The effect of Sustainability Dynamic Capabilities on firm performance: Evidence from Dutch manufacturing SMEs

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Abstract

The manufacturing sector is one of the most unsustainable sectors in the Netherlands. To meet the ambitious climate goals of the Dutch government, the manufacturing sectors must become more sustainable. Manufacturing SMEs are essential since they add much value to the economy. However, these SMEs struggle to become more sustainable. Prior research highlights the importance of integrating sustainability within the dynamic capabilities and states their potential to improve a firm's competitive advantage. This research aims to include sustainability into the dynamic capabilities to see how it relates to firm performance. This research collected survey data from responses from manufacturing SMEs in the Netherlands in January and February 2025; the total sample size is (n=46). The partial least squares structural equation modeling (PLS-SEM) results indicate that the first-order constructs that measure sustainability dynamic capabilities, only external resource integration, positively and significantly correlate with firm performance. However, firm performance significantly affects market and financial performance. The results help managers to understand better that while the sustainability dynamic capabilities may not directly boost firm performance, integrating them can improve overall firm success.

Keywords: Sustainability dynamic capabilities, Internal resource integration, External resource integration, Resource building and reconfiguration, Firm performance, Market performance, and Financial performance.

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1. Introduction

Sustainability has become a growing concern. According to Basiago (1995), sustainability refers to fulfilling current needs while ensuring that the next generation can also fulfil their own needs. Sustainability ensures economic growth, environmental integrity, and social equity for current and future generations. Sustainability includes economic, environmental, and social dimensions (Daly, 2017; Purvis et al., 2019). According to the Centraal Bureau voor de Statistiek, 18% of Dutch firms did not improve their sustainability performance in 2023. This can become a problem soon since the Netherlands wants all firms to be climate-neutral in 2050. Therefore, Dutch firms must keep improving their sustainability performance (Ministry-of-Economics-Affairs-and-Climate-Policy, 2019; Swagerman, 2023). Large firms (i.e., 501 – 1,000 employees) struggle to become more sustainable, and small and medium enterprises (SMEs, <250 employees) face similar, if not more significant, challenges. Large enterprises (i.e., more than 1,001 employees) are more likely to rate their business operations as largely sustainable than SMEs.

SMEs struggle with implementing sustainable practices due to limited capabilities (Karuppiah et al., 2020). Dutch manufacturing SMEs are particularly affected by the country's sustainability plans (Ministry-of-Economics-Affairs-and-Climate-Policy, 2019). This is highlighted by the fact that in 2023, the manufacturing sector emitted most of the greenhouse gas emissions in the Netherlands, 32% of the total greenhouse gas emissions. This means manufacturing firms need to increase their focus on sustainability (CBS, 2024). This research focuses on Dutch SMEs since they are essential for the Dutch economy. Those SMEs created an added value to the economy of 290.3 billion euros in 2022. Dutch SMEs contributed 61.4% to the total value of 472.7 billion euros compared to the 38.6% of large Dutch firms (EuropeanComission, 2023; OECD, 2023). Furthermore, Dutch SMEs are key players in advancing sustainability within the

Netherlands (NetherlandsEnterpriseAgency, 2023). Therefore, the scope of this research is Dutch manufacturing SMEs.

To address sustainability challenges, managers are increasingly implementing the dynamic capability perspective. Dynamic capabilities are a framework that helps businesses to sense, seize, and respond to changes and opportunities (Teece, 1997). These strategic and organizational activities enable firms to leverage new resource configurations and build competitive advantages (Eisenhardt & Martin, 2000; Teece, 1997). These help firms address the growing demand from stakeholders to reduce negative social and ecological impacts in the Netherlands. The literature covers these capabilities under the terms dynamic capabilities for sustainability, sustainability-oriented dynamic capabilities, and green dynamic capabilities. They all embed sustainability into the construct (Buzzao & Rizzi, 2021; Ortiz-Avram et al., 2024).

Successful sustainability requires constant adjustments, which can be achieved via sustainable dynamic capabilities. However, dynamic capabilities theory for Dutch SMEs is hardly covered in academic research (Eikelenboom & de Jong, 2019). This is further evidenced by the fact that the Scopus database contains only 10 documents with the keywords “Dynamic capabilities” and “SMEs” for the Netherlands. To comply with regulations and seize opportunities, Dutch SMEs must develop and leverage dynamic sustainability capabilities. Despite the relevance of combining sustainability with dynamic capabilities, research on this topic remains limited. Existing literature addressed these two topics separately. However, integrating sustainability and dynamic capabilities can create a competitive advantage (Amui et al., 2017; Geissdoerfer et al., 2018). Given the growing importance of sustainability in businesses, there is a need for more research on dynamic capabilities for sustainability (Amui et al., 2017). Patagonia is an example of a company that successfully integrated sustainability into its capabilities. Patagonia

invests in sustainable materials and integrates sustainability into R&D. They also work with suppliers to ensure sustainability. Patagonia was also able to reconfigure its business model to be more sustainable and developed the worn-wear program, which extends product lifecycles. Patagonia's sustainability-driven innovation results from integrating sustainability into its capabilities, resulting in a sustainable competitive advantage (Dezi et al., 2025; Rattalino, 2018).

Recent studies investigated the effect of various sustainability-oriented dynamic capabilities on performance (Dangelico et al., 2017; Hofmann et al., 2012; Leonidou et al., 2015). The dynamic capabilities have relevant implications for firm performance, which is affected by the abilities of firms to integrate, build, and reconfigure their resources and competencies (Zott, 2003). Research of Bhadra et al. (2024) states that dynamic sustainability capability has direct effects on sustainability performance. However, this paper did not investigate the impact on firm performance. Research of Dangelico et al. (2017) investigated the effect of sustainability-oriented dynamic capabilities (SODC) on market performance. The three types of SODC have a positive effect on market performance, whereas resource building and reconfiguration have a direct significant impact on market performance. However, according to the research of Wamba et al. (2017), market performance is part of the overall variable firm performance, including financial performance, which was not tested in the paper of Dangelico et al. (2017). Therefore, this research tests the effect of sustainability dynamic capabilities on firm performance. Firm performance is a financial and non-financial measure that makes it easier to compare firms (Bharadwaj, 2000; Lumpkin & Dess, 1996). Firm performance consists of market performance and financial performance (Protogerou et al., 2012; Wamba et al., 2017).

This research uses the conceptualization of sustainability dynamic capabilities. These refer to a firm's ability to integrate, build, and reconfigure its resources and competencies to adapt to

changing environmental, social, and economic conditions. These capabilities enable firms to embed environmental sustainability into core business processes (Bhadra et al., 2024; Dangelico et al., 2017; Demirel & Kesidou, 2019; Strauss et al., 2017). Existing literature about dynamic capabilities from a sustainability/ecological approach (e.g., green dynamic capabilities) focuses primarily on innovation (Abbas, 2024; Singh et al., 2022). The paper of Buzzao and Rizzi (2021) indicates inconsistencies in findings regarding the effect of dynamic capabilities for sustainability (DCSs) on firm performance. This research bridges the gap in the literature by expanding the focus on sustainability dynamic capabilities beyond innovation and addressing the inconsistencies in the findings about firm performance by applying a broader scope of firm performance.

This research aims to incorporate sustainability into the dynamic capability perspective to enhance firm performance. Furthermore, this research tests the effect of sustainability dynamic capabilities on firm performance. This research answers the following research question:

RQ: *"How does integrating sustainability into dynamic capabilities relate to firm performance"?*

This research builds on the conceptualization of sustainability dynamic capabilities and extends prior studies of Dangelico et al. (2017) and Wamba et al. (2017). While previous studies primarily focused on market performance, this study introduces a more extended model that examines the effects of sustainability dynamic capabilities on market and financial performance. Furthermore, this research expands the existing literature on dynamic capabilities by focusing on Dutch SMEs, unlike the study by Eikelenboom and de Jong (2019). This study was limited to SMEs in Friesland. This research considers a broader perspective by including SMEs across the Netherlands.

From an academic perspective, this research is necessary because it extends the existing dynamic capability framework by integrating sustainability (Amui et al., 2017). By testing the developed conceptual model, this research provides empirical evidence supporting existing theories about integrating sustainability with dynamic capabilities to enhance (firm) performance (Bhadra et al., 2024; Dangelico et al., 2017). Additionally, most research in this area is about larger firms. This study contributes to the underexplored context of Dutch SMEs

Furthermore, from a managerial perspective, this research is necessary because Dutch manufacturing SMEs need to be more sustainable to comply with the climate goals of the Dutch government (Ministry-of-Economics-Affairs-and-Climate-Policy, 2019). Integrating sustainability into dynamic capabilities successfully can help SMEs become more sustainable, since they struggle with that (Karuppiah et al., 2020). This research gives SMEs practical insights into developing and implementing sustainability dynamic capabilities. It also offers valuable insights on how managers can leverage sustainability to improve their firm's performance. This research informs policymakers and stakeholders about SMEs' opportunities to adopt sustainability dynamic capabilities.

The paper is organized as follows: First, it starts with an extended literature review of the independent variable, sustainability dynamic capabilities, and the dependent variable, firm performance. Furthermore, a conceptual framework is presented. Chapter 4 is the method section, which explains the research design, selected sample, data collection, and data analysis. Chapter 5 presents the results. The last chapter is a discussion and conclusion with limitations and future research.

2. Literature review

This chapter offers an up-to-date understanding of sustainability dynamic capabilities, and firm performance. This chapter also contains the hypotheses and conceptual model that were developed. To identify related literature, this study follows a systematic literature review strategy based on the studies of Kitchenham et al. (2009) and Kraus et al. (2020).

2.1 Search strategy

This literature review gives an overview of the relevant literature. It was conducted in October 2024, browsing all fields in Scopus, Web of Science, and ScienceDirect databases. This literature review follows a predetermined search strategy, using specific search terms, as shown in Table 1. A keyword strategy is used to narrow down the total number of papers.

Table 1: Keyword strategy.

Concepts	Keywords
1. Sustainability Dynamic capabilities (SDC)	Sustainability Dynamic capabilities OR Sustainability-oriented dynamic capabilities OR Green dynamic capabilities
2. Firm performance (FP)	Firm performance OR Market performance OR Financial performance
Final search: #1 AND #2	

2.2 Study selection

This literature review only includes peer-reviewed journal articles. The quality of the journals is assessed via the AJG Journal Guide. Articles included in this review are at least grade 2 or 3 out of a scale ranging from 1 to 4*, with 4* being the highest grade. This approach ensures a literature review with high-quality sources. Journals with an AJG score of 1 are referred lightly to accepted conventions, and only a few of those journals have a citation metric; therefore, journals with a score of 1 are omitted (Laing et al., 2024).

The search resulted in 40 articles in Scopus, 54 articles in Web of Science, and three additional articles from ScienceDirect due to overlap. Duplicates are removed, and the title, abstract, and keywords are analyzed (Kraus et al., 2020). The inclusion and exclusion criteria can be found in Figure 1. Articles that did not meet the requirements are not included. This review contains a total of 12 articles. The entire search process can be found in Figure 1.

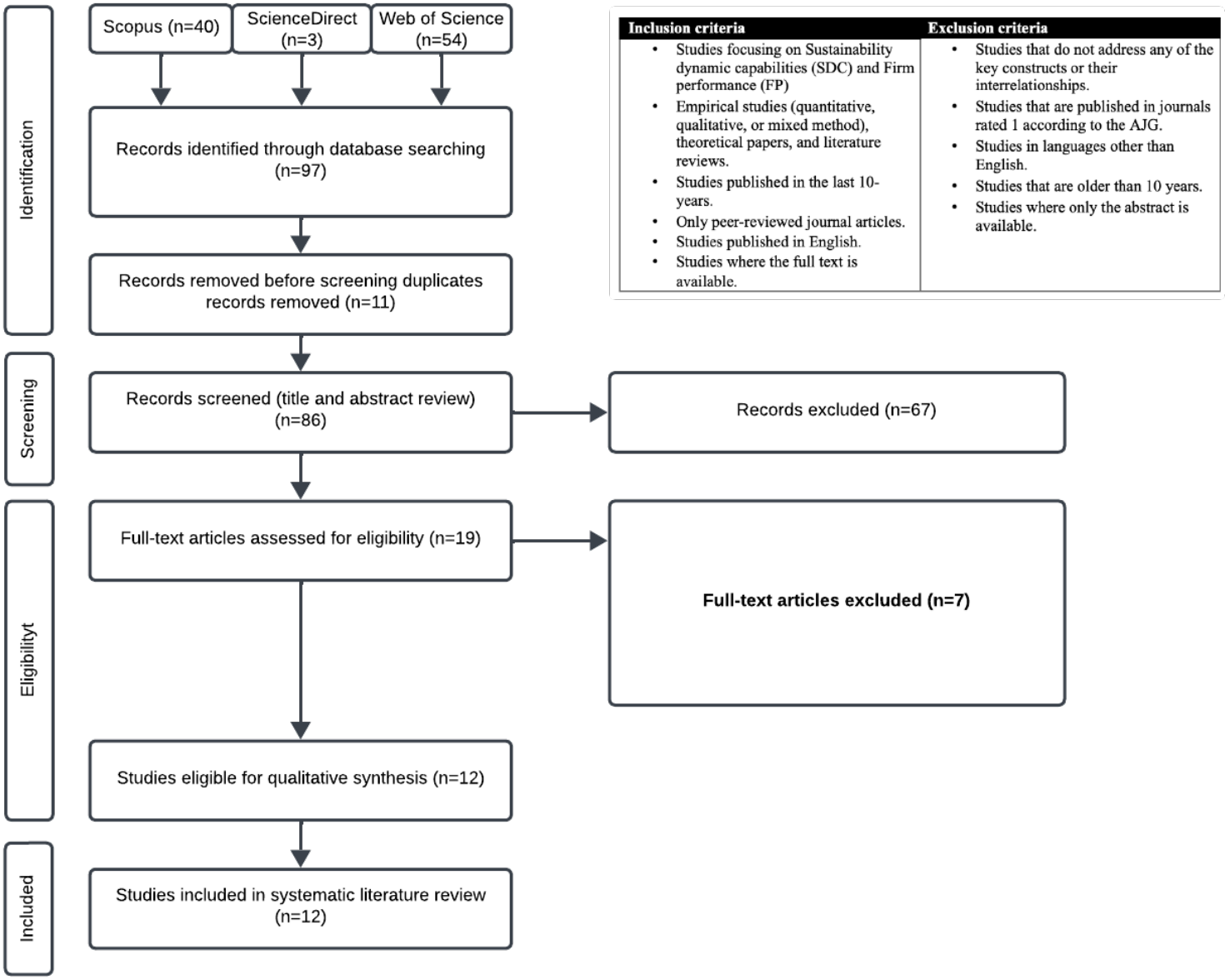

Figure 1: Search process.

Table 2 provides an overview of the selected articles for this review. The articles are published in the Journal of Cleaner Production, Business Strategy and the Environment, and the Journal of Business Research. The oldest selected article is from 2017, and the newest is from 2024. The literature table is organized by publication date, journal, research aim, key variables, research method, sample, findings, and limitations. The themes that will be covered in the following paragraphs are Sustainability dynamic capabilities and Firm performance.

Table 2: Literature review.

Author	Research aim	Key variables	Research method	Sample	Findings	Limitations
(Amui et al., 2017) *Journal of Cleaner Production*	Current lack of research integrating dynamic capability and sustainability.	Dynamic capabilities Sustainability Sustainable innovation	Systematic literature review.	33 articles.	There is more research needed on dynamic capabilities for sustainability including quantitative studies in developed and developing countries.	There is a lack of consensus on which dimensions to consider when classifying dynamic capabilities for addressing sustainability challenges.
(Dangelico et al., 2017) *Business Strategy and the Environment*	Developing and testing a theoretical framework that provides insights into green product innovation from a capability perspective.	Sustainability-oriented dynamic capabilities Sustainability-Oriented Ordinary Capabilities Market Performance	Quantitative	189 Italian manufacturing firms.	Sustainability-oriented dynamic capabilities are crucial for green production innovation. Especially through external resource integration which as the strongest positive impact.	Cross-sectional data collection. In sustainability research, respondents tend to provide higher scores related to commitment and knowledge.
(Qaiyum & Wang, 2018) *Journal of Business Research*	Testing the effect of ordninary and dynamic capabilities on firm performance.	Dynamic capabilities Ordinary capabilities Firm performance	Quantitative	260 Indian high-tech firms.	Ordinary capabilities outperform dynamic capabilities in improving firm performance. For firm in the middle stage of their life cycle is the effect equal.	Focus on ordinary and dynamic variants of marketing and technological capabilities only.

(Eikelenboom & de Jong, 2019) *Journal of Cleaner Production*	Investigating the effect of integrative dynamic capabilities on the social, environmental and economic performance of SMEs.	Transformational leadership Perception sustainability as a threat External integrative dynamic capabilities Internal integrative dynamic capabilities Social performance Environmental performance Economic performance	Quantitative	297 Dutch SMEs.	There is a positive relationship between external integrative dynamic capabilities and all three pillars of sustainability performance in SMEs.	Lack in depth due to reliance on survey data. Limited sample size and focused on specific firm characteristics. Need for broader, more diverse research.
(Singh et al., 2022) *Business Strategy and the Environment*	Examining the direct and indirect effects among stakeholder pressure, green dynamic capabilities, green innovation, and performance of emerging market small and medium-sized enterprises (SMEs).	Stakeholder pressure Green dynamic capabilities Green innovation Firm performance	Quantitative	248 SMEs in manufacturing sector.	Stakeholder pressure influence green dynamic capabilities, this influences green innovation. Green innovation also influences firm performance.	Study focused only on SMS from the UAE's manufacturing sector.
(Ortiz-Avram et al., 2024) *Business Stategy and the Environment*	Synthsizing the current knowledge on conceptualizations of dynamic capabilities of sustainability.	-	Systematic literature review	86 articles.	Conceptualising sustainability-oriented innovation and level of stakeholder integration as integral dimensions offer a more nuanced understanding of the construct.	Lack of empirical validation.

(Demirel & Kesidou, 2019) *Business Strategy and the Environment*	Investigating the capabilities firm need to develop eco-innovation and investigagint the sustainability-oriented capabilities.	Sustainability-oriented capabilities Eco-innovation	Quantitative	169 U.K manufacturing firms.	Eco-innovation is more likely to arise when firms build capabilities on voluntary self-regulation (e.g., environmental management and CSR) to address regulatory pressures, (b) invest in eco-focused R&D to develop technologies for sustainability, and (c) develop green market sensing capabilities to meet green consumer demands.	Limited sample to UK manufacturing firms. No longtidual data as capabilities change over time in response to environmental demands.
(Annunziata et al., 2018) *Journal of Cleaner Production*	Investigating the role of three organizational capabilities for implementing proactive socio-environmental practices and related economic performance	Organizational capabilities Proactive Socio-Environmental practices Economic performance	Quantitative	357 Italian wineries.	Two of the three organizational capabilities have a significant positive effect on economic performance. Furthermore, Proactive sustainable practices positively affect economic performance.	Sample focused on Italian wineries only. Self-evaluation by CEO's of the companies.
(Bhatia, 2021) *Business Strategy and the Environment*	This study test the relationship between proactive environment strategy, green process innovation, and operational performance. It also	Proactive environment strategy Green process innovation Dynamic capabilities	Quantitative	137 Indian manufacturing firms.	Proactive environment strategy is important for green process innovation. Dynamic capabilities mediate between green	Study is conducted in a developing country. Focus on one industry only.

	examines the mediation effect of dynamic capabilties.	Operational performance			processs innovation and operational performance.	
(Algarni et al., 2022) *Journal of Cleaner Production*	Investigating the effect of adaptive capability and pro environment behavior on corporate sustainability performance, and financial performance.	Adaptive capability Pro environment behavior Corporate sustainability performance Financial performance	Quantitative	311 ISO 14001 certified firms in Saudi Arabia.	Adaptive capability and environmental behavior have a positive and significant effect on corporate sustainability performance as well as on financial performance.	Specific working culture and context of Saudi Arabia was difficult to control. Focus on ISO 14001 firms only.
(Yi & Demirel, 2023) *Business Strategy and the Environment*	The paper examines whether firms can attain sales growth through a range of sustainability-oriented dynamic capabilities	Sustainability-oriented dynamic capabilities Green supply chain management Firm growth	Quantitative	277 public US firms.	Positive growth effects of green political capabilities are short-lived, while those of internal green supply chain capabilities are long-lived.	No focus on SMEs. Used variables formed from the CDP questionnaire as proxies for the independent variables.
(Bhadra et al., 2024) *Business Strategy and the Environment*	Developing and testing a model with links between dynamic sustainability capabilities to firms sustainable performance	High order dynamic capability Low order dynamic capability Firm level outcome	Quantitative	210 large Indian manufacturing firms.	Dynamic sustainability capability has facilitating effects on environmental and social performance directly and indirectly through managerial capability.	Reliance on cross-sectional design. Sample of firms from a developing country.

3. Theoretical background and Hypotheses development

3.1 Dynamic Capabilities View and Sustainability

Dynamic capabilities are organizational and strategic routines that enable firms to achieve new resource configurations—for example, integrating resources, configuring resources, and guiding the gain and release of resources (Eisenhardt & Martin, 2000). The original dynamic capability framework can be disaggregated into the capacity of firms to sense and share opportunities and threats, seize opportunities, and maintain competitiveness through enhancing/protecting the firms' assets (Teece, 1997). Firms with strong dynamic capabilities are more entrepreneurial and have better firm performance (Teece, 2007). Firm performance is a multifaceted construct that can be influenced by various factors. Firm performance is a measure that makes comparing firms easier (Bharadwaj, 2000; Lumpkin & Dess, 1996). Another paper defines firm performance as the ability of firms to achieve objectives in a changing environment while responding to change and coping with challenges (Taouab & Issor, 2019).

Dynamic capabilities have relevant implications for sustainability (Eikelenboom & de Jong, 2019). Amui et al. (2017) is the first paper that addresses a new framework of dynamic capabilities for sustainability (DCsS); these are dynamic capabilities that only focus on and address sustainability issues. However, there is no integral definition of sustainability; most definitions focus on the triple bottom line (TBL), which consists of economic, social, and environmental dimensions (Amui et al., 2017; Daly, 2017; Purvis et al., 2019). Another alternative definition of sustainability comes from the Brundtland report, which defines sustainability as meeting the needs of the present without compromising the ability of future generations to meet their own needs (Basiago, 1995). Sustainability practices help firms to adopt a long-term focus and a set of responsibilities. They also allow long-term value creation,

help firms develop opportunities, and manage economic, social, and environmental risks (Chakrabarty & Wang, 2012).

The growing literature about the new framework that integrates sustainability with dynamic capabilities has different conceptualizations and definitions (Dynamic capabilities for sustainability, sustainability-oriented dynamic capabilities, green dynamic capabilities, and dynamic sustainability capability). The most popular definition is the DCsS. These are the firms' ability to create sustainability-oriented innovation in multi-stakeholder arrangements (Ortiz-Avram et al., 2024). Another popular definition is the sustainability-oriented dynamic capabilities. These are the firm's ability to integrate, build, and reconfigure resources to integrate environmental sustainability into developing new products and responding to market change (Dangelico et al., 2017). Green dynamic capabilities enhance responsible innovation while sensing and seizing opportunities to create green business strategies (Chuhan, 2024). A more recent conceptualization is the dynamic sustainability capability, which can be defined as the firm's ability to provide sustained value to its shareholders through integrating and adjusting resources and functional routines to pursue economic, environmental, and social goals simultaneously (Bhadra et al., 2024). This research uses the sustainability dynamic capabilities view, which is the firm's ability to integrate, build and reconfigure resources to adjust to the changing environmental, social, and economic conditions (Bhadra et al., 2024; Dangelico et al., 2017; Demirel & Kesidou, 2019; Strauss et al., 2017).

3.2 Sustainability dynamic capabilities and firm performance

Research of Amui et al. (2017) conducted a systematic literature review on dynamic capabilities for sustainability. Amui states a lack of research on integrating dynamic capabilities and sustainability. Future research should conduct quantitative and qualitative studies about combining these two phenomena. The paper of Ortiz-Avram et al. (2024) builds on the paper

of Amui et al. (2017) by analyzing conceptualizations of dynamic capabilities for sustainability (DCsS). However, there are some inconsistencies in the literature about dynamic capabilities for sustainability. Amui et al. (2017) highlights that there is no consensus about what dimensions to use for conceptualizing dynamic capabilities for sustainability. However, the paper of Ortiz-Avram et al. (2024) explains that stakeholder integration and sustainability innovation should be integral parts of the framework. Based on the existing literature, there is a debate about whether integrating sustainability with dynamic capabilities has the same relevance for SMEs as large firms. The papers of Bhatia (2021), Dangelico et al. (2017), Yi and Demirel (2023), and Bhadra et al. (2024) focused on large firms. However, there is limited research on SMEs, with only the papers of Eikelenboom and de Jong (2019) and Singh et al. (2022) considering SMEs.

The DCsS are behavior patterns in organizations that specialize in adapting to the demand for sustainability. Firms need to understand the importance of sustainability dynamic capabilities to tackle sustainability-related challenges (Strauss et al., 2017). Research of Eslami et al. (2019) surveyed sustainability in manufacturing firms and states that the environmental dimension is the most significant. Furthermore, consumers perceive environmental sustainability as long-term and global (Catlin et al., 2017). Therefore, this research focuses solely on the ecological dimension of sustainability. The environmental dimension of sustainability is based on the firm's capacity to reduce pollution, waste, and environmental accidents (Le, 2024).

The sustainability dynamic capabilities have a direct effect on social and environmental performance. However, the impact of these capabilities is estimated on sustainability performance and not on firm performance (Bhadra et al., 2024). The research of Singh et al. (2022) investigated the effect of green dynamic capability on green innovation and firm

performance. Green dynamic capabilities enhance firms' performance through green innovation.

A few papers investigated the effect of sustainability-oriented dynamic capabilities (SODC) on market performance and increased competitiveness (Dangelico et al., 2017; Demirel & Kesidou, 2019). However, the paper of Dangelico et al. (2017) investigated the impact of those capabilities on market performance, where resource building and reconfiguration had a direct significant impact. Furthermore, the paper did not test the effect of sustainability-oriented dynamic capabilities on financial performance. Therefore, the following hypotheses are proposed:

H1: *"Perceived external resource integration positively affects firm performance."*

H2: *"Perceived internal resource integration positively affects firm performance."*

H3: *"Perceived resource building and reconfiguration have a positive effect on firm performance."*

Research of Wamba et al. (2017) states that dynamic capabilities enhance firm performance. However, it is relevant to investigate whether sustainability dynamic capabilities positively affect firm performance. Research of Yi and Demirel (2023) states that sustainability-oriented dynamic capabilities have different implications for firm growth. However, this paper did not focus on SMEs, even though these account for 90% of the economic activity. While research of Eikelenboom and de Jong (2019) applied a Dutch SME focus, they investigated the effect of dynamic capabilities on sustainability performance without integrating sustainability into the dynamic capabilities. Firm performance is a reflective latent construct composed of 1) financial performance and 2) market performance (Protogerou et al., 2012; Wamba et al., 2017). A latent construct cannot be observed directly. This latent construct is linked to its observable variables, which makes the measurement of the latent construct possible (Byrne, 2013). This research

aims to fill the gap in understanding how Dutch SMEs can leverage sustainability dynamic capabilities to enhance firm performance. Therefore, the following hypotheses are proposed:

H4: "*Firm performance is a reflective, latent construct of second order and captures the following two factors, namely, market performance and financial performance*".

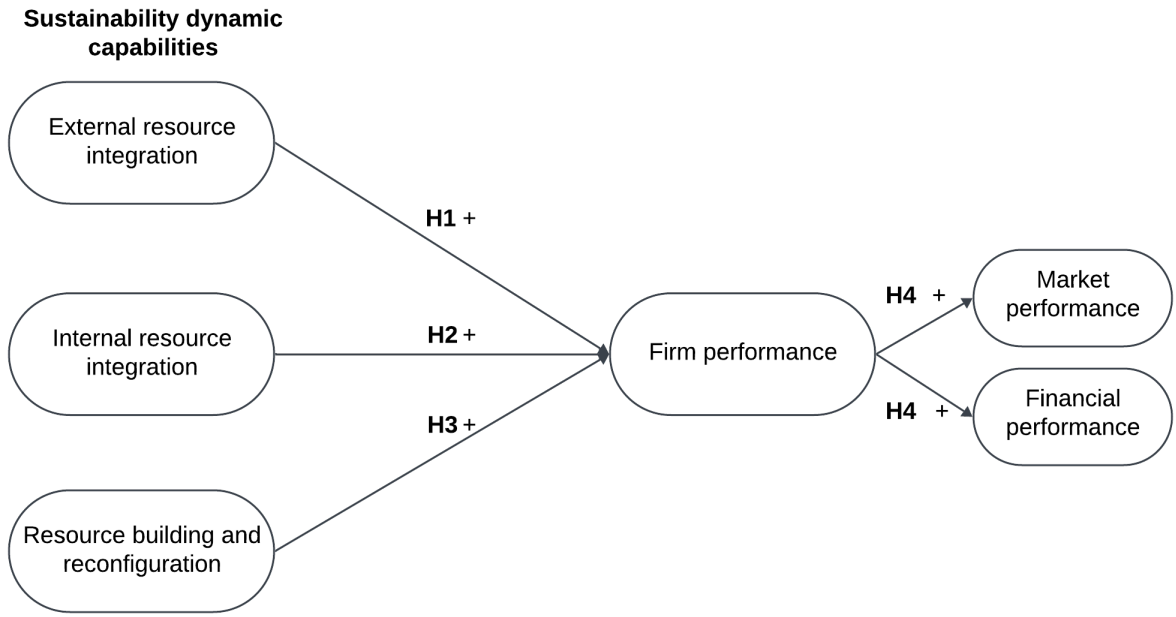

Figure 2: Conceptual model ((Buzzao & Rizzi, 2021; Dangelico et al., 2017; Protogerou et al., 2012; Wamba et al., 2017)).

4. Methodology

This research tests the impact of sustainability dynamic capabilities on firm performance. This paper follows a quantitative approach, with data collected via a survey conducted among Dutch SMEs from the manufacturing sector.

4.1 Sample and data collection

The data was collected through an online survey in the Netherlands in January and February 2025. The sample of this research consists of Dutch manufacturing firms with 10 to 250 employees. According to CBS, the Netherlands had 76.235 manufacturing SMEs in 2022, approximately the total population in this research (CBS, 2023). The sample comprises manufacturing firms with SBI group codes 10 to 28 (without group 18). The SBI group codes indicate the activities of a firm. Codes 10 to 28 are the SBI codes of manufacturing firms.

The decision to choose a minimum of 10 employees is based on the study of Saunila (2019) since firms with less than 10 employees do not have the opportunity to focus on sustainability due to limited financial resources and knowledge. With the criteria above, a sample was extracted from the NexisUni database sampling frame. The online survey was created via Qualtrics and sent as a direct link via e-mail to the respondents. Managers of manufacturing were approached via e-mail with the request to evaluate their firm regarding sustainability dynamic capabilities and firm performance on a 7-point Likert Scale ranging from “Strongly Disagree” to “Strongly Agree.”

Despite the limitations of self-reported survey data, PLS-SEM is a widely accepted and used method in research. Online surveys offer several advantages: they enable data collection from large samples, provide direct insights from decision-makers (Evans & Mathur, 2005). Therefore, this research uses a survey approach.

This research's sample is a non-probability convenience sample since the firms included are based on availability within the database, and the companies are not randomly selected from the population. After cleansing the data, which included responses with missing values above 10% and responses with a firm size below 10 and above 250 employees, the final sample consisted of 46 responses (Madley-Dowd et al., 2019). The final dataset consists of (n=46) Dutch manufacturing SMEs.

Table 3: Descriptive statistics for the final dataset (n=46).

Number of employees	**Sample (n=46)**	**Percentage (%)**
10-49	24	52%
50-249	22	48%

Non-response bias is assessed by testing the differences between the variable response time and firm size. The non-response bias assumes that the late respondents are less readily and are thus treated as non-respondents (Armstrong & Overton, 1977). The variable response time consists of early respondents (coded 0) who filled in the survey within 2 weeks and late respondents (coded 1) who filled in the survey after a few reminders. An independent sample t-test is performed in JASP to check the difference between the two groups of respondents. The non-response bias is not present in this study since the p-value is 0.362, which means it is above the threshold of 0.05.

4.2 Measurement

The constructs and their relationships in the conceptual model are based on the theoretical background described in Chapter 2. Previous studies have validated and confirmed the measurement items' validity and reliability. Table 4 lists the measurement items of external resource integration, internal resource integration, resource building and reconfiguration, financial performance, and market performance.

Table 4: Measurement items of the constructs.

Construct	Item	References
External resource integration (ERI)		
ERI1	The firm considers customer requirements about the environmental performance of the product.	(Dangelico et al., 2017; Qiu et al., 2020).
ERI2	The firm integrates knowledge on environmental impact of products during customers' use	(Dangelico et al., 2017; Qiu et al., 2020).
ERI3	The firm integrates suppliers' knowledge and competencies on environmental impact of components or materials.	(Dangelico et al., 2017; Qiu et al., 2020).
ERI4	The firm integrates suppliers' knowledge and competencies on environmental impact of production processes.	(Dangelico et al., 2017; Qiu et al., 2020).
Internal resource integration (IRI)		
IRI1	The firm collaborates between the specialized environmental unit (e.g., environmental sustainability managers, environmental sustainability unit) and the design department within the SBU to integrate sustainability into product and service development.	(Dangelico et al., 2017).
IRI2	The firm collaborates between the specialized environmental unit and the production department within the SBU to align	(Dangelico et al., 2017).

	production processes with environmental sustainability objectives.	
IRI3	The firm collaborates between the specialized environmental unit and the marketing department within the SBU to ensure sustainability principles are reflected in marketing strategies and communications.	(Dangelico et al., 2017).
IRI4	The firm integrates environmental knowledge and competencies across internal functions and departments (e.g., design, manufacturing, marketing) within the SBU to embed sustainability throughout its operations.	(Dangelico et al., 2017).
Resource building and reconfiguration (RBR)		
RBR1	We provide training (e.g., conferences, workshops, courses) to upgrade environmental knowledge and competencies of employees.	(Bhadra et al., 2024; Dangelico et al., 2017).
RBR2	We reconfigurate organizational strucutres to focus on environmental sustainability (e.g., creating a new division, reconfiguring product lines).	(Dangelico et al., 2017).
RBR3	We perform auditing and risk analysis about the potential factors that cause environmental impacts.	(Bhadra et al., 2024).
RBR4	We are capable of regulateing organizational sustainability behaviors and operations by introducing a standard environmental management system, such as ISO9000 or ISO14001.	(Bhadra et al., 2024).
RBR5	We will step up research and development in terms of product environmental protection (such as increasing investment).	(Qiu et al., 2020).

Market performance (MP)		
MP1	Our firms market share has exceeded that of our competitors.	(Protogerou et al., 2012; Wamba et al., 2017).
MP2	Our firm have introduced new products to the market faster than our competitors.	(Wamba et al., 2017).
MP3	Our firms success rate of new products has been higher than our competitors.	(Wamba et al., 2017).
MP4	Our firm have entered new markets more quickly than our competitors.	(Wamba et al., 2017).
Financial performance (FP)		
FP1	Our firms current financial performance is better than our competitors in terms of sales.	(Torres et al., 2018).
FP2	Our firms current financial performance is better than our competitors in terms of profit.	(Torres et al., 2018).
FP3	Our firms current financial performance is better than our competitors in terms of net profits.	(Protogerou et al., 2012; Torres et al., 2018).
FP4	Our firms current financial performance is better than our competitors in terms of return on assets.	(Protogerou et al., 2012; Torres et al., 2018).

4.3 Data analysis

The researcher followed the partial least squares structural equation modeling (PLS-SEM) to examine the relationship between sustainability dynamic capabilities and firm performance. Structural equation modeling (SEM) is a popular multivariate technique to evaluate causal links. SEM examines direct and indirect effects on the hypothesized links (Fan et al., 2023). This research uses the PLS-SEM since it's about testing a theoretical framework from a prediction perspective, and the model is complex and consists of multiple constructs, indicators, and relationships (Hair, 2019), unlike covariance-based structural equation modeling (CB-SEM), which focuses on theory testing and confirmation and requires larger sample sizes (n=>100). Moreover, compared to CB-SEM, PLS-SEM is more appropriate for models with a formative construct (Hair Jr et al., 2021). PLS-SEM provides several advantages compared to ordinary least squares (OLS). The OLS method assumes homogeneity in data, and PLS-SEM accounts for unobserved heterogeneity in the relationships between the variables. The researcher cannot assume that the sample is homogeneous because not all SMEs have the same level of effort in sustainability. There are differences in resources and firm sizes. PLS-SEM is a more appropriate analytical method (Sarstedt et al., 2017). Additionally, PLS-SEM works well with small sample sizes (n=<100), making it a more robust choice for this research (Sarstedt et al., 2022). Based on the 10-times rule, the sample could be as small as 30 in this research (Hair Jr et al., 2023). Also, PLS-SEM has no problem dealing with distribution issues and lack of normality, and it avoids identification issues, which are common in CB-SEM (Hair, 2019; Sarstedt et al., 2016). Given the exploratory nature of this research and theory extension, PLSE-SEM is the best-fitting analytical technique.

SMARTPLS 4.0 is used to analyze the data. The guidelines developed by Sarstedt et al. (2022), Ringle et al. (2023), and Sarstedt et al. (2019) are used to assess the measurement model and evaluate the structural model. The formative model is assessed via the convergent validity,

collinearity between indicators, and significance and relevance of the outer weights. The reflective measurement model is evaluated via internal consistency (Cronbach's alpha, composite reliability), convergent validity (indicator reliability, AVE), and discriminant validity. The structural model is assessed via collinearity between the constructs, significance and relevance of the path coefficients, and explanatory (R-squared) and predictive power (PLSpredict). Furthermore, a bootstrapping sample with 10.000 subsamples was used (Hair Jr et al., 2021; Sarstedt et al., 2022).

The common method bias (CMB) is assessed using the procedures explained in the literature of Podsakoff et al. (2024). A marker variable is used to detect CMB. The marker variable (MV) technique detects CMB by including a variable unrelated to the main variables but similar in format. If this MV correlates with the main variables, it's likely due to bias (Podsakoff et al., 2024). The marker variable was made using Excel's rand() function and a 7-point Likert scale to simulate an unrelated variable.

5. Results

Sustainability dynamic capabilities are measured via their first-order constructs: external resource integration (ERI), internal resource integration (IRI), and resource building and reconfiguration (RBR). These first-order constructs are measured by their formative items. This approach is confirmed by the highly cited paper of Pavlou and El Sawy (2011) that used a measurement model where dynamic capabilities is a second-order construct measured by its first-order constructs (sensing, learning, integrating, and coordinating capabilities). These first-order constructs are measured by their formative indicators. Moreover, the study of Dangelico et al. (2017) does not state if ERI, IRI, and RBR are formative or reflective. However, the conceptualization suggests a formative approach, ERI. IRI and RBR contribute uniquely to the overall construct.

Firm performance is a higher-order construct (HOC) measured via its lower-order constructs (LOCs), market performance, and financial performance. It is a reflective-reflective HOC. First, the reliability and validity of the formative first-order constructs are assessed. After that, the reliability and validity of the HOCs are assessed by extracting the latent variable scores of the LOCs and adding them to their HOCs.

5.1 Measurement model

The formative model is assessed via the convergent validity, collinearity between indicators, and significance and relevance of the outer weights. Most of the items measuring the first-order constructs are not significant. However, based on the guidelines, these items can be removed when the items also have low loadings (<0.5) (Sarstedt et al., 2019). Out of the 13 items measuring the sustainability dynamic capabilities, six are insignificant and have loadings below the threshold of 0.5. The remaining seven are significant, confirming the outer weights' significance and relevance (Table 5). The variance inflation factor (VIF) indicates whether collinearity between the indicators is present. This model's VIF values range between 1.369 and 4.708, indicating possible collinearity issues. However, this is below the threshold of ≤5, and above 5 indicates critical collinearity issues. Most of the VIF values are even ≤3, which means no collinearity issues (Hair, 2019; Sarstedt et al., 2022). So, there is moderate collinearity since three items out of 13 are above 3.

Table 5: Formative measurement model check via item weights, loadings, VIF = variance inflation factor.

Construct	Item	Outer weights	Outer loadings	VIF
ERI	ERI1	-0.471	-0.095	1.369
	ERI2	1.126	0.731	1.646
	ERI3	-0.855	0.078	2.311
	ERI4	0.610	0.325	2.147
IRI	IRI1	0.133	0.542	2.922
	IRI2	-0.684	0.440	4.708
	IRI3	1.534	0.889	3.952
	IRI4	-0.240	0.559	4.218
RBR	RBR1	0.257	0.672	2.259
	RBR2	0.364	0.818	1.825
	RBR3	-0.140	0.472	1.610
	RBR4	-0.048	0.405	1.646
	RBR5	0.675	0.912	1.697

The reflective measurement model is assessed via internal consistency (Cronbach's alpha, composite reliability), convergent validity (indicator reliability, AVE), and discriminant validity. Only one item loading is slightly below the recommended threshold of 0.708. All the other loadings are above the threshold; this confirms indicator reliability (Sarstedt et al., 2022). The composite reliability ρ_A assesses the internal consistency reliability of the constructs. For all constructs, the ρ_A is between the thresholds of 0.7 and 0.95, confirming composite reliability. The AVE is above the threshold of 0.5, confirming the constructs' convergent validity (Hair, 2019; Sarstedt et al., 2022). Cronbach's alpha is above the acceptable threshold of 0.7, which confirms internal consistency reliability (Table 6) (Sarstedt et al., 2019).

Table 6: Reflective measurement model check via outer loading, composite reliability, AVE, and Cronbach's alpha.

Construct	Item	Outer loading	ρ_A	AVE	Cronbach's alpha
MP	MP1	0.663	0.863	0.662	0.829
	MP2	0.850			
	MP3	0.815			
	MP4	0.907			
FP	FP1	0.915	0.955	0.879	0.954
	FP2	0.945			
	FP3	0.956			
	FP4	0.933			

Discriminant validity is assessed via the heterotrait-monotrait ratio of correlations (HTMT). The HTMT value is below the conservative threshold of 0.85 or 0.90, meaning that market performance and financial performance are not too highly correlated (Hair, 2022; Henseler et al., 2015; Sarstedt et al., 2022). Furthermore, this confirms discriminant validity (Table 7).

Table 7: Discriminant validity check via HTMT.

Correlation	HTMT ratio	Percentile bootstrap confidence interval
Market performance <-> Financial performance	0.450	[0.271; 0.714]

To assess the reliability and validity of the HOC, the latent variable scores of market performance and financial performance are extracted and added to the HOC (firm performance). Market and financial performance have outer loadings above the threshold of 0.708 and are both significant (Table 8) (Sarstedt et al., 2022).

Table 8: Reflective model HOC check via outer loadings.

Construct	Outer loadings
Market performance <- Firm performance	0.836
Financial performance <- Firm performance	0.865

5.2 Structural model

The overall model explains 40.9% of the variance in firm performance ($R^2 = 0.409$). All paths are significant except those between Internal resource integration (IRI) and firm performance, and Resource building and reconfiguration (RBR) (Table 9).

Table 9: Path coefficients and p-values.

Path	β	P-value	Significant
H1 ERI -> FIRMP	0.539	0.033	Yes
H2 IRI -> FIRMP	0.164	0.391	No
H3 RBR -> FIRMP	0.086	0.588	No
H4 FIRMP -> MP	0.784	0.001	Yes
H5 FIRMP -> FP	0.906	0.001	Yes

The $PLS_{predict}$ procedure is used to assess the quality of the structural model. Specifically, it evaluates the model's out-of-sample predictive power for firm performance (Sarstedt et al., 2019; Shmueli et al., 2019). The results of the $PLS_{predict}$ show that not all values of the $Q^2_{predict}$ are above zero. Moreover, MP2 and MP4 are the only items with a $Q^2_{predict}$ below 0.

Additionally, the prediction errors for the remaining items are symmetrically distributed. For the items with a $Q^2_{predict}$ above 0, their RMSE values are compared with the naïve LM benchmark. All indicators, except FP4, have lower PLS-SEM_RMSE values than the LM_RMSE benchmark at the indicator level (Table 10). This suggests the model has medium predictive power, as most indicators outperform the LM benchmark (Shmueli et al., 2019).

Table 10: PLSpredict.

Firm performance	**$Q^2_{predict}$**	**PLS-SEM_RMSE**	**LM_RMSE**	**PLS-SEM_RMSE – LM_RMSE**
MP1	0.063	1.457	1.975	-0.518
MP2	-0.010	1.390	1.606	-0.216
MP3	0.075	0.972	1.185	-0.213
MP4	-0.044	1.234	1.520	-0.286
FP1	0.167	1.044	1.095	-0.051
FP2	0.163	1.128	1.232	-0.104
FP3	0.026	1.180	1.289	-0.109
FP4	0.059	1.069	1.006	0.063

The marker variable approach is used to check for common method bias. A random unrelated variable was added to the dataset and loaded into SMARTPLS 4.0. This random, unrelated variable is the marker variable and was measured on the same scale as the other items in the dataset. Common method bias (CMB) is unlikely when the marker variable is unrelated to the variables included in the study (Podsakoff et al., 2024). CMB is not a problem in this study since the relationship between the marker variable and the other variables is insignificant (Table 11).

Table 11: Marker variable to detect common method bias (CMB).

Construct	Path coefficient	P-value
Random -> ERI	-0.290	0.218
Random -> FP	-0.103	0.553
Random -> FIRMP	-0.118	0.639
Random -> IRI	-0.211	0.449
Random -> MP	-0.090	0.706
Random -> RBR	-0.096	0.777

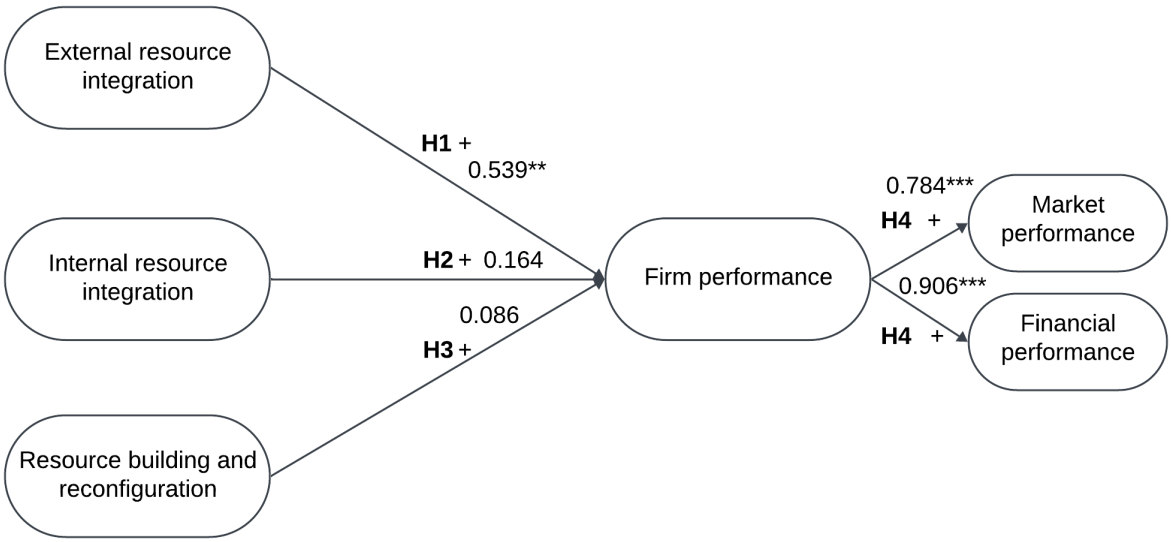

Figure 3: PLS-SEM results for the full dataset (N=46). Note: ** $p \leq 0.05$ *** $p \leq 0.01$.

5.3 Confirmation hypotheses

Table 12 gives an overview of all the confirmed and rejected hypotheses.

Table 12: Results of hypotheses testing.

Hypotheses	Result	P-value
H1: Perceived external resource integration positively affects firm performance.	Confirmed.	0.033
H2: Perceived internal resource integration positively affects firm performance.	Rejected.	0.391
H3: Perceived resource building and reconfiguration has a positive effect on firm performance.	Rejected.	0.588
H4: Firm performance is a reflective, latent construct of second order and captures the following two factors, namely, market performance and financial performance.	Confirmed.	0.001

To relate the findings to the research question, 'How does integrating sustainability into dynamic capabilities relate to firm performance?', it is necessary to examine Table 9. This table presents the results of the hypotheses testing. The findings of this study show that the first-order constructs of sustainability dynamic capabilities positively affect firm performance. Three path coefficients in the structural model are significant. These are the paths between external resource integration and firm performance, and between firm performance and market and financial performance. In short, all the hypotheses are accepted except for H2 and H3. Hypotheses H2 (Perceived internal resource integration positively affects firm performance) and H3 (Perceived resource building and reconfiguration positively affect firm performance) are insignificant for the entire dataset. Hypothesis H1 (Perceived external resource integration positively affects firm performance) is significant. Furthermore, hypothesis H4 (Firm performance is a reflective, latent construct of second order and captures the following

two factors, namely, market performance and financial performance) is significant for the entire dataset; this indicates that firm performance is a latent construct that is reflected in market and financial performance. This means that when the market and financial performance go up, it can be assumed that the firm's performance is high.

The relatively low sample size could explain the lack of statistical significance. There are two methods to calculate the minimum required sample. The first method is the 10-time rule, which claims that the minimum sample size should be greater than 10 times the maximum number of inner or outer model links pointing to the dependent variable. In this model, three links point to the dependent variable, firm performance, which means the required sample size is 30 (Hair Jr et al., 2023). The inverse square root method considers the probability that the ratio of the path coefficients and their standard error will be greater than the critical value. Assuming a significance level of 5% $\widehat{N} > \left(\frac{2.486}{|\beta|\, min}\right)^2$ respective minimum path coefficients, this would give the following required sample sizes (Kock & Hadaya, 2018).

Table 13: Results of the minimum sample size.

Minimum path coefficient	**1% significance level**	**5% significance level**	**10% significance level**
0.1	1004	**618**	451
0.2	251	**155**	113
0.3	112	**69**	51
0.4	63	**39**	29
0.5	41	**25**	19

Based on the table above, the lowest path coefficients are IRI-> FP (0.164) and RBR -> FP (0.086). This means that the minimum sample size should be at least 618 to detect significance

at the 5% level. Increasing the sample size would improve the power to detect more minor effects. Despite that, the researcher e-mailed the total sample extracted from NexisUni and achieved a response rate close to 10%. Increasing the sample size is inconvenient due to time constraints and ethical considerations. Sending multiple reminders to the same sample could be perceived as harassment or coercion of survey recipients. This threatens the requirements that participation in surveys is voluntary (Schirmer, 2009).

Possible mediators or moderating variables could explain the statistical insignificance. Innovation capability could be a relevant mediating variable that mediates the relationship between the constructs in the model. Innovation capability is the firm's ability to create innovative new products that satisfy market needs, apply appropriate process technologies to produce new products, and develop new products and processing technologies to meet future needs (Rajapathirana, 2018). Strong dynamic capabilities are necessary to achieve successful innovation. Innovation capabilities mediate the relationship between dynamic capabilities and performance. Innovation helps firms make external imitation more complex, allowing for long-term competitive advantage and better performance (Breznik & D. Hisrich, 2014; Ferreira et al., 2020). Sustainability dynamic capabilities (SDC) may first affect a firm's ability to innovate (innovation capability), enhancing firm performance. This means integrating suppliers, collaborating between different departments within the SBU, regulating organizational sustainability, and reconfiguring resources, which could result in new innovative ideas and eco-friendly products, boosting sales and market share.

Entrepreneurial orientation is the process that the main decision-makers create to apply their goals and visions and develop a competitive advantage (Dias et al., 2021). There is a positive link between entrepreneurial orientation and performance. Good entrepreneurial orientation allows firms to create, discover, exploit new opportunities and create value (Jiang et al., 2018).

Firms with strong dynamic capabilities are more entrepreneurial, and entrepreneurial orientation is shaped by a firm's resources and capabilities, which means that dynamic capabilities positively affect entrepreneurial orientation (Hernández-Linares et al., 2024). Entrepreneurial orientation may be a key mediator in explaining the relationship between SDC and firm performance. When a firm integrates knowledge from suppliers and customers, reconfigures organizational structures, and conducts auditing and risk analysis, it can improve entrepreneurial orientation. SDCs provide employees with more profound knowledge about sustainability, increasing their confidence and willingness to explore new sustainable ideas. This, in turn, can lead to improved firm performance.

Absorptive capacity is the ability to value, assimilate, and apply new knowledge (Zahra & George, 2002). A firm's absorptive capacity enables the company to exploit new knowledge, which serves as a resource that can enhance firm performance (Flatten et al., 2011). Adapted from the dynamic capability perspective, IT capabilities have a positive and significant effect on absorptive capacity. Absorptive capacity mediates the relationship between IT capabilities and firm performance (Liu, 2013). Integrating knowledge of customers and suppliers, internal cross-functional collaboration, training, and risk auditing. These SDCs could lead to new sustainability-related knowledge. Firms with higher levels of absorptive capacity are better at applying this new knowledge and can innovate or adapt faster. Furthermore, this could improve firm performance.

6. Discussion

The dimension resource building and reconfiguration (RBR) was expected to affect firm performance significantly. This study's results are somewhat in line with those of the previous research of Dangelico et al. (2017). Only RBR directly and significantly affected market performance in that study. Other constructs in that study are eco-design capability and green innovation capability, which are mediators. In this study, only external resource integration is significant. Internal resource integration (IRI) is insignificant in both studies. Furthermore, there is also a chance that the sustainability dynamic capabilities are mediators and mediate the effect on firm performance. Other research states that green dynamic capability, which consists of resource building and reconfiguration, resource integration (which consists of internal/external resource integration), and environmental capability, significantly impacts competitive advantage. Competitive advantage is measured via items that also measure market/financial performance. Furthermore, resource building and reconfiguration, resource reconfiguration, and environmental capability play intermediary roles between green product innovation and competitive advantage. Green product innovation enhances internal and external resource integration (Qiu et al., 2020).

The hypotheses about firm performance were expected to have a significant effect. The literature on firm performance also supports the results (Protogerou et al., 2012; Wamba et al., 2017). Firm performance is a higher-order construct in this research. It has a reflective impact on its lower-order dimensions, meaning a change in firm performance reflects a shift in market and financial performance (Hair Jr et al., 2023). Firm performance influences market performance, suggesting that firms with higher firm performance tend to gain greater market share. This is explained by the fact that firms with good internal and external integration have better firm performance, which is reflected in a greater market share (Droge et al., 2004). Firms with higher levels of firm performance have better market performance. Thus, they can

introduce products faster due to the affordance of shorter product development cycles and expand into new markets more effectively than their competitors (Chen et al., 2005; Protogerou et al., 2012). Furthermore, firm performance has an even more substantial effect on financial performance. This reinforces the idea that a firm's success in financial metrics such as sales, profit, net profit, and return on assets is a key outcome of overall firm performance (Omoush, 2025).

There could be other reasons apart from the mediating and moderating variables that influence the statistical insignificance of RBR and IRI on firm performance. RBR had the lowest effect on firm performance. Providing training to upgrade employees' environmental knowledge is one of the items measuring RBR. However, if the employees do not apply environmental knowledge to create sustainable products, it will not enhance firm performance. Some RBR initiatives, like increasing investments in research and development regarding product environmental protection and reconfiguring organizational structures to focus on environmental sustainability, are time-intensive and may take longer to see performance benefits. IRI also had a low effect on firm performance. The statistical insignificance could be explained by the fact that IRI is measured via items that measure the level of collaboration and integration within the SBU. These items focus on integrating sustainability into different departments and collaboration between the specialized environmental unit. This might enhance long-term capabilities instead of improving short-term effects on firm performance. Effective collaboration could take time; different departments have goals and working processes. Developing overarching sustainability goals requires trust, good leadership, and structures. Another alternative reason for the insignificance of IRI is that most SMEs have few resources to build a specialized environmental unit. This unit probably does not exist within most SMEs. Collaboration between the environmental unit and other departments is then not possible. This could be a reason why the effect of IRI on firm performance is low.

The opportunity that emerges from the findings is that external resource integration (ERI) is the only first-order construct of sustainability dynamic capabilities (SDC) that positively and significantly affects firm performance. This means that firms that actively engage with customer-related knowledge, leverage supplier expertise on materials, and use supplier expertise on production processes, achieve higher firm performance. Internal resource integration (IRI) and resource building and reconfiguration (RBR) have no significant impact. This means that collaborating between different departments within the SBU to integrate sustainability into the product does not immediately affect firm performance. This is also the case for RBR; investing in training and performing risk analysis of products does not involve financial outcomes. Moreover, firm performance significantly impacts market performance and financial performance, meaning firm performance has a vital role in driving both market success and financial outcomes.

6.1 Theoretical implications

While previous research of Dangelico et al. (2017) has focused on the effects of ERI, IRI, and RBR on market performance, these results demonstrate that only ERI has a significant impact on firm performance. Furthermore, this study provides empirical support for conceptualizing firm performance as a reflective higher-order construct (HOC) relevant to management literature (Wamba et al., 2017). Firm Performance is crucial in driving both market and financial performance**.** This indicates that firms need to strengthen overall firm capabilities to achieve market and financial success. While sustainability dynamic capabilities do not significantly impact firm performance (except for ERI), they can still positively improve firm performance.

6.2 Managerial implications

ERI has the biggest positive and significant effect on firm performance. Managers of manufacturing SMEs need to focus on integrating knowledge of the environmental impact of products during customer use and integrating knowledge of suppliers on the environmental effects of production processes. These actions contribute the most to ERI. Managers should improve overall firm performance for better market and financial performance instead of focusing primarily on enhancing the firm's market share or maximizing profits. Since sustainability dynamic capabilities (SDC) have a positive but non-significant effect on firm performance, managers cannot rely solely on SDCs to improve firm performance. However, the SDCs may contribute to the firm's sustainability goals. Managers need to integrate SDCs with other capabilities to achieve better firm performance.

6.3 Limitations and Future Research

The first limitation of this study is the lack of statistical significance of the effect of the sustainability dynamic capabilities on firm performance. Only one of the three first-order constructs of SDC is significant. Future research should consider other moderating or mediating variables that could influence the relationship. Examples of relevant mediating variables are innovation capability, entrepreneurial orientation, and absorptive capacity. Another limitation is the perceptual perspective of managers who participated in the survey. This research relies on self-reported survey data, which may introduce potential biases. An alternative to self-reported data is objective indicators such as market data, industry reports, customer reviews, or certifications like B Corp (Podsakoff et al., 2024). The sources could provide externally validated measures. In addition, qualitative methods such as interviews or focus groups with owners and managers could offer more profound insights. Another alternative would be a field experiment in which a sustainable initiative is implemented, and after that, the effect on firm performance is measured over time

The most significant limitation is the small sample size. Future studies should use larger sample sizes to confirm and validate the results. It could be that with a larger sample size, the effect of sustainability capabilities on firm performance is significant. This study relied on cross-sectional data. It would be helpful in other studies to perform longitudinal studies to get deeper insights into the long-term effects of sustainability dynamic capabilities on firm performance. Moreover, the findings of this study may not be generalizable across different industries, as the effect of sustainability dynamic capabilities on firm performance could vary by sector. Future research should consider other industries.

7. Conclusion

This research aimed to identify how integrating sustainability into dynamic capabilities relates to firm performance. Based on a quantitative analysis of the effect of sustainability dynamic capabilities on firm performance, it can be concluded that external resource integration has the highest positive and significant impact on firm performance. Internal resource integration and resource building and reconfiguration have a positive but insignificant effect. This means that they do not directly impact firm performance but can contribute to overall firm success when integrated into broader strategic and operational strategies. Furthermore, firm performance positively and significantly affects market and financial performance. Firms with a higher overall firm performance experience higher market and financial performance levels. While the lower sample size limits the generalizability of the results, this quantitative approach provided new insight into the reflective effect of firm performance on market and financial performance. Future research is needed to determine the significant impact of sustainability dynamic capabilities on firm performance. It should consider different mediators (e.g., innovation capability) or the sustainability dynamic capabilities as a mediator variable (Ferreira et al., 2020; Qiu et al., 2020). This research contributes to the literature about integrating

sustainability within dynamic capabilities. This research builds further on the conceptualization of sustainability dynamic capabilities and provides a model that researchers can expand on.

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