	5%					
400>499		8	4%					
Industry	202							
Manufacturing		77	38,1%	0,38	0,00	0,48	0,00	1,00
Retail		58	28,7%	0,29	0,00	0,45	0,00	1,00
Service		67	33,2%					
Family firms	202			0,66	1,00	0,47	0,00	1,00
Low price	202			4,96	5,00	1,30	4,00	6,00
Differentiation	202			5,56	6,70	0,84	5,00	6,00
Delivery & service	202			6,00	6,25	0,96	5,50	6,75

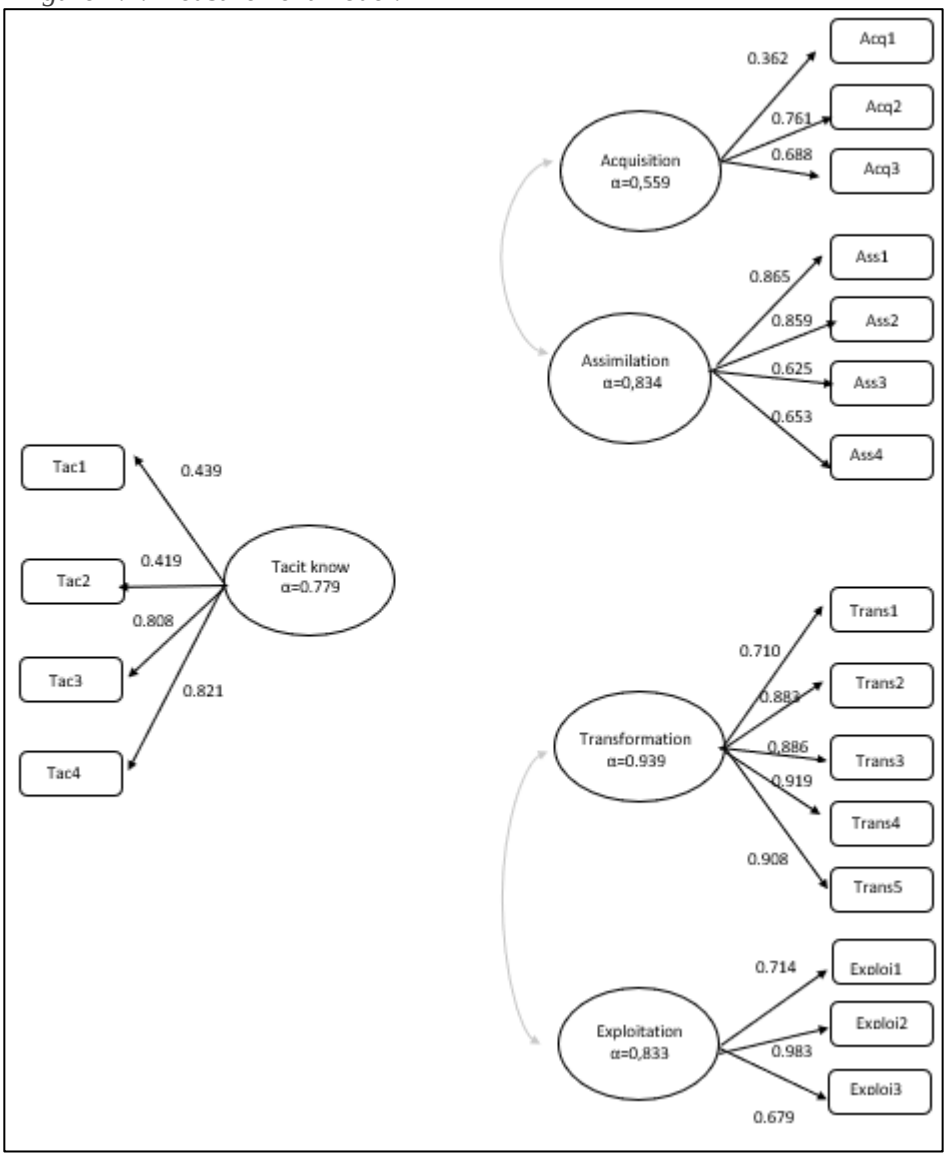
The items Manufacturing, Retail, and Family firms are dummy variables. N=202.

The industry distribution is relatively evenly spread between the manufacturing, retail, and service industry. More than half of the responding firms are small (employees < 49), and the other half range is medium-sized firms. 66% of the firms are family firms.

2.4.2 Evaluation of the measurement model

Before analyzing the regression results, we evaluate the measurement model and the overall fit. The measurement model assesses how the latent (unobserved) variables in the model are measured through their indicators (Byrne, 2016; Schreiber, 2008; Ullman and Bentler, 2012). This study's latent variables are acquisition, assimilation, transformation, exploitation, and tacit_know. There are reflective and measured by Amos. The measurement model's results show that all the items load significantly ($p<0,01$) on their expected construct. Figure 2.2 shows the standardized factor loadings.

Figure 2.2. Measurement model.



N=202.

The calculated Chi-square statistic amounts to 602,061 and the degrees of freedom stand at 435. The ratio of Chi-square to degrees of freedom (χ^2/df) equals 1.384. Furthermore, the overall model fit evaluation incorporates key fit indices, including the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR), following the suggestion of Schreiber (2008) and Byrne (2016). CFI and TLI fall in the accepted range for a well-fitting model since CFI equals 0,938 and TLI value is 0,924 (Bentler, 1992). Additionally, the RMSEA value for the model stands at 0.044, while the SRMR equals 0,063. Therefore, the overall model indicates that the model fits the data

since the Chi-square to degrees of freedom ratio is below the threshold of 3, the CFI and TLI values exceed the critical 0.90 benchmark, the RMSEA value falls below the 0.06 threshold, and SRMR value is below cut-off of 0.08 (Byrne, 2016; Hu and Bentler, 1999; Schumacker and Lomax, 2010; Iacobucci, 2010). Before proceeding with the regression results, we evaluate the internal consistency reliability, convergent validity, and discriminant validity.

We tested construct reliability and validity by convergent validity, composite reliability, and Cronbach's alpha (see Table 2.3). For convergent validity, the average variance extracted (AVE) of all the variables stand above 0.50, which shows the commonality across all items has an acceptable association with their particular reflective constructs (Sarstedt et al., 2021). The values of the composite reliability criterion are above 0.60, which is considered acceptable (Hair et al., 2022). Moreover, almost all values of Cronbach's alpha are above 0.6 (Sarstedt et al., 2021), reconfirming the internal consistency reliability.

Table 2.3. Construct reliability and validity.

Item	Composite reliability	AVE	Cronbach's alpha
Acquisition	0,673	0,548	0,559
Assimilation	0,857	0,674	0,834
Transformation	0,94	0,804	0,939
Exploitation	0,894	0,746	0,833
Tacit_know	0,813	0,598	0,779

N=202.

Discriminant validity reflects how distinct the latent variables are and how distinctly each item is associated with its particular construct (Byrne, 2016). Table 2.4 shows that the correlation with none of the reflective constructs is higher than their square root of AVE. Additionally, Table 2.4 shows that acquisition and assimilation correlate positively ($p<0,01$). Similarly, transformation relates significantly to higher exploitation, as expected from the literature ($p<0,01$). Tacit knowledge correlates positively with acquisition, but the Pearson correlation coefficient is insignificant ($p>0,1$). The relationship between tacit knowledge and assimilation, transformation, and exploitation is negative. Moreover, tacit knowledge significantly relates to less transformation ($p<0,05$). The relationship between PMS and all the AC capabilities is positive. In this vein, the PMS's connection with acquisition is significant ($p<0,1$). Similarly, PMS relates to a higher level of assimilation ($p<0,05$). Moreover, the more diverse PMS relates to a

higher level of exploitation (p<0,01). Table 2.4 also shows that PMS diversity and tacit knowledge relate negatively (p>0,1). Moreover, all constructs' variance inflation factor (VIF) is below 5.

Table 2.4. Correlation matrix.

	(1)	(2)	(3)	(4)	(5)
Acquisition(1)	0,548				
Assimilation(2)	0,379***	0,674			
Transformation(3)	0,369***	0,638***	0,804		
Exploitation(4)	0,171**	0,292***	0,246***	0,746	
Tacit_Know (5)	0,005	-0,116	-0,146**	-0,081	0,598
PMS diversity (6)	0,136†	0,143**	0,107	0,234***	-0,115

Note: Off-diagonal numbers show Pearson correlation coefficients while numbers on diagonal are AVE. †stands for p < 0.1, ** for p<0.05, *** for p< 0.01. N=202.

2.4.3 Structural model results

Table 2.5 provides an overview of the structural model relationships (i.e., the standardized path coefficients). Tacit knowledge is positively related to acquiring new external knowledge; however, the relationship is not significant (p>0,10). Therefore H1(a) is not supported. Moreover, the amount of tacit knowledge is negatively related to assimilating new knowledge in line with our expectations in H1b. However, the tacit knowledge relationship with assimilation is not significant. Thus, H1(b) is not supported. In H1c, we predicted a positive relationship between tacit knowledge with transformation. The coefficient is positive but insignificant (p>0,1) between tacit knowledge and transformation. Therefore, H1(c) lacks statistical support. H1(d) hypothesizes a positive relationship between tacit knowledge and exploitation. Since the coefficient for the relationship between tacit knowledge and exploitation is negative and insignificant (p>0,10), we lack enough evidence to support H1(d). In contrast with the general expectation in the literature that prior knowledge drives absorptive capacity (Cohen and Levinthal, 1990), our evidence questions whether any type of prior knowledge antecedes organizational absorptive capacity.

Table 2.5. Structural Model Assessment.

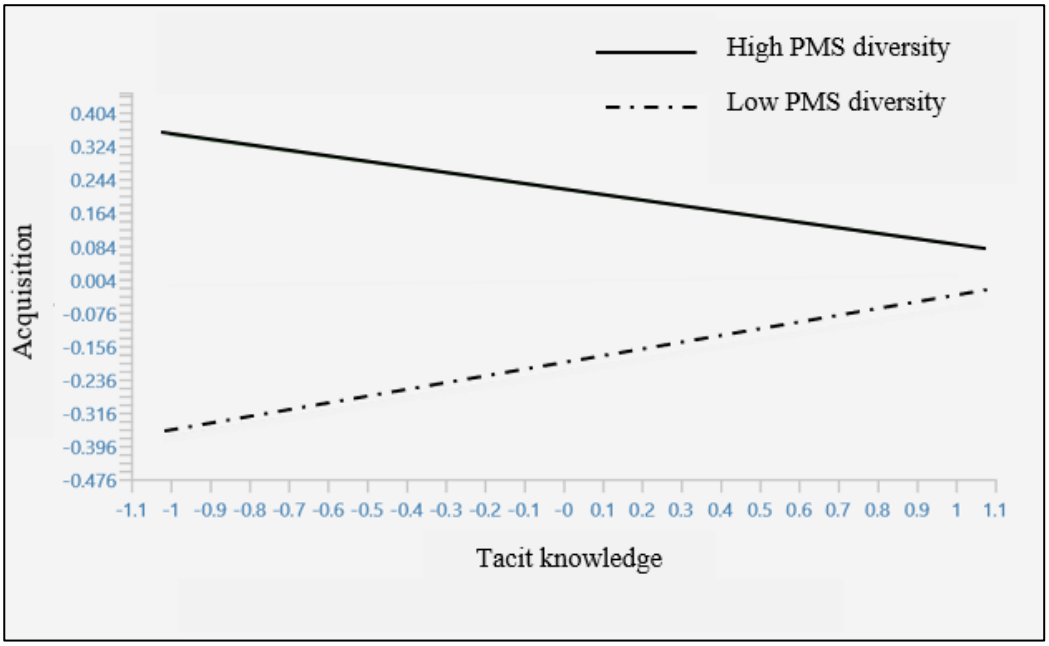
Independent variables	Dependent variables			
	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
Tacit_know	0,081 (0,928)	-0,048 (-0,625)	0,034 (0,395)	-0,055 (-0,764)
PMS diversity	0,228*** (2,646)	0,120 (1,581)	-0,127 (-1,493)	0,214*** (2,948)
Tacit_know* PMS diversity	-0,149† (-1,853)	0,076 (1,075)	-0,081 (-1,026)	0,060 (0,919)
Controls	YES	YES	YES	YES
R^2	0,182	0,168	-0,039	0,195

Note: †stands for p < 0,1, ** for p<0,05, *** for p< 0,01 (two-tailed). N=202.

Table 2.6 also provides insights into the interaction effect of tacit knowledge and PMS diversity on AC. We observe that the interaction between tacit knowledge and PMS diversity toward the acquisition of new knowledge is negative and significant (p<0,10). This seems to indicate that PMS diversity cannot overcome the hindering effect of tacit knowledge for opening up the firm for searching for and acquiring new external information. Therefore, H2(a), which predicates that tacit knowledge relationship and acquisition differs for firms with different levels of PMS diversity, is supported[11]. The interaction is insignificant and positive towards the assimilation of new knowledge, while it is insignificant and negative towards knowledge transformation (p>0.10). Thus, H2(b) and H2(c) are not supported. Moreover, when we test the interaction of tacit knowledge and PMS diversity toward the exploitation of new knowledge, the moderation is positive but insignificant (p>0,1). Thus, H2(d) is not supported.

[11] The effect size of the interaction term equal f^2=0,182-0,151/1-0,182=0,031/0,818=0,037. According to Kenny (2018) and Hair et al. (2021), the effect size of the moderation is large (f^2>0,02). Table E in the appendix shows the main effects and the R^2 value of acquisition when the interaction term is excluded.

Figure 2.2. Slope analysis for significant moderations.



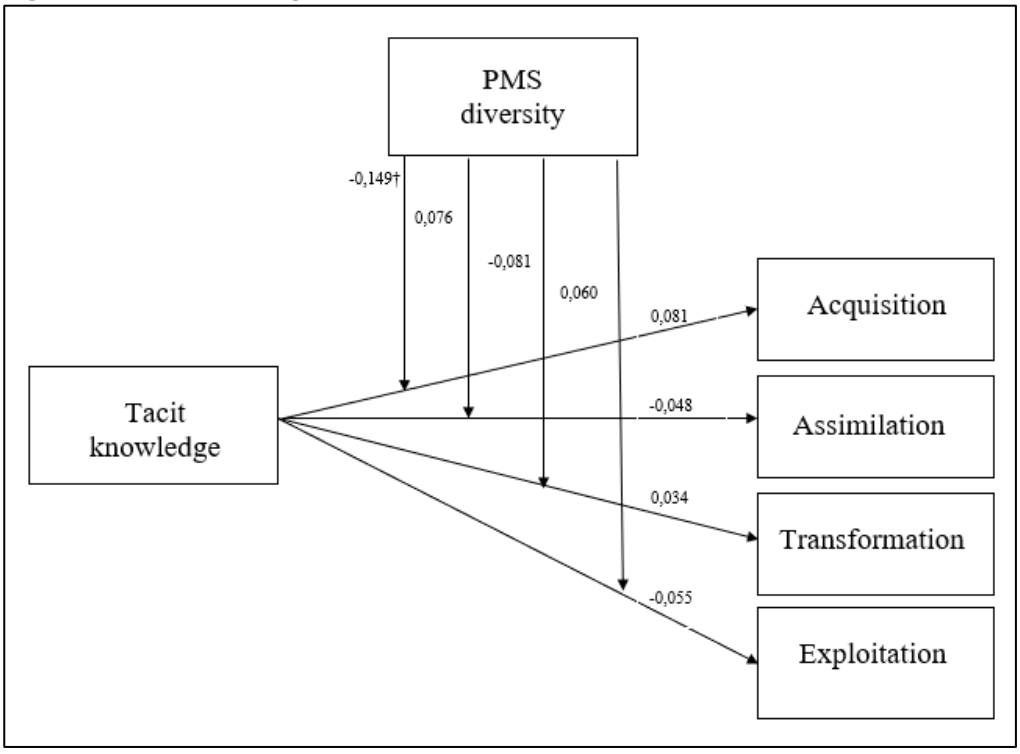
N=202.

The significant interaction term between tacit knowledge and PMS diversity regarding the acquisition of external knowledge shows that the impact of tacit knowledge on acquisition is contingent on the level of PMS diversity. Figure 2.2 shows that the relationship between tacit knowledge and external information acquisition becomes more negative at firms that design highly diverse PMS. In contrast, designing PMS with low diversity alters the direction of tacit knowledge relationship and acquisition of information. SMEs that accumulated more tacit knowledge and designed PMS with low diversity benefit from higher external information acquisition. The findings imply that tacit knowledge and PMS diversity are substitutes in firms aiming to acquire external information.

The relationship between PMS diversity and the acquisition of new external knowledge is positive and statistically significant ($p<0,01$), as well as the relationship between PMS diversity and the exploitation of new knowledge ($p<0,01$). On the other hand, PMS diversity and the assimilation of information relate positively but insignificantly to each other ($p>0,1$). In contrast, PMS diversity and transformation of new knowledge have a negative and insignificant coefficient ($p>0,1$). Overall, we conclude that a diverse PMS positively correlates with three AC components:

acquisition, assimilation, and exploitation, so PMS diversity is associated with increased AC. Figure 2.3 illustrates the hypothesized relationships for the AC capabilities after controlling for the the environment, age, size, industry, family firms, and strategy.

Figure 2.3. Structural regression results.



Note: the numbers of standardized path coefficients. †stands for p < 0.1, ** for p<0.05, *** for p< 0.01 (two-tailed). N=202.

Concerning the control variables, the more unpredictable the environment, the less transformation of new knowledge occurs (p<0,05). There is no significant relationship between environmental unpredictability and other dimensions of AC. We find no significant relationship between age and any of the AC dimensions. Similarly, we observe no significant relationship between size and any of the AC dimensions. The industry seems to play a role since manufacturing firms acquire new knowledge significantly less than firms in the service industry (p<0,05). We observe no significant connection between manufacturing and other AC dimensions. Similarly, firms in the retail industry relate to the AC dimension insignificantly. Moreover, we find that the acquisition and assimilation of new knowledge are significantly less in family firms than in non-family firms. This aligns with the literature indicating family firms innovate differently than non-family firms (Andersen, 2015; Rondi, De Massis, Kotlar, 2019). Finally, strategic priorities seem to matter for the firm's AC development. Firms prioritizing differentiation have higher

assimilation (p<0,05) and exploitation (p<0,01) of new knowledge. In contrast, firms that emphasize having low cost and low price assimilate significantly less new knowledge (p<0,05). Moreover, the strategy of cost leadership is significantly associated with less exploitation of new knowledge (p<0,01). Finally, the strategic priority of delivery and services has no significant relationship with any of AC's dimensions (p>0,1).

2.4.4 Additional analyses

We have conducted several additional analyses. In the first analysis, we define SMEs as firms with less than 250 full-time employees to check the robustness of our findings against the definition of SMEs employed in the primary analysis (N=184). The results in Table 2.A in the appendix show that the relationship with tacit knowledge is insignificant with any AC capabilities (p>0,1). However, the standardized coefficients align with the primary analysis in Table 2.5. Tacit knowledge negatively relates to assimilation (p>0,1) and exploitation (p>0,1), while it is positively related to the acquisition of external knowledge (p>0,1). Tacit knowledge and transformation also have a positive and insignificant relationship (p>0,1). Moreover, the interaction term between tacit knowledge and PMS diversity concerning acquisition is negative, which is in line with the primary analysis. However, the p-value is slightly above 0,1; therefore, the relationship is insignificant (p>0,1). Consistent with our findings in Table 2.5, the interaction effect between tacit knowledge and PMS diversity concerning exploitation is positive but, in this analysis, significant (p<0,05). Thus, we observe that in firms with less than 250 employees, PMS diversity moderates the relationship between tacit knowledge and AC. However, the difference is that in the primary analysis, the relationship between tacit knowledge and external information acquisition differs significantly for firms depending on the levels of diversity in PMS (p<0,1). Furthermore, in the primary analysis, it is noteworthy that the positive association between tacit knowledge and exploitation is bolstered (although not achieving statistical significance) with increased diversity in PMS (p > 0,1). We observe a similar pattern of moderation; however, the significance of the p-value differs when we define SMEs as firms with less than 250 employees. The results can signal that the beneficial moderating influence of PMS diversity is more apparent in smaller firms at the later stage of developing AC when changes are implemented. In line with the literature, we show that tacit knowledge combined with a diverse array of PMS information increases knowledge diversity and

subsequently creates a synergic effect that enhances contribution to exploitation of knowledge (Almeida and Phene, 2004; Grant and Baden-Fuller, 2004). In other words, installing a diverse PMS can be a means for smaller firms to stimulate learning more specifically during innovation attempts (Hall, Lotti, and Mairesse, 2009; Saunders, Gray, and Goregaokar,2013).

In the second additional analysis, we measure diversity as a mean score, following Dekker et al. (2013) to compare our finding with the primary analysis, where PMS diversity is measured as the HHI index. In contrast to the mean score that indicates the central tendency of importance on performance measures, HHI index results are proportional to the average importance of each performance indicator. Consistent with our main results, as in Table 2.B in the appendix, the relationship between tacit knowledge and all AC's capabilities remains in line with the primary analysis in Table 2.5. Moreover, in Table 2.B, we also observe that the interaction between tacit knowledge and PMS for the acquisition of external knowledge remains negative and significant ($p<0,05$), providing further evidence for the robustness of our findings.

In our principal analyses, we incorporated data from respondents who had completed at least 80% of the questionnaire items within the dataset. In the course of our third robustness assessment, we probed the sensitivity of our analysis by exploring the consequences of a 20% missing values threshold. As a result, we carried out an extra model iteration, concentrating on observations where respondents had answered more than 90% of the questions in the dataset (N=199). Consistent with our primary model, as Table 2.C in the appendix shows, the relationship of tacit knowledge with all AC capabilities is insignificant ($p>0,1$). Consistent with the primary analysis, there is a negative relationship between the interaction term tacit knowledge and PMS diversity with the acquisition capability (see Table 2.C in the appendix). However, the p-value of the moderation effect is slightly above the threshold of 0,1%, thus is no longer significant. Hence, we explored deeper, rerunning our analysis with various scenarios regarding missing values.

Fourth, we also rerun our findings after excluding all the observations with missing values (N=176). Table 2.D in the appendix shows that the negative relationship between tacit knowledge and assimilation persists but becomes marginally significant ($p<0,1$).

Moreover, the relationship between tacit knowledge and exploitation remains negative, consistent with the primary analysis in Table 2.5. However, tacit knowledge's negative relationship with exploitation capability is now significant ($p<0,05$). Moreover, the interaction between tacit knowledge and PMS diversity concerning assimilation is negative and significant ($p<0,05$). Overall, the outcomes are similar to the primary analysis in Table 2.5.

2.5 Discussion

This study examines whether prior knowledge captured by tacit knowledge and firm-especific knowledge, generated by the PMS, are antecedents of AC in SMEs. Given the scarcity of research on what drives AC at each dimension (Bedford et al., 2022a), the specific objective of this study is to broaden our understanding of (1) the role of tacit knowledge, (2) and whether the relationship between tacit knowledge, PMS diversity and AC is of a moderated nature. We thereby take into account the four complementary capabilities of AC to capture the multidimensionality of AC found in prior studies (Distel, 2019). According to Cohen and Levinthal (1990), tacit knowledge is a crucial antecedent of AC (Cohen and Levinthal, 1990). SMEs exhibit a propensity for accumulating tacit knowledge (Valentim et al., 2016; Valentim et al., 2016). This particular trait renders SMEs a pertinent context for the examination of the antecedents of AC. Furthermore, in accordance with Bedford et al. (2022a) and Tafkov et al. (2022), we take into account the role of PMS design, and more specifically of the diversity of firm-specific knowledge, on AC development. This allows us to test the interaction of the extant tacit knowledge that characterizes the firm, with the diversity of information generated by the PMS on AC. Therefore, we question whether knowledge accumulation, where each piece of information (e.g., PMS diversity) has been in constant interaction with tacit knowledge (Hadjimichael and Tsoukas, 2019; Nonaka and Toyama, 2015), has an moderating influence in the context of AC.

The results indicate that the relationship between tacit knowledge and AC in SMEs contains more complexities than previously assumed by Cohen and Levinthal (1990). We found no support for the detrimental effect of tacit knowledge on search behavior for new knowledge in the acquisition phase. We did not observe that tacit knowledge relates to the assimilation of knowledge. At the same time, there is no significant effect on the other AC dimensions. These findings reveal that a higher amount of tacit knowledge is far from

being always beneficial. If we define tacit knowledge as "the knowledge that is used as a tool to handle what is being focused on" (Sveiby, 1997, p. 30), it refers to the practical knowledge that can drive attention to how one can perform a task (Johannessen, Olaisen, and Olsen, 2001). This means that when SMEs are characterized by a higher amount of tacit knowledge, it is more likely that there is a shared understanding of how to perform tasks (Ancori, Bureth, and Cohendet, 2000). Volberda et al. (2021) relate this phenomenon as a "cognitive barrier", explaining that a dominant logic[12] may prevent individuals to achieve a new way of thinking. Therefore, fewer functional conflicts that are triggering the assimilation and transformation of new knowledge occur. This is consistent with Ditillo (2004), who argues that tacit knowledge can have a constraining influence in the context where diversified knowledge encourages perceiving problems or new knowledge in a multiplicity of ways. Although the negative influence of tacit knowledge on acquisition capability is not supported, the results advocate that we cannot take tacit knowledge as beneficial for acquiring external knowledge. Hence, we complement the work of Valentim et al. (2016) and consider tacit knowledge in SMEs pursuing the development of AC capabilities.

Moreover, our results indicate that tacit knowledge and PMS diversity are substitutes in SMEs pursuing new information acquisition. These conclusions confirm what we already know about SMEs' tendency to possess less bureaucratic structures and formal control systems, in addition to their reliance on tacit knowledge and informal interactions, which can be beneficial for acquiring new information (Thoma and Zimmermann, 2020; Valentim et al., 2016). Therefore, our results add to the literature discussing whether and how SMEs benefit from codified knowledge (Alhusen and Bennat, 2021; Knoppen et al., 2011; Mariano, 2023). The findings provide valuable insights for managers, emphasizing the importance of customizing the internal knowledge mechanism (e.g., designing more diverse PMS when firms possess lower tacit knowledge and vice versa) and exercising caution regarding the diverse implications associated with different types of knowledge for each absorptive capacity capability (e.g., the importance of intuition for acquiring external information when firms accumulated a vast amount of tacit knowledge).

[12] Dominant logic refers to how an organization approaches value creation and competition. Dominant logic becomes ingrained in the standard procedures that govern operations, influencing not just the behaviors but also the thought processes of organization members (Prahalad, 2004).

2.6 Conclusion

Despite the increasing importance of the AC for innovation, learning, and, eventually firm performance (Song et al., 2018), there is no coherent understanding of what drives AC (Bedford et al., 2022a; Distel, 2019). Particularly in SMEs, which encounter more vulnerability due to limited internal resources and reliance on external knowledge, studying AC's antecedents is pertinent (Valentim et al., 2016). Moreover, research on the antecedents of AC has been limited in its attempt to follow the suggestion of Jansen et al. (2005), to delve into the distinct processes of AC. We have contributed with this study to the AC literature in several ways. First, we conducted empirical analyses on how tacit knowledge is associated with AC, whereas prior publications discussed the relationship from a conceptual perspective (see Saad et al., 2017; Valentim et al., 2016; Jansen et al., 2005). Second, we illustrate that it is informative to study the effect of the amount of tacit knowledge in combination with PMS diversity on the different dimensions of AC. We do find that tacit knowledge and PMS interact positively in their association with acquisition. It means that both antecedents of AC need to be studied with careful consideration of their probable interaction. The results of individual effects prove that even though prior knowledge is considered the most critical AC antecedent and tacit knowledge is the essential component of a firm's internal knowledge base; it is simplistic to assume tacit knowledge is always beneficial for AC development. When PMS diversity is low, there is a positive correlation between tacit knowledge and external information acquisition. Conversely, within SMEs characterized by highly diverse PMS, the association between tacit knowledge and information acquisition tends to be negative. These results suggest that managers should pay more attention to the harmful effects of cognitive barriers when attempting to acquire external information and tailor their PMS design accordingly. We can conclude that PMS diversity can help firms benefit from accumulated tacit knowledge while attempting to acquire external information. This finding provides practical guidance for firms willing to improve the development of their AC.

The results should be considered in light of the limitations of this study. Taking the cross-sectional design of data and the contemporaneous measurement of variables into account, we cannot make any causal inferences but only point at associations. The perceptual judgment of managers besides the self-administrated modes of data collection might be influential. Finally, the data is generated from only one country, which might

limit the generalizability of the results in cross-country comparisons. Taking these limitations into account, we are confident to share new insights regarding the interrelated elements of the antecedents of AC. Future research can further advance our understanding of what drives AC by studying other types of knowledge (situational, conceptual, procedural, depth versus breadth, and general versus domain specific[13]) at various levels of analyses (team and organization), their probable interaction with one another as well as with organizational structure and design (for instance, PMS complexity, timeliness, aggregation[14]).

[13] See De Jong and Ferguson-Hessler (1996) for more information.
[14] See Bedford et al. (2022a)and Chenhall and Morris (1986) for more information.

Chapter 2 Appendix

Table 2.A. Only firms with less than 250 full time employees (N=184).

Independent variables	Dependent variables			
	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
Tacit_know	0,078 (0,852)	-0,027 (-0,335)	0,021 (0,238)	-0,055 (-0,763)
PMS diversity	0,242** (2,406)	0,035 (0,404)	-0,032 (-0,332)	0,141† (1,775)
Tacit_know* PMS diversity	-0,102 (-1,093)	0,128 (1,551)	-0,144 (-1,570)	0,162** (2,108)
Controls	YES	YES	YES	YES
R^2	0,161	0,158	-0,040	0,217

Note: †stands for p < 0,1, ** for p<0,05, *** for p< 0,01 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 647,912 with 435 degrees of freedom. CFI equals 0,917, TLI is 0,899. RMSEA is 0,052 and SRMR is 0,068. N=184.

Table 2.B. Dekker measurement for PMS.

Independent variables	Dependent variables			
	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
Tacit_know	0,085 (0,999)	-0,044 (-0,573)	0,031 (0,355)	-0,050 (-0,691)
PMS diversity	0,258*** (3,058)	0,116 (1,536)	-0,112 (-1,327)	0,203*** (2,818)
Tacit_know* PMS diversity	-0,203** (-2,473)	0,044 (-0,597)	-0,073 (-0,896)	0,044 (0,652)
Controls	YES	YES	YES	YES
R^2	0,216	0,165	-0,039	0,192

Note: †stands for p < 0,1, ** for p<0,05, *** for p< 0,01 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 08,279 with 435 degrees of freedom. CFI equals 0,936, TLI is 0,922. RMSEA is 0,045 and SRMR is 0,064. N=202.

Table 2.C. 10% threshold for random replacement (N=199).

Independent variables	Dependent variables			
	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
Tacit_know	0,076 (0,863)	-0,054 (-0,702)	0,038 (0,442)	-0,054 (-0,751)
PMS diversity	0,247** (2,556)	0,044 (0,521)	-0,055 (-0,592)	0,198** (2,476)
Tacit_know* PMS diversity	-0,152 (-1,625)	0,091 (1,120)	-0,093 (-1,022)	0,097 (1,265)
Controls	YES	YES	YES	YES
R^2	0,177	0,178	-0,020	0,189

Note: †stands for p < 0,1, ** for p<0,05, *** for p< 0,01 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 07,902 with 435 degrees of freedom. CFI equals 0,935, TLI is 0,921. RMSEA is 0,045 and SRMR is 0,067. N=199.

Table 2.D. Only observations with no missing values (N=176).

Independent variables	Dependent variables			
	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
Tacit_know	-0,002 (-0,020)	-0,167† (-1,924)	0,068 (0,702)	-0,165** (-2,009)
PMS diversity	0,196** (2,012)	0,048 (0,582)	-0,039 (-0,434)	0,275*** (3,405)
Tacit_know* PMS diversity	0,037 (0,432)	-0,160** (2,168)	-0,049 (-0,597)	0,038 (0,558)
Controls	YES	YES	YES	YES
R^2	0,162	0,205	0,075	0,230

Note: †stands for p < 0,1, ** for p<0,05, *** for p< 0,01 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 576,847 with 435 degrees of freedom. CFI equals 0,943, TLI is 0,931. RMSEA is 0,043 and SRMR is 0,062. N=176.

Table 2.E. Without the interaction term.

Independent variables	Dependent variables			
	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
Tacit_know	0,078 (0,888)	-0,046 (-0,596)	0,032 (0,364)	-0,053 (-0,739)
PMS diversity	0,218** (2,479)	0,127† (1,667)	-0,135 (-1,575)	0,221*** (3,014)
Controls	YES	YES	YES	YES
R^2	0,151	0,169	-0,042	0,198

Note: †stands for p < 0,1, ** for p<0,05, *** for p< 0,01 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 471,737 with 329 degrees of freedom. CFI equals 0,939, TLI is 0,925. RMSEA is 0,046 and SRMR is 0,061. N=202.

Chapter 3

Do the design and use of the Performance Measurement System matter for a firm's Absorptive Capacity?

Abstract

A firm's absorptive capacity (AC) compromises four capabilities being acquisition, assimilation, transformation, and exploitation. The literature identifies two clusters of antecedents to a firm's AC: prior knowledge and internal organizational mechanisms. We consider a firm's PMS as a firm-specific source of information that represents a unique resource to the firm. Relying on resource-based theory, we hypothesize that unique resources, including a firm's PMS information, are associated with higher AC capabilities. Moreover, the literature provides evidence that PMS's design and use are related to a firm's organizational outcomes. In addition, since diagnostic and interactive use of performance information are a form of communication and dialogue, we argue that both are associated with different types of organizational learning, which in turn also enhances a firm's capabilities. Based on organizational learning, we study whether a diagnostic and/or interactive use of performance information mediates the relationship between a firm's PMS and a firm's AC. We test our hypotheses using cross-sectional survey data from 215 small and medium-sized firms (SMEs) using structural equation modeling (SEM). The results indicate that the relationship between PMS design and use choices and AC differs according to the component of AC considered. We provide evidence that a more diverse PMS is significantly associated with a higher acquisition of new external information and higher exploitation of knowledge. Moreover, more interactive use of PMS information completely mediates the positive relationship between a more diverse PMS and a firm's transformation capability.

Keywords: Performance Measurement Systems; Diagnostic Use; Interactive Use; Absorptive Capacity.

3.1 Introduction

In this paper, we investigate whether the diversity of a firm's Performance Measurement System (PMS) is directly related to a firm's absorptive capacity (AC), as well as whether this relationship is mediated through a diagnostic or interactive use of that performance information provided by the firm's PMS. The diversity of a firm's PMS refers to the range or number of performance indicators considered for evaluating the performance of firms (Dekker et al., 2013). Regarding the AC definition, Zahra and George (2002, p. 186) define a firm's AC as "a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability." According to the literature, a firm's AC is associated with a firm's performance (Patel et al., 2015; Fernhaber and Patel, 2012) and the development of competitive advantages (Zobel, 2017); moreover, it can stimulate innovation and strategic change (Helfat and Martin, 2015; Volberda, Foss, and Lyles, 2010). AC is particularly important for small and medium-sized enterprises (SMEs) since they rely more on the external environment to compensate for their shortage of internal resources[15], and given that the development of AC is important for an SME's survival, it becomes pertinent to investigate the antecedents of AC in SMEs (de Araujo Burcharth, Lett, and Ulhoi, 2015; Flatten et al., 2011b; Zahra, Ucbasaran, Newey, 2009). However, despite the importance of AC, little is known about what drives AC, particularly in SMEs (Bedford et al., 2022a; Bouguerra et al., 2021; de Araujo Burcharth et al., 2015).

In the literature, the AC construct has evolved from a unidimensional concept, proxied by R&D spending intensity, to a multidimensional construct consisting of four dimensions: acquisition of external information, assimilation of information, the transformation of knowledge, and exploitation of knowledge (Flatten et al., 2011a; Cohen and Levinthal, 1990). Zahra and George (2002) categorize the acquisition of external information and assimilation of information as potential AC, while the transformation and application of knowledge constitute realized AC. They argue that these two higher-order capabilities complement each other in achieving strategic change (Zahra and

[15] Resources here is a general concept that can refer to the number of employees, their time and knowledge, as well as financial resources available to firms (Flatten et al., 2011b).

George, 2002). However, further research argues that AC compromises four distinct capabilities of acquisition, assimilation, transformation, and exploitation (Zobel, 2017; Flatten et al., 2011a; Todorova and Durisin, 2007), and such sub-categorization is crucial to research the antecedents of AC since each dimension can have unique drivers (Jansen, Van den Bosch, and Volberda, 2005). Similarly, we follow the suggestion of Bedford et al. (2022a) and investigate AC's antecedents and their relationship with each of the four dimensions of AC. Moreover, SMEs often face greater vulnerability and limited resources. Since building AC demands resources, it is crucial to focus on how SMEs can effectively manage their internal resources to enhance their AC (de Araujo Burcharth, Lett, and Ulhoi, 2015). In studying AC's antecedents, de Araujo Burcharth et al. (2015) provide evidence that elements that make a firm more open to external information, called openness, are the most critical drivers of AC in SMEs. Van den Bosch, Van Wijk, and Volberda (2003) introduce two clusters of antecedents of AC being prior knowledge and internal organizational mechanisms. In this study, we follow de Araujo Burcharth et al. (2015) in focusing on AC development in SMEs, and we build on Van den Bosch et al. (2003)'s observation to investigate whether a firm's internal information environment, captured by the diversity of a firm's PMS, is associated with its AC. The more diverse the PMS, the more comprehensive is the range of indicators examining a company's financial and non-financial performance. Consequently, firms gather and accumulate more information (Hall, 2010). We consider that the diversity of a firm's PMS allows the firm to build up prior knowledge and as such, PMS can be considered as a proxy for prior knowledge. Since the management control literature provides evidence that it is necessary also to consider the use of this performance information when studying the influence of PMS design on firm outcome, we consider the type of use of the information resulting from a firm's PMS as an internal organizational mechanism being an element of the second cluster of Volberda et al. (2010) to influence a firm's AC. As such, the degree of PMS diversity combined with the use of that PMS information are unique strategic resource to each firm[16] and can be considered as possible antecedents to a firm's AC through a resource-based view lens.

[16] Unique information refers to the valuable information that PMS accumulates internally within a firm. Therefore, PMS generates and accumulates a type of strategic resource relevant to possess a competitive advantage.

Research on the relationship between a firm's PMS and its AC is still scarce (Bedford et al., 2022a). In line with Henri (2006a), this study states that a more diverse PMS generates a more affluent knowledge base, which can be a significant antecedent of AC. As a firm's PMS is one of the firm's information provision tools (Franco-Santos, Lucianetti, and Bourne, 2012), we assume that a more diverse PMS as a formal tool (Franco-Santos et al., 2012) causes a broader scope of information accumulation and more prior knowledge. Moreover, PMS relates to formalization, which is recognized as an element of organizational structure that influences AC (Ali et al., 2018; Vega-Jurado, Gutierrez-Gracia, and Fernandez-de-Lucio , 2008; Jansen et al., 2005). PMS are part of organization structures by explicating objectives, supporting decision-making, and supporting the internal information flow (Lee and Yang, 2011). Therefore, Bedford et al. (2022a) encourage researchers to study PMS from various perspectives as one of AC's antecedents. They follow the differentiation between PMS design choices suggested by Franco-Santos et al. (2012) and test the relationship between broad-scope PMS and PMS integration (Bedford et al., 2022a).

Based on resource-based theory, we can state that designing the PMS includes "how much" and "what type" of idiosyncratic information accumulates to generate valuable, inimitable, and non-substitutable firm's resources, which can lead to developing unique firm capabilities (Barney et al., 2021b; Lin and Wu, 2014; Nudurupati et al., 2011). Since PMS information can be used in different ways and each type of use can generate different firm outcomes (Guenther and Heinicke, 2019), we consider PMS design choices simultaneously with the choice on how to use the performance information when studying the relationship between PMS diversity and a firm's AC and examine whether the type of PMS information use mediates the relationship between PMS design and AC.

The diagnostic and/or interactive use of performance information can be a relevant internal mechanism related to AC development. Both a diagnostic and an interactive use of performance information can stimulate organizational learning by encouraging interaction (Levitt and March, 1988; Widener, 2007). *Diagnostic use* of PMS information refers to applying that information for monitoring purposes and for providing feedback. *Interactive use* of PMS information refers to applying that information to foster information exchange, motivate debates, increase communication, and invite mutual

adjustments (Henri, 2006a)[17]. While both diagnostic and interactive use of PMS information stimulate learning, the interaction of organizational members in the diagnostic use of PMS information (e.g., feedback) emphasizes the improvement of the current state of products, services and processes, leading to incremental changes. So a diagnostic use of performance information results in single-loop learning. When managers use PMS information more interactively to manage uncertainty and discuss the future of the company, double loop learning can occur, leading to more radical innovation (Henri, 2006a; Muller-Stewens et al., 2020). Therefore, the relationship between PMS design and organizational outcomes could be through the intervening effect of how PMS information is used (Guenther and Heinicke, 2019; Muller-Stewens et al., 2020).

This research contributes to the management accounting literature by providing empirical evidence on the relationship of PMS design and performance information use choices for each dimension of AC. While management accounting research pays increasing attention to the role of PMS in firms engaged in innovation and strategic change (e.g., Abernethy, Dekker, and Grafton, 2020; Bedford, Bisbe, and Sweeney, 2019), insights into the relationship between PMS and AC, despite the importance of AC in firms' survival, are still scarce (Bedford et al., 2022a). Our research answers the call from Bedford et al. (2022a) to study AC's antecedents and their implications for AC's four capabilities. Our results illustrate that a more diverse PMS is significantly positively related to acquiring more external information and exploiting more new knowledge. Furthermore, we provide evidence that PMS diversity is indirectly associated with a firm's transformation capability through an interactive use of performance information. Therefore, aligned with Guenther and Heinicke (2019) and Bellora-Bienengraber et al. (2022), we provide further evidence that when studying the relationship between PMS design and a firm's AC capabilities, it is necessary to consider how the information is used.

The remainder of this study is organized as follows. Section 2 provides the theoretical framework. We discuss our hypothetical relationships and the research model in Section

[17] Interactive in this thesis refers to all kinds of interaction among employees at the same and different hierarchical levels of an organization. Interactive use of control information can more specifically refer to the interaction between employees at different organizational levels (managers and subordinates). In this thesis, our focus is on interaction without regard to whether the interaction is horizontal among employees at the same level or vertical between managers and subordinates.

3. Section 4 describes the research method, while Section 5 represents the results. We discuss the empirical findings and conclude in Section 6.

3.2 Literature review and hypothesis development

3.2.1 Antecedents of Absorptive Capacity in SMEs

AC was first introduced by Cohen and Levinthal (1990, p. 128) as the "ability to recognize the value of external information, assimilate it, and apply it to commercial ends." AC is one of the most discussed topics in management because of its connection with innovation, strategic change, and competitive advantage (e.g., Miroshnychenko et al., 2021; Liao et al., 2017). Since Cohen and Levinthal (1990) introduced the concept of AC, there has been a dialogue on the conceptualization and operationalization of this construct (Yao and Chang, 2017; Flatten et al., 2011a; Volberda et al., 2010; Todorova and Durisin, 2007; Zahra and George, 2002). Yet the literature reaches a consensus that studying antecedents of AC at the organizational level requires a multidimensional perspective to capture a more accurate picture of AC's variance (Flatten et al., 2011a; Volberda et al., 2010; Vega-Jurado et al., 2008). Therefore, in this study, consistent with the framework proposed by Zahra and George (2002), we differentiate among four capabilities of AC: (a) *Acquisition*, encompassing the identification and procurement of external information essential for the firms' operation; (b) *Assimilation*, which involves the dissemination and sharing of acquired information within the organization; (c) *Transformation*, denoting the organizational capacity to facilitate the integration and synthesis of the newly acquired and assimilated information with the existing knowledge; and (d) *Exploitation*, representing the organizational capability to refine, expand, and leverage existing competencies, or generate novel ones, through the application of transferred knowledge.

Studying AC's antecedents can additionally benefit SMEs. Since SMEs are characterized by higher vulnerability and scarcity of resources, there are calls to devote further attention to AC in SMEs (Flatten et al., 2011b; Miroshnychenko et al., 2021; Valentim, Lisboa, and Franco, 2016). Consequently, scholars try to provide various solutions for protecting SMEs and increasing their odds of survival. Possible solutions include the combination of internal resources (Yang, Bossink, and Peverelli, 2017; Li, de Zubielqui, and O'Connor, 2015), the collaboration with other firms (Quas, Martí, and

Reverte, 2021; Flatten et al., 2011b), and internationalization to other markets (Dabic et al., 2019). Flatten et al. (2011b) argue that SMEs can suffer more from a lack of heterogeneity in their existing knowledge base. Therefore, they suggest considering means to expand SMEs' internal knowledge stock. Hence, there is an additional incentive for scholars to study AC's antecedents in smaller firms (e.g., Pittz et al., 2019; Ali et al., 2018; de Araujo Burcharth, Lett, and Ulhoi, 2015).

3.2.2 Design of Performance Measurement Systems

PMS diversity is an element of PMS design that captures the scope of PM information (Dekker et al., 2013). In general, a PMS can be considered an internal database that provides information concerning a firm's processes and outcomes and also as a management control mechanism that can influence the behavior of organizational members to facilitate the delivery of organizational goals (Franco-Santos et al., 2012; Ferreira and Otley, 2009). PMS design refers to the format, sophistication, comprehension, and extent of details collected with respect to the different aspects of performance of the firm(Bisbe et al., 2019). Design characteristics refer a.o. to the number of key performance measures used to create goal alignment and reduce uncertainty (Franco-Santos and Otley, 2018). Relying on resource-based theory, PMS design, reflected in the diversity of the performance indicators present in the company, is an accounting tool generating firm-specific information which can be a strategic and unique information resource to the firm (Hall, 2010). Moreover, PMS is integrated into a company's formal structure since PMS involves documenting information containing written communications, procedures, and instructions specific to the firm (Bedford et al., 2022a; Ali et al., 2018; Vega-Jurado et al., 2008; Jansen et al., 2005).

A number of prior studies examined management control elements and their correlation with AC, yielding the following insights. In brief, the literature indicates that prior knowledge accumulated within a firm and internal mechanisms are two main antecedents of AC. Cohen and Levinthal (1990) introduce prior knowledge as the primary driver of AC. Moreover, internal mechanisms, which refer to organizational features and actions relating to how employees interact and how information circulates within a firm, are another vital element in studying AC's antecedents (Volberda et al., 2010). For instance, formalization, participation in decision-making, and job rotations are internal mechanisms (Jansen et al., 2005). Jansen et al. (2005) categorize internal mechanisms

that are antecedents of AC at the organizational level into mechanisms related to coordination and mechanisms related to socialization. Internal mechanisms related to coordination enhance knowledge dissemination (Bouguerra et al., 2021; Jansen et al., 2005; Lewin, Massini, and Peeters, 2020; Vega-Jurado et al., 2008; Volberda et al., 2010). In this line, formalization and socialization processes contain explicit and tacit knowledge. Formalization refers to the degree of written down instructions and procedures, and socialization processes involve tacit rules and boundaries. Moreover, Elbashir, Collier, and Sutton (2011) focus on the association between cultural controls and the development of AC. Elbashir et al. (2011) provide evidence that AC at the top management relates to AC at the organizational level. They suggest applying cultural controls to embed an influential knowledge culture supporting organizational AC (Elbashir et al., 2011). Moreover, Ben-Oz and Greve (2015) evaluate goal-setting and performance feedback as AC's antecedents. When a company's performance declines, there is an increased dedication to strengthening AC as a means to offset the effects of poor performance (Ben-Oz and Greve, 2015). Moreover, the literature also recognizes that particular antecedents have a distinct connection with AC capabilities. While long-term goals affect acquisition and assimilation capabilities, short-term goals driven by actions related to problems at hand impact transformation and exploitation capabilities (Ben-Oz and Greve (2015). In this vein, environmental dynamism is a trigger for lagging firms to invest more in general knowledge and increase their acquisition and assimilation capabilities. Thus, Ben-Oz and Greve (2015) emphasize considering the role of environmental dynamism in studying organizational AC. Bedford et al. (2022a), the first researchers who studied PMS in the AC context, provide evidence that PMS design choices relate positively to transformation and exploitation (compromise realized absorptive capacity). They argue that PMS design choices can have different implications for each AC dimension (acquisition and assimilation within potential AC in contrast to realized AC). They study PMS from two perspectives: *Scope* (referring to the number of measures, their focus, orientation, and time horizon) and *Integration* (the degree to which PMS information reveals the cause and effect of the relationship between actions and outcomes throughout the value creation chain). They collect data from innovative industries to test the relationship between PMS design choices at the top management team with AC in different environmental uncertainty levels. In this vein, we add to the study of Bedford et al. (2022a) by considering the simultaneous inclusion of PMS design and use while studying the relationship with AC's four capabilities at the organizational

level and within various industries (Bellora-Bienengraber, Derfuss, and Endrikat, 2022; Guenther and Heinicke, 2019). Overall, studies investigating the link between management control and AC are scarce.

PMS provides accounting information that can be viewed as a valuable resource to enhance a firm's internal knowledge base, leading to improved decision-making (Burney and Widener, 2007; Hall, 2010). According to the resource-based theory, internal resources, including information, knowledge, and capabilities, which are valuable, rare, imperfectly imitable, and non-substitutable, facilitate sustained competitive advantage (Barney, 1991). Hence, the examination of elements of management control in relation to organizational capabilities from the perspective of the resource-based theory is highly relevant.

3.2.3 The use of the performance information

Within the scope of our study, the utilization of performance information can be categorized into two distinct forms: diagnostic use and interactive use. Aligned with the principles of organizational learning, the diagnostic and interactive forms of performance information utilization encompass internal mechanisms that actively shape the extent and quality of performance information communication within a firm. Therefore, PMS diversity relates to AC also indirectly through the level of interaction among organizational members driven by the type of PMS use. With diagnostic use, managerial attention is focused on monitoring the achievement of pre-established standards, detecting deviations, and subsequently fostering corrective actions (Simons, 1995a). Interactive use of performance information refers to managers' regular involvement in subordinates' decision-making activities through discussions, debates, and face-to-face meetings (Widener, 2007; Henri, 2006a; Simons, 1995a). In this thesis, "interactive" encompasses all forms of interaction among employees, regardless of whether it occurs horizontally among employees at the same level or vertically between managers and subordinates. To comprehensively grasp the interconnectedness between PMS design, organizational processes and capability development, captured by AC, it becomes imperative to incorporate the mediating impact of managerial utilization of performance information (Bellora-Bienengraber, Derfuss, and Endrikat, 2022; Guenther and Heinicke, 2019). Therefore, in this study, we consider both aspects of PMS, i.e., the design of the

PMS, captured by the diversity of the PMS, and how this PMS information is used, i.e., in a diagnostic and interactive way.

The dimensions of AC are influenced by organizational mechanisms such as coordination, communication, and formalization, as noted by Distel (2019) and Jansen et al. (2005). Managers' utilization of performance information, encompassing both diagnostic and interactive uses, is embedded within the context of coordination mechanisms, organizational norms and values, communication routines, and the degree of formalization. The diagnostic use of control information provides insights into performance deviations from pre-established standards, enabling single-loop learning. On the other hand, the interactive use of control information promotes double-loop learning by going beyond the initial performance evaluation and fostering conversations and discussions (Argyris, 1977). Moreover, the diagnostic and interactive use of information links to capabilities as the types of use are mechanisms preventing firms from generating dysfunctional routines, thus improving coordination, resource allocation, and implementing strategy (Bellora-Bienengraber et al., 2022; Simons, 1995). Information provision and coordinating mechanisms align with the principles of the resource-based theory, which emphasizes the role of unique internal resources in fostering a firm's sustained competitive advantage (Barney, 1991). Relying on organizational learning, we argue that diagnostic and interactive use of performance information are internal mechanisms that regularly guide behavior, introduce targets, enhance behavior adaptation based on feedback, and influence interactions among organizational members (Levitt and March, 1988; Simons, 1995a). Therefore, we anticipate that how managers employ performance information is highly relevant to understanding the relationship between the available performance information included in a firm’s PMS and AC's capabilities.

A more diverse PMS design leaves more room for decisions related to the use of performance information in terms of the intensity of use, the level of attention to the information, and the type of communication pattern used (Bisbe et al., 2019). In case of a more diverse PMS , more information is available for monitoring and feedback. As a result, more corrective actions can be taken, from which more insight into companies’ processes and opportunities for improvement is obtained. For instance, Hofmann, Wald, and Gleich (2012) suggest that SMEs collect vast amounts of information in PMS to apply it diagnostically and interactively to mitigate uncertainty. Furthermore, a diverse set of

performance measures improves the usefulness of accounting information (Hall, 2010), as it can contain more cues related to strategic issues that can stimulate debate and promote discussion (Henri, 2006b). Thus, the design of a firm's PMS is related to the type of use of performance information, which is in turn related to a firm's PMS informativeness and organizational communication pattern (Dekker, Groot, and Schoute, 2013; Ittner et al., 2003; Perego and Hartmann, 2009).

3.2.4 Hypotheses development

In this section, relying on resource-based theory, we first develop the hypotheses supporting whether or not a diverse PMS relate to AC capabilities. After that, we develop hypotheses based on the relationship between design and use of PMS. We argue that diagnostic and interactive use are forms of organizational learning through which the design of PMS is related to a firm's AC.

Acquisition

Based on the resource-based theory, we expect that firms with a higher PMS diversity have accumulated a greater range of strategic resources. Consequently, this higher level of strategic resource accumulation is anticipated to be associated with an enhanced acquisition capability in AC. The reason is that PMS is part of the stock of prior knowledge, which is required to recognize external information's value and obtain relevant information (Todorova and Durisin, 2007). Prior knowledge is the backbone for comprehending the received external information and the type of information sought (Schmidt, Rotgans, and Yew, 2011; Case, 2002; Cohen and Levinthal, 1990). Therefore, the more extensive the reservoir of existing knowledge, the greater the likelihood that firms will be able to grasp the significance of external information.

Bedford et al. (2022a) argue that the scope of the PMS is a design attribute that is tailored to the needs of firms without restricting the search for new knowledge and its understanding. This is in line with Bertrand and Mol (2013), who emphasize the role of heterogeneity of knowledge inputs, while they acknowledge that searching for new knowledge is myopic and typically involves limited distance. Bedford et al. (2022a) and Bertrand and Mol (2013) oppose Jansen et al. (2005), who hypothesize (but find no significant effect) that written down rules and formalization constrain attention devoted to the external environment. Despite this mixed evidence in the literature, we follow the

argument that a PMS providing a diverse set of performance measures is a mechanism that supports the accumulation of internal firm-specific knowledge.

Additionally, we argue that SMEs are likely to benefit from a more diverse PMS design since they need to heterogenize their internal knowledge base to recognize more broadly the relevancy of external information. While SMEs are characterized by possessing a homogeneous knowledge base[18] (Flatten et al., 2011b), Brunswicker and Vanhaverbeke (2015) suggest SMEs' recognition of widely diverse knowledge domains is pertinent to the acquisition of external information from various sources. Taking into consideration the aforementioned perspectives, we propose the following hypotheses:

H1(a): A more diverse PMS is positively associated with acquiring more new external information.

Diagnostic use of performance information encompasses various processes, such as establishing predefined goals, quantifying outcomes, assessing performance variances, contrasting actual performance with predetermined benchmarks, highlighting deviations from established performance standards, and initiating corrective measures. These processes collectively create a framework for facilitating internal interactions within the organization (Simon, 2014; Hofmann et al., 2012). The traditional feedback role of diagnostic use is to align the performance of the firm with the goals of the organization and to maintain the alignment (Henri, 2006a). It is likely that the feedback process motivates an organization with negative variance to seek a solution and subsequently acquire external information as a remedy (Ben-Oz and Greve, 2015). Pre-established goals in a formal feedback system of diagnostic use highlight the relevancy of external information with the organization's plan (Mundy, 2010; Henri, 2006a). Therefore the existence of regular feedback inherited in the diagnostic use of performance information can be associated with higher information acquisition since feedback can indicate that more information is required and therefore will initiate attempts to acquire external information (Nonaka and Toyama, 2003; Zhou and Li, 2012).

[18] Homogenous knowledge refers to a lack of heterogeneity in the knowledge base of small companies. For example, engineering knowledge dominates while marketing knowledge remains inadequate (Flatten et al., 2011b).

Moreover, similar to our argument above, repeated and intense interaction and openness to sharing information, opinions, and comments pave the way for firms to acquire external information (Smith, 2011; Yli-Renko, Autio, and Sapienza, 2001). In an interactive use of PMS, the diversion of attention to strategic issues and uncertainties can contribute to an external search routine which can lead to a search for the causation of problems, the prospect of solutions, and further information in general (Henri, 2006b; Simons, 1995a). Similarly, we argue that the positive relationship between PMS diversity and the acquisition of new information is mediated by managers' interactive use of PMS information.

H1(b): The positive association between a diverse PMS and the acquisition of new external information is mediated by the diagnostic use of the performance information.

H1(c): The positive association between a diverse PMS and the acquisition of new external information is mediated by the interactive use of the performance information.

Assimilation

Sharing information requires understanding the value and meaning of information (Cohen and Levinthal, 1990; Elbashir et al., 2011). A more diverse PMS provides a richer accounting tool to assist information sharing beyond the heterogeneity in culture, function, expertise, and experience (Hall, 2010). Since the assimilation of information requires understanding and interpreting information, we argue that a more diverse PMS is likely to reduce the time and effort needed to assimilate information, especially distant ones (Alavi and Leidner, 2001; Moreira, Markus, and Laursen, 2018; Zahra and George, 2002). Learning from new knowledge requires capturing the linkage between prior knowledge and new knowledge (Song et al., 2018). A broad knowledge base is useful to absorb new knowledge, especially from an unrelated domain (Santoro, Bresciani, and Papa, 2020). A heterogeneous knowledge base increases the probability that one understands the value of new knowledge and foresees its relevance (Schweisfurth and Raasch, 2018). Classen et al. (2012) rely on the notion of cognitive background to argue that a limited diversity in background knowledge affects search behavior, interpretation of a current situation, expectations related to future events, and upcoming alternatives to these events. We argue that collecting more information through a diverse set of performance measures is typically linked to more assimilation of new information. The

diversity of performance indicators provides information on different and separate aspects of organizational effectiveness (Henri and Wouters, 2020). Therefore, a diverse set of performance information opts for a richer organizational knowledge base where assimilation, interpretation, and comprehension of newly acquired knowledge are facilitated. A more diverse PMS design enhances firms' managerial understanding of the value of external knowledge and, consequently, the higher likelihood of attempts to assimilate information internally (Bedford et al., 2022a). Therefore, we argue that more diverse background knowledge, which is stimulated by a diverse PMS, is more likely associated with higher internal assimilation of information. Overall, the explicit representation of performance indicators provides a communication background, triggers awareness, and creates a shared understanding of challenges (Bisbe and Malagueño, 2012). Altogether, we hypothesize:

H2(a): A more diverse PMS is positively associated with higher assimilation of new external information.

The structure of communication is one of the organizational design characteristics that influence AC (Colombo, Foss, and Rossi-Lamastra, 2012). Moreover, a diagnostic and an interactive use of PMS influence within-firm communication (Muller-Stewens et al., 2020). Colombo et al. (2012) acknowledge that information-sharing practices relate to AC; either information sharing occurs under supervision as a feedback mechanism (e.g., in the diagnostic use of information), or it occurs formally or informally in social settings when discussing and communicating the future and strategy of the firm and coordination of actions within the firm (e.g., in the interactive use of information). Diagnostic use of PMS can lead to the commitment of organizational members to accentuate novel solutions and share relevant information (Mundy, 2010; Henri, 2006a). Diagnostic use of information directs the channel of information flow to specific people and conditions (Henri, 2006a)[19]. Moreover, the ability to direct external information to the right people within the organization is vital for AC. Therefore, structures such as diagnostic use, which increase accountability (Sion, 1994), and routines that provide a clear picture of responsibilities can contribute to AC (Matusik and Heeley, 2005). Consequently, it is

[19] The feedback inherited in the diagnostic use of PMS information causes information related to performance beyond the expected range to be reported for further discussion between managers and subordinates. Therefore, the diagnostic use of PMS develops an information flow hierarchically within firms.

reasonable to expect a relationship between the diagnostic use of PMS and the assimilation of information.

Interactive use of PMS information coordinates a firm's activities by inviting managers to interact with subordinates regularly and participate in their daily decision-making activities (Henri, 2006a; Jansen et al., 2005). This can act as a liaison device, harmonizing tasks across organizational ranks, where management can navigate a cause-effect relationship between operations and goals throughout the value chain (Henri, 2006b; Chenhall, 2005). As such, the interactive use of PMS integrates and links various parts of an organization to get things done (Henri, 2006b). This orchestrates organizational activities and participates in coordination mechanisms (Muller-Stewens et al., 2020), consequently enhancing the assimilation of information (Jansen et al., 2005). We argue that such regular interactions are linked to coordinating activities and provide a setting where parties can acquire external information, and share it further. Interactive control systems involve operational managers at all levels and motivate information exchange and processing through debate and face-to-face dialogue (Bisbe and Otley, 2004). Wider communication channels and frequent interactions facilitate the dispersion of critical information (Henri, 2006b; Hoegl, Parboteeah, and Munson, 2003). Therefore, it is likely that an interactive use of PMS information encourages organizational members to share information and unravel its value. So we hypothesize that

H2(b): The positive association between a diverse PMS and the assimilation of new external information is mediated by the diagnostic use of the performance information.

H2(c): The positive association between a diverse PMS and the assimilation of new external information is mediated by the interactive use of the performance information.

Transformation

According to the resource-based theory, the more performance information recorded in the PMS (i.e., degree of PMS diversity), the more strategic resources are available to develop new capabilities, including a transformation capability. The transformation capability requires modified knowledge and new insights (Zahra and George, 2002). More detailed firm-specific knowledge is more likely to support a firm in synthesizing new knowledge with prior ones, since diverse performance information allows more interpretations and meanings of performance measures, enabling the formation of new

alternatives (Bedford, Bisbe, Sweeney, 2022b). In contrast, firms developing inadequate performance measures suffer unavoidably from dysfunction, bias, failure, and rigidity in exploiting opportunities (Guenther and Heinicke, 2019). Performance measures are among the indicators that show the desired way for managers to control performance and intra-organization relationships (Dossi and Patelli, 2010) and the more diverse the PMS, the more information and possibilities for transformation are available. Moreover, achieving goal congruence and cooperation in dispersed actions is better done through a diverse array of task-relevant information to mitigate uncertainty, control day-to-day business activities with more specificity, and advocate stability (Bedford et al., 2022b). In this vein, Tafkov et al. (2022) argue that adopting and designing a more diverse PMS promotes the sharing and using of new knowledge since it supports goal congruence and goal linkage communication. Therefore, it is reasonable to argue that a higher PMS diversity represents a higher level of formalization of performance information. In this way, it coordinates a broader scope of activities, leading to better uncertainty management, which facilitates finding novel insights and alternatives (Bedford et al., 2022a). Ultimately, implementing changes and emerging new routines is facilitated (Pertusa-Ortega et al., 2010).

Moreover, we argue that a higher PMS diversity enriches organizational memory to facilitate the retrieval of prior knowledge and identify outdated systems for modification or gaining new insight (Franco-Santos et al., 2012; Walsh & Ungson, 1991; Zahra and George, 2002). Organizational learning theory is used to explain the relationship with the use of performance information and AC. Enriching organizational memory enhances organizational learning since prior knowledge is stored, recorded, and organized in documents. As a result, knowledge loss due to the time or movement of employees is reduced (Argote, 2011). Therefore, storing diverse performance information eases the accessibility to a broad range of prior knowledge related to organizational routines, and hence, performance information is embedded in organizational memory, which facilitates knowledge retrieval to generate new insight (Camison, Boronat and Villar, 2010; Hargadon and Sutton, 1997). Moreover, enriching organizational memory enhances a firm's capability to interpret new knowledge in such a way that builds a basis for the transformation of knowledge (Moorman and Miner, 1997). Taken together, we hypothesize:

H3(a): A more diverse PMS is positively associated with transforming knowledge.

Knowledge transformation requires multiple occurrences of "negotiation of meaning" in the form of casual conversation, debate, and face-to-face interaction (Brix, 2017). Organizations develop knowledge transformation capability through structures and mechanisms which encourage interaction, engagement, and involvement within firms (Kenney and Gudergan, 2006; Jansen et al., 2005). Therefore, we argue that the use of performance information in a diagnostic way and in an interactive way are both socially enabling mechanisms associated with transformation capability.

Socialization enhances the bisociation between new knowledge and prior one and, in this way, facilitates knowledge transformation (Zahra and George, 2002). Socialization between organizational members, including exchanging feedback, associates with a higher commitment to organizational goals and a higher likelihood of change in knowledge and skills (Chao et al., 1992; Michel, 2011). We argue that diagnostic and interactive use of performance information relates to socialization and organizational learning; thus, it is likely that these types of use also relate to transformation capability.

Diagnostic use of performance information encourages interaction among managers and subordinates, especially concerning the gap between performance and expectations, thus providing single-loop learning (Argyris, 1977). Diagnostic use of performance information signals deviation in performance from expectations and, in this way, enhances organizational learning (Widener, 2007). Unraveling performance devitations from expectations stimulates organizations to find solutions and alternatives as fast responses to compensate for the shortcomings (Ben-Oz and Greve, 2015). Therefore, we argue that the higher the diagnostic use of performance information, the more likely organizations will develop transformation capability. Communicating performance information interactively promotes social interaction and creates double-loop learning while providing a basis to take inquiries and actions (Argyris and Schon, 1978; Kruis, Spekle, and Widener, 2016; Lewin et al., 2011). The resulting interactions foster the development of a common language, trust, and compliance necessary to transform knowledge and apply it in operation (Jansen et al., 2005; Adler and Kwon, 2002). Therefore, we hypothesize that:

H3(b): The positive association between a diverse PMS and the transformation of knowledge is mediated by the diagnostic use of performance information.

H3(c): The positive association between a diverse PMS and the transformation of knowledge is mediated by the interactive use of performance information.

Exploitation

Exploitation capability requires congruence and alignment of actions to manage and mitigate the risks and uncertainty involved. Order, stability, and control are associated with the development of exploitation capability (Cepeda-Carrion, Cegarra-Navarro, and Jimenez-Jimenez, 2012). Accordingly, the PMS provides a formal framework to represent control information explicitly and, in this way, participate in the extent of formalization in SMEs. Jansen et al. (2005) hypothesize (but do not find a significant relationship) that formalization allows firms to respond to organizational phenomena 'in known ways' (p.1002) and organizational members to profoundly understand the set of tasks. The codification of best practices, through formalization, sustains the exploitation process of AC (Jansen et al., 2005). Formalization is exactly what a PMS, as a formal control system within the firm, provides. Similarly, Vega-Jurado et al., (2008) provide evidence that formalization is correlated with higher exploitation of scientific knowledge. Consistent with this argument, Bedford et al. (2022a) find a relationship between a broad scope of PMS and exploitation capability.

Moreover, background knowledge formed by a more diverse set of information sources offers a more systematic and informed position (Foss, Lyngsie, and Zahra, 2013; Hall, 2010) to access the knowledge necessary for adapting operational activities (Paruchuri and Awate, 2017). Therefore, performance measures accumulate organizational experience as prior knowledge, which can tackle emerging opportunities (Endrikat, Guenther, and Titus, 2020). Considering these arguments and in line with Bedford et al. (2022a), we expect a positive relationship between a diverse PMS and the exploitation of knowledge.

H4(a): A diverse PMS is positively associated with exploiting knowledge.

PMS diversity can provide input for a diagnostic use of information to enhance compliance, and mutual strategic adjustments throughout knowledge exploitation (Henri,

2006a). In this way, a diagnostic use of performance information helps organizations to coordinate complex and challenging problems during applying knowledge (Henri, 2006a; Muller-Stewens et al., 2020). Thus, since the diagnostic use of PMS directs organizational endeavors toward a specific goal, we argue that PMS diversity relates to higher knowledge exploitation through the mediating role of diagnostic use.

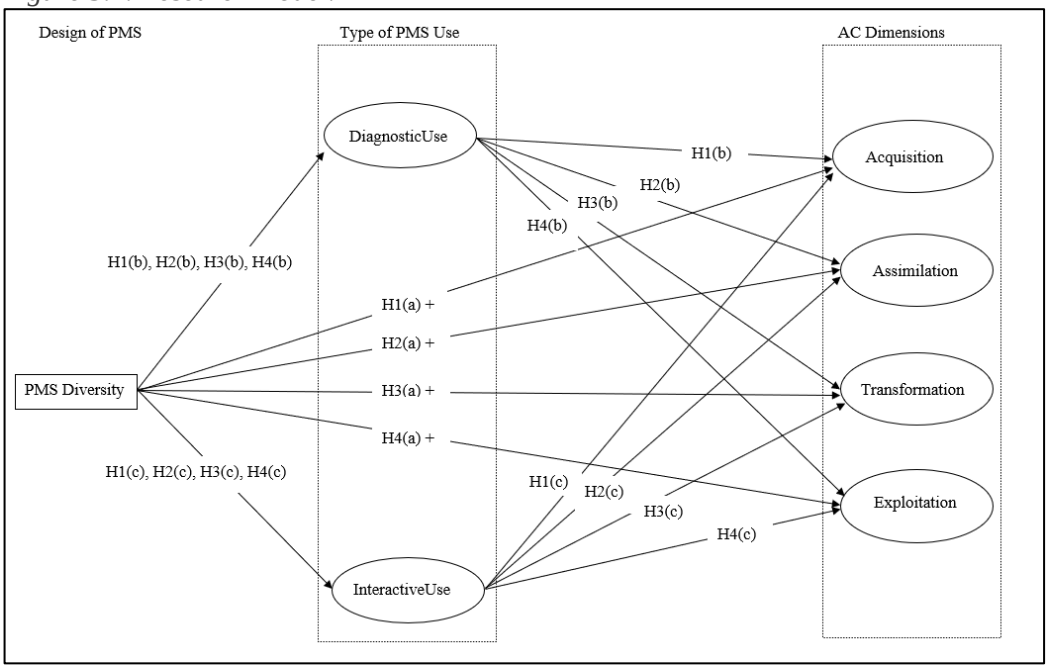
Foss et al. (2013) emphasize that an organizational mechanism that facilitates interaction is necessary for the exploitation phase since an organizational structure that supports social interaction persuades the emergence of a common language (Gutierrez-Gutierrez, Barrales-Molina, and Kaynak, 2018) to mitigate the uncertainties coming from the introduction of new routines in operation (e.g., changes in resource allocation, schedules, and priorities) (Muller-Stewens et al., 2020). This is in line with Abernethy and Brownell (1999), who argue that interactive use of information keeps firms undergoing some changes more alert by widening the information stream while revealing and spreading top managers' most recent priorities, values, and preferences across functions and levels. Therefore, while PMS diversity generates performance information, the diagnostic and interactive use of PMS encourages dialogue and mitigates uncertainties to enhance exploitation capability. All together, we argue that PMS diversity relates to higher exploitation capability through the way managers use this information.

H4(b): The positive association between a diverse PMS and the exploitation of knowledge is mediated by the diagnostic use of the performance information.

H4(c): The positive association between a diverse PMS and the exploitation of knowledge is mediated by the interactive use of the performance information.

An overview of the theoretical relationships between variables is represented in Figure 3.1.

Figure 3.1. Research model.



3.3 Research method

3.3.1 Survey design

We opted for cross-sectional data from an online questionnaire because it suits our research questions targeting higher-level managers in SMEs (Guenther and Heinicke, 2019; Bedford and Spekle´, 2018). The target population for the survey consisted of all active Belgian firms (privately held) from all industries except finance, insurance, and government organizations. Moreover, we applied sample selection criteria of having a minimum of 10 full-time employees, considering that these companies are more likely to apply management controls (Davila, 2005). We used the Bel-first database of Bureau Van Dijk to select our companies. The database includes the financial statements for all Belgian companies. Reporting requirements imposed by the Belgian government require all limited liability firms—irrespective of size and age—to file detailed financial statements annually with the Belgian National Bank. We randomly selected 4,531 companies out of the 26,279 active Belgian companies in the population in 2020 to determine the sample of companies to be send the survey to. Next, we used the database Trends, a Belgian commercial mailing list provider, to obtain the email addresses of the CEOs of the selected firms in our sample. Furthermore, we rely on the respondents' job

titles[20] and a minimum tenure of one year at the firm to prove the adequacy of respondents' information concerning management decisions.

The measures included in the survey are based on prior research published in high-quality journals, and they are all measured for the year 2020. First, we translated the survey into Dutch and French. Then we translated it back into English to compare with the original survey items and validate the similarity between information content across languages. Moreover, following the suggestion of Collins (2003) to consider cognitive testing before the survey submission, we applied a pilot test. Five practitioners and two academics participated in pretesting the questionnaire. The suggested adjustments were conducted to ensure face validity and readability.

To control for non-response bias, we run t-tests for all the measured items, including the firms' characteristics suchde as age and industry, to see whether late respondents answered significantly differently from early respondents (Mellahi and Harris, 2016). We solidified the results of the non-response bias test by defining late respondents several times and through various approaches. Table 3.Alie and Table 3.B in the appendix show the results of our tests. First, we determined early respondents as those who completed the survey before submitting the reminders (62 observations) and late respondents who filled in the study after the reminders (153 see table 3.A). Table 3.A in the appendix indicates no significant difference between the two groups in almost all the variables. Second, in Table 3.B, we compared the first 30% of the answered questionnaire as early respondents to the last 30% as the late ones . Table 3.B in the appendix confirms no meaningful difference between early and late respondents. We found no significant difference in the means of almost all the variables, which informs us that the sample does probably not suffer from the non-response bias.

Concerning common method bias, evidence suggests substantial bias can be involved in self-administrated modes of data collection like surveys (Brenner and DeLamater, 2016). To mitigate this threat, we have carefully designed our survey by assuring confidentiality, reverse coding, offering mid-point in questions with Likert-scale, and offering various response formats. We also run Harman's one-factor test for all items of the research constructs as one of the common post-hoc tests to detect common method

[20] More than 90% of the respondents are CEO directors, and in the remaining part, the majority hold the CFO title.

bias (Fuller et al., 2016). The principal component analysis for the unrotated factor solution reveals that the variance explained by the first component explains only 18.69% of the total variance. Based on our analysis, we have determined that there is little reason for concern regarding single-source bias, as suggested by Podsakoff and Organ (1986).

3.3.2 Variable measurement

Absoptive Capacity. The respondents answered 15 questions of the measurement of Flatten et al. (2011a), assessing organizational AC on a scale from (1) strongly disagree to (7) strongly agree. The ranking reflects four dimensions of AC, including three items of *Acquisition*, four items for *Assimilation*, five items of *Transformation*, and three items of *Exploitation*. Questionnaire items are inserted at the end of this dissertation.

Table 3.1. Exploratory factor analysis for absorptive capacity.

Label	Items	Oblique rotation			
		Factor 1: acquisition	Factor 2: Assimilation	Factor 3: Transformation	Factor 4: Exploitation
Acquisition1	The search for relevant information concerning our industry is everyday business in our company.	**0,662**	-0,036	-0,119	0,120
Acquisition2	Our management motivates the employees to use information sources within our industry.	**0,864**	-0,012	0,045	-0,048
Acquisition3	Our management expects that the employees deal with information beyond our industry.	**0,724**	-0,019	0,158	-0,095
Assimilation1	In our company ideas and concepts are communicated cross-departmental.	0,113	**-0,790**	0,082	-0,021
Assimilation2	Our management emphasizes cross-departmental support to solve problems.	0,026	**-0,880**	-0,004	0,018
Assimilation3	In our company there is a quick information flow, e_g_, if a business unit obtains important information it communicates this information.	-0,057	**-0,836**	-0,060	0,003
Assimilation4	Our management demands periodical cross-departmental meetings to interchange new developments, problems, and achievements.	0,112	**-0,452**	0,301	0,077
Transformation1	Our employees have the opportunity to structure and use self-collected knowledge.	0,094	0,057	**0,801**	-0,021
Transformation2	Our employees are used to absorbing new knowledge.	-0,007	-0,045	**0,858**	0,091
Transformation3	Our employees process new knowledge and make it available for further purposes.	0,119	0,089	**0,893**	0,023
Transformation4	Our employees successfully link existing knowledge to new insights.	-0,078	-0,072	**0,891**	0,034
Transformation5	Our employees are able to apply new knowledge in their practical work	-0,123	-0,172	**0,854**	-0,043
Exploitation1	Our management supports the development of prototypes.	0,042	0,033	-0,060	**0,873**
Exploitation2	Our company regularly reconsiders technologies and adapts them accordant to new knowledge.	0,018	-0,042	0,015	**0,908**
Exploitation3	Our company has the ability to work more effectively by adopting new technologies.	-0,059	-0,005	0,101	**0,823**
Variance explained by each factor		9,761%	7,833%	40,143%	14,137%
Cronbach alpha		0,648	0,820	0,928	0,846

Notes: The oblique-rotated loadings are in bold, respectful to the expected factors.
N=215.

Diversity of Performance Measurement Systems. Following the measurement of Dekker et al. (2013), we captured the diversity of the PMS present in a company (*PMS*) by providing a list of performance indicators that reflect a company's performance through four perspectives, including the financial perspective, the customer perspective, the internal business process perspective, and the innovation and learning perspective. Respondents were asked to indicate the importance of each item for the evaluation of firm performance by using a 7-point scale ranging from 1 (not important at all) to 7 (extremely important) in 2020 (T1). After Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) test approve the suitability of the factor analysis, we assess the dimensionality by extracting factors with eigenvalues above 1. Table 3.1 confirms that PMS indicators include various elements and load on different factors. We measure diversity by the Herfindahl–Hirschman index (HHI). It is the standard measure of diversity (i.e., an average rarity) in applied economics (Patil and Taillie, 1982), showing scattered versus complete PMS information. The higher the score of the PMS, the more diversity its collected information possesses. We correlate the sum score, the average score, and the HHI index. The results approve that *PMS* design adequately captures diversity at T1 (r = 0.962; $p < 0.001$). Table 3.G, found in the appendix, presents the findings of our primary analysis utilizing the PMS diversity measure introduced by Dekker et al. (2013).

Table 3.2. Exploratory factor analysis for PMS diversity.

	Items	Oblique rotation			
		Factor 1: Internal business	Factor 2: Financial	Factor 3: Customer focused	Factor 4: Innovation and learning
1	Number of customers complaints	**0.556**	-0,094	0,375	0,106
2	on time delivery	**0.710**	-0,104	0,170	-0,072
3	Labor efficiency variance	**0.887**	0,128	-0,244	-0,244
4	Employee turnover	**0.867**	0,160	-0,194	-0,132
5	Operating income	0,125	**0.651**	-0,044	0,129
6	Sales growth	-0,187	**0.726**	-0,058	-0,294
7	Return on investment (ROI)	-0,007	**0.714**	0,085	0,016
8	Net cash flows	0,126	**0.653**	0,227	0,154
9	Costs per unit produced	0,325	**0.333**	0,288	0,011
10	Market share	-0,074	**0.580**	-0,128	0,42
11	Customer response time	-0,018	0,098	**0,611**	-0,285
12	Survey of customer satisfaction	0,108	-0,030	**0,843**	0,065
13	Employee satisfaction	-0,163	0,141	**0,722**	-0,168
14	Number of new product launches	0,135	0,038	0,006	**-0,860**
15	Time-to-market for new products	0,105	-0,094	0,100	**-0.887**
16	Materials efficiency variance[21]	0,082	-0,038	0,137	**-0,365**
Cronbach alpha		0.780	0.680	0.591	**0.859**
KMO Measure of sampling adequacy				0,692	
Bartlett's test of sphericity				<0.01	

N=215.

Type of use: Diagnostic and Interactive. We measure the diagnostic use of performance information using a measurement of Bedford and Malmi (2015). Diagnostic use (*Diagnostic Use*) is a construct that focuses on using performance information in five different situations (questionnaire items and their scales are at the end of this dissertation). The construct captures to what extent performance information is used in 2020 for monitoring a company's performance and to take corrective actions when performance deviates from the prespecified targets (Bisbe and Otley, 2004). The respondents were requested to assess and indicate the extent to which management relies on companies' performance measures in five areas. A Likert-type scale in a reversed coded format ranges from (1) strongly agree to (7) strongly disagree. After solving the reverse coding, we interpret the higher score of their accordance as the more diagnostic use of performance measures.

[21] Material efficiency variance loads sufficiently (>0.4) on all the factors suggested by Dekker et al. (2013).

In order to measure an interactive use we rely on Kruis et al. (2016), who applied five questions of Henri (2006a) to measure the interactive use (*Interactive Use*) of performance measures in 2020 (questionnaire items and their scales are at the end of this dissertation). The questions were reversely coded, ranging from (1) strongly agree to (7) strongly disagree. After solving the reverse coding, we interpret the higher the score of the respondents, the more interactive use of performance information in the company. Moreover, to validate the instruments, we run an explanatory factor analysis by oblique rotation (Direct Oblimin). Table 3.3 shows the one-dimensionality of diagnostic and interactive use and the adequate factor loadings for all the items.

Table 3.3. Exploratory factor analysis on diagnostic and interactive types of use.

Label	Items	Oblique rotation	
		Factor 1: Diagnostic	Factor 2: Interactive
Diagnostic1	To identify the critical variables (especially those factors leading to the achievement of the current strategy).	**0,904**	-0,017
Diagnostic2	To set targets and objectives for those critical variables.	**0,924**	0,022
Diagnostic3	To assess the achievement of those targets and objectives (monitoring - comparing the results with the expectations).	**0,955**	-0,042
Diagnostic4	To obtain information to correct deviations between objectives and actual performance.	**0,939**	-0,022
Diagnostic5	To evaluate critical performance areas	**0,848**	0,077
Interactive1	To enable discussion in meetings of supervisors, subordinates and peers.	0,045	**0,854**
Interactive2	To provide a shared view of the organization.	0,070	**0,848**
Interactive3	To tie the organization together.	-0,043	**0,906**
Interactive4	To enable the organization to focus on common issues.	0,021	**0,833**
Interactive5	To develop a common vocabulary in the organization.	-0,060	**0,806**
Variance explained by each factor		55.14%	23,36%
Cronbach alpha		0.952	0.904

Notes: The oblique-rotated loadings, respectful to the expected factors, are in bold.
N=215.

Controls: Age, Size, Family firms, Industry, Environment, and Strategy. We controlled for several potentially influential variables such as age, size, family firms, industry, environmental unpredictability, and strategic orientation measured in 2020. Firm age (*Age*) refers to the years since the firm was incorporated till 2020. The firm size (*Size*) is calculated as the natural log of the total number of full-time employees. We applied the log-transformed measure in the analyses. Concerning industry effect, we

broadly categorize industries applying 2-digit NACE codes to make 3 cohorts of manufacturers (*Manufacturing*), retail (*Retail*), and service.

We use service as the reference industry. Since family firms' internal stability and social capital can enhance AC (Brinkerink, 2018; Andersen, 2015), we also control for family firms (*Family*). We defined family as the people who are linked by blood or marriage. Then, we asked respondents to consider the following statements (1) More than 50% of the ownership is in the control of one family; (2) The company is considered a family business; and (3) None of the above answers apply. No respondent claimed contradictory statements. The respondents who chose option 1 and (/or option 2) are denoted as family firms; those who chose none of the above are considered non-family firms.

Moreover, we consider the external environment's potential influence on our interest variables via perceived environmental unpredictability (*Environment*). It is recommended to consider the unpredictability of the competitive condition when studying the antecedents of absorptive capacity (Bedford et al., 2022a). In a more turbulent environment where unpredictability is higher, the reliance on external knowledge and innovation is more critical compared to a more stable environment (Bedford et al., 2022a; Ben-Oz and Greve, 2015). Thus we asked our respondents to assess and rate five changes in various environmental aspects (in terms of customers, suppliers, competitors, technological changes, and regulation) on an increasing 7-point Likert scale (Bedford and Malmi, 2015) (based on Doty, Glick, Huber, 1993, and Gordon and Narayanan 1984). *Environment* is measured as a mean score of the five questions suggested by Bedford and Malmi (2015). We also control for the strategy of firms by three variables suggested by Kruis et al. (2016) that capture three dominant strategic orientations, including low-cost, low price (*Low Price*), differentiation (*Differentiation*), and Delivery and Service (*Delivery & Service*). We ask 11 questions about strategy (Kruis et al., 2016), and then we follow Chenhall's (2005) measurement, which uses an aggregated measure to capture and control for the strategic orientations.

3.3.3 Statistical methods

In this study, we measure the relationship of our variables of interest in Amos running SEM. SEM applies a confirmatory approach that suits theory-testing purposes. Moreover,

given that this study has multi-item constructs, SEM is suitable to simultaneously measure unobserved variables while running regression analyses to determine the relationship among the variables (Byrne, 2016).

3.4 Results

3.4.1 Descriptive statistics

As illustrated in Table 3.4, we focus on SMEs[22] by defining SMEs as firms with less than 500 full-time employees. The dataset comprises a total of 215 observations from respondents who answered a minimum of 80% of the questions[23]. Most of the firms (67%) in the sample are family firms, with less than 50 full-time employees (SD = 0,47)[24]. Table 3.4 provides an overview of firms' demographics and descriptive statistics.

[22] Belgian firms are located in three regions of Flanders, Wallonia, and Brussels, where the majority of the firms are concentrated in Flandres (Artige and Bignandi, 2022). Regarding size, most non-financial and profit-seeking firms with more than 10 employees in Belgium are SMEs. Concerning industry, according to OECD, Belgian firms are most active in three sectors of manufacturing, retail, and service. Moreover, in Belgium, 67% of businesses are considered family firms (Lambrecht and Molly, 2011).

[23] The imputation method is discussed in detail in Chapter 1, general introduction.

[24] We compared the sample demographics (age, size, percentage of family firms, and industry) with the characteristics of the population of firms in Belgium (see footnote number 2); there is less concern about sample representativeness.

Table 3.4. Firms' demographics and descriptive statistics.

Variables	N		Percentage	Actual Range	*Mean*	SD	Percentiles		
							25%	50%	75%
Acquisition	215			1,67-7	4,55	1,03	4	4,66	5,33
Assimilation	215			1,75-7	5,5	0,89	5	5,5	6
Transformation	215			1,20-7	5,12	1,29	4,6	5,4	6
Exploitation	215			1,67-7	5,91	1,05	5,33	6	6,66
PMS	215			1-732	522	113,36	463	534	601
Diagnostic Use	215			1,40-7	5,44	1,19	5	5,8	6,2
Interactive Use	215			1-7	5,33	1,09	4,8	5,6	6
Age	215			3-257	39,18	30,15	21	32	48
Size	215			10-450	87,15	102,98	25	42	100
<49		122	56,70%						
50-99		39	18,10%						
100-199		30	14%						
200-299		5	2,30%						
300-399		12	5,60%						
400-499		7	3,30%						
Family Firms	215			0-1	0,67	0,47	0	1	1
Industry	215								
Manufacturing		81	37,70%						
Retail		62	28,80%						
Service		72	33,50%						
Environment	215			1-6,20	4,17	0,93	3,6	4,2	4,8
Low Price	215			1-7	4,97	1,3	4	5	6
Differentiation	215			1-7	5,6	0,8	5,2	5,8	6
Delivery & service	215			1-7	6,01	0,97	5,5	6,25	6,75

Family Firms, Manufacturing, and Retail are dummy variables.

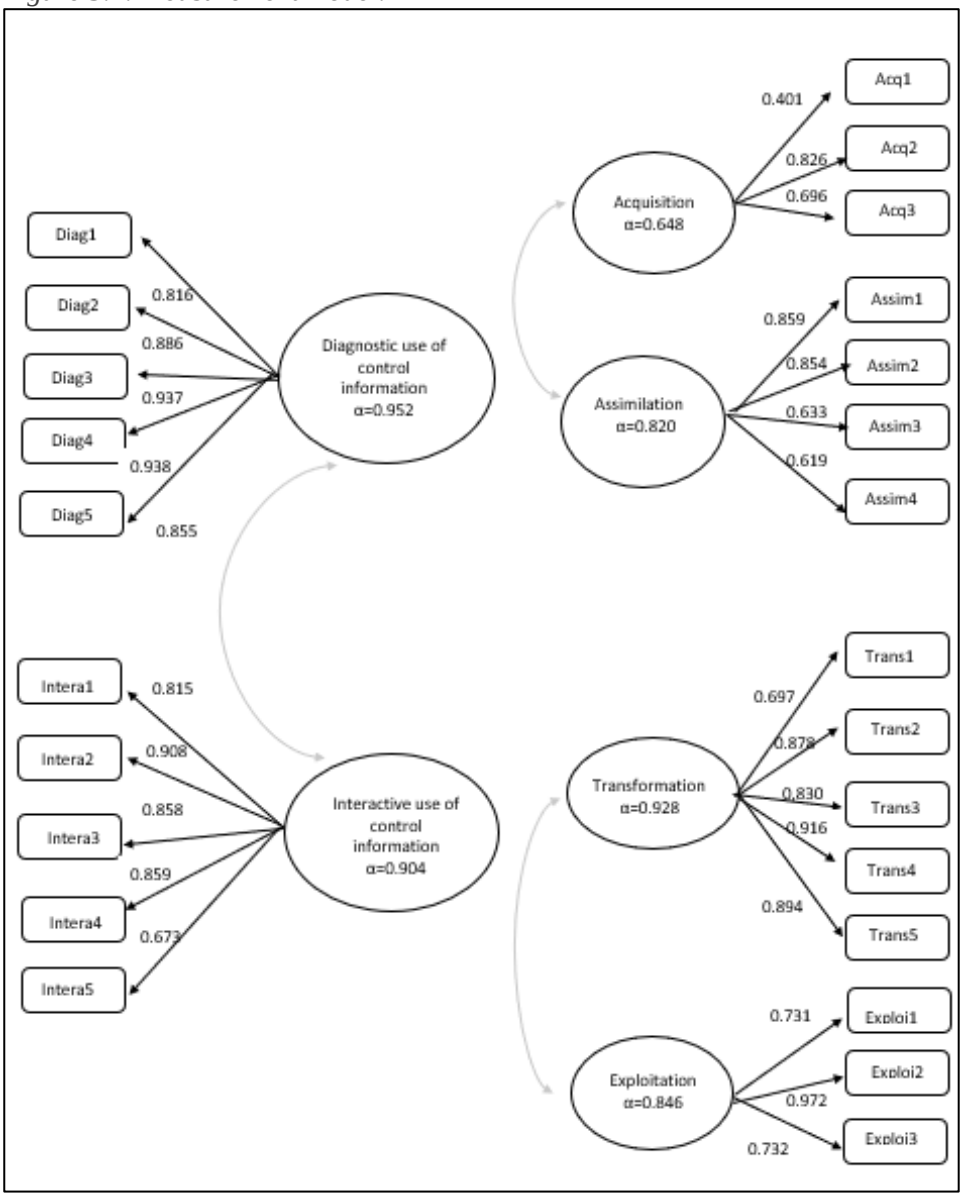
The included SMEs in the sample are characterized by an average of 39 full-time employees and are on average 87 years old. Furthermore, the firms are reasonably distributed across three distinct industries: manufacturing, retail, and service.

3.4.3 Assessment of the measurement model

Within the SEM framework, the measurement model focuses on how well the indicators measure their underlying factors. Therefore, assessing the measurement model is recommended to show whether the constructs are reliable and valid before evaluating the regression results in SEM (Byrne, 2016). In this study, all the latent constructs are reflective and include acquisition, assimilation, transformation, exploitation, diagnostic use, and interactive use, which Amos measures. The Chi-square value of the model equals

891,977 with 509 degrees of freedom. The ratio of Chi-square to degree of freedom $x^2/_{df}$ is 1,752. We report a collection of goodness and badness of fit, including CFI, TLI, RMSEA, and SRMR, to ensure adequate overall fit (Schreiber, 2008). CFI is 0,910 and TLI has the value of 0,894. Moreover, RMSEA IS 0,059 and SRMR equales 0,073. Therefore, $x^2/_{df}$ is less than 3, CFI and TLI values are close to the acceptable threshold of 0,9. Mover, RMSEA is below 0,08 and SRMR is less than 0,08. Thus, the overall fit is acceptable, allowing for proceeding further (Hu and Bentler, 1999; Schumacker and Lomax, 2010; Iacobucci, 2010). Moreover, Figure 3.2 shows the load of the items satisfactorily on their expected constructs.

Figure 3.2. Measurement model.



N=215.

Before proceeding to the results of regression and path analysis, we assess whether the reflective constructs in the model are valid and reliable through internal consistency reliability, convergent validity, and discriminant validity. Table 3.5 examines Cronbach's alpha and composite reliability, assuring survey data reliability. The AVE results in Table 3.5 approve that the shared variance between items per construct exceeds the measurement error variance. Thus, the constructs have sufficient convergent validity.

Table 3.5. Construct reliability and validity.

Construct	Convergent Validity	Reliability	Consistency
	AVE	Composite reliability	Cronbach's alpha
	>0.50	>0.7	>0.70
Acquisition	0.595	0.736	0.648
Assimilation	0.658	0.835	0.820
Transformation	0.776	0.929	0.928
Exploitation	0.765	0.887	0.846
Diagnostic Use	0.838	0.966	0.952
Interactive Use	0.723	0.949	0.904

Discriminant validity reflects how distinct each latent variable is and how each item is uniquely associated with its particular construct. When the purpose of the research is theory testing, the square root of AVE is a proper technique to test discriminant validity (Zai and Bertea, 2011). Table 3.6. shows the correlation coefficient on off-diagonals, while diagonals show the square root of AVE to test for discriminant validity. The square root of AVE for all the reflective constructs is higher than their correlation among latent variables.

Table 3.6. Correlation matrix.

	1	2	3	4	5	6
Acquisition (1)	0,595					
Assimilation (2)	0,373***	0,658				
Transformation (3)	0,055	0,078	0,776			
Exploitation (4)	0,158**	0,310***	0,175**	0,765		
PMS (5)	0,100	0,133†	0,810***	0,227***	--	
Diagnostic Use (6)	0,128†	0,156**	0,068	0,213***	0,138**	0,838
Interactive Use (7)	0,082	0,196***	0,120†	0,299***	0,240***	0,398***

Off-diagonal numbers show Pearson correlation coefficients, while numbers on the diagonal are AVE.
† Correlation is marginally significant at the 0.1 level; ** significant at 0.05 and *** significant at 0.01 (two-tailed).
N=215.

Moreover, Table 3.6 shows that *PMS* correlates significantly with *Diagnostic Use* ($P < 0.05$) and *Interactive Use* ($P < 0.01$), indicating first, there is an association between the design and the use of *PMS*. Second, more diverse *PMS* is associated with more diagnostic and interactive use of control information. Furthermore, despite the high correlation coefficients between the dimensions of absorptive capacity as well as between *DiagnosticUse* and *InteractiveUse* ($rb = 0.414$), it is unlikely that multicollinearity is a concern (VIF < 10) (see Table 3.C, in the appendix).

3.4.4 Structural model results

3.4.4.1 The direct relationship between PMS diversity and AC

A concise overview of the path coefficients and the interconnections within the model can be observed in Table 3.7. Direct effects denote the associations between variables controlling for the mediation effect of diagnostic and interactive types of use. The concurrent interplay involving PMS, how PMS information is employed, and AC is discernible within the framework of the mediation analyses and via indirect effects. As we expect in H1(a) and H4(a), more diversity in *PMS* associates significantly with higher *Acquisition* ($p < 0,1$) and *Exploitation* ($p < 0,01$). We found a positive relationship between *PMS* and *Assimilation* in line with H2(a) ($p > 0,1$). However, in contrast to H3(a), there is a negative relationship between *PMS* and *Transformation* ($p > 0,1$). Therefore, since the results are insignificant for the relationship between *PMS* and *Assimilation* and *Transformation*, there is not enough evidence to support H2(a) and H3(a).

3.4.4.2 Results with respect to the mediation analyses

In H2, we predicted that *Diagnostic Use* mediates the association between *PMS* and *Acquisition* (a), *Assimilation* (b), *Transformation* (c), and *Exploitation* (d). We evaluate the significance of direct and indirect effects at a 90% confidence interval to confirm the mediation. *PMS* and *Diagnostic Use* have a positive and significant direct association ($p<0,05$). However, the indirect effects between *PMS*, *Diagnostic Use*, and the *AC dimensions* are insignificant at a 10% significance level. Therefore, we lack evidance to support H2(a), H2(b), H2(c), and H2(d). Table 3.7 shows the standardized path coefficients and more details of the path regression results.

Table 3.7. Results of the structural path model.

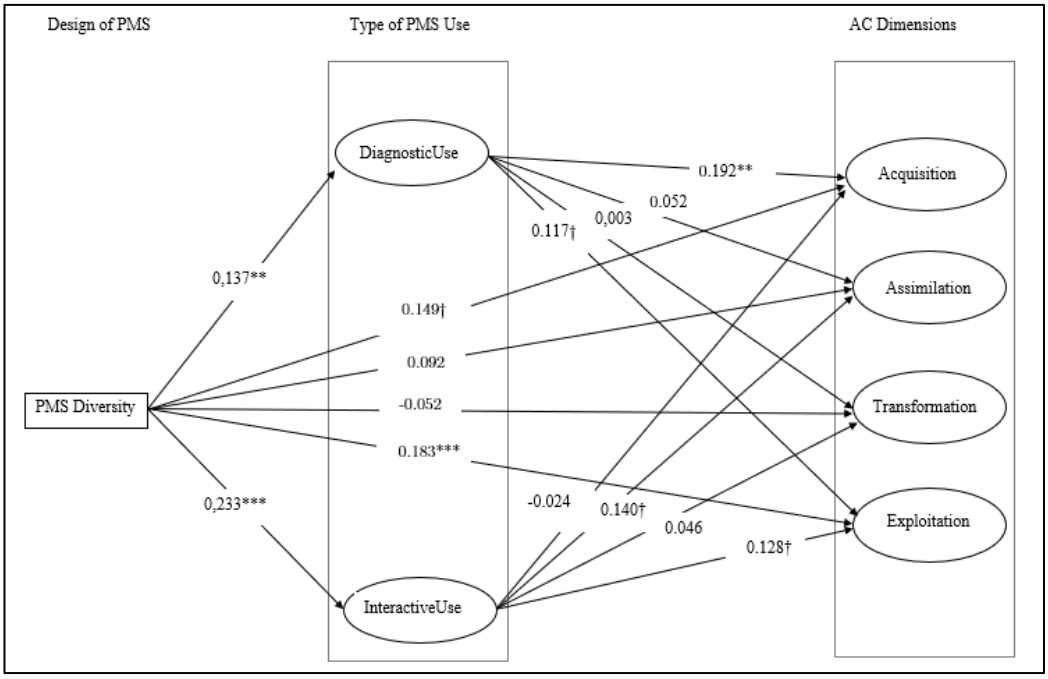
Independent variables	Dependent variables					
	Diagnostic Use	Interactive Use	Acquisition	Assimilation	Transformation	Exploitation
Direct effects						
PMS	0.137** (1.832)	0.233*** (3.559)	0.149† (1.595)	0.092 (0.576)	-0.052 (0.825)	0.183*** (1.924)
Diagnostic Use			0.192** (1.532)	0.052 (0.879)	0.003 (0.295)	0.117† (1.110)
Interactive Use			-0.024 (0.499)	0.140† (1.447)	0.046 (1.026)	0.128† (1.573)
Controls			YES	YES	YES	YES
Specific indirect effect						
PMS → DiagnosticUse			0,000 [0,000 0,000]	0,000 [0,000 000]	0,043 [-0,064 0,170]	0,000 [0,000 0,000]
PMS → InteractiveUse			0,000 [0,000 0,000]	0,000 [0,000 0,000]	0,114† []0,011 0,264]	0,000 [0,000 0,000]
R^2			0.158	0.184	0.435[25]	0.214

Each cell contains the standardized path coefficients (t statistics) and [CI bias corrected]. † p < ,10; ** p < ,05; *** p < ,01. Two-tailed. N=215.

Similarly, *PMS* and *Interactive Use* have significant direct effects (p<0,01*). Interactive Use* relates positively to *Assimilation* (p<0,1) and *Exploitation* (P<0,1). However, the indirect effects between *PMS*, *Interactive Use*, and AC dimensions are insignificant concerning *Acquisition*, *Assimilation*, and *Exploitation* (p>0,1). Therefore, H3(a), H3(b), and H3(d) lack sufficent statistical support. However, since the indirect effect between *PMS*, *Interactive Use*, and *Transformation* is marginally significant (p<0,1), we confirm that *Interactive Use* mediates the relationship between PMS and *Transformation*. Thus, H3(c) is supported. Figure 3.3 visualizes the results of the regression results for the direct effects.

[25] R square for transformation is 0,435. Thus, the variables included in the model explain about 43% of the variation in the transformation capability. The transformation capability is controlled by the assimilation capability, as suggested by the literature (Zahra and George, 2002). The standardized path coefficient is 0,818 (t-value=4,298; p<0,01).

Figure 3.3. Structural regression results.



Note: Figure 3.3 shows the standardized path coefficients of the direct effects, while meditation analyses are recognized as statistically significant if the specific indirect effects between PMS and AC capabilities are significant (p<0,1). † p < ,10; ** p < ,05; *** p < ,01 (two-tailed). The specific indirect effect is only significant for the PMS relationship with transformation through the mediating role of interactive use (p <0,1). N=215.

Concerning control variables, age, and size have no significant relationship with any AC dimensions (p>0,1). Family firms acquire less external information (p<0,05) and are considerably less likely to assimilate information than non-family firms (p<0,1). Furthermore, manufacturing firms assimilate significantly less information than firms from the service industry (p<0,1). However, firms in the retail industry have no significant difference concerning AC dimensions compared to the service industry. Firms in the manufacturing industry share information significantly less than firms in the service industry (p <0,1). Moreover, *Environment* and Exploitation have a marginally significant relationship (p<0,1). When the environmental uncertainty is higher, there is less exploitation of new knowledge. Furthermore, there is a significant relationship between a low price strategy and assimilation (p<0,01) and between a low price strategy and exploitation (p<0,01). The strategy also plays an essential role in firms developing AC capabilities. Firms with a low price strategy assimilate

significantly less information ($p<0,01$) and exploit new knowledge also significantly less ($p<0,01$). In contrast, firms pursuing differentiation as a strategy show significantly higher assimilation of information ($p<0,01$) and higher exploitation of new knowledge ($p<0,01$). Furthermore, firms emphasizing delivery and service as the primary strategy are associated with significantly less acquisition of new information ($p<0,05$). The overview of the hypotheses and results is organized in Table 3.8.

Table 3.8. Overview of the hypotheses and results.

Count		Hypotheses	Results
H1			
	(a)	A more diverse PMS is positively associated with acquiring more new external information.	Supported
	(b)	The positive association between a diverse PMS and the acquisition of new external information is mediated by the diagnostic use of performance information.	Not supported
	(c)	The positive association between a diverse PMS and the acquisition of new external information is mediated by the interactive use of the performance information.	Not supported
H2			
	(a)	A more diverse PMS is positively associated with higher assimilation of new external information.	Not supported
	(b)	The positive association between a diverse PMS and the assimilation of new external information is mediated by the diagnostic use of performance information.	Not supported
	(c)	The positive association between a diverse PMS and the assimilation of new external information is mediated by the interactive use of the performance information.	Not supported
H3			
	(a)	A more diverse PMS is positively associated with transforming knowledge.	Not supported
	(b)	The positive association between a diverse PMS and the transformation of knowledge is mediated by the diagnostic use of performance information.	Not supported
	(c)	The positive association between a diverse PMS and the transformation of knowledge is mediated by the interactive use of performance information.	Supported
H4			
	(a)	A diverse PMS is positively associated with exploiting knowledge.	Supported
	(b)	The positive association between a diverse PMS and the exploitation of knowledge is mediated by the diagnostic use of performance information.	Not supported
	(c)	The positive association between a diverse PMS and the exploitation of knowledge is mediated by the interactive use of the performance information.	Not supported

N=21
5.

3.4.5 Additional analyses

Moreover, several additional analyses confirm the consistency of the main results. First, we include firms with less than 250 employees as SMEs (e.g., Grabner, Posch, and Wabnegg, 2018; Malagueno, Lopez-Valeiras, and Gomez-Conde, 2018). The observations by the respondents who answered at least 80% of the questions remain in

the sample. The current sample encompasses a total of 192 observations. After checking that the overall model fits the measurement model and assuring that the load of the item is as expected, we observe that the hypothesized relationships align with the primary model. As indicated in Table 3.D in the appendix, there is a significant positive relationship between PMS and Exploitation ($p<0,05$) after controlling for the mediating role of Diagnostic Use and Interactive Use. The direct effect of PMS is positively related to Diagnostic Use ($p<0,05$). Similarly, PMS and Interactive Use are positively related ($p<0,01$). Similar to the primary analysis, Diagnostic Use and Acquisition have a significant association ($p<0,05$). The relationship between PMS and Exploitation is also positive and in line with the primary analyses ($p<0,1$). Interactive Use is associated positively with Assimilation ($p<0,1$). Similarly, Interactive Use and Exploitation have a marginally significant association ($p<0,1$). Moreover, in line with the primary analysis, the indirect effect of *PMS*, *Interactive Use*, and *Transformation* is positive, but since the confidence interval includes zero; thus, we lack enough evidence to support the meditation.

Second, since the primary analysis is based on observations of those respondents who answered a minimum of 80% of the questions, we rerun the analysis after changing the threshold of missing values randomly to 10% (N=212). As illustrated in Table 3.E in the appendix, the results are almost identical to the findings of the main analyses. PMS relates positively to external information Acquisition ($p<0,1$). Moreover, PMS and Exploitation of knowledge are positively related ($p<0,01$). As we have seen in the primary analysis, PMS relates positively to Diagnostic Use ($p<0,1$). PMS and Interactive Use are also positively related ($p<0,01$). Moreover, Diagnostic Use and Acquisition relate positively ($p<0,05$). Similar to the primary findings, Interactive Use and Assimilation as well as Interactive Use and Exploitation, relate positively ($p<0,1$). Since the indirect effect of PMS, Interactive Use, and Transformation is positive with a confidence interval that lacks zero at a 10% significance level, the meditation is statistically supported. Interactive use completely mediates the PMS relationship with Transformation. Therefore, we conclude that our findings are robust.

Third, in order to assess the robustness of our findings concerning the methodology employed for addressing missing data, we opt to omit all observations that contain missing values.Table 3.F represents the results for the sample with observations with no

missing values (N=191). First, we check the overall fit based on the CFI, TLI, RMSEA, and SRMR. As Table 3.F shows, the model fits the data well. The measurement model for the latent variables acquisition, assimilation, transformation, exploitation, diagnostic use, and interactive use looks satisfactory since all the items load significantly on their construct (p<0,01). Consistent with our primary findings, PMS diversity correlates positively with Acquisition (p<0,05). Moreover, SMEs that design more diverse PMS have higher exploitation capability (p<0,01). Given the lack of a significant direct impact between PMS diversity and transformation capability, it becomes evident that PMS diversity corresponds to higher transformation capability exclusively in scenarios where managers apply the information interactively, thereby illustrating complete mediation (p<0,1). As such, our findings remain consistent with our primary observations.

In the primary analysis, PMS is measured via the HHI index. We here measure *PMS* diversity as the mean score of all the indicators following Dekker et al. (2013) as the last robustness check. As shown in Table 3.G in the appendix, the results are nearly identical to the primary model. PMS associates significantly with *Acquisition* (p<0,05). Moreover, PMS and *Exploitation* are related (p<0,05). PMS relates positively to Diagnostic Use (p<0,05). The relationship between PMS and interactive Use is also positive (p<0,01). Therefore, PMS design and use are significantly related, in line with the primary analysis. Diagnostic Use relates positively to Acquisition (p<0,05). Interactive Use also relates to Assimilation (p<0,1). Similarly, Interactive Use and Exploitation are marginally significant relationships (p<0,1). The indirect effect between PMS, Interactive Use, and Tranformation is positive and marginally significant (p<0,1). Therefore, in line with the main results, the relationship between *PMS* with Tranformation is significantly mediated by *Interactive Use* (see Table 3.G in the appendix for more details).

3.5 Discussion

The empirical results contribute to our understanding of the association of the diversity of PMS with a firm's AC in SMEs. Control information (including performance information) improves managerial rationality, stimulates value creation from internal knowledge, and facilitates organizational learning (Batac and Carassius, 2009; Jasimuddin and Naqshbandi, 2019). Similar to this view, our results indicate that more diversity in the internal information base, which arises from a more diverse PMS, is

associated with acquiring more external information and higher knowledge exploitation capabilities. This advocates that designing a more diverse PMS is one of the ways for smaller firms to strengthen their AC and mitigate their lower internal knowledge creation capability (Fores and Camison, 2016). We add to Bedford et al. (2022a) that PMS design and use are both relevant and interconnected in studying firms' AC. Following the suggestion of Guenther and Heinicke (2019), our results confirm that PMS design relates to firms' outcomes (e.h., transformation capability) when the way the control information is used is considered and accounted for. Our results confirm Bellora-Bienengraber et al. (2022), who call for consideration of how managers use control information in studying firms' dynamic capability development.

In addition, our results provide evidence that the use of performance information intervenes in the relationship between the diversity of PMS information and AC. We reveal that PMS design can relate to higher transformation capability when the PMS information is used more interactively. Interactive use of information relates PMS information to higher knowledge integration, alternative findings, solution creation, new knowledge combination, and developing and reinternalizing new routines. The interaction between managers and subordinates encouraged through the interactive use of PMS information embraces what external and new knowledge suggests (Muller-Stewens et al., 2020). This aligns with the importance of collaboration required in the innovation process where uncertainty is higher (Mennens et al., 2018; Simon, 1990). The interactive use of performance information stimulates dialogue and debate between managers and subordinates and enhances collaboration and coordination among many functions during knowledge transformation (Muller-Stewens et al., 2020). More specifically, SMEs have a more flat hierarchical structure and less bureaucratic systems; thus, the significance of personal interactions is more substantial (Valentim et al., 2016). In this vein, the interactive use of PMS information provides an information exchange opportunity in SMEs where direct and informal communication is more common. The higher information exchange opportunity aligns with organizational learning and innovation literature, which suggests that SMEs invest in within-firm communication to benefit from their more flat structure to enhance further learning (Saad, Kumar, and Bradford, 2017; Thoma and Zimmermann, 2020). Interactive use of PMS information stimulates social interaction and learning and, in this way, safeguards SMEs against their constraining characteristics, in which most knowledge is stored in the minds of key

employees and/or owner-manager (Chenhall, 2003; Saad, Kumar, and Bradford, 2017). Similarly, Thoma and Zimmermann (2020) believe SMEs' more profound ability for interactive learning can compensate for their lack of resources to some extent. A more open communication culture is associated positively with innovation and the overall performance of SMEs (Thoma and Zimmermann, 2020). Similarly, our results introduce the interactive use of PMS information to promote the intensity of communication, which is recognized as beneficial for AC (Pittz et al., 2019; Jansen et al., 2005). In brief, our results suggest designing more diverse PMS systems to accumulate more diverse performance information and to heterogonize SMEs' internal knowledge base. Moreover, we show that using performance information to stimulate dialogue is one of the ways to strengthen transformation capability.

3.6 Conclusion

This study examines whether designing a more diverse PMS relates to developing AC capabilities in SMEs. We also further evaluate how using performance information intervenes in the positive relationship between PMS design and AC capabilities. Our results reveal that designing a diverse PMS enriches the internal knowledge base and associates with the higher acquisition capability of SMEs. Furthermore, we also provide evidence that diverse PMS relates to higher SMEs' exploitation capability. Moreover, performance information relates to higher transformation capabilities if SMEs use control information more interactively. Therefore, we answer the call from Bedford et al. (2022a) by considering PMS design concerning all the AC capabilities. We also answer the call from Guenther and Heinicke (2019) and Bellora Bienengraber et al. (2022) to study PMS design and use in firms aiming to develop organizational capabilities. Our results indicate the relevance and importance of the design and use of PMS in SMEs developing organizational AC.

The generalizability of the results is subject to certain potential limitations. First, considering the cross-sectional design of data and the contemporary measurement of variables, we cannot make any causal interferences but only point at associations. The dynamic nature of AC calls for the operationalization of the construct longitudinally, for instance, with panel data where the pace and paths of changes are traceable (Volberda et al., 2010). However, it makes sense to start investigating the mediation and potential

causal link by establishing the existence of an association between PMS and AC (Spector, 2019).

Second, this study analyzes PMS design (in terms of diversity) and use (being a diagnostic or interactive use). Considering that the MCS literature highlights that management accounting practices work as a system (Grabner and Moers, 2013) or a package (Bedford, Malmi, and Sandelin, 2016), it is possible that other types of control elements present in the firm influence the design and use of PMS. For instance, in the next chapter of this dissertation, we consider all the ways managers use control information concerning AC capabilities, whereas, in this chapter, we only study the diagnostic and interactive use of PMS information. Therefore, the interpretation of the findings is subject to the limitation that in every chapter, we could select and evaluate a limited number of relationships given our limited sample size and the limited complexity that we could impose on our model. Future research can expand our findings by considering other potentially relevant management accounting practices or PMS attributes to reveal further how management controls relate to AC.

Third, evidence suggests bias might be involved in self-administrated modes of data collection like surveys (Brenner and DeLamater, 2016). Self-reported survey design can contain bias related to the perceptual judgment of managers. Despite the extensive pre-testing of survey instruments and demonstration of the absence of severe types of noise by tests such as validity and reliability checks, we cannot avoid measurement noise. A multiple respondents survey design targeting other top-level executives or managers besides CEOs can allow consolidation of the results further. Finally, although the results are based on cross-sectional industries and firms of different sizes and ages, the data is generated from only one country, limiting the generalizability of the results. Future research can include control variables to rule out spurious relationships between PMS design and use with AC or by applying longitudinal data.

Notwithstanding these limitations, the results show how PMS can considerably build and maintain AC in firms. We developed arguments related to the mediating role of PMS use, unpacked PMS attributes in terms of design, and measurement considerations of AC. In this way, we contributed to the research aiming to understand how accounting information relates to a firm's AC.

Chapter 3 Appendix

Table 3.A. Non-response bias checks based on reminder submission.

	T test						
			Significance_ P value		Std.	95% Confidence Interval of the Difference	
	F	Mean Difference	One-Sided	Two-Sided	Error Difference	Lower	Upper
Acquisition	1,119	-0,016	0,450	0,900	0,130	-0,272	0,239
Assimilation	1,577	0,019	0,441	0,883	0,126	-0,230	0,268
Transformation	0,125	-0,108	0,220	0,441	0,140	-0,384	0,168
Exploitation	2,795	0,054	0,389	0,778	0,190	-0,320	0,428
PMS	0,285	0,069	0,303	0,606	0,133	-0,194	0,332
Diagnostic Use	4,812	0,313	0,035	0,069	0,172	-0,025	0,652
Interactive Use	1,050	-0,834	0,158	0,317	0,831	-2,472	0,804
Age	0,728	-0,028	0,390	0,780	0,100	-0,224	0,168
Size	2,876	-78,308	0,133	0,267	70,344	-216,928	60,312
Family Firms	0,197	0,015	0,414	0,828	0,070	-0,123	0,153
Manufacturing	0,138	-0,013	0,428	0,855	0,071	-0,152	0,126
Retail	1,948	0,047	0,234	0,468	0,065	-0,080	0,174
Environment	0,000	-0,050	0,356	0,713	0,137	-0,320	0,219
Low Price	1,608	0,224	0,115	0,230	0,186	-0,142	0,590
Differnetitation	5,524	0,079	0,257	0,513	0,121	-0,160	0,318
Delivery & service	0,212	-0,037	0,398	0,796	0,141	-0,315	0,242

N=215.

Table 3.B. Non-response bias checks based on late respondents.

	T test						
			Significance_ P value		Std.	95% Confidence Interval of the Difference	
	F	Mean Difference	One-Sided	Two-Sided	Error Difference	Lower	Upper
Acquisition	0,005	0,065	0,941	0,346	0,693	-0,258	0,388
Assimilation	4,071	0,024	0,046	0,441	0,882	-0,29	0,337
Transformation	0,097	-0,113	0,756	0,263	0,527	-0,464	0,238
Exploitation	3,842	-0,2	0,052	0,187	0,374	-0,645	0,244
PMS	0,028	-0,023	0,868	0,431	0,863	-0,284	0,238
Diagnostic Use	5,162	0,432	0,025	0,019	0,038	0,025	0,84
Interactive Use	0,368	-0,473	0,545	0,328	0,655	-2,561	1,616
Age	0,772	0,016	0,381	0,447	0,893	-0,22	0,252
Size	0,871	-17,247	0,352	0,330	0,661	-94,793	60,299
Family Firms	1,203	-0,044	0,275	0,292	0,583	-0,203	0,115
Manufacturing	0,123	-0,015	0,726	0,430	0,861	-0,18	0,151
Retail	0,576	0,029	0,449	0,352	0,705	-0,124	0,183
Environment	2,028	0,095	0,157	0,299	0,598	-0,26	0,45
Lo Price	0	0,05	0,996	0,402	0,804	-0,348	0,448
Differnetitation	7,991	0,155	0,005	0,130	0,26	-0,116	0,427
Delivery & service	2,324	0,063	0,130	0,359	0,718	-0,284	0,41

N=215.

Table 3.C. VIF chcek.

Item		VIF value	Item		VIF value	Item	VIF value
AC			PMS		1.00	Family firms	1.00
	Acquisition1	1.182	Diagnostic Use			Manufacturing	1.00
	Acquisition2	1.683		Diagnostic Use1	4.691	Reatil	1.00
	Acquisition3	1.486		Diagnostic Use2	6.411	Low Price	1.00
	Assimilation1	2.503		Diagnostic Use3	5.987	Differnetitation	1.00
	Assimilation2	2.650		Diagnostic Use4	5.844	Delivery & service	1.00
	Assimilation3	1.507		Diagnostic Use5	3.322	Environment1	1.362
	Assimilation4	1.472	Interactive Use			Environment2	1.428
	Transformation1	1.905		Interactive Use1	3.002	Environment3	1.539
	Transformation2	3.609		Interactive Use2	3.628	Environment4	1.155
	Transformation3	3.162		Interactive Use3	3.693	Environment5	1.162
	Transformation4	4.607		Interactive Use4	2.811		
	Transformation5	4.078		Interactive Use5	1.844		
	Exploitation1	2.084					
	Exploitation2	2.842	Age		1.00		
	Exploitation3	1.920	Size		1.00		

N=215.

Table 3.D. SME < 250 full-time employees.

Independent variables	Dependent variables					
	Diagnostic Use	Interactive Use	Acquisition	Assimilation	Transformation	Exploitation
Direct effects						
PMS	0.150** (2,032)	0.262*** (3,653)	0.107 (1.255)	0.040 (0.544)	-0.002 (-0,038)	0.165** (2,465)
Diagnostic Use			0.247** (2.340)	0.054 (0.955)	0.044 (0.632)	0.121† (1,656)
Interactive Use			-0.038 (-0,420)	0.137† (1.662)	0.016 (0.217)	0.143† (1934)
Controls			Yes	Yes	Yes	Yes
Specific indirect effect						
PMS → DiagnosticUse			0.000 [0.000 0.000]	0.000 [0.000 0.000]	0.040 [-0.070 0.228]	0.000 [0.000 0.000]
PMS → InteractiveUse			0,000 [0,000 0.000]	0.000 [0,000 0.000]	0.113 [-0.005 0.299]	0.000 [0.000 0.000]
R^2			0.153	0.176	0.455	0.248

Each cell contains the standardized path coefficients (t statistics) and [CI]. *** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 879,434 with 509 degrees of freedom. CFI equals 0,904, TLI is 0,888. RMSEA is 0,062 and SRMR is 0,075. N=192.

Table 3.E. 10% threshold for random replacement of missing values.

Independent variables	Dependent variables					
	Diagnostic Use	Interactive Use	Acquisition	Assimilation	Transformation	Exploitation
Direct effects						
PMS	0.118†	0.212***	0.149†	0.054	-0.034	0.181***
	(1.680)	(3.082)	(1.865)	(0.775)	(-0,561)	(2,763)
Diagnostic Use			0.186**	0.053	0.012	0.117
			(2,050)	(0.694)	(0.182)	(1,631)
Interactive Use			-0.018	0.136†	0.053	0.133†
			(-0,208)	(1.760)	(0,753)	(1.853)
Controls			Yes	Yes	Yes	Yes
Specific indirect effect						
PMS → DiagnosticUse			0.000 [0.000 0.000]	0.000 [0.000 0.000]	0.043 [-0.073 0.196]	0.000 [0.000 0.000]
PMS → InteractiveUse			0.000 [0.000 0.000]	0.000 [0.000 0.000]	0.109† [0.002 0.280]	0.000 [0.000 0.000]
R^2			0.149	0.185	0.452	0.210

Each cell contains the standardized path coefficients (t statistics) and [CI]. *** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 868,625 with 509 degrees of freedom. CFI equals 0,914, TLI is 0,899. RMSEA is 0,058 and SRMR is 0,072. N=212.

Table 3.F. Only observations with no missing values (N=191).

Independent variables	Dependent variables					
	Diagnostic Use	Interactive Use	Acquisition	Assimilation	Transformation	Exploitation
Direct effects						
PMS	0,188**	0,239***	0,196**	0,029	0,012	0,247***
	(2,552)	(3,326)	(2,174)	(0,391)	(0,195)	(3,530)
Diagnostic Use			0,127	0,074	-0,035	0,154**
			(1,354)	(0,900)	(-0,495)	(2,035)
Interactive Use			0,004	0,139†	0,060	0,093
			(0,048)	(1,692)	(0,825)	(1,256)
Controls			Yes	Yes	Yes	Yes
Specific indirect effect						
PMS →			0,000	0,000	0,063	0,000
DiagnosticUse			[0,000 0,000]	[0,000 0,000]	[-0,060 0,233]	[0,000 0,000]
PMS →			0,000	0,000	0,118†	0,000
InteractiveUse			[0,000 0,000]	[0,000 0,000]	[0,002 0,308]	[0,000 0,000]
R^2			0.156	0.184	0.490	0.248

Each cell contains the standardized path coefficients (t statistics) and [CI]. *** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 858,705 with 509 degrees of freedom. CFI equals 0,908, TLI is 0,893. RMSEA is 0,060 and SRMR is 0,076. N=191.

Table 3.G. Dekker measurement for PMS.

Independent variables	Dependent variables					
	Diagnostic Use	Interactive Use	Acquisition	Assimilation	Transformation	Exploitation
Direct effects						
PMS	0.142** (2,039)	0.206*** (3,027)	0.173** (2,136)	0.110 (1,605)	-0.040 (-0,630)	0.162** (2,505)
Diagnostic Use			0,186** (2,065)	0,049 (0.637)	0,003 (0,039)	0,117 (1,633)
Interactive Use			-0.023 (-0,274)	0.139† (1.816)	0.043 (0,606)	0.136† (1.909)
Controls			Yes	Yes	Yes	Yes
Specific indirect effect						
PMS → DiagnosticUse			0.000 [0.000 0.000]	0.000 [0.000 0.00]	0.040 [-0.077 0.196]	0.000 [0.000 0.000]
PMS → InteractiveUse			0.000 [0.000 0.014]	0.000 [0.000 0.000]	0.113† [0.003 0.283]	0.032 [0.000 0.000]
R^2			0.164	0.190	0.436	0.212

Note: Each cell contains the standardized path coefficients (t statistics) and [CI]. *** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 884,456 with 509 degrees of freedom. CFI equals 0,911, TLI is 0,896. RMSEA is 0,059 and SRMR is 0,072. N=215.

Chapter 4

The relation between levers of control and absorptive capacity

The moderating effect of slack resources

Abstract

We draw on Simons' levers of control (LOC) framework to investigate the relationship between the levers of control and a firm's absorptive capacity (AC) at the organizational level. LOC considers boundary and belief control as well as a diagnostic and interactive use of control information. A firm's AC represents a firm's ability to acquire, assimilate, transform, and exploit new external knowledge. First, this study examines the relationships between the individual elements of the LOC framework and four AC capabilities. Thereafter, we delve into the relationship between LOC and AC, taking into account the simultaneous use of the control levers. In addition, we explain how a firm's context moderates the relationship between LOC and AC by investigating whether a firm's human resource (HR) and financial slack have a moderating role in the relationship between LOC and AC. Using survey data from 211 small and medium-sized enterprises (SMEs), we find that boundary controls relate to higher acquisition, assimilation, and transformation capabilities. Moreover, the diagnostic use of control information is associated with higher exploitation capability. Finally, we observe that SMEs emphasizing interactive use of control information have higher transformation capability. When considering the simultaneous use of the control levers, we find that LOC significantly relates to higher AC in all four capabilities. Moreover, the relationship between LOC and acquisition capability is stronger for firms possessing HR slack resources.

Keywords: levers of control; absorptive capacity; human resource slack; financial slack.

4.1 Introduction

Absorptive capacity (AC) is a concrete example of an organizational capability that leverages external knowledge as an entrepreneurial opportunity to commercialize new ideas, thus driving innovation and sustaining competitive advantage (Cohen and Levinthal, 1990; Qian and Acs, 2013; Zobel, 2017). More specifically, AC is the primary antecedent of competitive advantage in small and medium-sized enterprises (SMEs) (Flatten et al., 2011b). AC refers to "a set of organizational routines and strategic processes by which firms acquire, assimilate, transform, and exploit knowledge for the purpose of value creation" (Zahra and George, 2002, p 198). Therefore, AC is an umbrella term for various but complementary organizational capabilities. Zahra and George (2002) believe that acquisition and assimilation of knowledge compromise potential AC, which drives strategic flexibility, while transformation and exploitation of knowledge compromise realized AC, leading to innovation and competitive advantage. AC requires an entrepreneurial mindset that is curious about new external knowledge and is embedded in a degree of freedom that enables implementing potentially beneficial changes (Zahra and George, 2002). Given the importance of AC for organizational outcomes like innovation, survival, and development of competitive advantage, there are various calls to unravel the antecedents of AC (Bedford et al., 2022a; Bouguerra et al., 2021). The management control literature suggests considering performance feedback, PMS scope and integration as relevant antecedents of AC (Bedford et al., 2022a; Ben-Oz and Greve, 2015). Still, we lack an understanding of how the simultaneous use of controls relates to AC. The literature suggests that emphasizing different control levers simultaneously benefits innovation (Barros and Ferreira, 2019; Chenhall and Moers, 2015; Lill and Wald, 2021). Moreover, considering multiple controls is vital for within-firm coordination and collaboration (Smets, Langerak, and Tatikonda, 2016). This research focuses on the Levers of Control (LOC) as a taxonomy capturing multiple controls and styles of use (Chenhall and Moers, 2015; Curtis and Sweeny, 2017).

LOC focuses on goal alignment and effective strategy implementation (Simons, 1994a): it renders information while simultaneously embracing the need for redirection and revitalization (Atkinson et al., 1997). Evidence shows that LOC is an internal organizational mechanism that plays a driving role in building new capabilities in general

(Bellora-Bienengraber, Derfuss, and Endrikat, 2022; Bisbe and Malagueno, 2015; Henri, 2006a; Widener, 2007). However, our understanding of the interrelationship between LOC and AC (which is a specific type of organizational capability focusing on innovativeness) is still limited. In this regard, Grabner et al. (2018) call for further empirical research unraveling how control systems relate to specific types of capabilities (e.g., innovation capabilities). Moreover, from a practical point of view, the possibility to benefit from external resources is one of the ways for SMEs to compensate for possessing fewer resources compared to their larger counterparts (Thoma and Zimmermann, 2020; Flatten et al., 2011b). For instance, SMEs often lack distinct R&D departments, making innovation more dependent on non-R&D antecedents like internal mechanisms and organizational structure (Hervas-Oliver et al., 2021). Therefore, it is informative and practical to question whether and how LOC relates to AC, specifically in SMEs with higher reliance on external resources (Thoma and Zimmermann, 2020; Flatten et al., 2011b). Mitchell and Reid (2000) recommend studying the outcomes of control tools in SMEs. SMEs provide a less complex organizational environment that helps navigate management control effects more easily and clearly than larger firms (Mitchell and Reid, 2000). Thus, this paper aims to expand our understanding of the association between LOC and AC in SMEs.

The levers of control framework (LOC) captures how managers apply control systems to establish new agendas and routines (Simons, 1994a). LOC consists of boundary and belief control as well as diagnostic and interactive use of control information[26]. Boundary[27] controls promote innovation and keep employees creative and entrepreneurial in a setting where employees know what is unacceptable. Belief controls empower employees to see the big picture and inspire new ideas (Simons, 1995b). Belief controls[28] legitimize the time and effort devoted to experimental activities. Diagnostic use of control information[29] is associated with deviation correction, where managers establish rules and accessible time and attention for other issues (Simons, 1995b). Finally,

[26] Hereafter, we interchangeably refer to 'boundary' and 'boundary control'. Similarly, 'belief' refers to 'belief control' and vice versa. The terms 'diagnostic control,' 'diagnostic use,' and 'diagnostic use of control' refer to 'the diagnostic use of control information.' Moreover, to simplify, we also refer to the 'interactive use of control information' by the term 'interactive control' or 'interactive.' It is worth mentioning the terms 'absorptive capacity,' and 'AC' refer to 'organizational absorptive capacity.' Likewise, 'capabilities' is synonymous with 'organizational capabilities' and 'dynamic organizational capabilities.'

[27] Codes of business conduct are an example of boundary controls. For instance, the employee behavior must comply with corporate policy related to honesty, security, and cleanliness (Simons, 1994b).

[28] Mission statements and credos are examples of belief controls (Simons, 1994b).

[29] Budgets and profit plans are examples of the diagnostic use of control information (Simons, 1994b).

the interactive use of control information[30] consists of intense interaction and communication centered around strategic uncertainties and opportunities, which allow managers to absorb a vast amount of information to make reactive decisions timely (Simons, 1995b). The interactive use of control information focuses on the interaction between managers and subordinates and increases overall within-firm dialogues and information-based infrastructure (Davila, 2005). In studying LOC's outcome, in addition to the individual effect of each lever, it is also suggested to study the "combined use" of control levers where their simultaneous dependency is considered (Bellora-Bienengraber et al., 2022; Simons, 1995b; Spekle´, van Elten, and Widener, 2017). The integrated utilization of levers considers the interdependencies within the LOC framework, thereby offering additional insights into the varied outcomes observed when studying individual control levers[31] in isolation (Bellora-Bienengraber et al., 2022). While individual levers are potentially informative to specific relationships between each lever and AC, the combined use of LOC assesses the overall LOC environment where all the levers work together and, in this way, enhances the external validity of LOC relationships with organizational outcomes (Bellora-Bienengraber et al., 2022; Heinicke, Guenther, and Widener, 2016). Consequently, we aim to evaluate the relationship between LOC and AC by analyzing both the influence of the individual levers separately as well as the combined use of levers on AC.

Managers use LOC to allocate resources effectively and meet conflicting organizational demands like efficiency and innovation comprehensively and consistently (Simons, 1995a). In this vein, to pursue new knowledge absorption, slack resources can provide a stimulating contextual condition where lower competition for resources reinforces the entrepreneurial mindset and mitigates inertia (de Araujo Burcharth, Lettl, and Ulhøi, 2015; Cyert and March, 1963; Kuusela, Keil, and Maula, 2017). Therefore, slack provides a context where risk-taking and experimentation are more probable (Lungeanu, Stern, and Zajac, 2016). This is pertinent and imperative since, during the AC process, uncertainty and posterior ambiguity are higher (Patel et al., 2015). Verbeke and Yuan (2013, p 238) define human resources (HR) slack as "the common availability of human resources' time and effort to be deployed for purposes other than planned

[30] Open dialogues that proceed beyond checking the results of subordinates can be an example of interactive use of control information (Simons, 1994b).

[31] Individual control lever or individual lever refers to single elements LOC in contrast to the combined use of multiple control lever. Both individual lever and LOC refer to the control at the organizational level throughout this thesis.

production." Moreover, financial slack refers to excess financial resources available in a firm, such as cash and cash equivalents (Paeleman, Fuss, and Vanacker, 2017). Given that both types of slack resources, HR and financial slack, affiliate closely with knowledge in organizations (Wang et al., 2016), we further delve into their potential contextual influence and question whether LOC's relationship with AC is robust for firms with HR and financial slack resources.

We applied cross-sectional data collected through online questionnaires from Belgian SMEs. The results show that firms emphasizing boundary controls possess higher acquisition, assimilation, and transformation capabilities. Diagnostic use of control information relates to higher exploitation capability. Moreover, SMEs that stress the interactive use of control information show higher transformation capability. Additionally, the results show that all the control levers relate to higher AC capabilities when used together; thus, the simultaneous use of control levers considers the levers' synergic effect, which is vital in studying LOC outcomes (in line with Simons, 1995a; Bellora-Bienengraber et al., 2022). Our results imply that SMEs benefit from applying multiple controls. Furthermore, applying LOC relates to higher acquisition capability in companies with more HR slack resources. Therefore, this study acknowledges that the LOC and AC relationship should be studied concerning how much and what type of slack resources exist in firms.

This study contributes to the existing body of literature on the relevance of LOC in developing new capabilities in SMEs (Albertini, 2019; Henri, 2006a; Mundy, 2010). We answer the call to investigate LOC's individual and combined effects on new organizational capability building (Bellora-Bienengraber et al., 2022). The results provide further evidence that multiple controls are more relevant to developing AC capabilities than studying controls in isolation (/individually). This aligns with the findings of scholars who regard the simultaneous use of multiple controls in the innovation literature (Chenhall and Moers, 2015; Moll, 2015; Revellino and Mouritsen, 2015). By exploring the link between LOC and AC, our study adds to the literature that explains firms' differences in effectively managing AC (e.g., Bedford et al., 2022a; Jansen, Van Den Bosch, and Volberda, 2005). Studying LOC as a taxonomy for MCS design and use, we provide evidence that how managers apply LOC can explain part of a firm's differences in AC development. Taken together, our results point to the need for future research in multiple domains.

The remainder of this paper is organized as follows. Section 2 reviews the theoretical background and develops hypotheses. Section 3 centers around the research method, while we represent the results in section 4. Section 5 discusses the results, and we conclude this research in Section 6.

4.2 Theoretical background and development of hypotheses

4.2.1 Absorptive capacity

Absorptive capacity (AC) is a knowledge-based capability that enables organizations to acquire, assimilate, transform, and exploit new external knowledge (Cohen and Levinthal, 1990). AC argues that the learning process at the organizational level develops new capabilities, drives innovation, influences performance, and can lead to competitive advantage (Cohen and Levinthal, 1990; Flatten et al., 2011b; Zahra and George, 2002). AC requires organizational investment in prior related knowledge and internal mechanisms (Cohen and Levinthal, 1990; Van Den Bosch, Van Wijk, Volberda, 2003). In this study, we focus on AC's antecedents from a management control perspective, including the levers of control (LOC).

4.2.2 Levers of control as an antecedent of absorptive capacity

LOC drives organizational capabilities since it provides discipline and harmony, hinders the creation of dysfunctional routines through regular monitoring, and facilitates double-loop learning (Bellora-Bienengraber et al., 2022). Moreover, LOC creates information flows and directs managerial attention (Simons, 1994a). The literature provides evidence that the tools related to information flows are generally relevant in studying AC antecedents (Bedford et al., 2022a; Robert, 2015). In particular, organizational factors with a close relationship with social activities like connectedness, system integration, knowledge sharing, coordination, and collaboration, are considered as AC's antecedents (Balle, Oliveira, and Curado, 2020; Marrucci et al., 2022; Robert, 2015; Zobel, 2017).

In this vein, LOC is centered around the relationship of control systems with strategy, specifically focusing on how top managers employ control systems to reach organizational objectives. LOC consists of four distinct cohorts or levers: boundary, belief, diagnostic, and interactive. Tessier and Otley (2012) describe Levers of Control

(LOC) as a framework encompassing various forces like boundary controls and diagnostic use of control information, which aim to correct, punish, prescribe, and control, as well as belief controls and the interactive use of control information, which aim to motivate, empower, reward, and enhance learning. LOC plays a crucial role in conveying new strategic initiatives, directing attention to-wards new strategic agendas, and surmounting resistance to change. The LOC framework goes beyond the conventional control and monitoring functions, providing a comprehensive approach to managing strategic change in organizations.

Boundary controls are established through limits and rules that are formally stated and must be respected. Organizations clarify the code of conduct, and risks should be avoided through boundary controls (Simons, 1994a). They can provide creativity and control, emphasize innovation, and be one amongst the mechanisms that communicate changes in a new strategic direction (Curtis and Sweeney, 2017; Lill and Wald, 2021).

Belief controls communicate the core values in a formal way in an organization and spread direction and purpose formally and explicitly. This can stimulate and guide opportunity-seeking behavior (Simons, 1995a). Belief controls associate with embodying strategy as a perspective throughout the organization (Kruis, Spekle´, and Widener, 2016). This includes a mission or value statement, which can provide momentum for activities aligned with organizational shared values without specifying or restricting the characteristics of activities (Lill and Wald, 2021). Lill and Wald (2021) hypothesize that belief controls are associated positively with innovation since they increase knowledge exchange, control the disruptive effect of uncertainty, promote exploratory projects, and internalize organizational commitment. Therefore, belief controls motivate desired behavior and can incorporate the firm's folklore and storytelling (Pesalj, Pavlov, and Micheli, 2018).

Diagnostic use of control information monitors performance, corrects deviation, and encourages formal feedback (Simons, 1994a). Diagnostic use communicates critical performance factors by pre-set standards (Simons, 1995a) while motivating single-loop learning (Widener, 2007). Guenther and Heinicke (2019) provide empirical evidence for the beneficial impact of the diagnostic use of controls on organizational outcomes. Endrikat et al. (2020), in their meta-analytic review of 67 studies, found an association between diagnostic use and organizational capabilities. Notably, performance feedback

inherited in diagnostic use can motivate learning in the AC context (Bedford et al., 2022; Ben-Oz and Greve, 2015).

Interactive use of control information emerges around strategic uncertainties and new opportunities in the form of constant communication (Simons, 1995b). Interactive use of control information orients toward flexibility more than control; therefore, it is more likely that it relates to breaking narrow search routines and creating new capabilities (Bedford, 2015). Lill and Wald (2021) argue that interactive use of control information relates positively to innovation since its communicative nature establishes an open forum to utilize creativity quicker to meet market changes.

In addition to the individual elements of LOC, studying the combined use of LOC elements matters since the systematic and simultaneous move of levers of control creates an environment where empowerment, creativity, self-control, motivation, and access to necessary information exist (Spekle´ et al., 2017). The interconnectedness of the LOC elements underscores the importance of adopting a more holistic approach that considers the interplay and integration of levers within the LOC framework (Simons, 1994a). Spekle´ et al. (2017) suggest studying the organizational outcomes of LOC with respect to the combined use of all the LOC elements to capture how managers prioritize and balance structure, autonomy, and information exchange simultaneously. Without considering the simultaneous use of LOC elements, the model suffers from internal validity where the complementary aspects of levers in following different purposes are neglected (Bellora-Bienengraber et al., 2022). Therefore, we aim to investigate the potential relationship between LOC and AC at both the individual and combined levels of linkage.

4.2.3 Levers of control and absorptive capacity's capabilities

4.2.3.1 Boundary controls

I hypothesize that boundary controls introduce formal rigidity that can hamper searching for new external knowledge as well as internal information flow. There is inconsistency in studying whether formalization (i.e., explicit rules) enhances the acquisition and assimilation capabilities of AC (e.g., Bedford et al., 2022a; de Araujo Burcharth et al., 2015). Boundary controls are formal control systems rooted in risks to be avoided (Simons, 1994a). Thus, boundary controls can limit external scanning

behavior to what is framed as acceptable to structure the current pattern of the behavior (Simons, 1994a). In the search for new knowledge, boundaries emphasize control, reducing the flexibility of the search to consider beyond current needs (Widener, 2007). Concerning current needs, boundary controls can enhance creativity but only for tailored and limited organizational demands (Vega-Jurado, 2008). Therefore the emphasis on boundary controls serves legitimacy and retains the current strategic position of SMEs rather than appreciating the emergence of new opportunities (Kruis et al., 2015). Similarly, boundary controls are part of organizational efforts to enforce the rule, which can make organizations less adaptive to external changes (Jaworski and Kohli, 1993). This approach aligns with Widener (2007), who believes boundary controls constrain the exploration that managers inspire and motivate.

Similarly, Bellora-Bienengraber et al. (2022) discuss the relationship between boundary controls and organizational learning depending on whether boundary controls emphasize general issues like ethical behaviors or innovative-related concerns. However, since boundary controls are "based on the prior strategy" (Simons, 1994a, p 177), assimilation of newly acquired information is more a matter of compliance with the prior strategy. Simons (1994a, p 177) mentions that the "failure to comply would be considered a serious offense when top managers were assessing which subordinates to retain and which to replace." Therefore, if new information is valuable but does not support the strategic agenda, the boundary controls will not tolerate it, and the assimilation will be hindered. Therefore, even in the case of no conflict between new information and prior strategy, we are suspicious of whether there is a positive association between boundary controls and assimilation capability. Boundary controls define the organizational strategic domain and communicate it through checklists, operational guidelines, and codes of businesses (Journeault, Ronge, and Henri, 2016). Therefore since boundary controls participate in communicating risk information, they are less relevant to the type of information flow that are building blocks of assimilation capabilities like sharing ideas, concepts, problem-solving, and achievements (Flatten et al., 2011a; Simons, 1994a). In this vein, Laguir et al. (2022) discuss extensive rules and boundaries as more likely to weaken employee involvement. All in all, we hypothesized that there should be a negative relationship of boundary controls with acquisition and assimilation capabilities of AC.

H(1): Boundary controls relate negatively to the (a) acquisition and (b) assimilation of new external information.

Transformation capability enables the selection of novel knowledge recombination or interpretation, while exploitation capability enables the implementation of new routines from a broad range of alternatives (Patel et al., 2015; Zahra and George, 2002). Selecting from a comprehensive set of alternatives can be an iterative process to reach a successful commercial output (Camison and Fores, 2010; Patel et al., 2015). Therefore, transforming and exploiting knowledge requires an entrepreneurial mindset that invests in the heterogeneity of knowledge, insights, revisions, bisociation, and interpretations (Zahra, 2015; Zahra and George, 2002). On the contrary, boundary controls refer to an acceptable domain of activities through prioritizing compliance with explicit orders (Simons, 1994a). Boundary controls establish a structured framework encompassing the potential avenues that can be assessed and ultimately leveraged for strategic advantage (Simons, 2000). The analysis of risks determines where the boundaries are and when an organization must brake (Simons, 1994a). We argue that while boundary controls can deploy the predefined framework to justify alternatives, they can constrain looking beyond the predefined framework (Simons, 1994a; Tessier and Otley, 2012). Transformation of strategic intention into practice is less likely to be stimulated through boundary controls which is more constraining rather than inspirational (Journeault et al., 2016). Therefore, we argue that there should be a negative relationship between boundary controls and AC's transformation and exploitation capabilities.

H(1): Boundary controls relate negatively to the (c) transformation and (d) exploitation of knowledge.

4.2.3.2 Belief controls

We argue that belief controls such as credos, vision statements, and mottos can justify opportunity-seeking behavior outside the organization, thereafter, the endeavor of sharing the valuable findings internally. Organizations communicating core values in a more formal way are more likely to face initiatives and new ideas (Blount and Leinwand, 2019). Moreover, since it encourages and commits search behavior in line with the established goals (Spekle´ et al., 2017), the internal assimilation of new findings is set readily. In this vein, Bellora-Bienengraber et al. (2022) argue that belief controls enhance existing and new capabilities by empowering organizations in general and searching for new valuable ideas specifically. Emphasizing beliefs promotes strategy as a perspective, increases positive actions, and enables strategic responsiveness by scanning the external

environment and collecting new information (Spekle´ et al., 2017). Belief control techniques such as personal and active communication, drafting guidelines, conducting workshops, and documenting mission statements diminish organizational inertia, induce public commitment, and offer an underlying logic (Simons, 1994a) that can be deployed to evaluate new information throughout the assimilation phase. Altogether, we expect to see a positive relationship of belief controls with acquisition and assimilation capabilities of AC.

H(2): Belief controls relate positively to the (a) *acquisition and (b) assimilation of new external information.*

Belief controls support knowledge integration and exploitation through providing direction via organizational core values (Grant, 1996; Simons, 1994a; Tkotz, Munck, and Wald, 2018). The knowledge integration mechanism encompasses a broader range of knowledge complexity- whether computational, technical, or cognitional-that can benefit from a sense of direction suggested by organizational core values (Ditillo, 2004). In fact, belief controls provide a stable reference point without restricting knowledge integration or exploitation (Mundy, 2010). According to Lill and Wald's (2021) empirical findings, belief controls are foundations for facilitating knowledge exchange and the emergence of novel ideas, ultimately contributing to improved performance in innovation projects. Similarly, Ylinen and Gullkvist (2014) further prove that belief controls improve performance by fostering exploitative projects. Internalization of core values increases commitment to practicing changes (Adler and Chen, 2011); therefore, it is salient to expect that belief controls lead to innovative outcomes (Lill and Wald, 2021). Accordingly, we hypothesize that a positive relationship exists between belief controls and transformation and exploitation capabilities.

H(2): Belief controls relate positively to the (c) transformation and (d) exploitation of knowledge.

4.2.3.3 Diagnostic use of control information

We argue that since regular feedback is intrinsic to the diagnostic use of control information[32] (Simons, 1994a), it is probable to expect a positive relationship between

[32] Simons (1995b) posits that feedback systems can be employed in either a diagnostic or interactive manner, but we recognize that even interactive utilization of feedback systems necessitates evaluative

the diagnostic use of control information and the acquisition and assimilation capabilities of AC. Feedback leads to searching for new knowledge when performance is below the aspiration level and in this way, creates a foundation for change (Gavetti et al., 2012). Regular feedback systems, as part of governing the development of effective routines, link to strategically relevant actions, management of learning processes, and development of new capabilities (Gavetti et al., 2012). Moreover, feedback increases the likelihood of problematic searches while influencing the direction of change, guiding, and strengthening organizational learning (Ben-Oz and Greve, 2015; Greve, 2003; Yu et al., 2019). For instance, top managers with poor subunit performance are more likely to create opportunities for lower-level managers to seek external knowledge (Gavetti et al., 2012). Therefore, deviation from pre-described goals triggers seeking solutions, and the enhanced effort devoted to implementing changes, which can associate with risk-taking activities and end in organizational changes (Posen and Chen, 2013; Yu, Minniti, and Nason, 2019). In this vein, diagnostic use of control information unravels deviations and creates accountability for actions (Cyert and March, 1963; Simons, 1994a). Therefore, we hypothesize that diagnostic use of control information relates positively to acquisition and assimilation capabilities of AC.

H(3): Diagnostic use of control information relates positively to the (a) acquisition and (b) assimilation of new external information.

We argue that diagnostic use of control information relates to transformation and exploitation capabilities since it provides cooperation among activities. Diagnostic use of information enables the coordination of activities by establishing project milestones, regularly monitoring actual performance against expected progress, and aligning activities across different geographical locations and timeframes (Davila, Foster, and Li, 2009; Henri and Wouters, 2020). Moreover, diagnostic use of control information can facilitate the identification and recombination of resources in new and alternative ways, thereby promoting the alignment of activities with organizational objectives (Curtis and Sweeney, 2017). In this way, the diagnostic use of control information encourages the redirection of actions towards new areas (Curtis and Sweeney, 2017). Thus, the diagnostic use of control information can be a mechanism for examining

judgment concerning the organization's operational efficiency and the locations of deviations; hence, while feedback systems can ultimately have the potential to be used interactively, they first necessitate diagnostic use of information for identifying deviations.

interdependencies and complementarities among coordinating activities that contribute to the development of AC through routines (Lewin et al., 2011). As a result, we anticipate a positive correlation between the diagnostic use of control information and the transformation and exploitation capabilities of AC.

H(3): Diagnostic use of control information relates positively to the (c) transformation and (d) exploitation of knowledge.

4.2.3.4 Interactive use of control information

Interactive use of control information can benefit the acquisition and assimilation capabilities of AC by circulating critical strategic issues and new knowledge without restricting the search. Interactive use of control information conveys information about market competition, threats, and opportunities while it opens a forum to debate, discuss issues, and challenge the status quo (Simons, 1994a). The interactive use of control information facilitates inspirational and feed-forward dialogues, creating a more innovative setting centered on emergent opportunities (Bedford, 2015). Moreover, the flexibility associated with interactive use of control information opens the discussion of any matter that sounds important (Hall, 2010). Given the above arguments, we hypothesize that:

H(4): Interactive use of control information relate positively to the (a) *acquisition and (b) assimilation of new external information.*

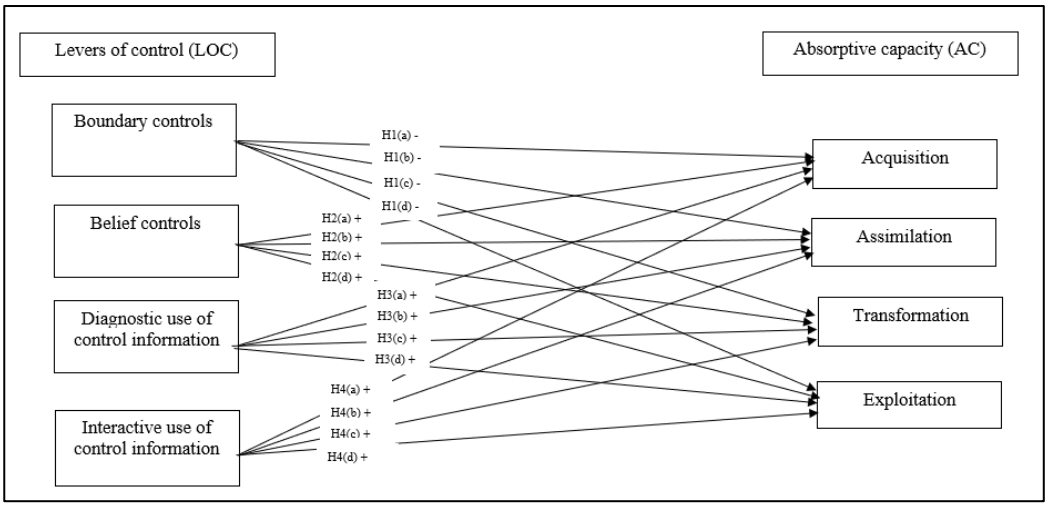
Formal social integration mechanisms antecede transformation and exploitation capabilities of AC through enhanced connectedness (Zahra and George, 2002). Vega Jurado (2008) and Jansen et al. (2005) prove that socialization capabilities significantly improve transformation and exploitation capabilities. Andersen (2015) argues that social integration, mechanism, capital, or capabilities refer to the driving impact of employee interactions on organizational realized AC. In this vein, there is a growing consensus that interactive use of control information promotes knowledge integration and exploitation capabilities (Bisbe and Otley, 2004; Malagueno and Bisbe, 2010). Organizations emphasizing more interactive use of control information constitute more heterogeneity in knowledge transformation, consideration of broader alternatives in knowledge integration, and a higher probability of conducting strategic changes (Naranjo-Gil and Hartmann, 2007). For instance, to encourage revised action plans and innovation, interactive use of controls connects organizational members to discuss and exchange

ideas about ideally broad matters that are understandable for managerial and operational levels, such as budgets for planning, project management systems, and human development systems (Chenhall and Moers, 2015; Simons, 1995b). Therefore, we hypothesize that the interactive use of control information will likely enhance transformation and exploitation capabilities.

H(4): Interactive use of control information relates positively to the (c) transformation and (d) exploitation of knowledge.

Figure 4.1 summarizes the first four hypotheses regarding the relationship between LOC individual levers and AC capabilities.

Figure 4.1. Hypothesized relationships I.



4.2.3.5 LOC combined use

The four levers of control are interconnected, meaning that managers use the four levers simultaneously to pursue different purposes (Simons, 1995b). The LOC combined use refers to the simultaneous use of all the levers, which captures the common variance in all the levers concurrently (Bellora-Bienengraber et al., 2022). Bellora-Bienengraber et al. (2022, p 7) mention that as "the emphasis on the simultaneous use of the levers increases, the emphases on the beliefs, boundary, diagnostic, and interactive control increase correspondingly." From a practical point of view, firms follow various and even conflicting goals. For instance, managers need to follow predictable goal achievement for short-term policies centered around efficiency, while innovation is necessary for long-term growth. In this vein, organizations emphasizing both boundary and belief controls

stimulate the entrepreneurial mindset of organizational members through enhancing the coordination of actions among individuals, promoting cooperation, and facilitating the sharing of knowledge, ultimately increasing the likelihood of discovering and pursuing new business opportunities (Linder and Torp, 2017). In another example, Simons (1994a) discusses that the consistent strategic behavior of firms requires output-oriented control (e.g., diagnostic use of control information) as well as behavior-oriented systems (e.g., interactive use of control information) to simultaneously direct input and evaluate performance (Simons, 1994a). In this vein, the power of levers concerning organizational learning and control is inherited in their simultaneous use[33] when organizations attempt to reach balance and discover complements and substitutes among the levers (Simons, 1995b).

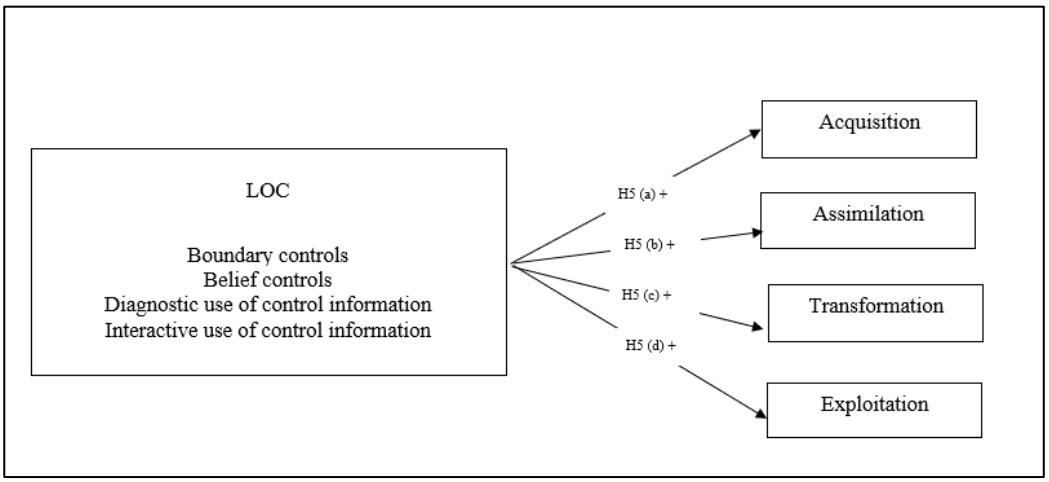
Simons (1995b) underscores the concurrent utilization of all four levers. However, limited research has addressed these four levers collectively, and a notably smaller body of studies has quantitatively investigated the organizational outcomes of LOC (Martyn, Sweeney, and Curtis, 2016). The joint use of the four levers appears to drive organizational learning and new capability development (Bellora-Bienengraber et al., 2022; Kruis et al., 2016; Mundy, 2010; Widener, 2007). Bellora-Bienengraber et al. (2022) study 58 samples to synthesize the LOC framework via a metanalysis of more than 10000 observations. They validate Simons' LOC and conclude that the combined use of LOC outperforms the individual control levers in isolation in studying LOC's outcomes. They provide evidence that the combined use of LOC enhances organizational performance by supporting new organizational capability building (Bellora-Bienengraber et al., 2022). They call for the consideration of LOC combined use where the second-order construct examines the global relationship between LOC and other constructs. Kruis et al. (2016) propose that organizational learning can be facilitated through the effective use of multiple levers of control by managers, who should adapt their emphasis on different levers based on strategic and contextual challenges to achieve internal stability. They rely on contingency theory, to suggest there are various but limited combinations where levers can work together effectively (Kruis et al., 2016). Similarly,

[33] In this research, the simultaneous use of LOC refers to an organization's emphasis on the four levers of control while disregarding how much intensity exists in using each lever individually. An organization's capacity to successfully balance using the four levers relates to internal consistency, historical tendency, dominance, and logical progress (Simons, 1995b; Mundy, 2010). In this vein, there is a stream of research concerning the notion of balance and dynamic tention discussing interdependencies and interaction among the levers (for more information, see Bedford, 2015, Heinicke et al., 2016, Henri, 2006a, Johansson, 2018, Widener, 2007).

there is further empirical evidence that the combined use of levers of control leads to desirable organizational outcomes like organizational capability (Mundy, 2010), learning (Widener, 2007), and creativity (Spekle´ et al., 2017). Thus, we postulate that the combined LOC use will likely enhance AC's capabilities. Note that we hypothesized that the relationship between boundary controls and AC is more of a negative nature since boundary controls direct attention to avoiding risks and imposing constraints (Simons, 1994b). Therefore, the individual lever of boundary is more about narrowing choices and limiting opportunity seeking (Simons, 1994b). However, when considering LOC, the boundary effect is embedded in a pool of control forces where the boundary constraint is just part of the whole effect. Simons uses the terms yin and yang to demonstrate that the tension between forces of control results in a mixture and synthesis, creating new leverage that is different from the effect of each control individually (Simons, 1995a). Figure 4.2 shows the hypotheses.

H(5): The combined use of LOC is related positively to the (a) acquisition, (b) assimilation of new external information as well as (c) transformation, and (d) exploitation of knowledge.

Figure 4.2. Hypothesized relationships II.



4.2.4 The moderating role of slack resources

The effectiveness of management control is contingent on the contextual elements involved in firms (Chenhall, 2003). Accordingly, in studying LOC's outcomes, Bellora-Bienengraber et al. (2022) recommend considering contextual factors that act as boundary conditions limiting the generalization of the theoretical model. Bellora-Bienengraber et al. (2022) rely on resource-based theory to show that the contextualized use of LOC can

lead to organizational capabilities (Bellora-Bienengraber et al., 2022). Similarly, Heinicke et al. (2016) discussed the characteristics of smaller firms and the importance of considering contingent factors in studying LOC. Consequently, the relationship between LOC and organizational outcomes depends on contingency elements that should be regarded (Kruis et al., 2016; Simons, 1995b). Given that resource allocation of SMEs aiming to develop AC capabilities is more challenging due to resource constraints, we question the robustness of the LOC-AC relationship in SMEs with slack resources.

Nohria and Gulati (1996, p 1246) define slack "as the pool of resources in an organization in excess of the minimum necessary to produce a given level of organizational output." Bourgeois (1981, p 30) refers to the enabling role of slack as it" allows an organization to adapt successfully to internal pressures for adjustment or to external pressures for change in policy, as well as to initiate changes in strategy with respect to the external environment." Munjal et al. (2019) argue that organizations with the availability of slack can enjoy technical and professional support and services customized to their needs. Studies generally find evidence for the relationship between slack and organizational learning, knowledge creation, R&D, innovation, risk-taking, and organizational change (Agrawal et al., 2018; Argote, Lee, and Park, 2021; Carnes et al., 2019). Slack provides a cushion of resources in various forms, including human and financial, which can promptly mitigate internal and external pressure and uncertainties (Carnes et al., 2019). More specifically, there is evidence that slack is an influential factor in the organizational learning attempts of SMEs (Fredrich, Bouncken, and Kraus, 2019; de Araujo Burcharth et al., 2015).

However, there is debate on the exact role of slack in an organization's propensity to change (Agrawal et al., 2018; Lungeanu et al., 2016). Behavioral theorists argue that slack allows firms to engage in riskier activities such as experimentation (Levinthal and March, 1981; Lungeanu et al., 2016). In this view, slack enables the absorption of uncertainty and the disruptive effect of failure (Lungeanu et al., 2016). Thus, slack encourages change in this school of thought (Schumpeter, 1942). Others counterargue from the agency theory perspective and approach slack as a source of conflict between agent and principal, which associates with inefficiency, less effort, and distraction (e.g., Tan and Peng, 2003).

Hence, a stream of research emerges that delves into the types of slack and consideration of contingency factors to clarify the tension between slack's positive and

negative effects on organizational outcomes (Agrawal et al., 2018; Marlin and Geiger, 2015). Moreover, there are several calls to examine the potentially different implications of various types of slack in studying organizational outcomes such as external knowledge search, innovation, R&D intensity, change, learning, and new capability building (Argote et al., 2021; Fredrich et al., 2019; Marlin and Geiger, 2015; Rau, Flores, and Simha, 2020; Salge and Vera, 2013; Wang and Guo, 2020). Since HR and financial slack focus on the knowledge domain in organizations (Wang et al., 2016), we hypothesize the moderating effect of HR and financial slack in the LOC-AC relationship.

4.2.4.1 Human resource slack

HR slack refers to the excess in-house employees; thus, it depends on the nature of workflow decided by a firm's choices (Lecuona and Reitzig, 2014). Following this approach, Barney (1991) employs a resource-based perspective to explore how a company's internal assets, including its human resources, explain the fundamental process by which a firm attains a competitive advantage. Mishina et al. (2004) argue that HR slack as a path-dependent and firm-specific resource enhances market expansion's influence on growth. Moreover, HR slack is a more valuable resource for firms under competitive pressure (Lecuona and Reitzig, 2014), which can influence the organizational ability to exploit external opportunities (Paeleman et al., 2017).

Organizations with more HR slack are better positioned during strategic change because of enhanced AC-related cognitive capacity, time, and endeavor (Bentley and Kehoe, 2020; Eggers and Kaplan 2009). Therefore, HR slack shows a firm's ability to allocate time and effort to innovative activities (Agrawal et al., 2018). Similarly, Medase (2020) suggests allocating HR slack as one of the ways to flourish innovation. Medase (2020) argues that control measures like monitoring in firms with abundant resource enhances innovation outcomes. Following this argument, and in line with Rau et al. (2020), Fredrich et al. (2019), and Agrawal et al. (2018), we question whether the LOC's relationship with AC is moderated by HR slack resources.

H(6): HR slack positively moderates the relationship between LOC and AC capabilities ((a) acquisition, (b) assimilation, (c) transformation, and (d) exploitation).

4.2.4.2 Financial slack

Financial slack refers to the amount of liquid resources, such as cash and cash equivalents, which are easily available and (re)deployable (e.g., Greve 2003; Paeleman et al., 2017). Financial slack can provide a contextual condition that influences the alignment of firms' internal resources with environmental factors and, consequently, firms' strategic responses to external stimulants (Bentley and Kehoe, 2020). Organizations endowed with substantial financial resources often exhibit diminished requirements for information processing. However, concurrently, the information they process tends to be approached with a more receptive attitude toward entrepreneurship and experimentation (Bourgeois, 1981; Rau et al., 2020). Given the influence of financial slack on the cognitive position of organizations and, subsequently, resource allocation decisions of managers in SMEs (see Kiss, Fernhaber, and McDougall-Covin, 2018), this research emphasizes financial slack as a potentially influential context in the relationship between LOC and AC.

LOC's relationship with acquisition and assimilation capabilities in firms with abundant resources is probably intensified since these firms have a more affluent context to search for more information, foresee the value of new knowledge, and pay for the cost of absorbing new knowledge. Less slack provides a context where underperforming firms suffer more from financial distress and anxiety, search less broadly, and process information less coherently (Chen and Miller, 2007; Singh, 1986). Hence, it is crucial to note that organizations endowed with more abundant slack resources are inherently better situated to explore and contemplate a wider array of resources and opportunities; consequently, such organizations possess an enhanced capacity to process information in a more optimal manner (Rau et al., 2020; Tyler and Caner, 2016).

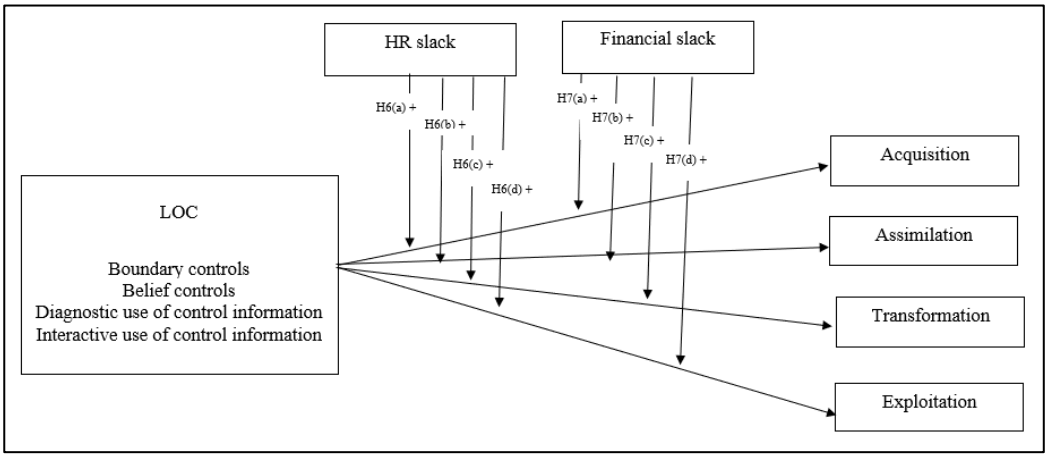
Moreover, acquisition and assimilation capabilities impose the cost of renewing the internal knowledge base (Jansen et al., 2005). Selecting external sources to consider, evaluating the value of external knowledge, actively trying to share new findings, and monitoring the sharing activities could be regarded as the costs of renewing the internal knowledge base (Grigoriou and Rothaermel, 2017). Szulanski (1996) expounds upon diverse costs associated with transferring external knowledge into an organization's internal knowledge base. These costs include the ability to retain new knowledge within the organization and allocate attention toward identifying problems and discerning

potential solutions (Szulanski, 1996). On the other hand, leveraging LOC to pursue organizational goals like organizational learning is costly (Widener, 2007). We argue that if an organization possesses an excess level of resources, it can likely afford the costs of internal knowledge base renewal more easily (Levinthal and March 1993). Organizations with slack resources can better divide organizational resources to consistently operate and devote resources to consider new knowledge (Levinthal and March 1993). Therefore, slack provides a context that influences the mental model of key decision-makers (Steensma and Corley, 2001) through searching and evaluating for new knowledge and a firm's ability to pay for the cost of potential AC. Therefore, we expect that the relationship between LOC and acquisition, as well as LOC and assimilation, varies depending on the level of slack resources.

While we hypothesize that LOC relates positively to transformation and exploitation capabilities, we argue that slack resources strengthen this linkage. Transformation and exploitation capabilities are accelerated via an entrepreneurial mindset, in which there is an eye for a broad range of untapped alternatives (Zahra and George, 2002) and a risk-taking attitude to exploit opportunities (Simons and Davila, 2020). Organizations with more slack are more likely to possess expensive thinking and make riskier decisions (Audia and Greve, 2006; Nohria and Gulati, 1996). Slack resources reduce fears of failure and enhance institutionalized innovation and experimentation (Cyert and March 1963). Therefore, psychologically, managers in a context with rich resources are more likely to make riskier decisions, accept experimentation, and bear failure (Cyert and March, 1963; Singh, 1986). More specifically, HR slack stimulates ideas and empowers cognitive judgment (Agrawal et al., 2018), while financial slack leverages riskier changes (which firms with less or no financial slack cannot take into account) (e.g., Parida and Ortqvist, 2015). Therefore, the relationship between LOC and transformation and exploitation probably varies for firms possessing different levels of financial slack resources. Figure 4.3 summarizes the moderation effect of slack resources in the LOC-AC relationship.

H(7): Financial slack positively moderates the relationship between LOC and AC capabilities ((a) acquisition, (b) assimilation, (c) transformation, and (d) exploitation).

Figure 4.3. Hypothesized relationships III.



4.3 Research Method

4.3.1 Sampling

We collect data through a survey from our study population, which consists of active Belgian SMEs (privately held) from all industries except finance, insurance, and government organizations. In 2020, a random sample of 4,531 companies was drawn from the total population of active Belgian enterprises, comprising 26,279 entities. Subsequently, our emphasis shifted to SMEs since they provide a more direct and suitable setting to study management control systems (Mitchell and Reid, 2000; Lopez and Hiebl, 2015). Moreover, SMEs mostly lack the organizational structure and resources to establish R&D departments (Ortega-Argiles, Vivarelli, and Voigt, 2009). Therefore, studying antecedents of AC, when AC is defined broader than R&D expenditure, in SMEs is suitable (Flatten et al., 2011a; Flatten et al., 2011b). Thus, we consider SMEs a proper unit of analysis for this research. In addition, choosing respondents amongst the executive-level managers with a minimum tenure of one year at the firm ensured that the respondents' information was adequate to address the SME's managerial decisions. We applied the sample selection criteria of having a minimum of 10 full-time employees. The database Trends, a Belgian commercial mailing list provider, was used to obtain the email addresses. For further information related to the balance sheet, income statement, and social balance sheet, we also used the Belfirst database of Bureau Van Dijk.

4.3.2 Survey implementation

Since all the measurements were from published articles in English (e.g., Flatten et al., 2011a; Nohria and Gulati, 1996), we applied a forward-backward translation method to provide adequately equivalent questions across languages. Comparing the English translation obtained from Dutch and French translations to the questions in the original version of English validates the similarity between information content. Then, a pilot study with the help of five practitioners and two academics led to minor corrections and improved face validity and readability (Collins, 2003).

This study yields a 13.55% response rate after acquiring 556 filled-in questionnaires, comparable to research targeting top managers in the management accounting literature (e.g., Bedford et al., 2022b; Guenther and Heinicke, 2019). The survey was sent in mid-October 2020, followed by two reminders. Submission of reminders started in October 2020, and the second followed in mid-November. We reached 4,102 respondents out of 4,531 emails since some CEOs retired or the submitted emails failed to be delivered. We followed Millar and Dillman (2011) in offering different response modes sequentially to increase the response rate. In January 2021, we phone-called those who started the survey but still need to complete it to encourage them to proceed further. In total, we called 1,216 respondents who answered the survey to some extent. To test the hypotheses, we included observations who answered more than 80% of the questions (211 observations). We applied random replacement to fill in missing values[34]. The sample includes 211 observations. Moreover, we acknowledge that the respondents' sample is representative of the population.

We test the data quality by considering non-response bias and biases associated with the self-administrated data collection mode. First, we check late respondents as proxies for non-respondents (Goyder, 2019). We define who is late based on the last 30% and then include those who answered after the reminder's submission (the last 171). Since we did not find significant differences between populations after comparing the means for all the variables, the non-response bias is less likely to be a concern. Moreover, in the design phase, considerable attention was devoted to wording, confidentiality, reverse coding, the possibility of choosing a mid-point in questions with a Likert scale, and various response formats to advance data quality. After the data collection, we also ran

[34] The pattern of missing values suggests there is a missing value at random when the missing data is not systematically related to the missing values but rather related to the place of the questions in the survey (Baraldi and Enders, 2010).

Harman's one-factor test for all the items involved in the analyses. Unrotated factor solution reveals that the first factor only covers 22.32% of the total variance; we conclude there is little evidence for single-source bias (Podsakoff et al., 2003). Moreover, we also conduct a full multicollinearity test as an additional analysis for detecting common method bias suggested by Kock (2015). VIF values associated with the random variable are all below 3.3, further confirming that common method bias is not a concern.

4.3.3 Variable measurement

This study relies on the prior definition of the constructs and how they are used in the literature to measure them in 2020. Questionnaire items are at the end of this dissertation. In the following sub-sections, we clarify how the four AC capabilities are measured. Moreover, we measure the levers of control as four individual levers and also as one variable, called LOC, in which the combined use of controls and the styles of use are considered. In the end, we clarify how HR and financial slack is measured.

Dependent variables

In this study, we apply the multi-dimensional scale of AC introduced by Flatten et al. (2011a) to measure the dependent variables. Acquisition, assimilation, transformation, and exploitation are latent variables. *Acquisition* (*Acquisition)* includes three items. Assimilation (*Assimilation*) includes four items. Five questions measure transformation (*Transformation*), and three items relate to exploitation (*Exploitation*). All four dimensions (= capabilities) are measured reflectively and as first-order constructs. Table 4.1 shows an exploratory factor analysis with an oblique rotation. Oblique rotation (Direct Oblimin) on the AC's items allows for correlations among AC dimensions (Fabrigar et al., 1999). Four factors with an eigenvalue above one show an underlying pattern of AC's dimensions in line with the literature (Hair, Howard, and Nitzl, 2020; Zahra and George, 2002). The Cronbach alpha validates the adequate reliability of the AC's dimensions.

Table 4.1. Exploratory factor analysis on absorptive capacity.

Label	Items	Oblique rotation			
		Factor 1: Acquisition	Factor 2: Assimilation	Factor 3: Transformation	Factor 4: Exploitation
Acquisition1	The search for relevant information concerning our industry is everyday business in our company.	**0,636**	-0,033	-0,071	0,219
Acquisition2	Our management motivates the employees to use information sources within our industry.	**0,839**	0,067	0,052	-0,077
Acquisition3	Our management expects that the employees deal with information beyond our industry.	**0,731**	0,074	0,125	-0,084
Assimilation1	In our company ideas and concepts are communicated cross-departmental.	0,153	**0,781**	0,074	0,046
Assimilation2	Our management emphasizes cross-departmental support to solve problems.	0,061	**0,879**	-0,039	0,039
Assimilation3	In our company there is a quick information flow, e_g_, if a business unit obtains important information it communicates this information.	-0,082	**0,826**	-0,017	-0,048
Assimilation4	Our management demands periodical cross-departmental meetings to interchange new developments, problems, and achievements.	0,028	**0,525**	0,257	0,099
Transformation1	Our employees have the opportunity to structure and use self-collected knowledge.	0,044	-0,015	**0,751**	-0,061
Transformation2	Our employees are used to absorbing new knowledge.	0,004	-0,033	**0,886**	0,044
Transformation3	Our employees process new knowledge and make it available for further purposes.	0,120	-0,007	**0,870**	-0,010
Transformation4	Our employees successfully link existing knowledge to new insights.	-0,041	0,044	**0,904**	0,060
Transformation5	Our employees are able to apply new knowledge in their practical work	-0,066	0,105	**0,866**	0,041
Exploitation1	Our management supports the development of prototypes.	0,020	-0,093	-0,024	**0,883**
Exploitation2	Our company regularly reconsiders technologies and adapts them accordant to new knowledge.	0,029	0,083	0,001	**0,878**
Exploitation3	Our company has the ability to work more effectively by adopting new technologies.	-0,051	0,069	0,097	**0,820**
Variance explained by each factor		9.18%	7.97%	40.95%	14.18%
Cronbach alpha		0.648	0.836	0.925	0.856

Notes: The oblique-rotated loadings are in bold, respectful to the expected factors.
N=211.

Independent variables

We utilize the 7-point Likert scale of Bedford and Malmi's (2015) questions for boundary and belief controls. They rely on Simons's (1995b) LOC framework for the definition and underlying logic. Boundary controls (*Boundary*) consist of four questions representing the possible boundaries managers could apply (Widener, 2007). Similarly, we measured belief controls (*Belief*) by asking four questions Bedford and Malmi (2015) asked about four different attributes of belief controls (Widener, 2007). To form the final boundary and belief variables' score, we averaged their underlying items (in line with Kruis et al., 2016; Grabner et al., 2018; Widener, 2007).

Diagnostic use of control information (*Diagnostic*) was measured through five questions that Bedford and Malmi's (2015) asked to navigate performance, track progress, and adjust deviations. They introduce a unidimensional reflective construct of diagnostic use of control information based on the cybernetic control logic of Simons (1995a), Henri (2006a), and Widener's (2007) work on a 7-point Likert scale.

Interactive use of control information (*Interactive*) are operationalized differently across accounting studies (Kruis et al., 2016). We measure facilitating the use of interactive use of control information based on Henri's (2006a) attention-focusing role, which emphasizes frequent and consolidated communication. We follow the questions of Kruis et al. (2016) to reflectively measure the unidimensional construct of interactive use on a 7-point Likert scale. Table 4.2 shows the factor loadings have an underlying pattern for two latent variables in which each construct has an acceptable level of reliability and internal consistency with Cronbach alpha above 0.9.

Table 4.2. Exploratory factor analysis on diagnostic and interactive types of control information use.

Label	Items	Oblique rotation	
		Factor 1: Diagnostic	Factor 2: Interactive
Diagnostic1	To identify the critical variables (especially those factors leading to the achievement of the current strategy).	**0,837**	0,043
Diagnostic2	To set targets and objectives for those critical variables.	**0,910**	0,049
Diagnostic3	To assess the achievement of those targets and objectives (monitoring - comparing the results with the expectations).	**0,930**	0,004
Diagnostic4	To obtain information to correct deviations between objectives and actual performance.	**0,915**	0,021
Diagnostic5	To evaluate critical performance areas	**0,827**	0,119

Interactive1	To enable discussion in meetings of supervisors, subordinates and peers.	0,093	**0,843**
Interactive2	To provide a shared view of the organization.	0,101	**0,860**
Interactive3	To tie the organization together.	-0,026	**0,903**
Interactive4	To enable the organization to focus on common issues.	0,066	**0,774**
Interactive5	To develop a common vocabulary in the organization.	-0,039	**0,793**
Variance explained by each factor		55.52%	22.51%
Cronbach alpha		0.948	0.906

Notes: The oblique-rotated loadings, respectful to the expected factors, are in bold.
N=211.

LOC combined use (*LOC combined use*) is a mean score of boundary, belief, diagnostic, and interactive. According to Bellora-Bienengraber et al. (2022), the *LOC combined use* reflects the changes common in all the control levers. Similarly, the mean score of LOC captures the extent of emphasis on the control levers together, regardless of whether managers emphasize any particular lever. Therefore, the specific variances related to the individual effect of control levers are disregarded (Bellora-Bienengraber et al., 2022). LOC combined use is then measured all types of control levers used simultaneously by managers in an organization.

The moderating role of slack resources

Nohria and Gulati (1996) measure slack by asking managers to report the loss in output by representing scenarios targeting changes in working time and budget. They argue that the higher reported loss indicates that a lower level of slack exists. We used Nohria and Gulati's (1996) measure of slack to measure HR (*HR slack*) and financial slack (Financial slack) on a 5-point Likert scale[35].

Control variables

We apply measures to account for potentially influential variables in our study, such as Environmental unpredictability, Strategic priorities, Family firms, Age, Size, and Industry. Our inclusion of environmental unpredictability (Environment) acknowledges the potential for variations in environmental factors that can impact organizational substances (Bedford et al., 2022a; Bedford and Malmi, 2015). The respondents were asked to rate and assess five changes in various environmental aspects, including customers, suppliers, competitors, technological changes, and regulation, on a 7-point

[35] We check for multicollinearity as the types of slack correlate (r = 0.473; p < 0.01) as we expect from the literature. Since VIF values are below 3, the variances cannot threaten the regression results (Hair et al., 2019a).

Likert scale (Bedford and Malmi, 2015). The variable environment is measured as the mean score of the underlying items (Grabner et al., 2018; Widener, 2007). We also measured business strategy, as strategy is relevant to the levers of control and AC (Chenhall, 2005; Zahra and George, 2002). Our approach employs the strategic priorities measurement developed by Kruis et al. (2016), which is grounded on the work of Chenhall (2005) and designed to capture the emphasis placed on cost leadership (*Low Price*), product differentiation (*Differentiation*), or customization and after-sale service (*Delivery & Service*). We also control for family firms (*Family*) since the internal stability and social capital of family firms can enhance AC (Brinkerink, 2018). We defined family as the people who are linked by blood or marriage. Then, we asked respondents to consider the following statements (1) More than 50% of the ownership is in the control of one family; (2) The company is considered a family business; and (3) None of the above answers apply. No respondent claimed contradictory statements. The respondents who chose option one and (/or) option two are denoted as family firms. Those who chose none of the above are considered non-family firms. Firm age (*Age*) refers to the years since the firm was incorporated till 2020. We applied the log-transformed measure in the analyses. Moreover, firm size (*Size*) is measured as the natural log of the total number of full-time employees. Regarding industry effect, we broadly categorized industry by applying 2-digit NACE codes to make three cohorts of manufacturers (*Manufacturing*), retail (*Retail*), and service, using service as the reference industry.

4.3.4 Statistical methods used

Given a combination of observed and unobserved variables among the variables and our interest in theory testing, we apply Structural Equation Modelling (SEM) to test our hypotheses. SEM allows for the removal of errors associated with the measurement of unobserved variables through indicators during the parameter estimation (Ullman and Bentler, 2012). Moreover, SEM provides the possibility to examine the reliability of the measurement of unobserved variables (Ullma and Bentler, 2012) and an overall test of model fit that best explains the parameter estimates and their interrelationships (Anderson and Gerbing, 1988).

4.4 Results

4.4.1 Descriptive statistics of the respondent population

Table 4.3 displays the descriptive statistics of the SMEs included in the sample. Of the sample size of 211 respondents, 67% are family firms. On average, firms are 39 years old and have 86 full-time employees. Moreover, nearly 75% of the firms had less than 100 full-time employees. Additionally, the majority of the SMEs, consistent with the population of Belgian firms, operated in three industries of manufacturing (38%), retail (26%), and service (36%).

Table 4.3. Descriptive statistics.

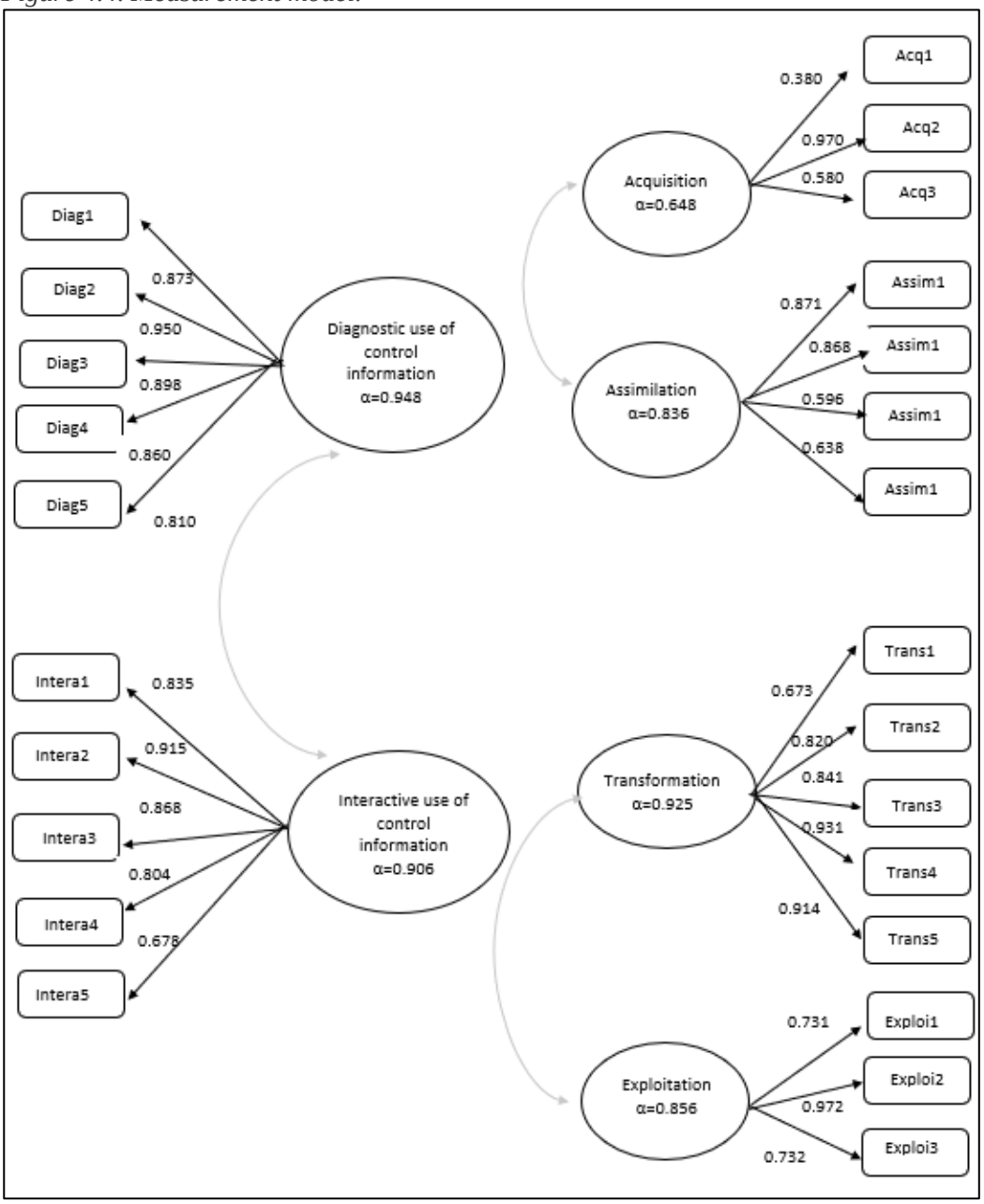
	N		%	Mean	Standard deviation	Min	Max	Percentile	
								25	75
Acquisition	211			4,537	1,033	1	7	4	5
Assimilation	211			5,502	0,947	1,75	7	5	6,25
Transformation	211			5,225	0,976	2	7	4,60	6
Exploitation	211			5,835	1,106	1	7	5,33	6,66
Boundary	211			5,086	1,033	1	7	4,5	5,7
Belief	211			4,702	1,189	1	7	4	5,75
Diagnostic	211			5,419	1,198	1,4	7	4,80	6,2
Interactive	211			5,279	1,151	1	7	4,80	6
LOC combined use	211			5,121	0,812	2,60	7	4,58	5,16
HR slack	211			3,480	1,307	1	5	2	5
Financial slack	211			3,180	1,431	1	5	2	5
Environment	211			4,181	0,935	1	6	3,80	4,80
Low Price	211			4,979	1,298	1	7	4	6
Differentiation	211			5,543	0,841	2	7	5	6
Delivery & Service	211			5,994	0,972	1	7	5,50	6,75
Family	211			0,67	0,472	0	1	0	1
Age	211			38,905	29,902	3	257	21	47
Size	211			86,445	101,825	10	450	25	95
10>49		126	59,7%						
50>99		33	15,6%						
100>199		28	13,3%						
200>299		6	2,8%						
300>399		11	5,2%						
400>499		7	3,3%						
Industry	211								
Manufacturing		80	37,9%	0,38	0,486	0	1	0	1
Retail		55	26,1%	0,26	0,440	0	1	0	1
Service		76	36%						

4.4.2 Assessment of the measurement model

The measurement model results focus on how well the indicators capture latent (/unobserved) variables (Schreiber, 2008; Ullman and Bentler, 2012). Therefore, the measurement model evaluates the reliability and validity of reflective latent variables. In

this research, all the unobserved variables are reflective and measured by Amos. The Chi-square value equals to 853,716 with 538 degree of freedom. The ratio of Chi-square to degree of freedom (x^2/df) equals 1,587. In addition, we report CFI, TLI, RMSEA, and SRMR (Schreiber, 2008). The fit indices reported in this study are the combination of goodness (x^2/df, CFI, and TLI) and badness (Chi-square, RMSEA, and SRMR) of fit (Schreiber, 2008). CFI and TLI equal 0.926 and 0.913, respectively. The model has RMSEA of 0.053 and SRMR of 0.10. Since x^2/df is less than 3, CFI and TLI values are above 0.90, and RMSEA is less than 0.08 while SRMR is close to the cut-off value of 0.08, we conclude the hypothesized model is fairly fit to the data (Hu and Bentler, 1999; Schumacker and Lomax, 2010; Iacobucci, 2010). Moreover, figure 4.4 shows that the factor loadings are acceptable.

Figure 4.4. Measurement model.



Note: N=211.

Before evaluating the regression results and path analysis between the latent variables, we examine the reliability and validity of the reflective latent variables. We analyze the reflective variables based on the reliability through composite reliability score and validity in terms of convergent and discriminant aspects. Concerning reflective variables, in Table 4.4, Cronbach's alphas are acceptable (Hair et al., 2019a; Sarstedt, Ringle, and Hair, 2021). Moreover, all the reliability scores are above 0.7 suggested by Hair et al. (2022). Convergent validity, measured via average variance extracted (AVE), is above

0.5 for all the constructs, confirming that all the reflective variables show more than 50% of the variance of their items (Sarstedt et al., 2021).

Table 4.4. Multi-item construct reliability and validity.

	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Acquisition	0,648	0,708	0,592
Assimilation	0,836	0,861	0,671
Transformation	0,925	0,929	0,772
Exploitation	0,856	0,874	0,777
Diagnostic	0,948	0,953	0,953
Interactive	0,906	0,926	0,926

The model with the combined use of LOC, Chi-square equals 398,306 with 238 degrees of freedom. Moreover, the overall model is acceptable. The ratio x^2/df has a value of 1,674. CFI equals 0,926, TLI is 0,907. RMSEA value is 0,057, and SRMR is 0,091. Therefore, we confirm the overall model fit for the model with LOC combined used when no slack resources are present.

Moreover, we confirm the model's overall fit with LOC's combined us, AC capabilities, and slack resources as the moderators. The Chi-square value equals 554,244 with 322 degrees of freedom. Thus, the ratio x^2/df is 1,721. CFI generates a value of 0,933, and TLI is 0,915, and RMSEA is 0,059. SRMR is 0,073. Therefore, the results show an acceptable level of fit.

In Table 4.5, the square root of AVE for the reflective constructs is higher than their Pearson correlations with all other variables (Fornell-Larcker criterion), confirming that each latent variable is distinct (Fornell and Larcker, 1981). Therefore, Table 4.5's results confirm the discriminant validity of the unobserved variables in the model. Therefore, the model has acceptable discriminant validity. Moreover, the correlation table shows that except *Diagnostic* relationship with the *Acquisition*, all other elements of LOC relate significantly to AC dimensions. We also observe that this relationship is consistently positive. In contrast, neither *HR slack* nor *Financial slack* correlates significantly to AC's dimensions.

After confirming that the measurement model possesses an acceptable level of reliability and validity, we proceed with the structural model results.

Table 4.5. Correlation matrix.

	1	2	3	4	5	6	7	8	9	10
Acquisition(1)	0,764									
Assimilation(2)	0,360***	0,823								
Transformation(3)	0,386***	0,633***	0,880							
Exploitation(4)	0,194***	0,237***	0,229***	0,884						
Boundary(5)	0,265***	0,277***	0,325***	0,136**	--					
Belief(6)	0,281***	0,268***	0,262***	0,170**	0,588***	--				
Diagnostic(7)	0,077	0,159**	0,188***	0,197***	0,151**	0,269***	0,903			
Interactive(8)	0,141**	0,184***	0,254***	0,284***	0,286***	0,329***	0,419***	0,857		
LOC combined use(9)	0,266***	0,310***	0,358***	0,330***	0,690***	0,768***	0,663***	0,720***	0,600	
HR slack(10)	-0,114	0,006	-0,026	-0,011	-0,087	0,003	-0,023	-0,044	-0,052	--
Financial slack(11)	0,113	0,028	-0,027	0,114	-0,003	0,127*	0,046	0,069	0,086	-0,016

Off-diagonal represents Pearson bivariate correlations. The Square-root of AVE for reflective variables is shown on the diagonal. *** for significant at $p < 0.01$, ** stands for significant $p < 05$, * stands for $p < 0.1$ (2-tailed). N=211.

4.4.3 Structural model results

The findings in Table 4.6 indicate the relationship between the individual levers and AC capabilities after controlling for size, age, environment, family firms, and industry after 5000 times of bootstrapping. The bootstrapped procedure suggested by Byrn (2016) examines the hypothesized relationships without assuming normality. The bootstrapped procedure is especially recommended for testing mediation analysis (Hayes, 2009; Preacher and Hayes, 2004). H1(a) predicts a negative relationship between *Boundary* and *Acquisition*. The results demonstrate that *Boundary* significantly relates to *Acquisition*, as evidenced by the significant and positive standardized coefficients between *Boundary* and *Acquisition* (β=0,216, p<0,05). Therefore H1 (a) is not supported. H1(b) hypothesized a negative relationship between *Boundary* and *Assimilation*. The results show that *Boundary* and *Assimilation* have a positive and significant relationship (β=0,167, p>0,05). Thus H1(b) is not supported. H1(c) indicates a negative relationship between *Boundary* and *Transformation*, and H1(d) claims *Boundary* associates negatively with *Exploitation*. The standardized coefficient between *Boundary* and *Transformation* is positive and significant (β=0,154, p<0,05). Moreover, the standardized coefficient between *Boundary* and *Exploitation* is negative but not significant (β=-0,047, p>0,1). Thus, H1(c) and H1(d) lack statistical support.

Table 4.6. Individual levers and AC capabilities.

Independent variables	Acquisition Coef. (T-stat)	Assimilation Coef. (T-stat)	Transformation Coef. (T-stat)	Exploitation Coef. (T-stat)
Boundary	0,216** (2,240)	0,167** (1,971)	0,154** (2,366)	-0,047 (-0,602)
Belief	0,097 (1,136)	0,105 (1,234)	-0,075 (-1,176)	0,110 (1,398)
Diagnostic	1,074 (0,587)	0,021 0,264)	-0,491 (-0,472)	2,702*** (2,662)
Interactive	-0,870 (-0,203)	0,113 (1,329)	0,103† (1,719)	0,120 (1,639)
Controls	YES	YES	YES	YES
R^2	0,132	0,150	0,466	0,222

*** stands for p < 0.01; ** stands for p < 0.05; and † stands for p-value between 0,05 and 0.10 (two-tailed). N=211.

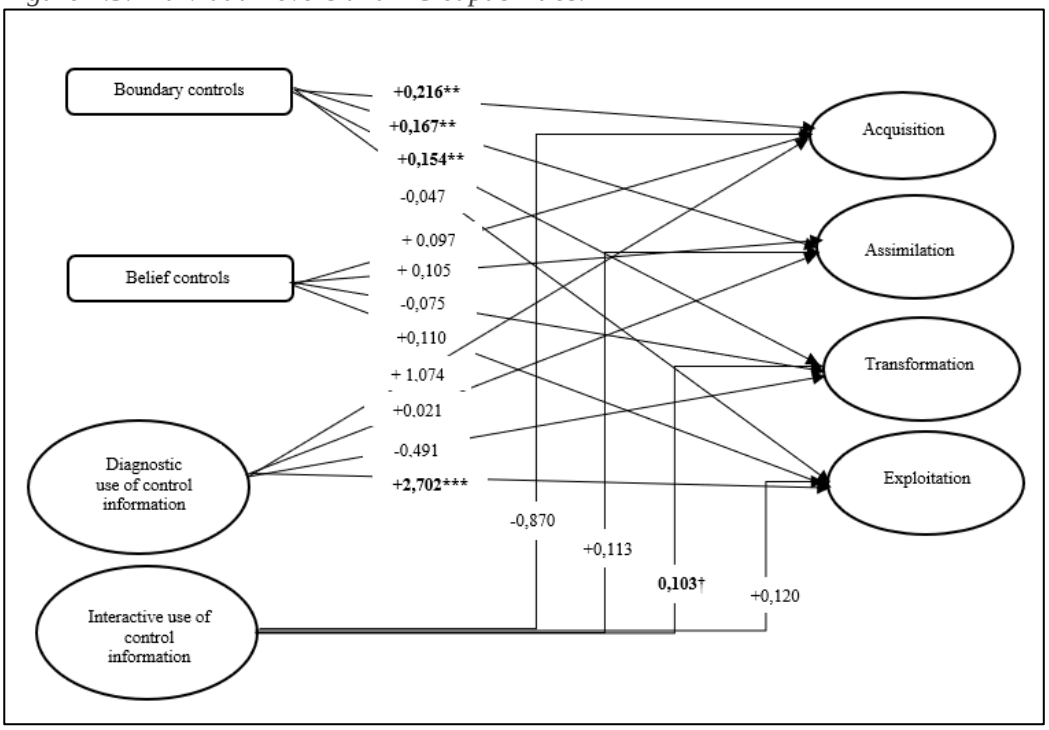
In addition, We predict that *Belief* associates positively with *Acquisition* (H2(a)), Assimilation(H2(b)), Transformation (H2(c)), and Exploitation (H2(d)). *Belief* relates positively to *Acquisition* (β=0,097, p>0,1). Similarly, *Belief* and *Assimilation* have a positive association (β=0,105, p>0,1). However, there is a negative relationship between *Belief* and *Transformation* (β=-0,075, p>0,1). According to Table 4.6, *Belief* and *Exploitation* also have a positive relationship (β=0,110, p>0,1). Therefore, there is insufficient statistical evidence to support H2(a), H2(b), H2(c), and H2(d).

In H3(a), *Diagnostic* and *Acquisition* are positively related. According to Table 4.6, the standardized coefficient is positive between *Diagnostic* and *Acquisition* but not significant (β=1,074, p>0,1). Therefore, H3(a) lacks statistical support. H3(b) hypothesized the positive relationship between *Diagnostic* and *Assimilation*. The results show that there is an insignificant relationship between *Diagnostic* and *Assimilation* (β=0,021, p>0,1). Moreover, contrary to the positive and hypothesized relationship between *Diagnostic* and *Transformation in* H3(c), the results show a negative but insignificant association between *Diagnostic* and *Transformation* (β=-0,491, p>0,1). However, aligned with hypothesized H3(d), the results show *Diagnostic* and *Exploitation* have a positive relationship (β=2,702, p<0,01). Thus H3(d) is supported.

H4(a) predicts a positive association between *Interactive* and *Acquisition*. The results show that H4(a) lacks support, as *Interactive* relates negatively to *Acquisition* (β=-0,870, p>0,1). H4(b) hypothesized that *Interactive* associates positively with *Acquisition*. Table

4.6 shows that H4(b) also lacks support since the positive relationship between *Interactive* and *Assimilation* is insignificant (β=0,113, p>0,1). H4(c) is supported since the hypothesized relationship between *Interactive* and *Transformation* (H4(c)) is marginally significant (β=0,103, p<0,1). H4(d) predicts that *Interactive* relates positively to *Exploitation*. The standard coefficient is positive but not significant (β=0,120, p>0,1). Thus, we lack enough evidence to confirm H4(d). Figure 4.5 summarizes the findings of the LOC individual levers with AC capabilities.

Figure 4.5. Individual levers and AC capabilities.



Notes: *** stands for p < 0.01; ** stands for p < 0.05; and † stands for p-value between 0,05 and 0.10 (two-tailed). The significant standardized coefficients are in bold. The latent variables are in circles, while the observed variables are in rectangles. N=211.

Table 4.7 tests the relationship between *LOC's combined use* and AC's capabilities. H5(a) hypothesized a positive relationship between *LOC combined use* and *Acquisition*. The results confirm H5(a) since there is a positive and significant coefficient between *LOC combined use* and *Acquisition* (β=0,238, p<0,01). H5(b) is also confirmed concerning the positive association between *LOC combined use* and *Assimilation* (β=0,275, p<0,01). H5(c) hypothesized *LOC combined use* relates positively to *Transformation*. There is statistical support for H5(c) as well (β=0,103, p<0,1). H5(d) predicts that *LOC combined use* and *Exploitation* has a positive relationship. There is also support for H5(d) (β=0,276, p<0,01).

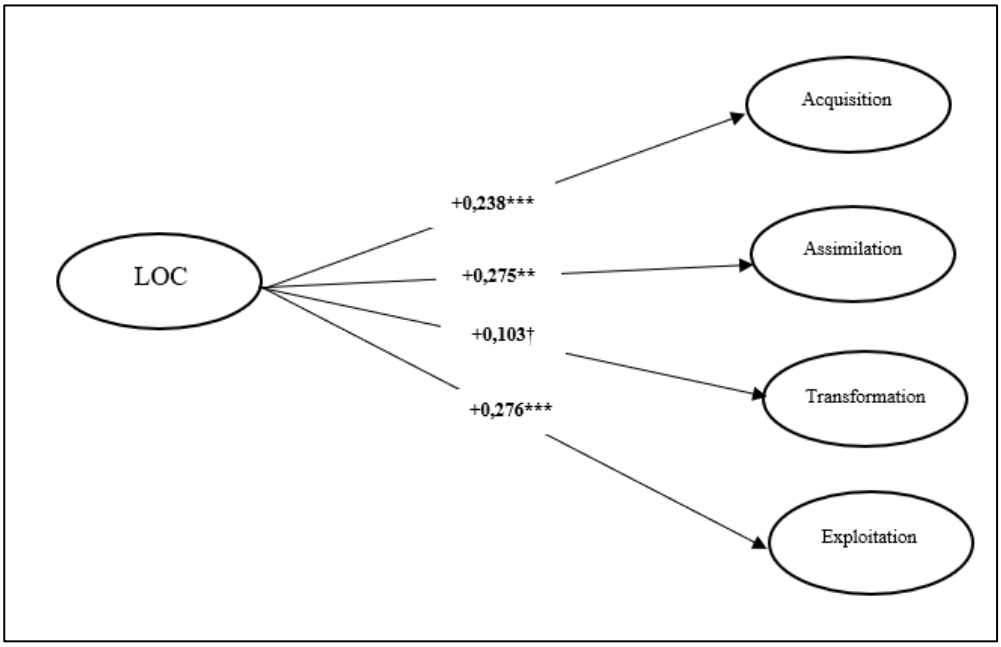
Table 4.7. LOC combined use relationship with AC capabilities.

Independent variables	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
LOC combined use	0,238*** (2,730)	0,275*** (3,987)	0,103† (1,885)	0,276*** (4,135)
Controls	YES	YES	YES	YES
R^2	0,115	0,155	0,471	0,199

*** stands for p < 0.01; ** stands for p < 0.05; and † stands for p-value between 0,05 and 0.10 (two-tailed).
N=211.

Figure 4.6 depicts that all the relationships between LOC combined use and the AC capabilities are significant and positive. The combined use of LOC shows the importance of considering how managers use control information and tools concurrently in SMEs pursuing the development of AC capabilities.

Figure 4.6. . LOC and AC capabilities.

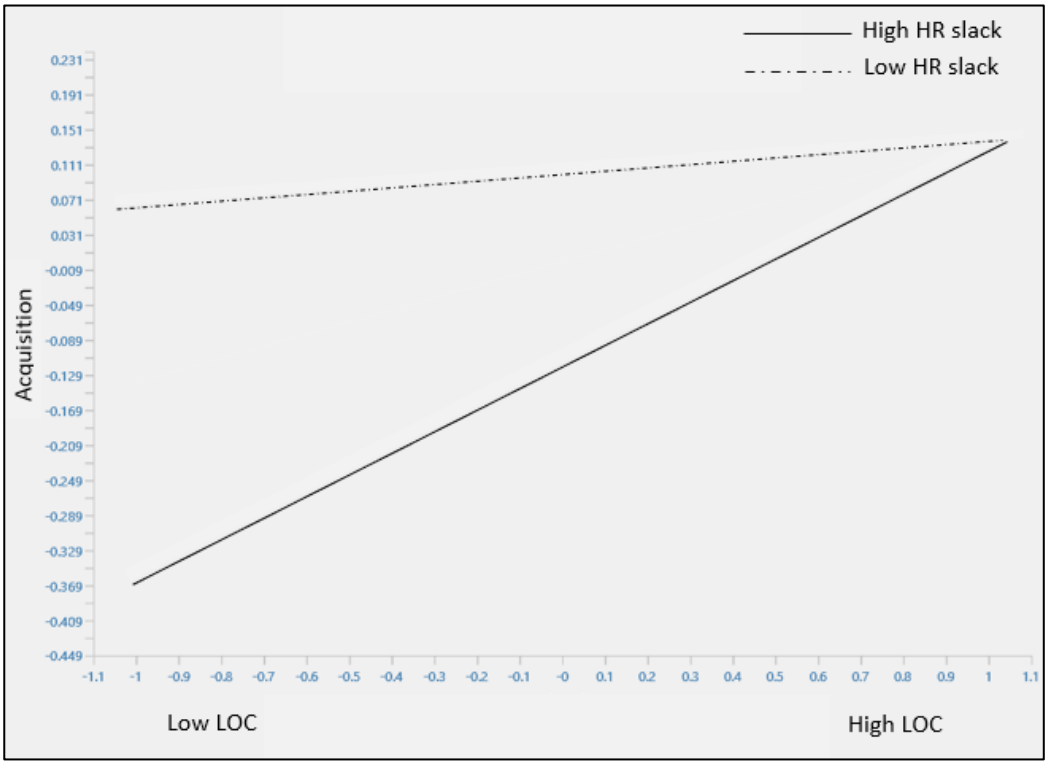


Note: the numbers of standardized path coefficients. †stands for p < 0.1, ** for p<0.05, *** for p< 0.01 (two-tailed). N=211.

In the next step, we test the hypotheses concerning whether LOC combined use's association with AC capabilities is the same in SMEs with abundant resources. We follow Hair et al. (2021), and first, we investigate the main effect of the LOC relationship with AC capabilities. Then, we test the moderation hypotheses in the next model after

introducing the interaction effects. Table 4.8 shows that HR slack moderates the relationship between *LOC combined use* and one of the AC capabilities. H6(a) predicts that *HR slack* moderates the *LOC combined use* association with *Acquisition*. The results show that the moderation effect is positive and significant (β=0,722, p<0,05); thus, H6(a) is supported. Figure 4.7 depicts that the positive relationship between LOC combined use and acquisition is stronger for SMEs with higher HR slack resources.

Figure 4.7. HR slack moderator in LOC relationship with Acquisition.



However, in contrast to H6(b) hypothesizing that *HR slack* moderates the *LOC combined use* with *Assimilation* (β=-0,136, p>0,1), the results lack support for H6(b). H6(c), regarding the moderating effect of HR slack in the relationship between *LOC combined use* and *Transformation*, has no support (β=0,001, p<0,1). Thus, H6(c) is not supported. H6(d) predicts *HR slack* moderates the *LOC combined use* with *Exploitation* (β=0,205, p>0,1). The results fail to support H6(d). H7(a) hypothesizes that *Financial slack* moderates the *LOC combined use* with *Acquisition*. The results show that *Financial slack* does not moderate *LOC combined use* with *Acquisition* (β=0,034, p>0,1). Thus, H7(a) is not supported. In H7(b), *Financial slack* is expected to moderate the *LOC combined use's association* with *Assimilation*. There is insufficient support to confirm

H7(b) (β=0,358, p>0,1). H7(c) relates to the moderating role of *Financial slack* in the relationship between *LOC combined use* with *Transformation* (β=-0,124, p>0,1). The results confirm that H7(c) is not supported. H7(d) hypothesizes that *Financial slack* moderates *LOC combined use's* relationship with *Exploitation*. The results show that H7(d) is not supported (β=-0,345, p>0,1). Therefore Table 4.8 evidences that *LOC combined use* relationship with AC capabilities is not the same for firms possessing abundant HR resources. More specifically, the LOC relationship with AC varies depending on the level of HR slack resources. Higher HR slack resources strengthen the positive relationship between LOC and the acquisition capability of AC.

Table 4.8. Slack's role in LOC's relationship with AC capabilities.

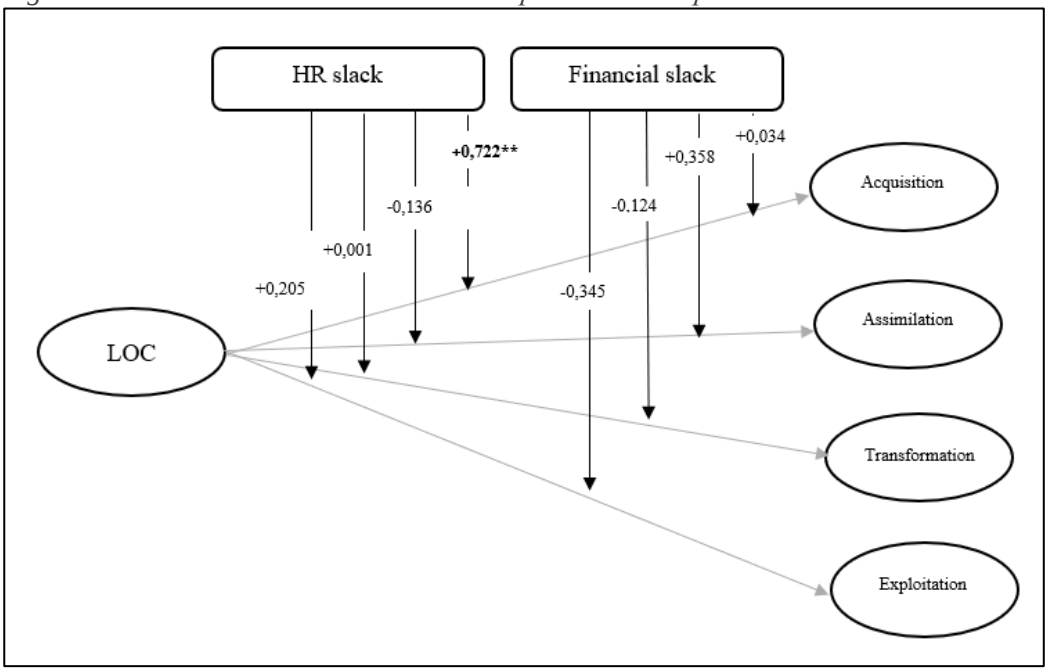
Independent variables	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
LOC combined use	0,209**	0,278***	0,106†	0,283***
	(2,570)	(4,101)	(1,960)	(4,295)
HR slack	0,576**	-0,104	-0,022	-0,077
	(2,059)	(-0,427)	(-0,120)	(-0,339)
Financial slack	0,006	0,308	-0,207	-0,210
	(0,020)	(1,025)	(-0,906)	(-0,750)
LOC combined use * HR slack	0,722**	-0,136	0,001	0,205
	(2,473)	(-0,557)	(-0,001)	(-0,906)
LOC combined use * Financial slack	0,034	0,358	-0,124	-0,345
	(0,106)	(1,192)	(-0,543)	(-1,232)
Control	YES	YES	YES	YES
R^2	0,180	0,168	0,490	0,244

N=211.

For the sake of brevity, this report only discusses the control variables in relation to AC for the model reported in Table 4.8. Concerning control variables, *Environment* relates to AC's capabilities, but non of the relationships are statistically significant (*Acquisition* (β=0,100, p>0,1), *Assimilation* (β=0,102, p>0,1), *Transformation* (β=-0,039, p>0,1), and *Exploitation* (β=0,081, p<0,01)). *Low Price* relates mostly negatively to AC's capabilities (*Acquisition* (β=0,035, p>0,1), *Assimilation* (β=-0,143, p<0,05), *Transformation* (β=-0,116, p>0,05), and *Exploitation* (β=-0,181, p<0,01)); while the relations are not significant. *Differentiation* relates positively to the AC dimensions (*Acquisition* (β=0,050, p>0,1), *Assimilation* (β=0,172, p<0,05), *Transformation* (β=0,090, p>0,1), and *Exploitation* (β=0,221, p<0,01)). The relationship between the Differentiation strategy and assimilation, and exploitation is significant. This is in line

with Patel et al. (2015) as well as Zahra and George (2002), who emphasize the connection between AC and firms' strategic objectives. Additionally, Delivery&service relation to AC's dimensions (*Acquisition* (β=0,038, p>0,1), *Assimilation* (β=0,045, p>0,1), *Transformation* (β=0,012, p>0,1), Exploitation (β=0,063, p>0,1)) are not significant. *Family firms* acquire external new knowledge significantly less than non-family firms (β=-0,155, p<0,05). This is aligned with the literature as firms approach external knowledge differently depending on whether they are *Family firms* (Brinkerink, 2018; Andersen, 2015). AC and *Age* relationship is not significant for any AC's capabilities. *Age* shows a negative connection with *Acquisition* (β=-0,002, p>0,1. In addition, *Age* is negatively related to *Assimilation* (β=-0,040, p>0,1), and *Exploitation* (β=-0,029, p>0,1). The relationship between Age and Tranformation is positive (β=0,007, p>0,1). Similarly, *Size* and AC show no statistically significant relationship expect for *Tranformation.* Larger firms are associated with possessing less transformation capability (β=-0,152, p<0,01). The negative standardized coefficient of *Transformation* suggests that AC can be different in smaller firms (e.g., Marrucci et al., 2022). Furthermore, the *Manufacturing* industry negatively relates to AC (*Acquisition* (β=-0,221, p<0,05), *Assimilation* (β=0,043, p>0,05), *Transformation* (β=-0,047, p>0,1), and *Exploitation* (β=0,029, p>0,1) compared to the service industry. Therefore, the results exhibit that *Manufacturing* firms acquire external new knowledge significantly less than firms in the service industry. Chang et al. (2014) argue that the nature and characteristics of prior resources differ in the Manufacturing versus service industry. The service industry relies more on knowledge, while resources in manufacturing refer more to technology intensity. Our results align with Chang et al. (2014), who believe in the difference in AC development between service and manufacturing firms. Figure 4.8 summarizes the findings and highlights the importance of considering the moderating effect of HR slack resources in studying LOC's relationship with AC capabilities. For brevity purposes, Figure 4.8 focuses on the hypothesized relationships of moderation, namely H6 and H7.

Figure 4.8 slack moderates LOC relationship with AC's capabilities.



Note: the numbers of standardized path coefficients. †stands for p < 0.1, ** for p<0.05, *** for p< 0.01 (two-tailed). N=211.

4.4.4 Additional Analyses

To verify the robustness of the findings, we performed additional analyses. Instead of defining SME firms with 500 employees in the primary analyses, we redefine SMEs as firms with fewer than 250 employees. As Table B.1 in the appendix shows, we find that boundary and acquisition have a positive relationship (β=0,232, p<0,05), as do boundary and assimilation (β=0,158, p<0,1). Similarly, boundary and transformation relate positively to each other (β=0,162, p<0,05). Furthermore, in line with our earlier findings, diagnostic relates to exploitation (β=0,209, p<0,01). Aligned with the primary findings, LOC combined use remains positively connected to AC's dimensions, as shown in Table B.2 in the appendix. After introducing HR and financial slack, we observe similar patterns to the primary model. Moreover, in line with the primary analyses, Table B.3 in the appendix shows that HR slack moderates the relationship between LOC and acquisition (β=0,562, p<0,01). However, there are a few differences. First, HR slack moderates the LOC relationship with assimilation (β=-0,240, p<0,05). Second, the interaction effect between HR slack and exploitation is significant (β=-0,195, p<0,05). Third, financial slack moderates the LOC relationship with acquisition (β=0,820, p<0,01). Lastly, the interaction between financial slack and LOC regarding exploitation is negative but

significant (β=1,036, p<0,05). Table B.3 in the appendix contains the details that confirm that considering slack resources is vital in studying the LOC relationship with AC capabilities.

Next, we focus on the number of observations and missing values. Since the primary analysis was based on observations where respondents answered over 80% of the questionnaire (N=211), we reran the analysis for those who answered over 90% (N=208). After evaluating the measurement model and overall fit, the regression results show that boundary is positively related to acquisition (β=0,212, p<0,05), assimilation (β=0,169, p<0,05), and also to transformation (β=0,149, p<0,05). Belief is positively related to acquisition (β=0,113, p>0,1) and assimilation (β=0,048, p>0,1) and exploitation (β=0,112, p>0,1). However, no relationship between belief and AC' s capabilities is significant. Diagnostic is positively related to acquisition (β=0,082, p>0,1). Moreover, the diagnostic and exploitation relationship is positive and significant (β=0,202, p<0,01). Interactive and transformation also have a positive and marginally significant relationship (β=0,108, p<0,1). Similarly, as shown in Table C.1 in the appendix, the relationship between interactive and exploitation is positive and marginally significant (β=0,127, p<0,1). In line with the primary findings, LOC combined use is positively and significantly related to the dimensions of AC (see Table C.2 in the appendix). After introducing slack resources into the model as Table C.3, we also found that considering the level and types of slack resources are vital in the relationship between LOC and AC capabilities. The interaction term between HR slack and LOC combined use is positive for acquisition but is no longer significant (β=0,094, p>0,1). Moreover, financial slack moderates LOC association with exploitation (β=-0,127, p<0,05). Therefore, the results are similar to the primary findings.

Next, we repeated the analysis for observations who answered all the questions (N=182); thus, we excluded the potential effect of replacing missing values with random scores. As Table D.1 in the appendix shows, there is a relationship between boundary and acquisition as well as boundary and assimilation is not significant (p>0,1). However, the boundary is positively related to transformation (β=0,197, p<0,01) and negatively to exploitation (β=-0,164, p<0,05). Belief is negatively related to transformation (β=-0,155, p<0,05) however, the association between belief and assimilation is positive and marginally significant (β=0,163, p<0,1). The belief relationship with other AC

capabilities is insignificant (p>0,1). Diagnostic and exploitation have a significant relationship aligned with the primary analyses (β=0,229, p<0,01). Interactive relates positively to the AC capabilities (except acquisition), but none of the relations are significant (p>0,1). Moreover, Table D.2 in the appendix shows that the LOC combined use results are robust as the relationship is positive and marginally significant with acquisition, assimilation, and exploitation (p<0,1). After introducing HR and financial slack, we observed that HR slack moderates the relationship between LOC-acquisition (β=0,213, p<0,05), LOC-assimilation (β=-0,137, p<0,05), LOC-transformation (β=0,112, p<0,05). Moreover, financial slack moderates the LOC relationship with all the AC capabilities. Financial slack and LOC interaction terms are negative for acquisition (β=-0,217, p<0,05), transformation (β=-0,130, p<0,05), and exploitation (β=-0,125, p<0,1). The interaction term between financial slack and LOC regarding assimilation is significant but positive (β=0,144, p<0,05). Therefore, the results confirm that LOC and AC capabilities are related, and this relationship should be regarded concerning whether firms possess HR and financial slack resources.

4.5 Discussion

This inquiry contributes to the stream of research investing control tools' effects in SMEs pursuing innovation and strategic change, and it follows up the call for studying the outcomes of applying the levers of control more thoroughly (Bellora-Bienengraber et al., 2022; Grabner et al., 2018). We build on research proving the implications of the LOC framework for promoting organizational learning (Tessier and Otley, 2012) and developing capabilities (Bellora-Bienengraber et al., 2022) to argue that we expect a positive relationship between LOC and AC's capabilities in SMEs. Therefore, we expand the literature emphasizing the importance of identifying driving factors and facilitative conditions of AC's development (e.g., Jansen et al., 2005; Lewin et al., 2011). Moreover, we test the LOC's outcomes rigorously by answering the call to study the levers of control one by one and concurrently. Managers increase their benefit of using LOC by releasing the complementary impact of the levers, which is applicable once managers use different levers at once. Ultimately, we also examine whether the LOC-AC relationship is the same for SMEs with abundant resources.

Our first primary contribution highlights a positive association between LOC and AC’s capabilities. This relationship is more apparent when we examine the concurrent use of

levers. For instance, the statistical significance of LOC concerning AC capabilities is repeated for all four AC capabilities. Moreover, the economic significance of LOC's combined use is more evident than the individual levers since the standard coefficient of LOC combined use is more substantial (i.e., more positive) than the coefficients of all the individual levers concerning AC capabilities. This shows that regardless of the nature of each lever (e.g., constraining effects of boundary controls[36]), first of all, managers apply the levers together, and second, their complementary connection releases more powerful follow-up effects, as Simons predicted (1995b). Thus, research studying LOC's outcomes, especially organizational capabilities, may fail to unravel the relevancy of each lever if the concurrent variance of all the levers is not considered. This is in line with Bellora-Bienengraber et al. (2022), who call for more research on the combined use of the control levers, where managers refine their goal achievement strategy with various emphases on each lever. Still, they pursue goals through the simultaneous use of the levers (Bellora-Bienengraber et al., 2022). Thus, whether we consider each lever of control or the levers' concurrent use, the LOC's beneficial impact is apparent. The findings affirm earlier studies suggesting that LOC fosters organizational learning and innovation (Tessier and Otley, 2012; Lill and Wald, 2021; Widener, 2007).

Concerning the following contribution, our findings reveal that the relationship between LOC and AC depends on the level and type of slack resources. More specifically, the positive relationship between LOC and AC capabilities is stronger in SMEs with higher HR slack resources. The moderation of HR slack is also economically significant and insightful. For instance, the relationship between LOC and acquisition increases (0,209+0,772=0,931) if the mean value of HR slack increases for one standard deviation (see Hair et al., 2021). Therefore, the economic significance of HR slack in the relationship between LOC and acquisition is substantial. Consequently, we provide further evidence that separating HR slack from other slacks promotes more fine-grain results (in line with Kiss, Fernhaber, and McDougall–Covin, 2018; Wang, Guo, and Yin, 2017).

4.6 Conclusion

[36] A plausible explanation for the positive relationship between boundary and AC's capabilities is that reining in behavior offers the courage and motivation needed for AC since off-limits behavior is now more apparent (Heinicke et al., 2016).

Despite the significant attention given to AC and its role in driving desirable organizational outcomes such as innovation, competitive advantage, and growth (Kohtamaki, Heimonen, and Parida, 2019; Miroshnychenko et al., 2021), the question of what drives organizational AC remains underexplored in the management control system literature (Bedford et al., 2022a). Given the observed variations in firms' ability to develop and configure AC (Weidner, Som, and Horvat, 2022), we question which control elements are more crucial for this process in SMEs. Therefore, we address the call from scholars who consistently advocate studying AC's antecedents, including the mechanisms driving firms' behavior (Peeters, Massini, and Lewin, 2014) and the interactions between organizational antecedents (Volberda et al., 2010).

The result of this research is twofold. First, we show that LOC per se is beneficial for SMEs pursuing AC. However, the positive relationship between LOC and AC is more directly evident when the synergy among the levers is considered. These results align with research investigating LOC benefits for strategic flexibility and innovation (e.g., Srour, Baird, Schoch, and 2016). Moreover, we suggest studying levers of control must respect the interconnected nature of the LOC construct. Our results acknowledge the outperforming empirics of the combined use of LOC in contrast to modeling individual levers of LOC. The simultaneous consideration of both approaches is worth more attention since the individual levers direct attention to the features of each lever and its manifestation in practice, whereas studying the combined use of levers enhances the relevancy of findings for practice where various controls are used in combination. Thus, our results suggest more focus on the interconnection with the control levers and styles of use rather than the individual levers to flourish the potential beneficiary effect of LOC on AC. Therefore, the relevant question for managers and scholars can be how to combine the levers and how much emphasis on each lever is optimal in the AC setting.

Second, the relationship between LOC and AC can vary depending on the level and type of slack resources available to the firm, emphasizing caution in interpreting LOC implications for AC in different contexts. Although we hypothesized that a high level of HR and financial slack enhances the positive relationship between LOC and AC capabilities, we observed that a low financial slack is more beneficial for knowledge acquisition. In contrast, a high level of HR slack strengthens the LOC's positive relationship with the acquisition capability. As a result, we call for further research to

validate these findings and to uncover additional contextual factors that may moderate the relevancy of LOC and AC.

While the findings of this study provide informative insights, we acknowledge the limitations. Although accounting literature consistently suggests that controls drive innovation, strategic change, and capability development (e.g., Bedford et al., 2022a; Mundy, 2010; Widener, 2007), establishing a causal claim on the driving influence of LOC on AC requires longitudinal research. We also acknowledge that the common method bias could be tested better via a marker variable technique. Future research could improve data quality and generalizability by foreseeing a proper marker variable to test for common method bias. Moreover, designing a survey with multiple respondents per firm across different countries can further improve the data quality.

We also acknowledge that our model disregards the role of designing control instruments in firms by focusing on only how controls are used. In the previous chapter, we analyzed the impact of PMS design and diagnostic and interactive use in developing AC in firms following the suggestion of Guenther and Heinicke (2019). In the current chapter, we acknowledge the importance of considering the design and use of PMS. Therefore, the results of this chapter should be interpreted with caution since we only provide a snapshot of how managers use controls concerning AC capabilities. We call for further research to model both design and use of control systems in SMEs aiming to improve their AC capabilities. We also call for other boundary conditions like possessing other types of slack resources (absorbed and unabsorbed) or considering specific types of firms (listed firms, public firms, non-profit) that can potentially alter the relevancy of control systems to firms' AC capabilities (e.g., Fabrizio, 2009; Huang and Li, 2012; Zou, Ertug, and George, 2018). We suggest further research on how managers can reach optimal level of emphasis on multiple control tools and whether the optimal focus on control tools should vary among the AC capabilities. Since our results are from the SMEs, we call for further research unraveling whether the LOC-AC positive relationship is robust in other types of firms like larger ones and listed companies. Moreover, since we only indicate the correlation between LOC and AC, we call for delving into whether LOC causes AC. Finally, forthcoming research can add to our findings by unraveling and elucidating additional contextual variables like size and industry that may alert the positive association between LOC and AC.

Nevertheless, our study indicates how the application of LOC relates to higher AC capabilities in SMEs. Our results highlight that the control levers concerning AC capabilities depend on SMEs' level and types of resources.

Acknowledgments

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Chapter 4 Appendix

Table 4.A. VIF values for all the latent variables.

Item	VIF	Item	VIF	Item	VIF
Acquisition1	1,160	Boundary1	1.450	Interactive3	3,552
Acquisition2	1,628	Boundary2	1.676	Interactive4	2,306
Acquisition3	1,465	Boundary3	1.427	Interactive5	1,821
Assimilation1	2,683	Boundary4	1.741	Environment1	1,413
Assimilation2	2,766	Belief1	2.125	Environment2	1,423
Assimilation3	1,493	Belief2	1,254	Environment3	1,555
Assimilation4	1,569	Belief3	2.658	Environment4	1,232
Transformation1	1,824	Belief4	1.974	Environment5	1,209
Transformation2	2,825	Diagnostic1	3,495		
Transformation3	3,317	Diagnostic2	5,614		
Transformation4	5,291	Diagnostic3	6,007		
Transformation5	4,475	Diagnostic4	5,462		
Exploitation1	2,090	Diagnostic5	3,253		
Exploitation2	2,984	Interactive1	2,984		
Exploitation3	2,081	Interactive2	3,634		

N=211.

Table 4.B. Robustness check to focus on firms with < 250 full-time employees.

Table 4.B.1 LOC relationship with AC with the individual levers.

Independent variables	Acquisition Coef. (T-stat)	Assimilation Coef. (T-stat)	Transformation Coef. (T-stat)	Exploitation Coef. (T-stat)
Boundary	0,232** (2,194)	0,158† (1,770)	0,162** (2,434)	-0,058 (-0,724)
Belief	0,074 (0,812)	0,107 (1,196)	-0,101 (-1,543)	0,067 (0,830)
Diagnostic	0,100 (1,152)	0,011 (0,137)	0,001 (0,008)	0,209*** (2,692)
Interactive	-0,080 (-0,930)	0,092 (1,102)	0,084 (1,363)	0,143 (1,871)
Controls	YES	YES	YES	YES
R^2	0,138	0,139	0,482	0,247

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 40,473 with 538 degrees of freedom. CFI equals 0,922, TLI is 0,908. RMSEA is 0,055 and SRMR is 0,100. N=189.

Table 4.B.2 LOC combined use relationship with AC.

Independent variables	Acquisition Coef. (T-stat)	Assimilation Coef. (T-stat)	Transformation Coef. (T-stat)	Exploitation Coef. (T-stat)
LOC combined use	0,229** (2,458)	0,250*** (3,424)	0,092 (1,645)	0,265*** (3,808)
Controls	YES	YES	YES	YES
R^2	0,117	0,139	0,480	0,203

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 385,218 with 238 degrees of freedom. CFI equals 0,926, TLIis 0,907. RMSEA is 0,057 and SRMR is 0,924. N=189.

Table 4.B.3 LOC relationship with AC when there are slack resources.

Independent variables	Acquisition Coef. (T-stat)	Assimilation Coef. (T-stat)	Transformation Coef. (T-stat)	Exploitation Coef. (T-stat)
LOC combined use	0,321** (2,494)	0,190 (-0,157)	0,229** (2,110)	0,520*** (3,857)
HR slack	-0,319*** (-3,883)	0,130 (1,622)	-0,010 (-0,168)	0,198 (2,645)
Financial slack	0,566 (1,555)	-0,195 (-0,471)	0,366 (1,555)	0,968** (2,499)
LOC combined use * HR slack	0,562*** (5,273)	-0,240** (-2,459)	-0,022 (-0,338)	-0,195** (-2,524)
LOC combined use * Financial slack	-0,820*** (-2,603)	0,343 (0,795)	-0,477 (-1,441)	-1,036** (-2,046)
Control	YES	YES	YES	YES
R^2	0,530	0,202	0,504	0,281

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is873,702 with 320 degrees of freedom. CFI equals 0,827, TLI is 0,780. RMSEA is 0,096 and SRMR is 0,114. N=189

The relationship between LOC combined use and acquisition increases by [(0,321)+(0,562)=0,887] if (ceteris paribus) the mean value of HR slack increases by one standard deviation. Therefore HR slack positively moderates the LOC relationship with acquisition aligned with the primary findings.

Table 4.C. Robustness check to focus on the threshold for missing value; replacement at max 10% missing values.

Table 4.C.1 LOC relationship with AC with the individual levers.

Independent variables	Acquisition Coef. (T-stat)	Assimilation Coef. (T-stat)	Transformation Coef. (T-stat)	Exploitation Coef. (T-stat)
Boundary	0,212** (2,184)	0,169** (1,986)	0,149** (2,273)	-0,049 (-0,627)
Belief	0,113 (1,285)	0,048 (1,178)	-0,076 (-1,183)	0,112 (1,420)
Diagnostic	0,082 (1,019)	0,020 (0,252)	-0,032 (-0,543)	0,202*** (2,672)
Interactive	-0,053 (-0,673)	0,095 (1,196)	0,108† (1,788)	0,127† (1,714)
Controls	YES	YES	YES	YES
R^2	0,151	0,160	0,467	0,216

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 851,736 with 538 degrees of freedom. CFI equals 0,925, TLI is 0,913, RMSEA is 0,053, and SRMR is 0,101. N=208

Table 4.C.2 LOC combined use relationship with AC.

Independent variables	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
LOC combined use	0,254*** (2,818)	0,265*** (3,836)	0,101† (1,837)	0,281*** (4,145)
Controls	YES	YES	YES	YES
R^2	0,138	0,165	0,471	0,194

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 398,998 with 238 degrees of freedom. CFI equals 0,925, TLI is 0,905. RMSEA is 0,057 and SRMR is 0,091. N=208.

Table 4.C.3 LOC relationship with AC when there are slack resources.

Independent variables	Acquisition Coef. (T-stat)	Assimilation Coef. (T-stat)	Transformation Coef. (T-stat)	Exploitation Coef. (T-stat)
LOC combined use	0,230***	0,281***	0,084	0,247***
	(2,642)	(4,115)	(1,541)	(3,712)
HR slack	-0,091	0,070	-0,030	0,102
	(1,211)	(1058)	(-0,599)	(-1,619)
Financial slack	0,019	-0,049	-0,089†	0,096
	(0,256)	(-0,741)	(-1,728)	(1,528)
LOC combined use * HR slack	0,094	-0,047	0,039	0,070
	(1,242)	(0,774)	(2,167)	(1,116)
LOC combined use * Financial slack	-0,107	0,044	-0,081	-0,127**
	(-1,391)	(0,661)	(-1,560)	(-1,984)
Control	YES	YES	YES	YES
R^2	0,179	0,187	0,495	0,238

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 481,090 with 320 degrees of freedom. CFI equals 0,926 and TLI is 0,907. RMSEA is 0,049 and SRMR is 0,0721. N=208.

Table 4.D. Robustness check to focus on observations with no missing values.

Table 4.D.1 LOC relationship with AC with the individual levers.

Independent variables	Acquisition Coef. (T-stat)	Assimilation Coef. (T-stat)	Transformation Coef. (T-stat)	Exploitation Coef. (T-stat)
Boundary	0,178† (1,740)	0,085 (0,937)	0,197*** (2,882)	-0,164† (-1,904)
Belief	0,128 (1,377)	0,163† (1,790)	-0,155** (-2,263)	0,131 (1,531)
Diagnostic	0,042 (0,566)	0,029 (0,357)	-0,021 (-0,349)	0,229*** (2,978)
Interactive	-0,061 (-0,826)	0,103 (1,308)	0,085 (1,463)	0,083 (1,123)
Controls	YES	YES	YES	YES
R^2	0,121	0,197	0,535	0,121

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 745,531 with 538 degrees of freedom. CFI equals 0,945 and TLI is 0,936. RMSEA is 0,046 and SRMR is 0,099. N=182.

Table 4.D.2 LOC combined use relationship with AC.

Independent variables	Acquisition	Assimilation	Transformation	Exploitation
	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)	Coef. (T-stat)
LOC combined use	0,211** (2,145)	0,266*** (3,666)	0,062 (1,086)	0,218*** (3,048)
Controls	YES	YES	YES	YES
R^2	0,102	0,206	0,515	0,184

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 358,825 with 238 degrees of freedom. CFI equals 0,938 and TLI is 0,922. RMSEA is 0,053 and SRMR is 0,094. N=182.

Table 4.D.3 LOC relationship with AC when there are slack resources.

Independent variables	Acquisition Coef. (T-stat)	Assimilation Coef. (T-stat)	Transformation Coef. (T-stat)	Exploitation Coef. (T-stat)
LOC combined use	0,192**	0,287***	0,037	0,204***
	(2,219)	(4,092)	(0,659)	(2,868)
HR slack	0,022	-0,015	0,022	0,119†
	(0,299)	(0,215)	(0,420)	(1,730)
Financial slack	-0,105	0,046	0,124**	0,062
	(-1,366)	(0,668)	(-2,326)	(0,901)
LOC combined use * HR slack	0,213**	-0,137**	0,112**	0,066
	(2,409)	(-1,998)	(2,089)	(0,960)
LOC combined use * Financial slack	-0,217**	0,144**	-0,130**	-0,125†
	(-2,414)	(2,066)	(-2,361)	(1,777)
Control	YES	YES	YES	YES
R^2	0,224	0,246	0,549	0,224

*** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed). Note that the overall fit is satisfactory. Chi-square is 518,547 with 322 degrees of freedom. CFI equals 0,905 and TLI is 0,880. RMSEA 0,058 is and SRMR is 0,079. N=182.

Chapter 5

General Conclusion

This dissertation examines and unravels the relationship between tacit knowledge, performance measurement systems' design, and how controls are used to develop absorptive capacity in SMEs. Specifically, this thesis studies whether tacit knowledge, the design of performance measurement systems, levers of control, and slack resources are all antecedents of an SME's absorptive capacity. In this chapter, I will first highlight the main findings and the contribution to the literature of the three individual studies. Second, managerial implications from the three studies are discussed, especially beneficial and relevant for firms aiming to have strategic changes. Ultimately, it is essential to acknowledge the limitations inherent in this research and recognize pathways for further investigation.

Contribution to the literature

AC drives strategic change, innovation, and competitive advantage (Muller, Buliga, and Voigt, 2021; Valentim, Lisboa, and Franco, 2016; Zahra and George, 2002; Flatten et al., 2011b). In particular, considering the high dependency of SMEs on external knowledge and the inherent constraints of internal resources, AC emerges as one of the main topics for fostering and cultivating competitive advantage within SMEs. Therefore, in general, there is a debate on what drives AC and, particularly, how firms can sustain AC-related capabilities in SMEs (e.g., Bedford et al., 2022a; Bouguerra et al., 2021; de Araujo Burcharth et al., 2015). Despite the importance of unraveling the determinants of AC, the scholarly discourse in the domain of management control has devoted scant attention to the development of AC. Consequently, our contribution to the existing body of literature is made through presenting three survey-based studies that shed light on the possible antecedents of AC in SMEs.

The first study focuses on the existence of prior knowledge in firms and considers two types of prior knowledge, namely tacit and explicit knowledge in relation to AC. Given that in SMEs tacit knowledge is often a considerable proportion of the internal knowledge base of an SME, focusing on data from SMEs, we question whether tacit knowledge relates to AC. Moreover, we question whether PMS diversity moderates the relationship

between tacit knowledge and an SME's AC. The findings suggest that the relationship between tacit knowledge and AC exhibits more intricacies than initially postulated by Cohen and Levinthal (1990). In contrast to the seminal work by Cohen and Levinthal (1990), which posited that prior knowledge, particularly tacit knowledge, is a primary driver of AC, our research offers empirical evidence that challenges this notion. Volberda et al. (2021) acknowledge that tacit knowledge at the organizational level can be linked to the concept of "cognitive barrier," which hinders the adoption of novel perspectives and approaches. In line with this perspective, which questions the driving effect of prior knowledge in AC development, we show that the relationship between tacit knowledge and the four individual components of AC is never significant. Thus, we conclude that the relationship between prior knowledge and AC requires more fine-grained consideration.

Moreover, firms characterized by more tacit knowledge are associated with acquiring more new and external knowledge if they design PMS with less diversity. This is in line with Ditillo (2004), who argues when firms are involved in complex and dynamic cognitive activities where the setting is subject to serendipities with unexpected results, tacit and explicit knowledge is less likely to be complementary. Consequently, this study disentangles the specific types of prior knowledge accumulated within firms regarding AC development, drawing attention to the intricate interplay among the antecedents of AC.

Given the results of the first study indicating the importance of PMS diversity concerning AC capabilities, we focus more on PMS diversity in the following study. In the second study, we focus on the design and use of PMS in relation to AC. Prior firms' internal knowledge and mechanisms are the main antecedents of AC at the organizational level (Araujo Burcharth et al., 2015; Cohen and Levinthal, 1990; Volberda et al., 2010). PMS serves as both an internal database, providing information on a firm's processes and outcomes, and a management control mechanism that influences the behavior of organizational members to facilitate the achievement of organizational goals (Franco-Santos et al., 2012; Ferreira and Otley, 2009). Moreover, we consider that the utilization of performance information can be in a more diagnostic or interactive way. These two forms of utilization, in alignment with the principles of organizational learning, encompass internal mechanisms that actively shape the extent and quality communication within a firm. In line with Bedford et al. (2022a)'s results and as an answer to their call

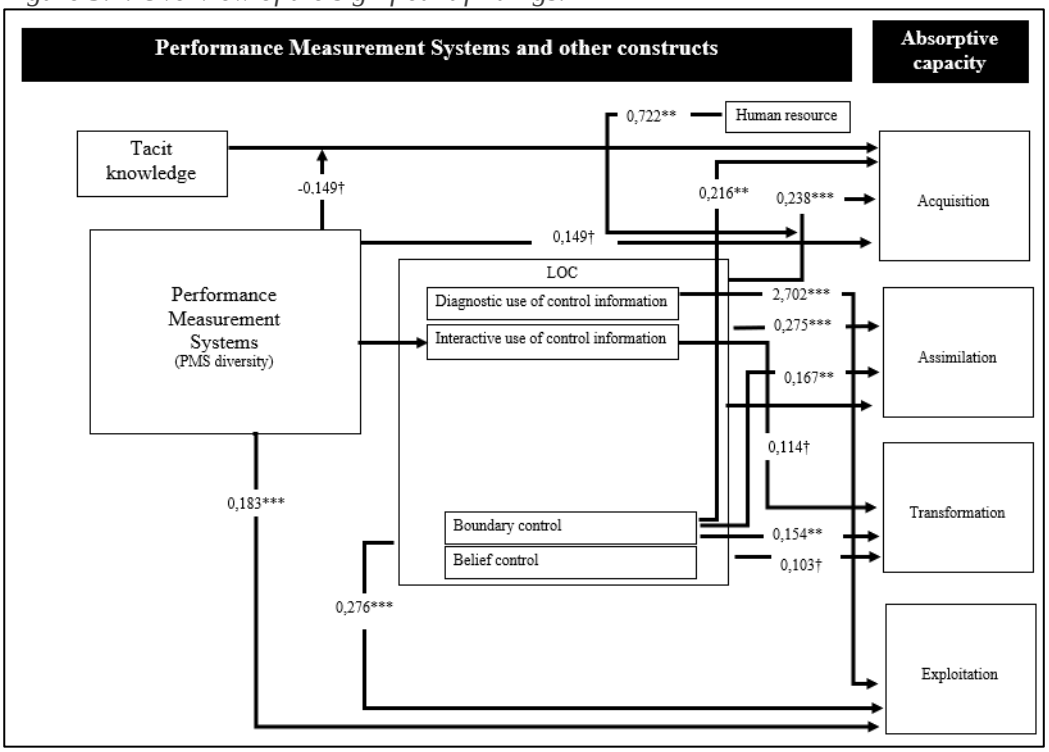
for a more detailed examination of PMS design's relationship with the four AC capabilities, we find that firms with greater PMS diversity are associated with more acquisition of external knowledge. Moreover, firms with more PMS diversity exploit external knowledge more.

In addition, our results provide evidence that the use of performance information intervenes in the relationship between the diversity of PMS information with AC. PMS diversity is related to higher transformation through a more interactive use of performance information. In line with Pittz et al. (2019) and Jansen et al. (2005), who recognized that internal communication within a firm promotes AC, we show that the interactive use of PMS information could be a means to promote the intensity of communication and in this way correlates with higher AC. In summary, adding to the findings of Bedford et al. (2022a) and Guenther and Heinicke, (2019), our findings indicate the way performance information is used provides insights into the relationship between PMS diversity and AC.

In the last chapter of this dissertation, we focus on the levers of control, namely boundary and belief control, as well as the diagnostic and interactive use of control information in relation to AC. Answering the call from Bellora-Bienengraber et al. (2022), we consider individual levers in relation to AC and the simultaneous application of all levers together. Moreover, given that the outcome of management control practices is contingent upon the firms' context (Chenhall, 2003; Heinicke et al., 2016; Kruis et al., 2016; Simons, 1995b), we question whether the LOC relationship with AC varies in firms with respect to the level of resource abundance, particularly the presence of HR and financial slack resources. We find that belief control correlates significantly with more acquisition, assimilation, and transformation of external and new knowledge. Moreover, diagnostic use of performance information is associated with more exploitation of external knowledge. Taking into account the simultaneous utilization of the control levers, the results confirm LOC is associated with higher AC. Moreover, LOC's positive relationship with acquisition is stronger for firms with abundant HR resources. Overall, our examination of the antecedents of AC contributes to the existing body of literature on the relevance of LOC in developing new capabilities (Albertini, 2019; Henri, 2006a; Mundy, 2010). Second, our findings reveal that the relationship between LOC and AC is contingent upon contextual factors of HR slack. Therefore, we show that the extent of human resource slack strengthens LOC's connection with AC.

Figure 5.1 serves as a brief overview of the significant empirical findings presented in the preceding three chapters of this thesis. We observe consistently that PMS diversity is an essential element to consider in SMEs developing AC capabilities. Furthermore, this observation unravels that LOC, with particular emphasis on the diagnostic and interactive utilization of performance-related information, is significant when implementing changes to enhance an organization's exploitation capability. Accordingly, we advocate for further scholarly exploration in order to navigate and unravel the antecedents of AC from the management control perspective.

Figure 5.1. Overview of the significant findings.



The numbers are standard path coefficients. *** stands for p < 0,01; ** stands for p < 0,05; and † stands for p-value between 0,05 and 0,10 (two-tailed).

Managerial Implications

Designing and using management control practices to support innovative activities is important for any organization pursuing sustained success. One of the major supports of innovative activities is the development of the capabilities that facilitate innovation. In this dissertation, we focus on how managers can design and use management control tools like performance measures to support the development of innovative capabilities. In this vein, if managers are unaware of the consequences of their decisions with respect to what kind of performance measure to record, how diverse the performance information should

be, how to use the control information gathered, and so forth, then the organization suffers in the short term when it needs to conduct strategic changes and in the long term when it needs to update its mindset.

In the first study, we unravel prior knowledge in relationship with innovative capabilities that must be studied concerning the types of prior knowledge (tacit versus explicit) and their interconnection. The results signal managers must consider how much of the internal knowledge is documented, for instance, via navigating and recording performance measures. We provide evidence to develop innovative capabilities that focus on gaining external knowledge; SMEs can rely more on their tacit knowledge and record less diverse performance measures. Therefore, managers support gaining new insights from the external environment more if they appreciate tacit knowledge in firms while recording fewer performance measures. Thus, for the long-term benefits of a firm, when the focus is on renewing the internal knowledge base, a combination of tacit knowledge with less diversified performance measures is more optimal.

In the second study, to develop capabilities supporting the exploitation of new knowledge in the firm, managers need to design diverse performance measures where information about financial, customer, internal business process, employee, innovation, and learning are gathered. Firms recording a diverse set of performance measures are more likely to recognize the value of new external knowledge and they are also better at implementing changes and establishing new routines.

Furthermore, for integrating new knowledge with what firms already know and the emergence of alternative ways of doing business, our results suggest using performance information more interactively. Thus, how managers use performance measures matters for developing absorptive capabilities that enhance innovation and strategic change. Our results encourage managers to communicate with employees about the company's future and exchange ideas. Thus, interactive performance information is essential for an organization's long-term goals and strategic changes benefiting short-term performance.

In the final study, we focus on how managers use control systems to develop AC, including setting boundaries, establishing beliefs, diagnosing deviations, and regularly involving themselves in the decision-making of subordinates. Setting boundaries (e.g., clarifying forbidden actions for employee behavior) supports renewing a firm internal knowledge base and integrating external knowledge for emerging new alternatives and

solutions. Moreover, comparing performance information with pre-established standards and navigating deviations (between performance and goals) is beneficial for firms trying to implement new routines. Furthermore, SMEs whose managers apply various controls and use performance information to diagnose deviations and interact with subordinates possess more innovative capabilities. Thus, our results encourage managers to communicate organizational values, set boundaries for employee behavior, compare employee performance with pre-set standards, and correct their deviation while regularly interacting with subordinates. Moreover, our results suggest managers in SMEs with abundant HR resources benefit more from the simultaneous use of control leverage. Thus, our results encourage managers to encounter extra employee time as a facilitating condition for developing innovative capabilities.

Overall, this thesis has several recommendations for firms aiming to conduct strategic changes. The established SMEs, which accumulated vast experience, are more likely to recognize the value of external knowledge if they record few performance measures and rely more on their tacit knowledge and intuition. However, overall, we encourage SMEs to register various aspects of performance measures. Thus, SMEs that document many aspects of performance are more likely to recognize the benefits of external knowledge. We promote the interactive style of using performance information besides a simultaneous correction of deviation, establishing aligned values and beliefs with strategic changes, and setting clear boundaries that employees must respect throughout the change processes.

Limitations and directions for future research

Within this section, I express my acknowledgment of the limitations inherent in this study and conclude this dissertation by highlighting the avenues this thesis proposes for future research.

First, this dissertation uses data from the questionnaire in 2020. Consequently, we applied cross-sectional data to address our research questions. We call for longitudinal research to understand the dynamic of developing AC capabilities, make causal claims about how performance measures and control levers drive each AC capability, and navigate the sequence of changes among the variables. Given the limited time setting to conduct my Ph.D., I acknowledge the usefulness of unraveling the association between

the variables of interest as a starting point for future research. Thus, future research setting with panel data can set a more comprehensive examination in which cause-and-effect claims are plausible. Therefore, for instance, further research can study performance measures design and use as well as AC capabilities through the years to further examine whether the use of performance information mediates the relationship between performance measurement design with AC capabilities.

Second, the survey design necessitates certain compromises to manage costs and time and attain satisfactory data quality. Consequently, it is crucial to highlight the implications of these compromises. The data collection is based on the respondents of one manager per firm. Such self-reported survey design can contain bias related to the perceptual judgment of the manager who answered our survey. Moreover, given the length of the questionnaire, we lack the inclusion of marker variables for our studies. Therefore, to improve the quality of future research, we promote including a suitable marker variable and repeat the analysis, preferably with longitudinal data. Moreover, since the sample population is all active Belgian SMEs, the generalization of our findings out of the scope of the population requires caution. Consequently, we call for further research to consider whether the results hold for larger firms.

Third, this study examines the management control (specifically PMS design and LOC) in relation to absorptive capacity. Studying management control's behavioral effects can further complete our understanding of management control outcomes. Therefore, in studying the management control relationship with AC, we call for further research on employee perception, individual attributes, and the social and cultural framework in which employees function.

Fourth, with respect to PMS design attributes, this dissertation applied PMS design choice focusing on the diversity of PMS following Dekker et al. (2013). To further unravel how PMS design relates to AC, we call for considering other PMS design characteristics like integration, aggregation, and timeliness (Chenhall and Morris, 1986). With respect to the LOC framework, in this dissertation, in line with Bedford and Malmi (2015) and Kruis et al. (2016), interactive use of control information and boundary controls are unidimensional constructs. Given that Tessier and Otley (2012) refine Simons' LOC framework, we call for a further detailed examination of various types of boundary controls and interactive use of control information in relation to AC. Further

research can focus on operational and strategic boundaries as well as strategic performance and operational performance in relation to AC capabilities.

Finally, interpreting results per chapter requires caution since every model provides a snapshot of a limited number of variables. This is inevitable due to the sample size and model complexity. For instance, in the first study, we focus on tacit knowledge interaction with PMS diversity without considering how managers use performance information concerning the development of AC capabilities. In this vein, the following chapter focuses on PMS diversity use and design, disregarding the level of tacit knowledge in SMEs and the potential interaction among various types of knowledge within the firm. In our final chapter, we include all types of using controls in firms aiming to conduct strategic changes without considering the design of performance measurement. Therefore, every chapter lacks an element that theoretically matters. This explains one of the reasons we are reluctant to have any causality claim throughout this thesis. However, after acknowledging these limitations, I still believe studying the relevance of management controls in firms for developing innovative capabilities is informative and practical. Thus, I am determined to conclude this thesis by encouraging scholars to examine how management controls can serve AC development.

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Questionnaire items

Absorptive Capacity
Please indicate to what extent you agree or disagree with the following statements

1. Strongly disagree
2. Disagree
3. Rather disagree
4. Neutral
5. Rather agree
6. Agree
7. Strongly agree

Acquisition

1. The search for relevant information concerning our industry is every-day business in our company
2. Our management motivates the employees to use information sources within our industry
3. Our management expects that the employees deal with information beyond our industry

Assimilation

1. In our company ideas and concepts are communicated cross-departmental
2. Our management emphasizes cross-departmental support to solve problems
3. In our company there is a quick information flow, e_g_, if a business unit obtains important information it communicates this information
4. Our management demands periodical cross-departmental meetings to interchange external developments, problems, and achievements

Please indicate to what extent you agree or disagree with the following statements

1. Strongly disagree
2. Disagree
3. Rather disagree
4. Neutral
5. Rather agree
6. Agree
7. Strongly agree

Transformation

1. Our employees have the opportunity to structure and use self-collected knowledge
2. Our employees are used to absorbing external knowledge
3. Our employees process external knowledge and make it available for further purposes
4. Our employees successfully link existing knowledge to external insights
5. Our employees are able to apply external knowledge in their practical work

Exploitation

Please specify to what extent the following statements fit the commercial exploitation of external knowledge in your company (NB: Please think about all company divisions such as R&D, production, marketing, and accounting)

8. Strongly disagree
9. Disagree
10. Rather disagree
11. Neutral
12. Rather agree
13. Agree
14. Strongly agree

---

1. Our management supports the development of prototypes
2. Our company regularly reconsiders technologies and adapts them according to external knowledge
3. Our company has the ability to work more effectively by adopting external technologies

PMS design

How important are each of the indicators below in evaluating the company's performance?

1. Not important at all
2. Not important
3. Rather not important
4. Neutral
5. Rather important
6. Important
7. Extremely important

---

1. Operating income
2. Sales growth
3. Return-on investment (ROI)
4. Net cash flows
5. Costs per unit produced/or for sevices
6. Market share
7. Customer response time
8. On-time delivery
9. Number of customer complaints
10. Survey of customer satisfaction
11. Materials efficiency variance
12. Labor efficiency variance
13. Number of external product launches
14. Time-to-market for external products
15. Employee satisfaction
16. Employee turnover

Levers of Control

Boundary controls

Please rate the extent to which you agree or disagree with the following statements.

1. Strongly disagree
2. Disagree
3. Rather disagree
4. Neutral
5. Rather agree
6. Agree
7. Strongly agree

---

1. Our organization relies on a code of business conduct to define appropriate behavior for our workforce.
2. There are guidelines and manuals that inform staff when their behavior is beyond the bounds of the permissible, but at the same time also inform them of the areas in which they can take initiative.
3. Our organization communicates to our workforce risks that should be avoided.
4. Our organization applies sanctions when employees have exceeded the limits of what is permissible, regardless of the result of their actions.

Belief controls

Please rate the extent to which you agree or disagree with the following statements.

1. Strongly disagree
2. Disagree
3. Rather disagree
4. Neutral
5. Rather agree
6. Agree
7. Strongly agree

---

1. There is clear communication of the core values of the organization to the staff through formal documents (mission statement, company credo).
2. Management actively communicates with our employees about the core values.
3. In our company, we use formal written communication of the core values to create commitment to the company's long-term strategy.
4. Our company uses formal written communication to motivate and direct employees to search for new opportunities for the company

Diagnostic use of control information

Please assess the extent to which management (including the CEO) relies on the company's performance measures (KPIs) and budgets

1. Strongly disagree
2. Disagree
3. Rather disagree
4. Neutral
5. Rather agree
6. Agree
7. Strongly agree

---

1. To identify the critical variables (especially those factors leading to the achievement of the current strategy)
2. To set targets and objectives for those critical variables
3. To assess the achievement of those targets and objectives (monitoring - comparing the results with the expectations)
4. To obtain information to correct deviations between objectives and actual performance
5. To evaluate critical performance areas

Interactive use of control information

Please assess the extent to which management is using performance measures (KPIs) and budgets

1. Strongly disagree
2. Disagree
3. Rather disagree
4. Neutral
5. Rather agree
6. Agree
7. Strongly agree

---

1. To enable discussion in meetings of supervisors, subordinates and peers
2. To provide a shared view of the organization
3. To tie the organization together
4. To enable the organization to focus on common issues
5. To develop a common vocabulary in the organization

Tacit knowledge

Please indicate to what extent you agree or disagree with the following statements

1 Strongly disagree
2 Disagree
3 Rather disagree
4 Neutral
5 Rather agree
6 Agree
7 Strongly agree

---

1. The usual tasks for jobs in the organization are **not** completely specified.
2. The procedures for how to act in a specific position in the organization **cannot** be easily written.
3. There are **no** manuals on how to develop on-the-job tasks in the organization.
4. There is **no** documentation to describe the critical parts of the organization's productive process.

Slack resources

HR slack

Suppose that due to some sudden development, 10% of the time of all people working in the firm has to be spent on work totally unconnected with the tasks and responsibilities of your firm_ How seriously will your output be affected over the next year?

1. The output drops by 20% or more
2. The output drops by 15%
3. The output drops by 10%
4. The output drops by 5%
5. Output will not be affected

Financial slack

Suppose that due to a similar development, your firm's annual operating budget is reduced by 10%_ How significantly will your work be affected over the next year?

1. The output drops by 20% or more
2. The output drops by 15%
3. The output drops by 10%
4. The output drops by 5%
5. Output will not be affected

Environmental unpredictability

How predictable or unpredictable were the following actions or changes in the external environment over the past three years?

1. Very unpredictable
2. Unpredictable
3. Rather unpredictable
4. Neutral
5. Rather predictable
6. Predictable
7. Very predictable

---

1. Actions of customers
2. Actions of suppliers
3. Actions of competitors
4. Technological changes
5. Economic / regulatory changes

Family firms

Please indicate which statements apply to your company_ (multiple answers are possible) (a family refers to people who are linked by blood or marriage)

1. More than 50% of the property is in the control of one family
2. The company is considered as a family business
3. None of the above answers apply

Strategy
How important are the following dimensions to your company?

8. Not important at all
9. Not important
10. Rather not important
11. Neutral
12. Rather important
13. Important
14. Extremely important

Low cost Low price

1. Low production costs
2. Low price

Differentiation

1. Providing high quality products
2. Provide unique product features / services
3. Make design changes and quickly introduce new products / services
4. Make quick volume and production mix changes
5. Adapt products and services to the needs of the customer

Delivery & service

1. Ensure fast delivery
2. Make reliable delivery promises
3. Provide effective after-sales service and support
4. Availability of products / services we provide

Thesis in Dutch

De absorptiecapaciteit van een bedrijf: De rol van managementcontroles

Doctor in de toegepaste economische wetenschappen

Proefschrift ingediend voor de graad van Doctor in de toegepaste economische wetenschappen aan de Universiteit van Antwerpen

Faculteit Bedrijfseconomische Wetenschappen

Afdeling Accounting & Finance

Sahar Salehi

2023

Samenvatting van het Proefschrift

Dit proefschrift heeft tot doel dieper in te gaan op twee belangrijke voorlopers van het absorptievermogen (AC) op organisatieniveau, namelijk voorkennis en interne mechanismen. AC wordt gedefinieerd als het vermogen tot innovatie; bovendien is AC geworteld in organisatorische leerprocessen die de capaciteit inhouden om nieuwe externe kennis te identificeren en hiervan te profiteren (Cohen en Levinthal, 1990; Lane en Lubatkin, 1998).

Het eerste hoofdstuk, geschreven in samenwerking met Martine Cools, Ann Jorissen, Ine Paeleman en Michiel Van Roy, onderzoekt of en hoe impliciete kennis verband houdt met AC. In dit hoofdstuk concentreren we ons op de belangrijkste voorloper van AC, namelijk voorkennis die intern is opgebouwd, en het meest dominante type kennis, namelijk impliciete kennis (Cohen en Levinthal, 1990; Volberda et al., 2010). Ons eerste doel is om empirisch te onderzoeken hoe impliciete kennis invloed heeft op de verschillende dimensies van AC, omdat we geen eenduidig positief effect verwachten. Vervolgens vragen we ons af of de expliciete formele informatiebasis van een bedrijf, vastgelegd door PMS-diversiteit en representatief voor voorkennis (PMS-diversiteit), optreedt als moderator voor de relatie tussen impliciete kennis en AC. Het aanbieden van een diverse set prestatie-indicatoren kan het bedrijf helpen routines te ontwikkelen die de potentieel verlammende effecten van impliciete kennis op AC kunnen overwinnen.

Terwijl eerdere onderzoeken op dit gebied kennis als een algemeen concept beschouwden (Volberda et al., 2010), richten we ons eerst op de rol van twee specifieke soorten voorkennis die al in het bedrijf aanwezig zijn als voorlopers van AC: de omvang van impliciete kennis en de diversiteit van prestatie-indicatoren die worden vastgelegd door het formele PMS van het bedrijf. Ten tweede betogen we dat het onderzoeken van impliciete kennis als een voorloper van AC zonder rekening te houden met de modererende rol van PMS-diversiteit tot inconclusieve resultaten leidt. Onze resultaten tonen aan dat verschillende soorten voorkennis verschillende gevolgen kunnen hebben voor AC-capaciteiten en mogelijk onderlinge effecten op elkaar kunnen hebben. Daarom is het voor bedrijven die AC-capaciteiten willen ontwikkelen van cruciaal belang om de structuur van intern opgebouwde kennis te begrijpen om hun inspanningen gedurende de ontwikkeling van AC te beheren.

Het tweede hoofdstuk, geschreven in samenwerking met Ann Jorissen, Martine Cools en Ine Paeleman, richt zich op PMS-ontwerp en hoe controle-informatie kan worden gebruikt, met name het diagnostisch en interactief gebruik van controle-informatie. De resultaten van het vorige hoofdstuk wijzen op het belang van het bestuderen van PMS met betrekking tot AC-capaciteiten. Daarom onderzoeken we of de diversiteit van het PMS van een bedrijf rechtstreeks verband houdt met AC, of dat deze relatie wordt bemiddeld door een diagnostisch en/of interactief gebruik van controle-informatie, een ander intern organisatiemechanisme. Het tweede hoofdstuk draagt bij aan de literatuur over management accounting door empirisch bewijs te leveren over de verschillende implicaties van PMS-ontwerp- en gebruiksopties voor elke dimensie van AC.

Het derde hoofdstuk is een studie waarvan ik de enige auteur ben en die voortbouwt op het levers of control (LOC) raamwerk van Simons om de relatie tussen de levers of control en het AC van een bedrijf op organisatieniveau te onderzoeken (Simons, 1994a). In eerste instantie onderzoekt deze studie de relaties tussen de afzonderlijke elementen van het LOC-raamwerk en AC-capaciteiten. Daarna duiken we in de relatie tussen LOC en AC en houden we rekening met het gelijktijdige gebruik van de vier controlehefbomen. Bovendien onderzoeken we ook hoe de context van een bedrijf de relatie tussen LOC en AC kan modereren door te onderzoeken of de menselijke hulpbronnen (HR) en financiële ruimte van een bedrijf een modererende rol spelen.

Onze studie naar de voorlopers van AC draagt bij aan het bestaande corpus van literatuur over de relevantie van LOC bij de ontwikkeling van nieuwe capaciteiten (Albertini, 2019; Henri, 2006a; Mundy, 2010). We reageren op de oproep om LOC's individuele en gecombineerde effecten te onderzoeken in de context van het opbouwen van nieuwe capaciteiten (Bellora-Bienengraber et al., 2022). Bovendien voegt onze studie, door de link tussen LOC en AC te onderzoeken, toe aan de literatuur die uitlegt waarom bedrijven uitdagingen ondervinden bij het effectief beheren van AC (bijv. Bedford et al., 2022a; Jansen et al., 2005).

We tonen aan dat LOC op zichzelf gunstig is voor KMO bedrijven die AC nastreven. De positieve relatie tussen LOC en AC wordt echter directer zichtbaar wanneer de synergie tussen de hefbomen in overweging wordt genomen. De relatie tussen LOC en AC kan variëren afhankelijk van het niveau en het type reservebronnen die beschikbaar zijn voor het bedrijf, waarbij wordt benadrukt dat voorzichtigheid geboden is bij het

interpreteren van de implicaties van LOC voor AC in verschillende contexten. Hoewel we hebben gehypothekeerd dat een hoog niveau van HR- en financiële reservebronnen de positieve relatie tussen LOC en AC-capaciteiten versterkt, hebben we geconstateerd dat een lage financiële reserve juist gunstiger is voor kennisverwerving. Daarentegen versterkt een hoog niveau van HR-reserve de positieve relatie tussen LOC en de verwervingscapaciteit.