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The Financial and Sustainability Consequences of R&D and Intangible Investments: UK Evidence

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LIST OF ABBREVIATIONS

ESG: Environmental, Social, and Governance

R&D: Research and Development

IFRS: International Financial Reporting Standards

IAS: International Accounting Standards

ISSB: International Sustainability Standards Board

TCFD: Task Force on Climate-related Financial Disclosures

SASB: Sustainability Accounting Standards Board

UK: United Kingdom

FRC: Financial Reporting Council

RBV: Resource-Based View

SDGs: Sustainable Development Goals

IoT: Internet of Things

GAAP: Generally Accepted Accounting Principles

FTSE: Financial Times Stock Exchange

CSR: Corporate Social Responsibility

LSEG: London Stock Exchange Group

ABSTRACT

This study examines how innovation-related investments, specifically research and development (R&D) intensity and intangible asset intensity, influence firms' financial and sustainability outcomes. Focusing on UK non-financial listed firms, it investigates the impact of innovation investment on corporate cash-holding behaviour, earnings management, and environmental, social, and governance (ESG) performance. The study is motivated by the growing economic importance of intangible assets, the discretion inherent in their accounting treatment under IAS 38, and increasing stakeholder demand for transparency and sustainable corporate behaviour. An explanatory sequential mixed-methods research design is adopted. The quantitative phase is based on panel data of 160 UK non-financial listed companies observed between 2011 and 2023, yielding 2,075 firm-year observations. Financial and ESG data are obtained from the Refinitiv Eikon database. Panel regression models with firm-clustered robust standard errors, industry fixed effects, and year fixed effects are employed to examine the hypothesised relationships. To contextualise and interpret the quantitative findings, the qualitative phase consists of semi-structured interviews with five academic and professional experts in innovation accounting, corporate reporting, and ESG within the UK context, analysed using thematic analysis. The results indicate that R&D intensity and intangible asset intensity are positively associated with higher corporate cash holdings, reflecting precautionary motives arising from innovation-related uncertainty. Innovation investment is also linked to greater earnings management, highlighting the role of accounting discretion in intangible-intensive firms. In contrast, firms with stronger innovation investment and governance structures exhibit superior ESG performance, suggesting that innovation and sustainability can be complementary under appropriate institutional conditions. The qualitative findings reinforce these results by providing insights into managerial motivations, reporting discretion, and the UK regulatory environment. This study contributes by integrating innovation, financial policy, earnings quality, and ESG research within a unified framework and by demonstrating the value of an explanatory sequential mixed-methods approach. The findings offer practical implications for managers, investors, and policymakers concerned with innovation investment, financial transparency, and sustainable value creation.

Keywords: R&D intensity; intangible assets; cash holdings; earnings management; ESG performance; mixed-methods research; UK firms.

CHAPTER 1: INTRODUCTION

1.1 Research Background

The increasing dominance of intangible and knowledge-based resources is one of the most profound structural shifts in modern economies. Over the past three decades, firms have progressively redirected capital toward research and development (R&D), software, data analytics, human capital, and other intangible assets that drive future economic benefits despite lacking physical form (Barker et al., 2022; Gumbau-Albert, 2024). This transformation has challenged long-standing assumptions in financial reporting and corporate finance, as intangible investments differ fundamentally from tangible capital in terms of uncertainty, risk, verifiability, collateral value, and the quality of information they provide to capital markets. As the IFRS Foundation (IFRS Foundation, 2024) notes, current standards were not designed for an economy where a majority of corporate value arises from intangibles, raising questions about whether existing reporting frameworks adequately capture firms' innovation capacity, financial risk, and long-term sustainability orientation.

A core difficulty lies in the accounting representation of innovation-related expenditures, particularly under IAS 38 Intangible Assets, which governs the recognition, measurement, and disclosure of intangible resources. Unlike physical assets, many intangible investments, especially internally generated intellectual capital, cannot be recognised on the balance sheet unless stringent criteria are met (Lundh et al., 2023). This creates a structural gap between a firm's economic reality and its accounting portrayal (Barker et al., 2022). Such gaps are not trivial: they influence earnings quality, book values, leverage ratios, investment models, and the interpretation of profitability. Dechow, Sloan and Sweeney (1995) established that managerial discretion in accruals increases the potential for opportunistic earnings management, and later work has shown that intangible-rich firms, because of their valuation subjectivity, may face stronger incentives to engage in reporting manipulation to meet market expectations (Chang et al., 2025; Kothari et al., 2005).

R&D expenditures illustrate these tensions keenly. R&D is inherently uncertain, irreversible, and characterised by long, unpredictable payback periods. It produces knowledge assets that are economically valuable but difficult for outsiders to verify. Consequently, firms undertaking high levels of R&D often face greater information asymmetry and higher financing frictions, as

creditors and investors cannot easily assess the recoverability or collateral value of intangible outputs (Friede et al., 2015; Guo et al., 2025; J. Sun, 2025; Wang et al., 2024) ,At the same time. (Brown et al., 2008; Hall & Lerner, 2009). These features shape corporate financial policies such as cash holdings, since innovation-intensive firms may accumulate large liquidity buffers as a precautionary response to volatile cash flows and limited debt capacity (Duchin, 2010; Opler et al., 1999). Recent evidence demonstrates that intangible-intensive firms also hold more cash following macroeconomic or regulatory uncertainty shocks, underscoring the strategic role of liquidity in sustaining innovation activity (Kruglov & Shaw, 2024).

In parallel, R&D and intangible assets influence financial reporting behaviour, particularly with respect to earnings quality. The conditions stipulated by IAS 38 for capitalising development expenditures technical feasibility, future economic benefits, and reliable measurement are inherently subjective. Managers may strategically apply these criteria to smooth earnings volatility associated with R&D cycles, enhance valuation multiples, or avoid losses (Cazavan-Jeny & Jeanjean, 2006; Markarian et al., 2008). Extensive research shows that firms with higher intangible intensity tend to exhibit higher discretionary accruals due to the low verifiability and high subjectivity of intangible valuation inputs (Dechow et al., 1995; Filip et al., 2015; Kothari et al., 2005). These reporting dynamics raise concerns for stakeholders regarding reliability, comparability, and transparency.

Beyond financial reporting, innovation investments have increasing consequences for sustainability performance, often captured through Environmental, Social, and Governance (ESG) metrics. ESG has become a central dimension of firm legitimacy, capital market risk assessment, and regulatory compliance. Research demonstrates that ESG performance influences cost of capital, investor trust, corporate reputation, and long-term competitive resilience (Friede et al., 2015; Guo et al., 2025; J. Sun, 2025; Wang et al., 2024) At the same time, sustainability reporting interacts with financial reporting quality. Higher ESG commitment has been associated with lower earnings manipulation (Palas et al., 2025) and stronger governance mechanisms (Erben Yavuz et al., 2024), although emerging evidence warns that ESG disclosure may also mask opportunistic behaviour in certain contexts (Desai, 2025; Vatis et al., 2025).

Despite these advancements, the relationship between innovation investment and ESG outcomes remains theoretically ambiguous and empirically underexplored. Some scholars argue that innovation enhances environmental and social performance by producing cleaner technologies, reducing resource intensiveness, and strengthening stakeholder engagement (Flammer, 2021). Others suggest that R&D may compete with ESG initiatives for financial and managerial resources, generating sustainability trade-offs, especially in the short term (Saleh et al., 2025). Very few studies examine whether intangible assets, such as organisational culture, brand equity, and human capital, serve as foundational mechanisms that support sustainability performance. This gap is particularly salient under IFRS conditions, where intangible recognition is partial and may distort researchers' ability to infer organisational capabilities from accounting data.

The UK institutional environment provides a compelling context for examining these issues. UK-listed firms operate under a principles-based IFRS regime that grants considerable discretion in recognising and valuing R&D and intangible assets, making earnings management concerns especially relevant. At the same time, the UK has been a global leader in sustainability reporting reforms. The Financial Reporting Council (FRC), the UK Corporate Governance Code, and the national adoption of TCFD-aligned climate disclosures have intensified expectations for ESG transparency and accountability. The coexistence of flexible reporting under IAS 38 and increasingly stringent ESG disclosure requirements creates a unique empirical setting to examine how innovation interacts with both financial and sustainability dimensions of firm behaviour.

Accordingly, this thesis investigates how R&D intensity and intangible asset intensity influence cash holdings, earnings management practices, and ESG performance among UK-listed non-financial firms. By integrating financial economics, accounting theory, and sustainability research, the study aims to contribute to a more coherent understanding of how intangible-driven business models reshape corporate financial strategies and societal responsibilities in the knowledge economy. These developments have not only reshaped corporate value creation but have also intensified practical and regulatory challenges surrounding financial reporting, risk management, and sustainability disclosure. As firms increasingly rely on innovation-driven and

intangible-intensive business models, understanding how these investments affect corporate financial behaviour and ESG outcomes has become both an academic and a practical priority.

1.2 Research Motivation

The motivation for this study stems from the rapid structural transformation of modern economies, in which intangible investments, particularly R&D, software, data-driven processes, and human capital, have become the primary drivers of corporate value creation. In contrast to tangible assets, intangible resources are characterised by uncertainty, opacity, and limited verifiability, which create substantial challenges for financial reporting, corporate governance, and capital market assessment (Barker et al., 2022). As intangible intensity rises across industries, there is a growing concern that existing reporting frameworks, especially under IAS 38, may be ill-equipped to reflect the economic substance of innovation activity, thereby distorting earnings, book values, and financial ratios (IFRS Foundation, 2024). These tensions highlight the need for empirical research that clarifies how innovation-related investments interact with financial outcomes and reporting quality.

A further motivation arises from the implications of innovation for corporate financial strategy, particularly liquidity management. Firms that invest heavily in R&D often face heightened financing frictions due to the non-collateralisable nature of intangible outputs and uncertainty over future returns (Hall & Lerner, 2009). Precautionary liquidity theory suggests that such firms compensate by retaining larger cash buffers (Duchin, 2010; Opler et al., 1999), yet evidence on this relationship remains limited, especially outside U.S. settings. In the UK context where capital markets, governance mechanisms, and disclosure practices differ there is a strong rationale to investigate whether innovation intensity systematically influences firms' cash holding behaviour. Understanding these dynamics is particularly important as UK firms navigate post-pandemic uncertainty, inflationary pressures, and increased scrutiny of liquidity resilience (Kruglov & Shaw, 2024).

Innovation also has direct implications for earnings management behaviour, providing another motivation for this research. Because the capitalisation of development expenditure under IAS 38 requires managers to exercise significant judgement, R&D-intensive firms have greater discretion to smooth earnings, defer expenses, or strategically classify investments (Cazavan-Jeny & Jeanjean, 2006; Markarian et al., 2008). Similarly, intangible-rich firms face challenges

in valuing and impairing assets whose recoverable amounts cannot be easily verified, increasing the scope for discretionary accruals and opportunistic reporting (Filip et al., 2015; Kothari et al., 2005). While earnings quality has long been a concern in accounting research (P. M. Dechow et al., 1995). There remains a critical need to investigate how innovation intensity interacts with reporting discretion in contemporary intangible-driven business environments, particularly under the principles-based orientation of IFRS.

The growing prominence of ESG performance as a determinant of corporate legitimacy and capital allocation provides a third motivational pillar. Investors, regulators, and stakeholders increasingly rely on ESG metrics to assess long-term value, risk exposure, and societal impact (Friede et al., 2015). Yet the relationship between innovation and ESG is theoretically contested. Some scholars argue that innovation supports sustainability through technological upgrading and cleaner production processes (Flammer, 2021), while others posit that R&D competes for organisational resources, thereby weakening sustainability commitment unless explicitly green or mission-driven (Saleh et al., 2025). Similarly, intangible assets such as human capital, organisational culture, and brand reputation may enhance ESG performance by strengthening stakeholder relations and governance quality. These mixed theoretical predictions create a clear need for empirical evidence that disentangles how different forms of innovation influence sustainability outcomes in practice.

A final motivation derives from the unique characteristics of the UK institutional environment, which make it an especially compelling setting in which to investigate innovation-related financial and sustainability consequences. The UK operates under a principles-based IFRS regime that affords significant managerial discretion in applying IAS 38, while simultaneously enforcing strong governance expectations through the UK Corporate Governance Code and advanced sustainability disclosure frameworks such as TCFD. This duality of discretion and accountability provides an opportunity to examine how innovation, reporting incentives, and ESG pressures interact in ways not fully observable in more rules-based environments such as U.S. GAAP. As policymakers and standard setters in the UK and globally debate the adequacy of intangible asset reporting, climate disclosures, and governance reforms, rigorous empirical evidence from the UK context is urgently needed to inform these discussions. The study is motivated by a combination of theoretical uncertainty, empirical gaps, regulatory relevance, and

practical importance. It seeks to clarify how R&D and intangible asset intensity shape corporate liquidity behaviour, earnings management practices, and ESG performance under IFRS, thereby contributing timely and policy-relevant insights to debates surrounding innovation reporting, financial transparency, and sustainability accountability in the knowledge-based economy. Despite the growing relevance of these issues, existing academic research has yet to provide a unified explanation of how innovation-related investments simultaneously influence firms' liquidity policies, reporting behaviour, and sustainability performance.

1.3 Problem Statement and Research Questions

Building on the conceptual foundations, empirical gaps, and contextual motivations outlined in the preceding sections, the present study is structured around a set of interrelated research questions designed to capture the financial and sustainability consequences of innovation-related investments in UK-listed firms. These questions arise from well-documented tensions in the accounting, finance, and sustainability literature regarding the economic substance and reporting treatment of R&D and intangible assets, as well as mounting interest in how such investments influence liquidity strategy, earnings quality, and ESG engagement. Existing evidence remains fragmented, often US-centric, and rarely integrated across multiple dimensions of corporate behaviour. Moreover, the UK's principles-based IFRS environment, strong governance codes, and advanced sustainability disclosure requirements create a distinctive institutional setting in which these relationships may differ meaningfully from those observed elsewhere.

Against this backdrop, the overarching research question guiding this thesis is as follows:

How do R&D and intangible investments influence corporate financial strategies and sustainability outcomes, specifically in terms of cash holdings, earnings management, and ESG performance?

This question reflects the need for a holistic examination of innovation-related investments that moves beyond single-outcome models and recognises the interconnected nature of corporate financial and non-financial behaviour.

To operationalise this aim and address distinct but complementary gaps in the literature, the main research question is partitioned into six focused sub-questions. These sub-questions

explore how each innovation construct R&D intensity and intangible asset intensity relates to each of the three outcome variables examined in the empirical analysis. The first three sub-questions concern R&D intensity, a form of innovation investment that is uncertain, irreversible, and non-collateralisable, and that under IAS 38 requires substantial managerial judgement in distinguishing between R&D phases. These characteristics give rise to important theoretical uncertainties regarding its effects on liquidity behaviour, reporting incentives, and sustainability alignment. The second group of sub-questions centres on intangible asset intensity, which reflects recognised intangible resources embedded within organisational processes, culture, and governance structures. Intangible assets differ from R&D not only in their accounting treatment but also in their maturity, verifiability, and strategic role within the firm, suggesting distinct behavioural implications.

Together, the six sub-questions provide a structured framework for empirically assessing the multi-dimensional consequences of innovation-related investment under IFRS, while enabling comparison between two innovation constructs often conflated in prior scholarship. By addressing these questions within the UK institutional context, the study aims to contribute meaningful insights into how firms strategically navigate innovation, reporting discretion, liquidity management, and sustainability expectations in an era where intangible capital plays an increasingly central role in corporate value creation.

The sub-questions examined in this thesis are:

- How does R&D investment relate to corporate cash holdings?
- What is the relationship between R&D investment and earnings management practices?
- How does R&D investment affect ESG performance?
- What is the impact of intangible asset investment on corporate cash holdings?
- How does intangible investment influence earnings management?
- Is there a relationship between intangible investment and ESG performance?

These questions serve as the empirical foundation of the study and guide the methodological design, variable specification, model selection, and qualitative inquiry presented in subsequent

chapters. Collectively, they allow for a nuanced exploration of how innovation operationalised through R&D and intangible asset intensity shapes the financial architecture and sustainability orientation of UK-listed firms.

1.4 Research Objectives and Importance

The overarching aim of this study is to deepen empirical and theoretical understanding of how innovation-related investments, specifically R&D intensity and intangible asset intensity shape corporate financial strategies and sustainability outcomes in the UK. Although intangible assets now account for an increasingly large share of firm value in developed economies, their implications for financial behaviour and non-financial performance remain insufficiently understood, particularly under IFRS, where recognition rules restrict the visibility of many internally generated assets (Barker et al., 2022; IFRS Foundation, 2024). This study is therefore motivated by the need to clarify how firms' innovation strategies interact with cash management practices, financial reporting discretion, and ESG performance, all of which constitute critical dimensions of corporate behaviour and stakeholder accountability.

The first research objective is to examine how R&D investment influences firms' liquidity behaviour, focusing on cash holdings as a key financial policy instrument. The precautionary motive framework predicts that firms facing high uncertainty or financing constraints accumulate larger cash reserves (Duchin, 2010; Opler et al., 1999). R&D investments amplify these frictions because they generate long-horizon, uncertain, and non-collateralisable outcomes (Hall & Lerner, 2009). Nevertheless, the empirical evidence on this relationship remains fragmented, and limited studies examine it in a UK setting where bank-based financing, governance structures, and IFRS reporting rules differ considerably from the U.S. context. Addressing this gap provides new insight into how innovation shapes liquidity strategies under a principles-based regulatory regime.

The second objective is to evaluate whether R&D intensity and intangible asset intensity are associated with earnings management practices. Extensive research shows that managerial discretion over accruals increases opportunities for earnings manipulation (Dechow et al., 1995; Kothari et al., 2005), and intangible-intensive firms often face higher information asymmetry due to the complexity of valuing non-physical assets. Under IAS 38, managers must exercise judgement when distinguishing between R&D phases, assessing technical feasibility, estimating

future benefits, and determining useful lives, all of which create conditions for strategic reporting (Cazavan-Jeny & Jeanjean, 2006; Markarian et al., 2008). This objective is therefore crucial for understanding how innovation intersects with reporting integrity, particularly in a UK environment where enforcement is strong but flexibility remains central to the standard-setting philosophy.

The third objective is to investigate whether R&D and intangible investments influence ESG performance, an increasingly important measure of corporate legitimacy, risk management, and stakeholder engagement (Friede et al., 2015). While some theories suggest that innovation fosters sustainability by enabling cleaner technologies and long-term value creation (Flammer, 2021), others posit that R&D may compete for organisational resources, thereby limiting firms' ability to invest in ESG initiatives (Saleh et al., 2025). Similarly, intangible assets such as human capital, organisational culture, and brand equity may strengthen ESG outcomes due to their alignment with reputational and governance capabilities. This objective responds to the lack of integrated evidence linking innovation to sustainability performance, particularly in contexts with mandated climate disclosures such as the UK.

Collectively, these research objectives are important for advancing both theoretical and practical understanding. From a scholarly perspective, the study clarifies how innovation-related investments operate through distinct mechanisms across cash holdings, earnings management, and ESG performance, thereby resolving ambiguities in previous literature that often treat R&D and intangible assets as interchangeable proxies. Practically, the results are highly relevant for managers seeking to balance innovation with reporting transparency and sustainability commitments; for investors evaluating intangible-rich business models; and for regulators considering reforms to IAS 38, climate disclosures, and corporate governance codes. By focusing on UK-listed non-financial firms, the research offers timely and context-specific insights into how innovation-intensive strategies shape organisational behaviour within a jurisdiction that combines strong investor protection, rigorous governance expectations, and evolving sustainability reporting mandates.

1.5 Research Hypotheses

Building on the theoretical foundations, empirical gaps, and research questions outlined above, this thesis develops six hypotheses that reflect the expected relationships between innovation-

related investments and corporate outcomes in the UK context. These hypotheses derive from established theories in corporate finance, financial reporting, and sustainability research, and are informed by the unique characteristics of R&D and intangible assets under IAS 38. Because R&D investments are highly uncertain, non-collateralisable, and subject to expensing in their early stages, they are expected to influence liquidity behaviour, earnings reporting practices, and sustainability performance differently from recognised intangible assets, which are more mature, strategically embedded, and often aligned with reputational or governance-oriented objectives.

Precautionary motive theory predicts that firms facing high uncertainty or financing frictions accumulate larger cash balances to protect against adverse shocks. R&D-intensive firms, which depend on internal liquidity to sustain innovation cycles, are therefore expected to hold more cash. Conversely, firms with high intangible asset intensity also face external financing constraints because intangible assets offer limited collateral value, suggesting a similar positive relationship with cash holdings.

Agency theory and information asymmetry suggest that both R&D and intangible investments increase managerial discretion in financial reporting. R&D classification under IAS 38 allows managers to influence earnings by capitalising development expenditure, while intangible asset valuation involves subjective estimation of useful lives, impairment testing, and recoverable amounts, all of which facilitate accrual-based earnings management.

Sustainability theories, including the resource-based view (RBV) and legitimacy theory, imply that intangible assets particularly human capital, organisational culture, and brand equity, may strengthen ESG performance due to their alignment with stakeholder expectations and governance structures. However, the sustainability effects of R&D investment remain theoretically ambiguous: while innovation may generate long-term environmental and social benefits, R&D expenditures may also compete with ESG commitments for managerial attention and financial resources, particularly when not explicitly “green” or sustainability oriented.

Based on these theoretical arguments, the following hypotheses are developed:

- H1: There is a relationship between R&D investment and cash holding.

Firms with higher R&D intensity are expected to retain more cash due to heightened uncertainty, irreversible investment cycles, and limited access to external financing.

- H2: There is a relationship between R&D investment and earnings management.

Because R&D expenditures create volatility and allow discretion in classifying development costs under IAS 38, firms with higher R&D intensity are expected to engage more frequently in accrual-based earnings manipulation.

- H3: There is a relationship between R&D investment and ESG performance.

Given resource competition and short-term financial pressures, firms with higher R&D investment may allocate fewer resources to sustainability initiatives unless R&D is explicitly sustainability-oriented.

- H4: There is a relationship between intangible investment and cash holding.

Due to the low collateral value of intangible assets and the financing frictions they create, firms with higher intangible asset intensity are expected to maintain larger internal liquidity buffers.

- H5: There is a relationship between intangible investment and earnings management.

Because the valuation and impairment testing of intangible assets involve substantial subjective judgment, firms with higher intangible intensity are expected to exhibit higher levels of discretionary accruals.

- H6: There is a relationship between intangible investment and ESG performance.

Intangible assets, especially those associated with human capital, organisational culture, and brand reputation, are expected to enhance a firm's ESG performance due to their alignment with stakeholder expectations and governance structures.

These hypotheses serve as the analytical foundation for the empirical models developed in Chapter 3 and tested in Chapter 4. They also reflect the central proposition of this thesis: R&D investment and intangible asset investment, although related, are distinct innovation constructs that produce materially different financial and sustainability consequences in UK-listed firms. By empirically testing these hypotheses, the study is positioned to generate meaningful theoretical, methodological, and practical contributions.

1.6 Research Contribution

This study makes several significant contributions to the literature on corporate finance, financial reporting, and sustainability. Its primary contribution lies in offering a comprehensive and comparative examination of R&D intensity and intangible asset intensity two innovation-related constructs that are frequently conflated in prior research but differ markedly in their economic characteristics, reporting treatment, and organisational implications. Whereas much of the existing literature treats R&D and intangible assets as interchangeable measures of innovation or firm intangibility, this thesis demonstrates that they operate through distinct theoretical mechanisms and yield markedly different outcomes across cash holdings, earnings management, and ESG performance.

A major theoretical contribution is the articulation and empirical validation of the proposition that R&D investments and intangible assets produce non-equivalent consequences for firms' financial and sustainability behaviours. Prior research has separately documented that R&D is uncertain, irreversible, and sensitive to financing constraints, while intangible assets require subjective valuation and are embedded within organisational processes. However, few studies have systematically compared their multidimensional effects on liquidity, reporting discretion, and ESG outcomes within a unified framework. By disentangling these constructs and examining them side-by-side, this thesis advances theoretical clarity in the understanding of innovation-related resources and demonstrates the importance of distinguishing between *innovation activity* (R&D) and *recognised innovation capability* (intangibles). This distinction resolves conceptual ambiguity in the literature and deepens theoretical models grounded in the precautionary motive, agency theory, information asymmetry, and the resource-based view.

Empirically, the thesis contributes new evidence by integrating three major outcome variables—cash holdings, earnings management, and ESG performance—within a single analytical model. Prior research has tended to examine these outcomes separately, resulting in fragmented insights into how innovation influences corporate behaviour. This study provides the first UK-based evidence showing that R&D increases liquidity buffers and reporting discretion while reducing ESG performance, whereas intangible assets simultaneously increase cash holdings and earnings manipulation but strengthen ESG outcomes. These findings reveal a nuanced pattern of effects that challenges simplistic assumptions about innovation being uniformly beneficial

for sustainability, and instead position intangible-based organisational capabilities as a key driver of ESG engagement.

Methodologically, the study contributes to mixed-methods research in accounting and finance by combining panel-data econometric analysis with qualitative expert interviews, following an explanatory sequential design. While quantitative models identify statistically significant relationships, the qualitative component clarifies the underlying mechanisms—such as managerial discretion under IAS 38, the internal governance of innovation activities, and the operational tensions between R&D and sustainability commitments. This triangulated approach enhances interpretation, mitigates common-method concerns, and provides a richer, context-sensitive explanation of empirical regularities. Mixed-methods designs remain rare in research on intangibles and financial reporting, making this integration a meaningful methodological advancement.

The study also offers an important contextual contribution by focusing on UK-listed firms operating under IFRS, a jurisdiction characterised by principles-based standards, robust governance expectations, and early adoption of climate and sustainability reporting initiatives such as TCFD. The UK context provides fertile ground for examining how managerial discretion interacts with innovation-related uncertainty and how evolving ESG disclosure requirements influence corporate strategy. The findings highlight how institutional features such as reporting flexibility under IAS 38, the UK Corporate Governance Code, and heightened stakeholder scrutiny shape the behavioural consequences of innovation investment. This adds valuable international evidence to a research field dominated by U.S.-centric studies and provides policymakers with insights relevant to ongoing debates about reforming intangible asset reporting and sustainability disclosure requirements.

Finally, the study offers practical contributions for corporate managers, investors, and regulators by clarifying the financial and sustainability trade-offs associated with R&D and intangible investments. By demonstrating that not all forms of innovation yield comparable sustainability benefits or risks, the research equips practitioners with a more discriminating understanding of how innovation strategies influence liquidity planning, reporting quality, and ESG alignment. This has implications for capital allocation, internal governance, and external communication, especially as intangible-driven business models become more central to firm competitiveness.

Overall, this thesis contributes a multi-dimensional, theoretically grounded, and empirically rigorous account of how innovation-related investments shape financial strategy, reporting discretion, and sustainability performance in the UK. Its combination of conceptual differentiation, integrative outcome analysis, mixed-methods design, and institutional focus positions it as a meaningful addition to the literature on corporate behaviour in the knowledge-based economy. The nature and significance of these contributions are foreshadowed by the study's key empirical findings, which are briefly summarised below.

1.7 Key Findings

The empirical analysis conducted in this thesis reveals several important and interconnected findings regarding the financial and sustainability consequences of R&D and intangible investments in UK-listed firms. First, the study demonstrates that R&D intensity consistently increases firms' cash holdings, reflecting the high uncertainty, irreversibility, and financing frictions associated with innovation activities. R&D-active firms appear to adopt more conservative liquidity strategies, consistent with precautionary motive theory and prior evidence that intangible-rich firms face limited access to collateral-backed debt financing. This finding reinforces the view that innovation strategy and liquidity management are tightly interlinked components of corporate financial policy.

Second, the results indicate that both R&D intensity and intangible asset intensity are positively associated with earnings management, though the underlying mechanisms differ. R&D investment contributes to earnings manipulation primarily through classification discretion under IAS 38 and the volatility it introduces into earnings streams. Intangible asset intensity, in contrast, facilitates earnings management through valuation subjectivity, impairment discretion, and unverifiable estimation inputs. This divergence underscores a central theme of the thesis: that innovation-related constructs exhibit distinct behavioural and reporting consequences, challenging the widespread practice of treating R&D and intangible assets as interchangeable indicators of innovation.

Third, the thesis establishes a negative relationship between R&D intensity and ESG performance, suggesting that general innovation expenditure does not automatically support sustainability objectives. Rather, R&D may compete with ESG initiatives for organisational resources and managerial attention unless the innovation is explicitly targeted toward

environmental or social goals. This finding offers a counterpoint to claims in the sustainability literature that innovation uniformly enhances ESG performance and underscores the importance of strategic alignment between innovation portfolios and sustainability commitments.

Finally, the study finds that intangible asset intensity is positively associated with ESG performance, reflecting the role of organisational capabilities such as human capital, governance quality, and reputational assets in shaping sustainability engagement. Intangible-rich firms appear better equipped to respond to stakeholder expectations and regulatory pressures, suggesting that intangible assets function as foundational enablers of ESG performance rather than mere complementary attributes.

Collectively, these findings reveal that R&D and intangible investments exert asymmetric and non-substitutable effects across key dimensions of corporate behaviour. R&D heightens financial risk, increases reporting discretion, and weakens sustainability alignment, whereas intangible assets enhance sustainability engagement while still raising concerns about reporting transparency. These patterns contribute to a more nuanced understanding of innovation in the UK context and highlight the need for differentiated theoretical, regulatory, and managerial approaches when assessing the consequences of intangible-driven business models. To develop these findings systematically and transparently, the remainder of the thesis is structured as follows.

1.8 Structure of the Thesis

The remainder of this thesis is organised into four substantive chapters represents in **Figure 1**, each of which builds systematically toward addressing the research questions and testing the hypotheses outlined above.

- Chapter 2 presents a comprehensive review of the theoretical and empirical literature relevant to the study. It critically examines the foundations of intangible and innovation-related investments, drawing on theories of liquidity management, earnings quality, information asymmetry, and sustainability performance. The chapter also highlights gaps in existing research, particularly regarding the distinct behavioural consequences of R&D and intangible assets under IFRS, thereby establishing the conceptual framework and justification for the empirical analysis.

- Chapter 3 outlines the research methodology and explains the rationale for adopting a mixed-methods design. The chapter details the quantitative component, including data sources, variable construction, model specifications, and econometric procedures and the qualitative component, which comprises semi-structured expert interviews aimed at contextualising and interpreting the quantitative findings. Emphasis is placed on methodological coherence, integration, and the suitability of the UK institutional environment for examining the research objectives.
- Chapter 4 presents the empirical findings of the study. It begins with descriptive statistics and correlation patterns before reporting the fixed-effects panel regression results for the two innovation constructs across the three dependent variables: cash holdings, earnings management, and ESG performance. The chapter then incorporates the thematic insights from the qualitative interviews to provide interpretive depth and explain the mechanisms underlying the statistical relationships. A comprehensive discussion synthesises the quantitative and qualitative evidence in light of existing theory and prior research.
- Chapter 5 concludes the thesis by summarising the main empirical insights, articulating the study's scientific contributions, and discussing theoretical, managerial, and policy implications. It also outlines key limitations of the research and identifies several promising avenues for future inquiry. The chapter situates the findings within broader debates concerning intangible asset reporting, innovation financing, and sustainability disclosure, thereby highlighting the relevance and originality of the study within the UK context and beyond.

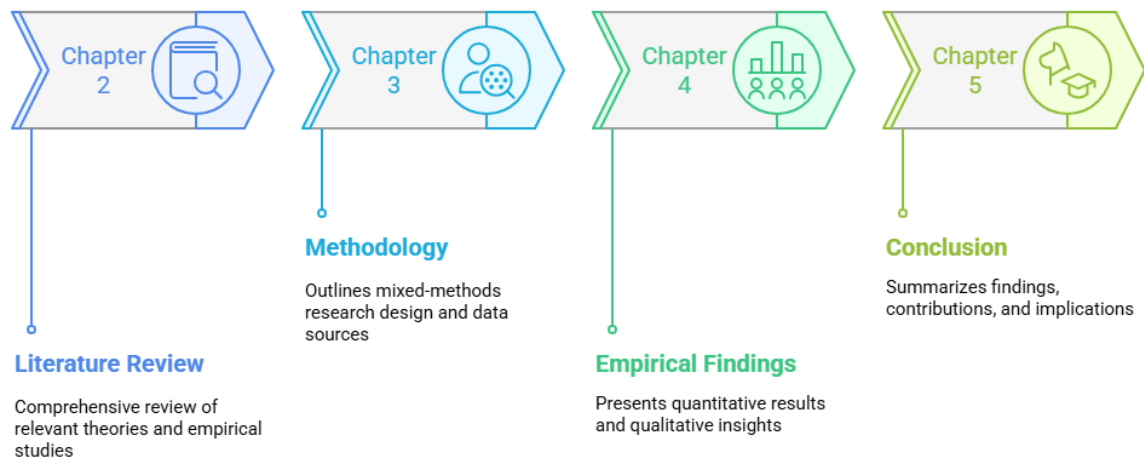


Figure 1. Thesis Structure

Source: Researcher's construction

Together, these chapters provide a coherent and rigorous examination of the financial and sustainability consequences of R&D and intangible investments, contributing to a deeper understanding of how innovation shapes corporate behaviour in the contemporary knowledge-based economy.

CHAPTER 2: LITERATURE REVIEW

This chapter provides a comprehensive and critical review of the theoretical and empirical literature underpinning the study. It examines the key constructs of R&D and intangible investments and their relationships with both financial outcomes (cash holdings and earnings management) and non-financial outcomes (ESG performance). Unlike much of the existing literature, which tends to examine these relationships in isolation, this chapter adopts an integrative perspective by positioning R&D and intangible assets as distinct yet interrelated dimensions of corporate innovation. It critically synthesises prior evidence, highlights inconsistencies and contextual limitations, and identifies key gaps in the literature. In doing so, it establishes the conceptual and theoretical foundations for the hypotheses developed later in this chapter.

2.1 Conceptualising R&D and Intangible Investments

It is essential to clearly define and distinguish between R&D and intangible assets, which represent two complementary yet fundamentally different dimensions of corporate innovation. While these constructs are often treated interchangeably in prior research, this study argues that they capture different stages of the innovation process and therefore have distinct economic and behavioural implications. While prior research has made significant progress in examining R&D and intangible assets, important conceptual and measurement challenges remain.

2.1.1 Defining R&D and Intangible Assets

In contemporary accounting and finance research, R&D and intangible assets represent two interrelated yet analytically distinct constructs. R&D captures the flow of innovative effort, expenditures that firms incur to create or improve products, processes, or technologies whereas intangible assets reflect the stock of non-physical resources that generate future economic benefits, including patents, software, brands, data, and organisational knowledge (Corrado et al., 2022; Peters & Taylor, 2017). Economically, R&D investment constitutes the main channel through which new knowledge enters the production system, while accumulated intangibles embody that knowledge once commercialised and codified (Purnamawati et al., 2022; Volkov & Garanina, 2007). Conceptually, therefore, R&D and intangible assets are the building blocks

of the knowledge-based economy and the foundations of long-term competitive advantage (Bagna et al., 2024; Harris, 2001).

In practice, however, these constructs overlap imperfectly. R&D expenditures often fail to yield identifiable intangible assets, and many intangibles arise outside the R&D boundary for example, through branding, design, training, or software development (Baruch Lev, Feng Gu, 2016; Dinh & Schultze, 2022). Moreover, while tangible assets depreciate through physical wear, intangible assets are subject to obsolescence and technological disruption, making their valuation more uncertain and their recognition more discretionary (Dardani et al., 2024; Elkemali, 2024). This inherent ambiguity has long complicated the task of standard-setters and analysts seeking to measure firms' true innovative capacity (Canibano et al., 2000; Hussinki et al., 2025). However, prior research often treats R&D and intangible assets interchangeably, which may obscure their distinct economic and behavioural roles.

2.1.2 Recognition and Measurement under IFRS

Under International Financial Reporting Standards (IFRS), accounting for R&D and intangibles is governed primarily by IAS 38 Intangible Assets, and IAS 36 Impairment of Assets. IAS 38 distinguishes between the research phase where costs must be expensed immediately and the development phase, whose costs may be capitalised if technical feasibility, future economic benefit, and reliable measurement can be demonstrated (Ma & Zhang, 2023; Mazzi et al., 2022). As a result, internally generated intangibles such as customer loyalty, brand reputation, or organisational know-how are typically omitted from balance sheets, while acquired intangibles are recognised at fair value in business combinations. The asymmetric treatment of internally generated and purchased intangibles produces systematic under-statement of asset values for innovative firms and introduces cross-firm incomparability (Cazavan-Jeny & Jeanjean, 2006; Markarian et al., 2008).

IAS 36 requires entities to perform annual impairment testing of capitalised intangibles with indefinite lives, yet empirical studies reveal that the accounting measurement of intangibles remains an arena where estimation uncertainty, earnings management and information asymmetry converge ((Hussinki et al., 2025; Teixeira & Oliveira, 2025). These differences often reflect managerial discretion and macro-economic conditions rather than genuine changes in asset value (Bilal, 2022; Elkemali, 2024).

Recent reforms introduced since 2023 in global reporting standards illustrate a growing concern with this opacity. The International Sustainability Standards Board (ISSB) has issued IFRS S1 and S2, which integrate sustainability-related disclosures with financial reporting. Although these standards do not directly alter recognition rules, they expand the required narrative around intangible-driven risks and opportunities, such as innovation capability, human capital, and data governance (Fianko et al., 2025; IFRS Foundation, 2023). This movement underscores the recognition that intangible resources and their governance are central to both enterprise value and sustainable performance. However, existing studies have not sufficiently examined how this accounting subjectivity interacts with ESG reporting and sustainability performance.

2.1.3 Economic Significance and Global Trends

Empirical evidence demonstrates the macroeconomic weight of intangible investment. Estimates by Corrado et al. (2022) indicate that intangible capital accounts for more than half of business investment in the United Kingdom and United States. The increasing dominance of software, data analytics, and design has redefined competitive advantage: firms with superior intangible capabilities exhibit higher productivity growth and market valuation multiples (Falato et al., 2022; Towse, 2020). Cross-country studies further reveal that intangible intensity correlates with innovation output, export sophistication, and resilience to shocks, particularly during crises such as COVID-19 (Uddin et al., 2022; Uribe, 2025),

At the micro level, research links R&D and intangible assets to diverse financial outcomes. Firms that consistently invest in R&D show higher future profitability and market-to-book ratios, but also higher earnings volatility and cash-flow uncertainty (Bates et al., 2009; Brown & Petersen, 2011). The valuation literature reports that capitalised R&D and recognised intangibles are value-relevant, yet investors apply significant discounts to intangibles relative to tangibles because of their measurement risk (Oliveira et al., 2010; Saharti, 2025; Yoo et al., 2019). These findings motivate continued inquiry into how intangible intensity influences liquidity management, earnings properties, and disclosure quality. However, the literature provides mixed evidence regarding the financial consequences of innovation investment, suggesting that its impact may depend on firm-specific and institutional factors.

2.1.4 Information Asymmetry and Valuation Challenges

Intangible-intensive firms face heightened information asymmetry because many of their critical assets such as algorithms, data sets, or organisational culture, are proprietary and non-observable (Khallaf & Kannan, 2024; C. Li & Ning, 2024). This opacity complicates external valuation and credit assessment, potentially leading to financing constraints and a greater reliance on internal funds (Falato et al., 2022; Opler et al., 1999). Moreover, the expensing of internally generated intangibles depresses accounting earnings in innovation-intensive periods, creating temporary misalignments between accounting and economic performance (Barth et al., 2023; Rajgopal et al., 2025). Analysts and investors respond by using alternative information channels such as patent data, R&D intensity, or ESG disclosures to infer innovation value, yet these proxies vary in reliability (Barth & Gee, 2024; Glaeser & Lang, 2023). The coexistence of high informational value and low accounting visibility is thus a defining paradox of the intangible era.

The measurement challenge extends to sustainability reporting. As firms disclose more ESG information, questions arise regarding the credibility and assurance of such data. Studies find that companies with extensive intangible assets, especially reputational and human-capital components, are more likely to obtain external ESG assurance and to integrate sustainability reporting with financial statements (Lanzalonga et al., 2024). This convergence implies that intangible governance is integral to both financial transparency and sustainability accountability. This suggests that the valuation of intangible assets remains inherently uncertain, highlighting the need for more integrated approaches that combine financial and non-financial information.

2.2 R&D, Intangibles and Cash Holding

Liquidity management is one of the most established topics in corporate-finance and accounting research. Within this literature, cash holdings represent the most flexible yet debated component of working capital, simultaneously reflecting precautionary motives, transaction needs, and agency considerations. The classic trade-off view maintains that optimal cash balances balance the benefits of liquidity that reduce transaction costs and protection against underinvestment, against the opportunity costs of holding idle funds (Miller & Orr, 1966; Pigou, 1936). However, in the modern intangible-intensive economy, this calculus changes dramatically. Firms

increasingly derive value from assets that are non-collateralizable, highly uncertain, and opaque to outsiders, such as proprietary software, data, and R&D pipelines. These features elevate financing frictions and amplify reliance on internal liquidity buffers. Consequently, recent scholarship identifies R&D intensity and intangible-asset intensity as key structural determinants of corporate cash policy (Bates et al., 2009; Falato et al., 2022; Magerakis et al., 2022). However, existing studies provide mixed evidence depending on institutional settings and firm characteristics, suggesting that the relationship between innovation investment and cash holdings is not uniform.

2.2.1 Determinants of Corporate Cash Holdings

The foundational study of Opler et al. (1999) established that cash holdings increase with growth opportunities, R&D expenditures, and cash-flow volatility, which are factors that constrain firms' ability to raise external funds quickly. Subsequent research under the precautionary-motive framework has shown that firms hoard liquidity to mitigate financial constraints and exploit investment opportunities when capital markets tighten (Almeida et al., 2004; Myers & Majluf, 1984). In the post-2000 period, aggregate cash ratios rose sharply across advanced economies, a trend linked to the structural rise of intangible capital and declining collateral values of tangible assets (Bates et al., 2009; Falato et al., 2022). These dynamics suggest that intangible intensity reshapes optimal liquidity behaviour at both the firm and the economy levels.

In addition to precautionary motives, the transaction-cost and tax motives remain relevant but secondary for innovation-driven firms. Transaction-cost motives relate to the cost of converting non-cash assets into means of payment, while tax motives stem from repatriation costs of foreign earnings (Pinkowitz et al., 2013). Because intangible assets are typically concentrated in high-tech and multinational corporations, both motives interact with global supply chains and intellectual-property regimes, making cross-country evidence heterogeneous (Brahmana et al., 2023; Zeng & Chan, 2023). Nonetheless, the dominant empirical pattern is that cash holdings rise with intangible intensity, even after controlling for firm size, leverage, and profitability (He & Wintoki, 2016; Magerakis et al., 2022). Nevertheless, much of this evidence is derived from aggregate or US-based data, which may limit its applicability to IFRS-based environments such as the UK.

2.2.2 R&D Intensity and Precautionary Liquidity

R&D investments exhibit high adjustment costs and uncertain pay-offs. Interrupting ongoing projects can destroy accumulated knowledge capital and disrupt learning effects, producing nonlinear losses. Accordingly, innovation-intensive firms accumulate precautionary cash to ensure continuity of R&D activities during external funding shortfalls (Brown & Petersen, 2011; Chung, 2017). Studies across the United States, Japan, and Europe consistently report a positive association between R&D intensity and cash-to-assets ratios (He & Wintoki, 2016; Kim & Park, 2012). The relationship tends to strengthen in financially constrained firms and during economic downturns, confirming that liquidity buffers substitute for limited debt capacity (Al-Najjar & Sarhan, 2024; Lins et al., 2017).

Recent evidence refines this view by incorporating macro-financial uncertainty and innovation regimes. Falato et al. (2022) document that rising intangible capital explains roughly one-third of the secular increase in U.S. corporate savings since the 1980s. Magerakis et al. (2022) show that the post-crisis period (2008–2018) amplified R&D-driven cash accumulation, especially among high-technology and service firms. Similarly, Li et al. (2023) report that firms with greater exposure to digital transformation maintain larger liquidity buffers to hedge against technological obsolescence. While the dominant empirical evidence supports a positive association between R&D intensity and corporate liquidity, the strength and direction of this relationship are contingent on firm-specific characteristics, financial constraints, and institutional settings. However, prior research rarely integrates this relationship with sustainability considerations, leaving the broader strategic implications of innovation-driven liquidity underexplored.

2.2.3 Intangible Asset Intensity and Liquidity Policy

While R&D captures innovation flows, intangible-asset intensity represents the stock of accumulated intellectual capital. Its relationship with cash holdings is multifaceted. On one hand, intangible assets reduce borrowing capacity, prompting firms to rely more on internal cash. On the other hand, firms rich in scalable intangibles may generate more stable cash flows through network effects and platform economies, partially offsetting precautionary needs (Baruch Lev, Feng Gu, 2016; Peters & Taylor, 2017). Empirical findings generally support the first mechanism: firms with higher intangible-to-total-asset ratios hold more cash, particularly

where collateral constraints bind (Caggese & Pérez-Orive, 2022; Döttling, 2020; Falato et al., 2022).

Cross-country evidence reinforces this association. Using European data, (Bagna et al., 2021), and Nguyen & Nguyen, (2025) find that intangible intensity significantly predicts cash reserves even after controlling for profitability and risk. In the UK, Al-Najjar & Sarhan, (2024) show that companies committed to strong governance and anti-corruption practices exhibit a positive but moderated relationship between cash and intangibles, suggesting that institutional quality conditions liquidity outcomes. These findings underscore the context-specific nature of cash policy under IFRS and the UK's governance framework. This suggests that the effect of intangible assets on liquidity is not straightforward and may vary depending on governance structures and institutional context.

2.2.4 Corporate Governance, Agency Issues and Monitoring

Beyond financing frictions, agency theory provides an additional perspective on liquidity policy. Holding excess cash can create potential for managerial opportunism, such as empire building or inefficient investments (Bhuiyan & Hooks, 2019; Jensen & Meckling, 1976). The agency-cost view posits that stronger governance mechanisms mitigate such inefficiencies by disciplining managers' cash retention behaviour (Dittmar & Mahrt-Smith, 2007). Empirical studies indicate that the governance–cash sensitivity interacts with innovation intensity: well-governed R&D-intensive firms maintain precautionary cash for strategic flexibility, whereas poorly governed counterparts hoard liquidity without a clear investment purpose (Atif et al., 2021; Wahal & Yavuz, 2013). Audit quality and board independence, both prominent under the UK Corporate Governance Code, thus serve as moderating factors aligning liquidity policy with shareholder interests (García-Sánchez et al., 2022). However, limited research has examined how governance mechanisms interact simultaneously with innovation intensity and sustainability objectives in shaping corporate liquidity policy.

2.2.5 Macroeconomic Uncertainty and ESG Interaction

Emerging evidence links corporate liquidity not only to financial constraints but also to sustainability orientation. ESG-oriented firms often exhibit higher cash ratios, interpreting liquidity as an instrument of resilience against environmental and social shocks (Arouri & Pijourlet, 2017; Bai et al., 2025). Conversely, some studies suggest that strong ESG governance

enables firms to deploy cash more efficiently, thereby reducing idle balances (X. Sun & Xiong, 2025). The dual role of ESG, which enhances prudence while promoting efficiency, mirrors the broader trade-offs of sustainability integration. Intangible capital, particularly reputational and relational assets, underpins this dynamic by affecting stakeholder trust and financing flexibility (Lanzalonga et al., 2024; Pham et al., 2024). In the UK context, where sustainability reporting has been progressively mandated and ESG assurance practices are widespread, these interactions are likely to be more visible. The integration of climate and sustainability risks into liquidity planning through scenario analysis, stress testing, and risk disclosure, extends the relevance of cash holdings beyond pure financial hedging to strategic and reputational risk management (IFRS Foundation, 2023). Despite these insights, the literature remains inconclusive regarding how ESG considerations and intangible intensity jointly influence liquidity decisions, indicating a need for more integrated analysis.

2.3 R&D, Intangibles and Earnings Management

Earnings management has been a central research concern in accounting for more than three decades, reflecting the persistent tension between financial reporting flexibility and faithful representation of performance. It is generally defined as the deliberate use of accounting discretion to influence reported earnings toward desired outcomes without necessarily altering the firm's underlying cash flows (Dechow et al., 2010; Healy & Wahlen, 1998). Under the principles-based framework of IFRS, managers enjoy considerable judgement in the timing and classification of revenues, expenses, and asset recognition, which can be used either to improve information quality or to distort it for opportunistic reasons. However, the existing literature provides mixed evidence regarding whether such discretion enhances reporting quality or facilitates opportunistic behaviour.

Within this context, R&D investment and intangible-asset accounting have emerged as particularly sensitive areas for earnings management. The inherent uncertainty of innovation projects and the discretion embedded in IAS 38 (Intangible Assets) and IAS 36 (Impairment of Assets) provide opportunities to manipulate accruals, capitalisation choices, and impairment timing (Cazavan-Jeny & Jeanjean, 2006; Markarian et al., 2008). Consequently, a large body of empirical research investigates how R&D intensity and intangible capital affect the quality, persistence, and informativeness of reported earnings (Barth et al., 2023; Bilal, 2022).

Nevertheless, prior research often examines these mechanisms in isolation, without integrating their implications within broader financial and sustainability contexts.

2.3.1 Conceptual Link between R&D, Intangibles and Earnings Management

2.3.1.1 Accrual discretion under IFRS

IAS 38 distinguishes between research costs, which must be expensed, and development costs, which can be capitalised when feasibility and future benefit are demonstrable. This rule grants managers latitude in assessing technical success probabilities and commercial potential. Firms can thereby adjust current earnings by deciding whether to expense or capitalise borderline expenditures (Aboody & Lev, 1999; Cazavan-Jeny & Jeanjean, 2006). Capitalisation increases total assets and defers expense recognition, boosting contemporaneous income but reducing future earnings persistence. Furthermore, the impairment requirements of IAS 36 rely on non-observable assumptions about discount rates and growth projections, offering additional scope for discretion (Hassine & Jilani, 2017). Under IFRS 3, fair-value recognition of acquired intangibles and goodwill further enlarges the discretion window, as post-acquisition performance and impairment testing can be used to smooth earnings over time (d'Arcy & Tarca, 2018). This suggests that IFRS-based accounting introduces both informational benefits and potential for opportunistic reporting, depending on managerial incentives and monitoring mechanisms.

2.3.1.2 Earnings-management mechanisms

Two broad categories of earnings management dominate the literature:

- Accrual-based manipulation: altering accounting estimates such as bad-debt provisions, amortisation, or R&D capitalisation (Dichev & Dechow, 2001; Jones, 1991).
- Real activities manipulation: changing actual operations, for example, accelerating sales or reducing discretionary expenses (Roychowdhury, 2006).

R&D and intangible accounting primarily relate to the first category, but can trigger the second when managers cut innovation spending to meet earnings targets (Bushee, 1998; K. Gunny, 2009). The magnitude and direction of such behaviour depend on monitoring, incentives, and

the informational environment. However, the interaction between accrual-based and real earnings management in the context of innovation investment remains insufficiently explored.

2.3.2 R&D Capitalisation and Accrual Quality

Empirical studies consistently report a negative association between R&D capitalisation and accrual quality, suggesting that discretion is often used opportunistically. Cazavan-Jeny & Jeanjean (2006) find that capitalised R&D under IFRS exhibits lower value relevance than expensed R&D. Markarian et al. (2008) document that Italian firms increase R&D capitalisation to avoid earnings declines. Bilal (2022) provides UK and France evidence showing that goodwill and other intangibles facilitate income-increasing accruals, particularly when audit oversight is weak. These results align with Dichev & Dechow's (2001) model, which interprets high accrual estimation errors as lower earnings quality.

More recent work, however, offers nuance. Herb et al. (2025) argue that R&D capitalisation can also signal managerial confidence about project viability, improving predictive value for future earnings. Empirical differentiation between opportunistic and informative accruals thus requires contextual analysis of governance, audit quality, and market expectations (Barth et al., 2023; Feng et al., 2022). In high-governance environments such as the UK, where external assurance and investor monitoring are strong, the net effect of R&D discretion may lean toward signalling rather than manipulation. Overall, the literature provides conflicting interpretations, indicating that R&D capitalisation may reflect both opportunistic behaviour and informative signalling.

2.3.3 Intangible Impairments and Earnings Management

Goodwill impairment testing has become another avenue for earnings management under IFRS. Because impairment losses are non-cash and rely on subjective assumptions about cash-generating units, timing them can substantially influence reported profit (Ramanna & Watts, 2011). Schatt et al. (2016) observe that European firms delay recognising impairment until performance deteriorates sharply, indicating big-bath accounting behaviour. Nobes (2021) reveal international heterogeneity in impairment recognition, reflecting both cultural and enforcement differences. In the UK context, consistent audit scrutiny by the Financial Reporting Council has curtailed the most extreme cases, yet discretion remains significant in volatile industries.

Recent research expands the scope beyond goodwill to include software, brands, and customer relationships. Barth et al. (2023) show that firms with larger intangible stocks experience greater volatility in discretionary accruals and lower forecast accuracy among analysts. These findings suggest that intangibles complicate earnings predictability even without overt manipulation, simply because valuation inputs are difficult to verify. This ambiguity highlights the difficulty of distinguishing between economic impairment and discretionary reporting behaviour.

2.3.4 Governance, Audit Quality and Monitoring Mechanisms

The governance–earnings–management nexus is particularly relevant for intangible-rich firms. Agency theory predicts that strong boards, independent audit committees, and high audit quality restrain opportunistic accruals (Francis et al., 2005; Xie et al., 2003). Empirical studies confirm that Big Four auditors and greater auditor tenure reduce the discretionary use of R&D capitalisation (Bilal, 2022; J.-C. Cheng et al., 2016). Corporate-governance indices in the UK, including gender-diverse boards and audit-committee expertise, are also associated with higher accrual quality (Alam et al., 2019; García-Sánchez et al., 2022). These mechanisms are crucial under a principles-based system such as International Financial Reporting Standards (IFRS), where professional judgement substitutes for prescriptive rules.

Digitalisation further strengthens monitoring capacity. Recent work documents that firms adopting data analytics and continuous-auditing technologies experience measurable reductions in discretionary accruals and smoother earnings (Celestin, 2020). This evidence suggests that technological governance tools complement traditional audit oversight, an important consideration for intangible-driven firms whose operations are data-intensive. However, limited research has examined how governance mechanisms simultaneously influence earnings management, innovation investment, and sustainability outcomes.

2.3.5 Interaction between R&D, Earnings Management and Real Investment

A parallel literature examines whether earnings-management incentives distort real investment decisions, particularly R&D itself. Bushee (1998) finds that transient institutional ownership induces managers to cut R&D to meet short-term targets. Subsequent studies confirm that income-increasing accruals are often accompanied by reductions in discretionary R&D outlays (Gunny, 2010; Haga et al., 2018). These behaviours undermine long-term innovation and are antithetical to sustainable performance. More recent research, however, identifies moderating

effects from sustainability orientation: firms committed to ESG goals exhibit weaker R&D-cutting behaviour, implying that ethical and long-term governance norms temper short-term earnings pressure (Lanzalonga et al., 2024; Pham et al., 2024). This emerging strand connects financial reporting quality with sustainability commitments, bridging the literature toward ESG performance outcomes discussed in the next section (2.4). This suggests that earnings management may not only distort financial reporting but also influence real innovation decisions, with implications for long-term firm performance.

2.3.6 Cross-Country and UK-Specific Evidence

Cross-jurisdictional comparisons highlight how institutional enforcement shapes the R&D–earnings-management relationship. Continental European settings, characterised by code law and weaker investor protection, show stronger income-increasing tendencies through R&D capitalisation (Bilal, 2022; Markarian et al., 2008). Common-law environments such as the UK display relatively lower opportunism due to stronger enforcement and audit oversight (Ioannou & Serafeim, 2017). Nevertheless, UK firms face substantial discretion in impairment testing and development-cost recognition, given the absence of quantitative thresholds. Recent UK evidence suggests that technology and pharmaceutical firms continue to use R&D timing adjustments to smooth volatility (Al-Najjar & Sarhan, 2024). These findings reaffirm the need for empirical analysis within the UK’s distinctive regulatory ecosystem, combining IFRS flexibility with strong external assurance. Despite these insights, evidence from the UK remains limited, particularly regarding how IFRS-based discretion interacts with innovation intensity and sustainability considerations.

2.4 R&D, Intangibles and ESG Performance

Over the past decade, sustainability performance, which is captured through environmental, social, and governance (ESG) indicators, has become a core dimension of corporate strategy and disclosure. The paradigm shift from shareholder to stakeholder capitalism, reinforced by the United Nations Sustainable Development Goals (SDGs) and regulatory initiatives such as the EU Green Deal, has embedded ESG considerations within mainstream corporate reporting. In this evolving environment, firms’ ability to generate, manage, and report non-financial value increasingly depends on their intangible resources, which are knowledge, technology, human capital, and organisational processes, and the innovative capacity proxied by R&D intensity.

Recent research has begun to explore how such intangible-driven capabilities contribute to ESG outcomes and how sustainability orientation, in turn, feeds back into innovation and corporate value creation (Bai et al., 2025; Flammer, 2021; Pham et al., 2024). However, the existing literature remains fragmented, with limited integration between financial, innovation, and sustainability perspectives.

2.4.1 The Rise of ESG Reporting and Assurance

The rapid diffusion of ESG reporting frameworks has transformed the information environment for investors and regulators. The launch of the ISSB and its IFRS S1–S2 standards marks a pivotal convergence between financial and sustainability reporting (IFRS Foundation, 2023). These standards emphasise decision-useful disclosures on sustainability-related risks and opportunities, requiring companies to integrate financial and non-financial metrics within one reporting architecture. Empirical evidence suggests that firms with greater intangible intensity are early adopters of ESG disclosure because they possess superior data systems, analytical capabilities, and governance infrastructure (García-Sánchez et al., 2022; Lanzalonga et al., 2024). Intangible-rich organisations are better equipped to translate sustainability narratives into verifiable indicators, often obtaining external assurance to enhance credibility.

In the UK context, mandatory TCFD-aligned climate disclosures and the Corporate Governance Code (2018) reinforce the link between sustainability and accountability. For listed firms, especially those in technology and service industries, ESG reporting has evolved from a reputational exercise into a strategic and compliance imperative. Such firms typically leverage intangible capital “data analytics, digital platforms, and skilled human resources,” to collect, process, and disclose sustainability information, thereby improving transparency and investor confidence (Ioannou & Serafeim, 2017; Khan, 2016). Nevertheless, the effectiveness of ESG reporting depends on the reliability of underlying data, which remains challenging in intangible-intensive firms.

2.4.2 R&D Intensity and ESG Outcomes

R&D investment plays a dual role in sustainability. On one hand, it acts as a driver of environmental and social innovation, producing cleaner technologies, resource-efficient processes, and products with reduced ecological footprints. On the other hand, R&D may prioritise profit-maximising innovation that is not inherently sustainable. The direction of the

R&D–ESG nexus thus depends on the orientation of research objectives, the governance environment, and stakeholder pressures (Flammer, 2021; Y. Li & Li, 2024; Pham et al., 2024).

Empirical studies increasingly document a positive association between green R&D and ESG scores. Dicuonzo et al. (2022) show that innovation in cleaner technologies enhances environmental disclosure quality, while H. Li et al. (2025) find that sustained R&D expenditure stabilises ESG performance over time by embedding sustainability into core operations. Conversely, R&D volatility or opportunistic cutbacks to meet short-term earnings targets undermine ESG achievements (Bushee, 1998; Gunny, 2010). These dynamics highlight the interdependence between financial reporting discipline and sustainability commitment. Firms that treat R&D as a long-term strategic investment rather than a discretionary cost tend to report higher ESG ratings and lower environmental risk exposure (Bai et al., 2025).

At the macro level, sectoral analyses reveal that industries characterised by high R&D intensity such as pharmaceuticals, information technology, and renewable energy, tend to outperform others on ESG metrics (Lee, 2025; Li & Li, 2024). The mechanism lies in innovation’s ability to generate sustainable products and improve resource efficiency, reinforcing legitimacy among regulators and consumers. However, empirical findings remain mixed, suggesting that the impact of R&D on ESG performance depends on firm-specific strategies and institutional context.

2.4.3 Intangible Assets and ESG Performance

Beyond R&D flows, intangible-asset stocks encompass intellectual property, brand equity, software, and human capital, constitute the structural capabilities enabling firms to operationalise sustainability. According to the resource-based view, intangible assets provide unique, inimitable advantages that underpin environmental and social strategies (Barney, 1991). Human-capital quality facilitates safety, diversity, and ethical conduct; relational and reputational capital support stakeholder engagement; and digital intangibles enhance monitoring of environmental performance.

Empirical evidence corroborates this perspective. Pham et al. (2024) show that intellectual-capital components, particularly structural and human capital, are positively associated with ESG scores across global firms. Lanzalonga et al. (2024) find that intangible assets mediate the link between corporate governance and ESG disclosure quality. In addition, firms with robust

intangible capital attract long-horizon investors who value sustainability consistency (Khan, 2016; Lins et al., 2017). The UK evidence mirrors these findings: companies in the FTSE 350 with higher intangible-to-asset ratios exhibit more comprehensive ESG disclosures and stronger assurance adoption (García-Sánchez et al., 2022).

From a financial reporting standpoint, intangible intensity improves non-financial information processing. The data infrastructure supporting intellectual-property management, human-resource analytics, and customer relations often overlaps with systems used for ESG metrics collection and assurance. Consequently, intangible-rich firms can achieve synergies between financial and sustainability reporting, leading to more consistent integrated reports (IFRS Foundation, 2023).

2.4.4 Mediating and Moderating Mechanisms

The R&D/intangibles–ESG relationship is not purely direct; it operates through several mediating and moderating channels. First, corporate governance quality conditions the translation of innovation into sustainability outcomes. Effective boards allocate R&D resources toward long-term societal goals, while weak governance allows short-termism that decouples innovation from ESG performance (Atif et al., 2021; Deng et al., 2024; García-Sánchez et al., 2022; Pu, 2025). Second, digital transformation amplifies the impact of intangible assets on sustainability. Firms adopting Industry 4.0 technologies such as IoT sensors, data analytics, and AI, use digital tools to monitor emissions, optimise logistics, and enhance transparency, thereby strengthening ESG outcomes (Beltrami et al., 2021; Huang et al., 2023). These technologies are themselves products of R&D and contributors to intangible-asset growth, creating a feedback loop between innovation capability and sustainability. Third, ESG assurance and stakeholder engagement mediate trust. Firms with extensive intangible assets (especially reputational capital) are more likely to seek external assurance for ESG disclosures, which in turn enhances investor confidence and market valuation (Bai et al., 2025; García-Sánchez et al., 2022). Assurance thus acts as both a signal of credibility and a mechanism linking intangible governance to market perception.

2.4.5 Potential Trade-offs and Ambiguities

While the preponderance of evidence suggests a complementary relationship between innovation and sustainability, some studies report trade-offs. Heavy R&D investment may

crowd out immediate environmental expenditure, especially in capital-constrained firms (Flammer, 2021; Sun & Xiong, 2025). Moreover, aggressive pursuit of innovation can elevate carbon intensity if technologies emphasise productivity rather than ecological efficiency (Pham et al., 2024). Similarly, the use of intangible asset valuations to justify ESG credentials can lead to greenwashing, the symbolic association of intangibles such as brand reputation with unverified sustainability claims (Ben Mahjoub, 2024; L. financing frictions theory et al., 2024; Hassan, 2024; Saha & Maji, 2025). These tensions underline the need for robust measurement, assurance, and governance to ensure that intangible-driven ESG strategies yield substantive rather than cosmetic outcomes. These conflicting findings highlight the need to distinguish between substantive and symbolic sustainability practices.

2.4.6 Cross-country and UK-specific Perspectives

Comparative studies reveal that the strength of the R&D/intangibles–ESG nexus varies across institutional contexts. In stakeholder-oriented systems (e.g., Northern Europe), intangible investments correlate strongly with ESG performance due to supportive regulation and cultural norms (Lanzalonga et al., 2024). In market-based systems (e.g., the United States), the relationship is more dependent on investor activism (Flammer, 2021). The UK combines market orientation with strong governance codes, yielding a hybrid environment. Empirical analyses of UK firms (Al-Najjar & Sarhan, 2024; Bilal, 2022) indicate that intangible intensity complements ESG adoption, especially when firms participate in voluntary sustainability assurance and maintain Big Four audits. This alignment reflects the UK’s principle-based regulation and investor demand for credible ESG data. Despite these insights, evidence from the UK remains limited, particularly regarding how innovation intensity and intangible assets jointly influence ESG performance.

2.5 Gaps in the Literature

Despite the growing body of research on R&D and intangible investments, the literature remains fragmented, theoretically inconsistent, and contextually limited, particularly regarding their combined financial and sustainability implications within developed markets such as the United Kingdom.

First, prior studies have predominantly examined financial outcomes and sustainability outcomes in isolation. A large stream of research focuses on financial dimensions such as cash

holdings (e.g., Adu-Ameyaw et al., 2024; Baldi & Bodmer, 2018a, 2018b; Brahmana et al., 2023b; Falato et al., 2022; Kadyrzhanova et al., 2012; Kim & Park, 2012; Lei et al., 2018; Magerakis et al., 2022b; Opler et al., 1999; Vadilyev, 2025) while another body of literature examines non-financial outcomes such as ESG performance (e.g., Anqi et al., 2023; Bai et al., 2025b; Casciello et al., 2024; C. Chen et al., 2025a, 2025b; Chokki, 2024; Edmans, 2023; Farooq & Thavorn, 2025a, 2025b; Lanzalonga et al., 2024b; Lapinskaitė et al., 2025; Pham et al., 2024b; Rauf et al., 2024; Saha & Maji, 2025; Y. Sun et al., 2025) However, integrated analyses that assess how R&D and intangible investments jointly influence both financial flexibility and sustainability alignment remain limited. This fragmented approach restricts a comprehensive understanding of how innovation-driven firms balance financial strategies and sustainability objectives.

Second, existing empirical evidence provides mixed and context-dependent findings. For instance, Nguyen & Nguyen (2025) show that cash holdings enhance the efficiency of R&D investments in multi-business firms, yet their focus on emerging markets limits the generalisability of the findings to developed institutional settings such as the UK. Similarly, Haque et al. (2024) demonstrate that R&D intensity improves operational efficiency, but they do not extend the analysis to sustainability outcomes. In contrast, Lee (2025) and Li & Li (2024) suggest that ESG performance can stimulate innovation quality, indicating a potentially reciprocal relationship. However, the reverse relationship, namely how R&D and intangible investments influence ESG outcomes, remains theoretically ambiguous and empirically underexplored, particularly in principle-based reporting environments such as the UK.

Third, an important gap relates to the treatment and reporting of intangible assets under IFRS. Recent studies Intara & Suwansin, (2024); Khallaf & Kannan, (2024) emphasise the growing importance of intangible-intensive business models, while also highlighting persistent challenges in measurement, recognition, and discretionary capitalisation. This accounting subjectivity creates opportunities for earnings management, yet contemporary research rarely integrates this issue within a broader framework that connects financial reporting behaviour with sustainability performance. Although earlier work (Bilal, 2022; Cazavan-Jeny & Jeanjean, 2006) established theoretical links between intangibles and accrual manipulation, these insights

have not been sufficiently extended to incorporate ESG considerations or recent regulatory developments.

Fourth, the relationship between intangible capital and sustainability performance remains underdeveloped and contextually constrained. While studies such as . Bai et al., (2025) and Pham et al. (2024) suggest that intangible assets play a mediating role between ESG performance and firm value, most evidence is derived from Asian or industry-specific contexts. Similarly, Lanzalonga et al., (2024) show that ESG engagement enhances intangible asset valuation, yet they do not examine the reverse causality. These limitations highlight the need for more comprehensive, context-specific investigations into how intangible accumulation shapes sustainability outcomes.

Finally, most prior research relies predominantly on quantitative approaches, limiting the ability to capture managerial motivations, institutional dynamics, and decision-making processes underlying observed relationships.

Overall, four major research gaps can be identified:

- The lack of integrated frameworks that jointly evaluate R&D and intangible investments across financial and sustainability dimensions;
- Limited understanding of how these investments simultaneously influence financial policies such as cash holdings and earnings management alongside ESG performance;
- A scarcity of UK-specific empirical evidence despite the country's advanced reporting environment and strong ESG disclosure frameworks;
- The dominance of quantitative methodologies in prior research, which limits the ability to capture managerial motivations, decision-making processes, and institutional nuances underlying observed empirical relationships.

This thesis addresses these gaps by integrating financial policy (cash holdings), earnings management, and ESG performance within a unified analytical framework, focusing on UK non-financial firms over the period 2011–2023, and adopting an explanatory sequential mixed-methods approach to provide both empirical evidence and contextual insights.

2.6 Theoretical Framework

The conceptual grounding for this research draws from three complementary theoretical traditions: precautionary motive theory in corporate finance, information asymmetry and agency theory in financial reporting, and the resource-based and legitimacy perspectives in sustainability management. Each lens elucidates a distinct pathway through which R&D and intangible investments influence financial and non-financial outcomes, which is summarised in **Table 1**.

Table 1. Summary of Theoretical Linkages

Theory	Main Concepts	Related Variables	Key Citations
Precautionary-Motive Theory	Firms retain cash to mitigate financing risk when investments are uncertain and non-collateralizable	R&D Intensity, Intangible Intensity → Cash Holdings	Pigou (1936); Opler et al (1999); Bates et al (2009)
Information Asymmetry / Agency	Managers use accounting discretion to influence reported earnings under uncertainty	R&D Intensity, Intangible Intensity → Earnings Management	Jensen & Meckling (1976); Dichev & Dechow (2001); Bilal (2022)
Resource-Based View & Legitimacy	Intangible and innovation capabilities drive sustainable value and legitimacy	R&D Intensity, Intangible Intensity → ESG Performance	(Barney, 1991); (Pham et al., 2024); (Bai et al., 2025)

Source: Researcher's construction

2.6.1 Precautionary-Motive Theory (Corporate Liquidity)

The precautionary-motive framework posits that firms maintain cash reserves as a buffer against external financing frictions and future investment opportunities (Myers & Majluf, 1984; Pigou, 1936). When assets are difficult to pledge as collateral and cash flows are volatile, the marginal value of internal liquidity rises. R&D and intangible investments exemplify such conditions: they are uncertain, firm-specific, and often non-redeployable. Consequently, companies engaging heavily in innovation tend to hold higher cash balances to safeguard project continuity and strategic flexibility (Brown & Petersen, 2011; Falato et al., 2022; He & Wintoki, 2016).

Under the trade-off model, cash holdings balance the costs of financial distress against the opportunity cost of idle resources (Miller & Orr, 1966). For R&D-intensive firms, the cost of under-investment in innovation typically outweighs the cost of carrying cash, leading to structurally higher liquidity levels. Conversely, firms with more mature intangible stocks may rely less on cash buffers if their intellectual capital yields stable cash flows or easier access to financing (Baruch Lev, Feng Gu, 2016; Peters & Taylor, 2017). The precautionary motive thus provides the theoretical foundation for examining how R&D and intangible intensity shape corporate liquidity.

2.6.2 Information-Asymmetry and Agency Theory (Earnings Management)

Information-asymmetry theory explains how differences in information between managers and external stakeholders influence financial-reporting behaviour (Akerlof, 1970). In the context of R&D and intangibles, asymmetry arises because the economic value of innovation projects and intangible assets is inherently uncertain and difficult to verify. Managers possess superior private information about project feasibility, development progress, and expected returns, which they may use to signal quality or manipulate earnings. This discretion is institutionalised in IAS 38, which allows managerial judgement in distinguishing between R&D phases, and in IAS 36, which governs impairment of intangible assets.

Agency theory complements this view by positing that managers may act in their own interests when their objectives diverge from those of shareholders (Jensen & Meckling, 1976). In innovation-intensive firms, the opacity of intangible investments amplifies this divergence, providing scope for accrual-based earnings management or strategic R&D expenditure timing (Bilal, 2022; Dichev & Dechow, 2001). At the same time, strong governance and audit mechanisms can reduce agency costs and align reporting with stakeholder expectations (Francis et al., 2005; Xie et al., 2003). The interaction of information asymmetry and agency theory thus explains why R&D and intangible investments may influence earnings quality through both opportunistic and informative channels.

2.6.3 Resource-Based and Legitimacy Perspectives (ESG Performance)

The RBV conceptualises firms as collections of unique resources and capabilities that provide sustained competitive advantage when they are valuable, rare, inimitable, and non-substitutable (Barney, 1991). Intangible assets such as human capital, organisational routines, data systems,

and reputational capital, fit these criteria. They form the infrastructure through which firms can develop and implement effective environmental and social strategies. R&D, as an investment in knowledge creation, generates dynamic capabilities that enable adaptation to stakeholder demands and regulatory changes. Together, these assets determine a firm's capacity to achieve and report superior ESG outcomes (Eccles et al., 2014; Lanzalonga et al., 2024; Pham et al., 2024).

Complementing the RBV, legitimacy theory posits that firms seek alignment between their actions and societal expectations to secure ongoing approval and access to resources (Suchman, 1995). Through ESG reporting, companies communicate conformity with environmental and social norms, enhancing legitimacy and reputation. R&D and intangible investments support this process by providing the technological and informational capabilities required for credible disclosure and sustainability innovation. The resource-legitimacy framework thus connects intangible intensity to ESG performance, suggesting that innovation and capability building are both instruments of competitive advantage and vehicles of social accountability.

2.7 Hypotheses Development

The preceding sections established that R&D and intangible investments influence multiple facets of firm performance through financial and non-financial pathways. Informed by the three theoretical lenses: the precautionary motive, information asymmetry and agency perspectives, and the resource-based and legitimacy views, this section consolidates the study's propositions into six hypotheses grouped under three conceptual categories: cash holding, earnings management, and ESG performance. **Figure 2** outlines the proposed research framework for this study. These groups reflect the multidimensional consequences of innovation and capability accumulation in the UK's IFRS-based corporate environment.

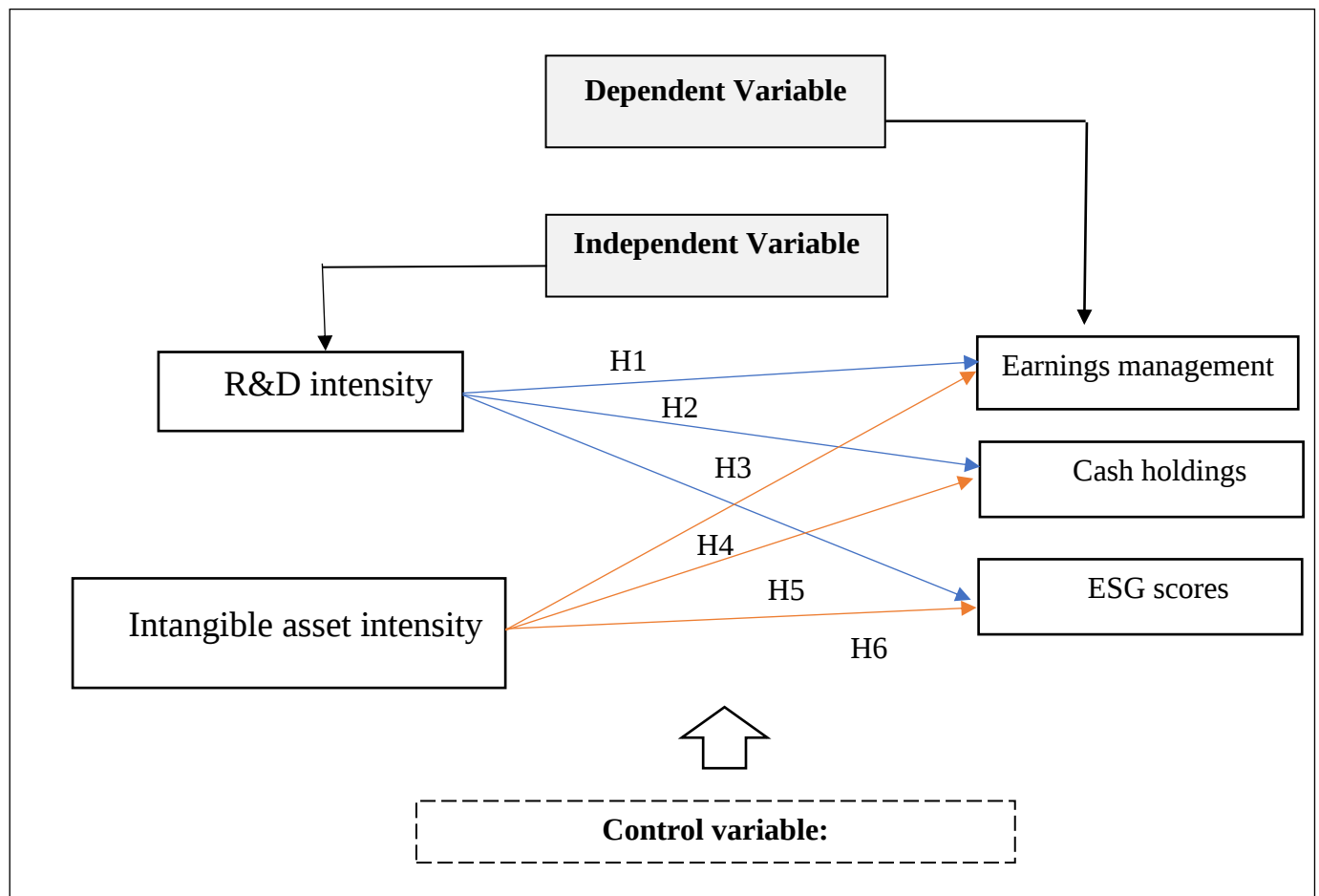


Figure 2. Research Framework

Source: Researcher's construction

2.7.1 R&D, Intangibles and Cash Holdings

The precautionary motive theory predicts that firms with higher R&D and intangible intensity retain larger cash buffers to safeguard ongoing projects from financial constraints. R&D activities involve irreversible investments with uncertain returns and limited collateral value, while intangible assets “, though productive”, are difficult to liquidate or use as security. Consequently, such firms rely more on internal liquidity as a form of self-insurance (Bates et al., 2009; Falato et al., 2022; Opler et al., 1999). Moreover, in the IFRS environment, capitalisation of development costs and recognition of intangible assets affect reported leverage and perceived financing capacity, further shaping cash-holding policies.

Empirical studies in the United States and Europe confirm the existence of a strong association between innovation intensity and cash holdings (Al-Najjar & Sarhan, 2024; He & Wintoki,

2016; Magerakis et al., 2022). However, these studies seldom separate the effects of R&D flows and intangible-asset stocks, leaving ambiguity about whether liquidity behaviour is driven by ongoing innovation or accumulated intellectual capital. In addition, the UK's robust governance and audit systems may moderate this relationship differently from other settings, making it necessary to re-examine these dynamics under local institutional conditions.

Accordingly, the following hypotheses are formulated:

- H1: There is a relationship between R&D investment and cash holding.
- H4: There is a relationship between intangible investment and cash holding.

These hypotheses test whether innovation-driven firms' liquidity management differs systematically according to their R&D and intangible intensity.

2.7.2 R&D, Intangibles and Earnings Management

Under information asymmetry and agency theory, managerial discretion in accounting for R&D and intangible assets creates opportunities for earnings management. IAS 38 allows management to exercise judgement in determining whether expenditures meet the criteria for capitalisation, while IAS 36 requires subjective impairment testing. Such flexibility can be used to smooth income, avoid losses, or signal internal optimism about project value (Bilal, 2022; Markarian et al., 2008). R&D expenditure may also be adjusted to influence earnings directly, either deferred or accelerated, depending on performance targets (Bushee, 1998; Gunny, 2010).

Empirical evidence presents mixed findings. Some studies report that R&D capitalisation decreases accrual quality and increases income-increasing behaviour (Bilal, 2022; Cazavan-Jeny & Jeanjean, 2006), while others suggest that under strong audit oversight, capitalisation conveys credible information about future performance (Barth et al., 2023). Similarly, intangible assets such as goodwill and brands can be managed through delayed impairments or selective amortisation, influencing reported profit (Han & Tang, 2020; Wilson & Stevenson, 2025). Yet governance quality, audit assurance, and sustainability orientation may constrain opportunism and encourage informative reporting (García-Sánchez et al., 2022; Xie et al., 2003).

Given these competing forces, the present study does not predict the direction of the association but posits that R&D and intangible intensity are systematically related to the extent of accrual-based earnings management.

- H2: There is a relationship between R&D investment and earnings management.
- H5: There is a relationship between intangible investment and earnings management.

These hypotheses examine whether higher exposure to intangible accounting discretion translates into greater variability or distinct patterns in reported accruals among UK-listed firms.

2.7.3 R&D, Intangibles and ESG Performance

The resource-based view and legitimacy theory jointly explain how R&D and intangible investments shape sustainability outcomes. R&D generates the technological and organisational capabilities necessary for eco-efficiency, cleaner production, and social innovation (Flammer, 2021; Li & Li, 2024). Intangible assets such as intellectual property, human capital, and reputational resources enable firms to implement and communicate sustainability strategies effectively. These assets are both drivers and enablers of ESG performance, providing the infrastructure for data management, stakeholder engagement, and transparent reporting (Lanzalonga et al., 2024; Pham et al., 2024).

Empirical evidence supports these linkages but remains fragmented. Pham et al. (2024) find that intellectual capital positively correlates with ESG scores across global firms, while Bai et al., (2025) show that intangible assets mediate the innovation ESG relationship. However, some research identifies trade-offs: heavy R&D investment can temporarily reduce ESG scores if financial resources are diverted from sustainability initiatives (Pham et al., 2024; X. Sun & Xiong, 2025). The heterogeneity of findings underscores the need for context-specific testing, especially in the UK, where IFRS-based reporting and TCFD-aligned ESG disclosure create a reliable empirical setting for examining these relationships.

Accordingly, the following hypotheses are proposed:

- H3: There is a relationship between R&D investment and ESG performance.
- H6: There is a relationship between intangible investment and ESG performance.

These hypotheses explore whether firms' innovation and intangible intensity contribute to measurable sustainability outcomes in a highly regulated and assurance-oriented environment, **Table 2** Summaries the hypotheses development.

Table 2. Summary of Hypotheses

Group	Focus Area	Hypotheses*	Conceptual Linkage	Supporting Theories
Group 1	R&D and Intangibles → Liquidity	H1: There is a relationship between R&D investment and cash holding. H4: There is a relationship between intangible investment and cash holding.	Innovation and intangibles create financing frictions, prompting higher liquidity buffers.	Precautionary-Motive Theory
Group 2	R&D and Intangibles → Earnings Management	H2: There is a relationship between R&D investment and earnings management. H5: There is a relationship between intangible investment and earnings management.	Accounting discretion and agency incentives affect reporting behaviour in innovation-intensive firms.	Information Asymmetry & Agency Theory
Group 3	R&D and Intangibles → ESG Performance	H3: There is a relationship between R&D investment and ESG performance. H6: There is a relationship between intangible investment and ESG performance.	R&D and intangible assets create organisational and technological capabilities that enhance sustainability.	Resource-Based & Legitimacy Theories

* Relationships are non-directional, reflecting empirical neutrality prior to hypothesis testing.

Source: Researcher's construction

2.8 Summary

This section synthesised the theoretical and empirical foundations of the study into a coherent conceptual framework. Three broad perspectives: precautionary-motive theory, information-asymmetry and agency theory, and the resource-based and legitimacy views, collectively explain how R&D and intangible investments influence firms' financial and non-financial behaviour. The resulting six hypotheses capture the multidimensional impact of innovation and capability accumulation: on liquidity management (H1, H4), earnings management (H2, H5), and ESG performance (H3, H6).

Together, these hypotheses provide the analytical bridge between the literature review and the empirical investigation that follows. Chapter 3 will operationalise these constructs, detailing the research design, variables, data sources, and econometric methods used to test the hypothesised relationships within the UK's IFRS and sustainability-reporting context.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The preceding chapter developed the theoretical foundations and reviewed the literature informing this study. Building on that foundation, this chapter outlines the methodological choices that guide the empirical investigation into how firms' investments in R&D and intangible assets influence cash holdings, earnings management, and ESG performance. The methodological design is shaped by the research aims and questions introduced earlier and reflects both theoretical considerations and practical constraints encountered during the research process. In particular, the chapter explains why a mixed-methods strategy is appropriate for the present study, the methodological advantages it offers, and the limitations associated with this approach.

Mixed-methods research has become increasingly recognised as a robust methodological paradigm within the social sciences, offering a way to integrate numerical and interpretive forms of evidence to address complex research problems (Bryman & Cramer, 2004; Creswell, 2009). In management, accounting, and finance, fields historically dominated by positivist and econometric approaches, there has been a growing call for methodological pluralism and the use of multiple methods to study organisational phenomena (Cassell et al., 2006; Laughlin, 1995; Modell, 2009, 2010). Much of this shift reflects recognition that quantitative methods alone cannot fully capture the contextual, behavioural, and institutional dynamics that shape financial reporting, innovation investment, or sustainability practice. Motivated by this methodological evolution and by the gaps identified in the literature review, this thesis adopts a mixed-methods methodology to examine how R&D and intangible assets influence firms' financial and ESG outcomes.

The decision to combine quantitative and qualitative methods is also consistent with the researcher's philosophical positioning. Where the researcher adopts a middle-ground stance that acknowledges the value of objective measurement while also recognising the importance of subjective interpretation in understanding managerial judgement, reporting discretion, and organisational behaviour. This philosophical position naturally accommodates a methodological approach that draws on both quantitative panel-data analysis and qualitative expert insights. In addition, practical considerations such as data availability, the judgment-based nature of

intangible asset accounting under IAS 38, and the complexity of ESG reporting, further support the decision to employ mixed-methods research.

Within this study, the mixed-methods design follows an explanatory orientation: quantitative and qualitative data are collected and analysed in sequence, with qualitative insights used to help interpret and contextualise the statistical findings. The quantitative analysis investigates the relationships between R&D intensity, intangible asset intensity, and the three dependent variables using a longitudinal dataset of 160 UK-listed non-financial firms. The qualitative analysis, based on expert interviews, complements this by examining the mechanisms, interpretations, and contextual conditions underlying the statistical relationships. By structuring the study this way, the research draws on the strengths of both approaches and mitigates their respective limitations. Mixed-methods integration therefore, facilitates triangulation, enhances explanatory depth, and increases the validity of the overall project.

It is acknowledged that choosing a mixed-methods design also introduces certain challenges. Differences in data types, sample coverage, and analytical procedures can create barriers to integration. Furthermore, reliance on expert interviews may reflect limitations in data availability or the complexity of measuring constructs such as managerial discretion or ESG intent. These challenges are recognised and discussed later in the chapter, alongside the steps taken to ensure methodological rigor in both quantitative and qualitative components.

The remainder of this chapter proceeds as follows. Section 3.2 outlines the methodological choice in detail, examining mixed-methods research as a paradigm and explaining why it is required for this study. Section 3.3 introduces the quantitative component, including the dataset, variable measurement, and econometric modelling strategy. Section 3.4 describes the qualitative component, including the sampling strategy, interview design, and analytical procedures. Section 3.5 evaluates the methodological rigor of both components, addressing reliability, validity, and ethical considerations. Section 3.6 concludes the chapter by summarising the methodological foundations underpinning the empirical analyses that follow

3.2 The Methodological Choice in This Thesis

The methodological position adopted in this thesis reflects the nature of the research problem and the complexity of the variables under investigation. As demonstrated in previous chapters, R&D intensity, intangible asset intensity, cash holdings, earnings management, and ESG

performance are multidimensional constructs that involve both measurable financial behaviours and interpretive, judgement-based practices shaped by accounting standards, governance influences, sector dynamics, and managerial discretion. Given this complexity, a single methodological tradition would be insufficient to fully address the research objectives. Consequently, this thesis adopts a mixed-methods approach, which integrates quantitative and qualitative analytical strategies to achieve a more comprehensive understanding of the research problem. The subsections that follow explain the rationale for using mixed methods, outline the philosophical and methodological foundations of this approach, and describe how mixed methods are employed in the current study.

3.2.1 Mixed-Methods Research as a Methodology

Mixed-methods research is commonly defined as the deliberate integration of quantitative and qualitative approaches within a single study to achieve broader, deeper, and more credible insights than either method could provide alone. Johnson, Onwuegbuzie, and Johnson et al. (2007) describe it as research in which “a researcher or team of researchers combines elements of qualitative and quantitative research approaches ... for the broad purposes of breadth and depth of understanding and corroboration.” At its core, mixed-methods research aims to exploit the complementary strengths of different methodological traditions while reducing their individual limitations (Johnson & Onwuegbuzie, 2004).

Over the past two decades, mixed-methods research has gained legitimacy across the social sciences, including education, sociology, evaluation research, and health studies (Bryman & Cramer, 2004; Creswell, 2009; Creswell, John W., 2018; Molina-Azorín, 2011). It is now widely considered a “third methodological movement” that sits alongside traditional quantitative and qualitative paradigms (Johnson & Onwuegbuzie, 2004). In management and accounting research, fields historically dominated by positivist, quantitative approaches, mixed methods have become increasingly valued for bridging the divide between economics-based functionalist traditions and more interpretive or critical perspectives. Modell (2009, 2010) notes that mixed-methods research provides a useful mechanism for integrating insights from different research paradigms and for developing richer theoretical explanations in areas where behavioural, organisational, and institutional factors interact with financial and economic outcomes.

Empirical work confirms these advantages. For example, Cassell et al. (2006), in an ESRC-sponsored project on methodological practice in management research, showed that academic and practitioner stakeholders frequently advocate the use of mixed methods, emphasising how qualitative insights add meaning, context, and interpretation to quantitative patterns. In this sense, mixed methods offer a pragmatic and flexible framework capable of addressing complex research problems, especially those involving judgement, interpretation, or organisational behaviour.

3.2.2 Mixed-Methods Research in This Study

The methodological choice in this thesis is shaped by the study's objectives and the characteristics of its key variables. R&D expenditures and intangible assets are not simply numerical items in financial statements; they reflect managerial assessments of technological feasibility, future economic benefit, risk, uncertainty, and compliance with IAS 38. Similarly, ESG performance involves narrative disclosures, governance processes, and context-dependent organisational strategies. Cash holdings and earnings management behaviours also involve managerial discretion influenced by firms' innovation profiles. Accordingly, the research seeks to analyse both quantitative relationships and the interpretive mechanisms behind them.

This study, therefore, adopts an explanatory sequential mixed-methods design. The quantitative phase is conducted first, using panel-data regressions to test six hypotheses involving the effects of R&D intensity and intangible asset intensity on cash holdings, earnings management, and ESG performance for 160 UK non-financial firms (2011–2023). The qualitative phase follows, using semi-structured interviews with five experts (four academics and one practitioner) to interpret and contextualise the regression results. This design is appropriate when quantitative results require further explanation or contextualisation (Creswell, John W, 2018), when variables exhibit complexity beyond what numeric indicators can capture, and when managerial or institutional contexts are central to the phenomena under investigation. The qualitative strand in this study is not used to generate hypotheses but to validate, refine, and explain the quantitative findings. This mirrors methodological strategies in recent accounting, sustainability, corporate governance, and risk disclosure studies, where mixed methods are used to clarify relationships that appear ambiguous, contradictory, or context-dependent when examined through quantitative analysis alone.

A summary of empirical studies supporting the use of mixed-methods is presented in **Table 3**. These studies provide strong methodological precedent and reinforce the appropriateness of the mixed-methods strategy used in this thesis. For example, Wei et al. (2024) used panel-data analysis and interviews to examine policy effectiveness across 283 Chinese cities. The qualitative interviews helped explain causal mechanisms uncovered in the quantitative analysis. Similarly, Mahmood et al. (2018) integrated interviews with panel-data analysis to validate findings on sustainability performance across 85 firms, providing more interpretive richness. In the taxation context, Salihu & Kawi (2021) found inconsistent quantitative results regarding board attributes and tax avoidance; qualitative interviews with tax auditors allowed them to interpret these inconsistencies. Studies in sustainability reporting (Rustam et al., 2019), enterprise risk management (Danisman & Demirel, 2019), risk disclosure (Mbithi et al., 2022), and corporate governance in emerging markets (Assenga et al., 2018) similarly relied on mixed methods to explain why certain statistical relationships emerge, vary, or contradict expectations.

Collectively, these studies show that mixed-methods designs are valuable when research variables are influenced by both measurable financial characteristics and interpretive, context-dependent factors precisely the case for R&D and intangible assets under IAS 38 and for ESG reporting in the UK. Therefore, a mixed-methods design is methodologically appropriate, enables triangulation, and enhances the validity of findings.

Table 3. Why the mixed-methods approach is chosen?

Study	Quantitative method	Qualitative method	Contribution to Mixed-Methods Justification
(Wei et al., 2024) Journal of Cleaner Production	Panel data analysis of 283 cities (2003–2021)	Semi-structured interviews (4 interviews)	To measure the policy's impact and to explain the mechanisms behind it. Interviews complemented quantitative data by revealing insights not captured in statistics.
(Mahmood et al., 2018) Sustainability	Panel Data Analysis of 85 companies (2012–2015)	Semi-Structured Interviews (5 interviews)	To validate the findings of the quantitative study and provide more depth and insight

(Salihu & Kawi, 2021) Journal of Accounting and Taxation	Panel data analysis of 63 companies (2009–2011)	Semi-structured interviews (10 tax auditors)	Because previous research produced “mixed findings,” and the quantitative results in this study also lacked consistency. The interviews were added to explain the quantitative findings and provide deeper insight into why board attributes relate weakly to tax avoidance.
(Rustam et al., 2019) Environmental Science and Pollution Research	Panel data analysis of 100 firms, (2006–2018)	Semi-structured interviews (6 participants)	To first measure the statistical relationship between foreign ownership and sustainability disclosure, and then explain and validate these results. The interviews helped clarify why foreign ownership influences sustainability reporting and provided context that the quantitative data could not reveal.
(Danisman & Demirel, 2019) Risk Management	Panel data analysis of 139 non-financial firms (2010–2015)	In-depth semi-structured interviews (10 Professionals)	Because quantitative results showed no significant effect of financial, operational, or ERM risk management on firm value, and the qualitative interviews were needed to explain why—revealing issues like weak disclosure, low top-management support, ambiguous risk roles, managerial risk aversion, and misuse of hedging tools.

(Tauringana & Chithambo, 2016) Journal of Accounting in Emerging Economies	Panel data regression analysis of 13 companies (2007–2009)	Personal semi-structured interviews (4 managers)	Because prior studies showed contradictory results, and the authors needed interviews to confirm, clarify, or contradict the quantitative findings. The qualitative insights provided explanations that the panel data alone could not reveal.
(Mbithi et al., 2022) Corporate Governance	Panel data regression analysis 39 firms (2008–2019) + content analysis	Semi-structured interviews (10 preparers of annual reports)	Because risk disclosure is multi-dimensional and cannot be fully captured with a single quantitative approach. Interviews helped interpret, clarify, and sometimes contradict the regression results, providing deeper insight into why board-related and firm-specific factors influence risk disclosure.
(Assenga et al., 2018) Corporate Governance	Balanced panel data regression analysis on 10 firms (2006–2013)	Semi-structured interviews (12 stakeholders)	Because Tanzania's governance context is under-researched, and quantitative analysis alone could not fully explain why certain board characteristics did or did not influence firm performance. Interviews provided deeper contextual insight, validated the regression findings, and enhanced the overall reliability of results.

Source: Researcher's construction

3.2.3 Research Process

The explanatory sequential design used in this thesis follows the logic recommended by Creswell, J. W (2014), Onwuegbuzie & Leech (2005), and Schoonenboom & Johnson (2017): quantitative methods identify relationships and patterns, while qualitative methods explain, refine, and contextualise them. In this study, the quantitative phase involves analysing panel data to test the six hypotheses developed in Chapter 2. These models reveal whether statistically significant relationships exist between innovation-related variables and the three focal outcomes. However, quantitative findings alone cannot explain managerial intent, judgment, or interpretation. Thus, a qualitative phase follows, involving semi-structured interviews with academic and professional experts who provide rich contextual perspectives on R&D accounting, intangible measurement, ESG reporting practices, and liquidity behaviour in the UK.

This sequential structure strengthens validity by allowing qualitative insights to refine and interpret the quantitative results. For example, interviewees can help explain why R&D-intensive firms accumulate cash, why intangible capital correlates with discretionary accruals, or why R&D may not immediately translate into higher ESG scores. The design therefore enhances explanatory power through methodological triangulation, allowing the findings to be evaluated from multiple lenses.

The research process followed in this thesis is summarised in **Figure 3**, which outlines the progression from literature review to quantitative estimation to qualitative interpretation. The research process adopted in this study follows an explanatory sequential mixed-methods design. The first stage involved an extensive literature review to identify variables, develop hypotheses, and establish the theoretical model. The second stage consisted of quantitative panel-data analysis of R&D, intangibles, cash holdings, earnings management, and ESG outcomes. In the third stage, qualitative semi-structured interviews were conducted to refine and contextualise the quantitative findings. The final stage involved integrating results from both strands to develop theoretical and practical conclusions.

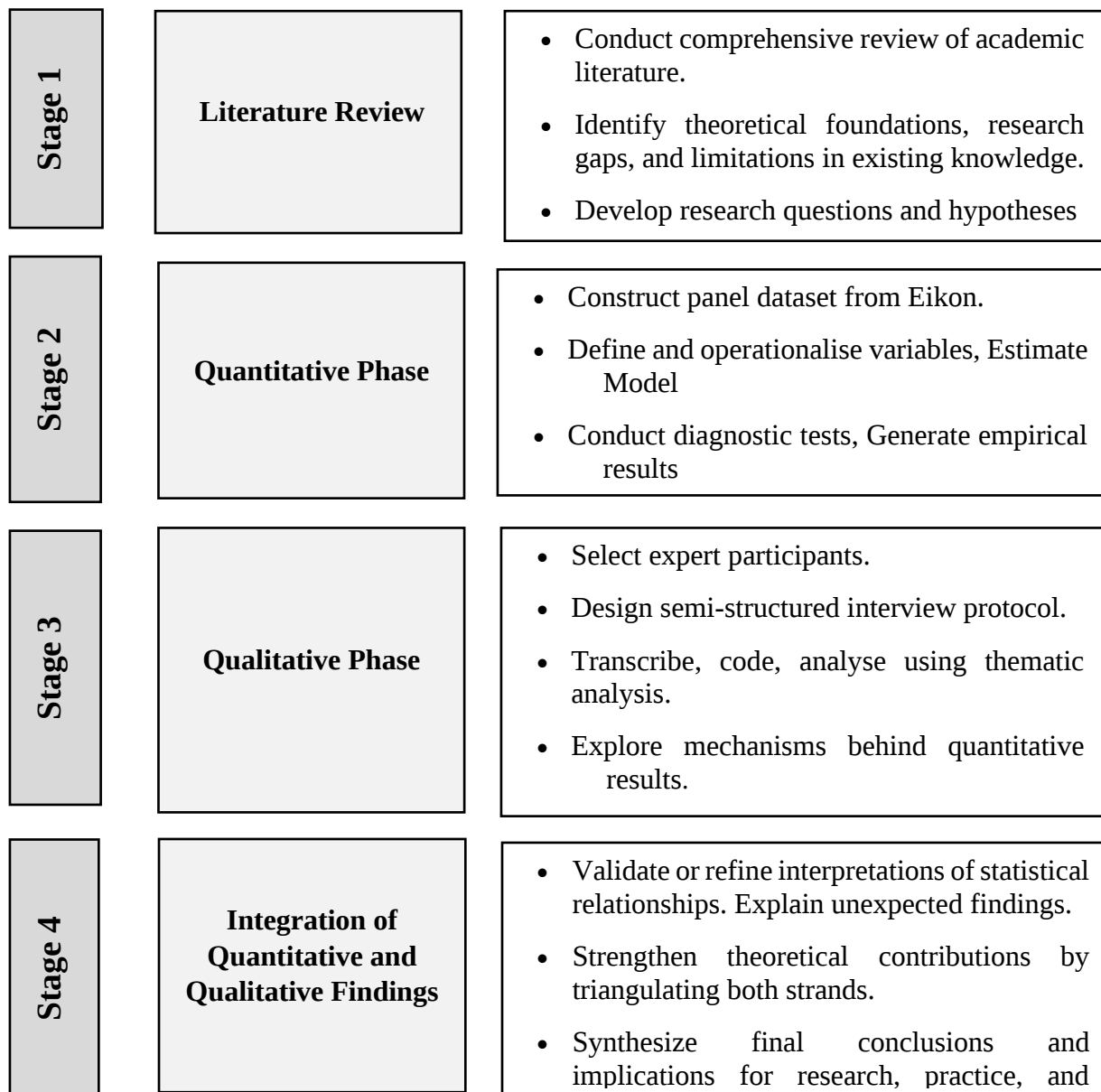


Figure 3. Research Process Flowchart

Source: Researcher's construction

3.3 Quantitative Method

3.3.1 Data and Sample

The quantitative component of this study is based on panel data of 160 UK non-financial listed firms observed over the period 2011–2023, yielding a total of 2,075 firm-year observations. All

financial data and environmental, social, and governance (ESG) measures were obtained from the Refinitiv Eikon database (formerly Thomson Reuters DataStream and now part of the London Stock Exchange Group (LSEG)). Data collection was conducted during a dedicated research visit to Bangor University between 4 May and 4 June 2025, during which full institutional access to the database was available.

Refinitiv Eikon is widely used in empirical accounting, finance, and sustainability research due to its extensive firm coverage, longitudinal consistency, and transparent data architecture (Hipólito et al., 2025). Its ESG indicators are constructed from several hundred publicly disclosed data points drawn from annual reports, sustainability and integrated reports, stock exchange filings, and verified third-party sources (Berg et al., 2022; Cheng et al., 2014). These indicators are systematically classified into environmental, social, and governance pillars and subsequently aggregated into composite ESG scores, allowing for meaningful cross-firm and intertemporal comparisons (Chatterji et al., 2016; Liang & Renneboog, 2017). The use of Refinitiv ESG data therefore enhances the credibility, reliability, and replicability of the empirical findings.

Financial firms, defined as companies classified under Standard Industrial Classification (SIC) codes 6000–6999, were excluded from the sample. This exclusion follows standard practice in empirical corporate finance and governance research, as financial institutions operate under fundamentally different regulatory regimes, capital structures, and risk profiles that are not directly comparable to those of non-financial firms (Bhagat & Bolton, 2008; Fama & French, 1992; Hassanein et al., 2019). Restricting the sample to non-financial firms improves sample homogeneity and mitigates potential estimation bias.

The sample firms were selected to purposive sampling strategy was employed based on objective inclusion criteria. Firms were included if they (i) were focuses on FTSE all-shares non-financial firms listed on the London Stock Exchange (ii) had available financial and ESG data in Eikon database, and (iii) reported sufficient observations over the study period to support panel estimation. No additional geographical restrictions were applied within the UK, and firms span a broad range of non-financial industries, ensuring sectoral diversity while maintaining a consistent institutional and regulatory environment. This approach enhances internal validity

and is consistent with prior panel-data studies in corporate governance and ESG research (Wooldridge, 2010).

The study period from 2011 to 2023 is justified on both theoretical and empirical grounds. The starting year of 2011 was chosen to avoid distortions associated with the global financial crisis of 2007–2009 and its immediate aftermath, during which firm behaviour, investment decisions, and financial reporting were heavily influenced by extraordinary economic conditions. Beginning the analysis in the post-crisis period allows the study to focus on firm decisions within a relatively stable regulatory and macroeconomic environment (Campello et al., 2010). The end year of 2023 reflects the most recent year for which complete and consistent financial and ESG data were available across the sample at the time of data collection.

This period also coincides with the rapid expansion and institutionalisation of ESG reporting and sustainability governance. In particular, it captures regulatory and normative developments such as the EU Non-Financial Reporting Directive (2014/95/EU), the growing adoption of the Sustainability Accounting Standards Board (SASB) framework, and the Task Force on Climate-related Financial Disclosures (TCFD), all of which significantly improved the scope and comparability of ESG disclosures over time (Ioannou & Serafeim, 2017; Krueger et al., 2020).

The United Kingdom was selected as the empirical setting due to its advanced capital market, strong investor protection, and well-established corporate governance framework. UK listed firms operate under a principles-based governance regime that promotes transparency and comparability, making the UK a widely used and appropriate context for corporate governance and ESG research (Aguilera et al., 2007; Porta et al., 1998). Moreover, UK firms have increasingly shifted toward intangible-intensive business models, particularly in technology- and knowledge-based sectors, rendering the UK an especially relevant setting for examining the interaction between R&D investment, intangible assets, and ESG performance (Alkaraan et al., 2022; Al-Najjar & Sarhan, 2024; Hasan et al., 2022).

3.3.2 Variable Measurement

The study employs three dependent variables: cash holdings, earnings management, and ESG performance, and two key explanatory variables capturing corporate innovation: R&D intensity and intangible asset intensity. Control variables (firm size, Leverage, Profitability, Growth, Market-to-Book, Inventory Intensity, Operating Cycle, Loss Indicator, Z-score, governance

score, and earnings volatility), are represented in **Figure 4**. All variable definitions and formulas correspond to the measurement framework presented in **Table 4**.

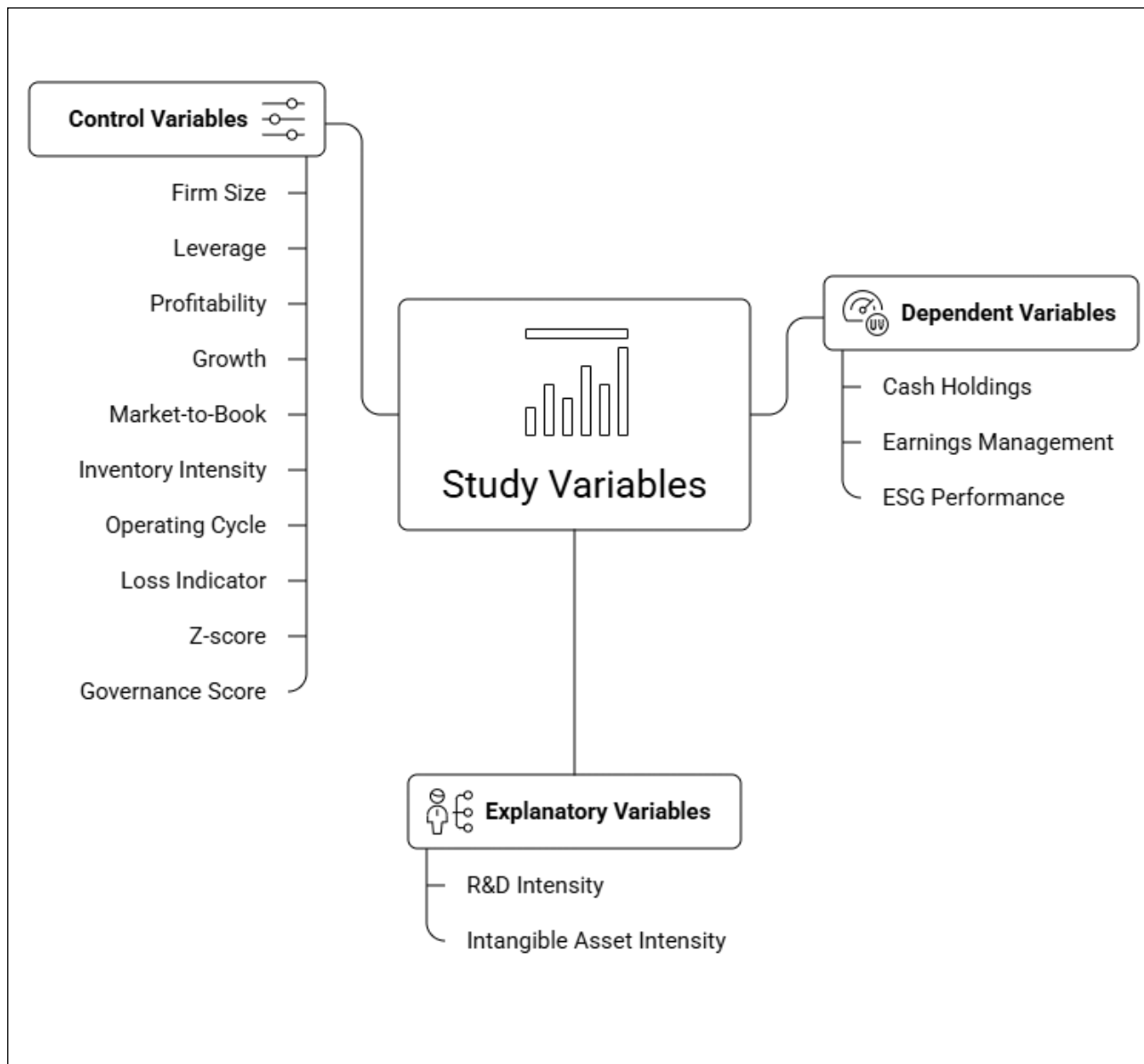


Figure 4. Study Variables

Source: Researcher's construction

Table 4. Variable Definitions

Variable Name	Symbol	Measurement/Formula
Cash Holdings	Cash_holding	Cash and cash equivalents / Total assets
Earnings Management (Discretionary Working Capital Accruals)	DisWCA	Measure proposed by (P. M. Dechow & Dichev, 2002) developed by (Francis et al., 2005)
ESG Performance	ESG	ESG score from Refinitiv Eikon database
R&D Intensity	R&D	R&D expenditure / Total Sales
Intangible Intensity	Intang	Intangible assets / Total assets
Firm Size	SIZE	Natural log of total assets
Leverage	LEV	Total debt / Total assets
Market to Book	MTB	(Liabilities + Market Cap) / Total assets
Sales Growth	GROWTH	$(Sales_t - Sales_{t-1}) / Sales_{t-1}$
Inventory Intensity	INV	Inventory / Total assets
Operating Cycle	OPCYCLE	DIO + DSO
Loss	LOSS	1 if Net Income < 0, 0 otherwise
Return on Assets	ROA	Net income / Total assets
ROA Volatility	SD_ROA	Std. dev. of ROA over 3 years
Altman's Z-score	ZSCORE	Standard Z-score formula
Corporate Governance	CG_Score	ESG governance component Eikon database

Source: Researcher's construction

This study includes a range of financial and sustainability-related variables, drawn from prior empirical literature. The dependent variables include measures of corporate liquidity, earnings quality, and ESG performance, while independent and control variables capture firm-level

characteristics that influence these outcomes. **Table 5** describe variables type and supporting literature to each variable.

- Dependent variables

Cash holdings (Cash_holding) are measured as the ratio of cash and cash equivalents to total assets, a standard proxy for corporate liquidity used in numerous studies on precautionary financial behavior and innovation-intensive firms (Magerakis et al., 2022; Brown and Petersen, 2011; He and Wintoki, 2016; Chung, 2017; Shin and Kim, 2011; Nguyen and Nguyen, 2025).

Earnings management is proxied by discretionary working capital accruals (DisWCA), estimated following the approach proposed by Dechow & Dichev, (2002) and extended by Francis et al. (2005). This measure captures the extent to which managers engage in accrual-based manipulation of earnings.

ESG performance is captured using the firm's ESG score, extracted from the Eikon database. This composite index reflects a firm's environmental, social, and governance disclosures and practices (Chen et al., 2025; Dicuonzo et al., 2022; Li & Li, 2024).

- Independent variables

The key independent variables include R&D intensity (R&D), measured as R&D expenditure scaled by total sales, reflecting a firm's investment in innovation (Magerakis et al., 2022; Brown and Petersen, 2011; He and Wintoki, 2016; Shin and Kim, 2011; Nguyen and Nguyen, 2025). Intangible asset intensity (Intang), measured as intangible assets divided by total assets (Bagna et al., 2021).

- Control variables

To isolate the effects of R&D intensity and intangible asset intensity on firms' financial and sustainability outcomes, a set of control variables is included to capture firm-level heterogeneity that may influence cash holdings, earnings management, and ESG performance.

Firm size (SIZE), measured as the natural logarithm of total assets, is expected to be positively associated with cash holdings and ESG performance, and negatively associated with earnings management. Larger firms typically hold more cash due to scale effects and operational

complexity, face greater public and regulatory scrutiny, and are subject to stronger monitoring, which constrains opportunistic reporting behaviour (He & Wintoki, 2016; Kim & Park, 2012).

Leverage (LEV), defined as total debt divided by total assets, is expected to have a negative relationship with cash holdings and ESG performance, and a positive association with earnings management. Highly leveraged firms face tighter debt covenants and financing constraints, which reduce liquidity buffers and sustainability investments while increasing incentives for earnings manipulation to meet contractual obligations (Chen et al., 2025; Kim & Park, 2012; Magerakis et al., 2022).

The market-to-book ratio (MTB), capturing growth opportunities, is expected to be positively related to cash holdings and ESG performance, as growth-oriented firms tend to retain liquidity for future investment and engage more actively in sustainability initiatives to signal long-term value creation. At the same time, higher growth opportunities may increase reporting discretion, potentially leading to higher earnings management (He & Wintoki, 2016).

Sales growth (GROWTH) is expected to be positively associated with cash holdings and ESG performance, reflecting reinvestment needs and expansion strategies, while also increasing operational uncertainty, which may heighten earnings management (Iskin et al., 2011; Morbey, 1988; Morbey & Reithner, 1990).

Inventory intensity (INV), measured as inventory over total assets, is expected to exhibit a negative association with cash holdings and ESG performance, as higher inventory levels tie up internal funds and signal lower operational flexibility. Inventory-intensive firms may also face greater pressure to smooth earnings, increasing the likelihood of earnings management (Haque et al., 2024).

The operating cycle (OPCYCLE) captures working-capital efficiency and is expected to be negatively related to cash holdings and ESG performance, as longer cash conversion cycles increase liquidity risk and constrain long-term investments. Inefficient working-capital management may also raise earnings management incentives to mask operational inefficiencies (Asman et al., 2022).

LOSS is a dummy variable indicating loss-making firms and is expected to have a positive association with cash holdings due to precautionary motives, while being positively related to

earnings management and negatively associated with ESG performance. Loss-making firms face heightened financial pressure, increasing incentives for reporting discretion and reducing resources available for sustainability initiatives (Haga et al., 2018).

Profitability (ROA) is expected to be negatively associated with cash holdings, as profitable firms rely less on precautionary liquidity, negatively related to earnings management, and positively associated with ESG performance, reflecting greater internal funding capacity and stronger stakeholder engagement (Chen et al., 2025).

Earnings volatility (SD_ROA), measuring risk and income uncertainty, is expected to be positively related to cash holdings and earnings management, and negatively associated with ESG performance, as volatile firms hoard liquidity and face greater difficulty sustaining long-term sustainability investments (Haga et al., 2018; Taffler, 1983).

Financial distress (ZSCORE) is expected to be negatively related to cash holdings and earnings management, and positively associated with ESG performance, as financially stable firms face lower bankruptcy risk, reduced reporting pressure, and greater capacity to invest in sustainability (Altman, 1968; Taffler, 1983).

Finally, corporate governance quality (CG_Score), measured using the governance component of the ESG score, is expected to be negatively associated with earnings management and positively related to ESG performance, reflecting stronger monitoring, improved accountability, and enhanced alignment with stakeholder interests. Governance quality may also reduce excessive precautionary cash retention by improving investment efficiency (Honoré et al., 2015; Ioannou & Serafeim, 2017).

Table 5. Variable Type and Supporting Literature

Type	Variable	Supporting Literature
Dependent	Cash Holdings (CASH)	(Magerakis et al., 2022; Nguyen and Nguyen, 2025)
	Earnings Management (DisWCA)	(P. M. Dechow & Dichev, 2002) (Francis et al., 2005)
	ESG Score (ESG)	Francis et al., 2005).
Independent	R&D Intensity (R&D)	
	Intangible Intensity (Intang)	(Bagna et al., 2021; Pan et al., 2025)
Control	Size (SIZE)	(He & Wintoki, 2016)
	Leverage (LEV)	(He & Wintoki, 2016; Magerakis et al., 2022).
	Profitability (ROA)	(C. Chen et al., 2025)
	Growth (GROWTH)	(Iskin et al., 2011)
	Market-to-Book (MTB)	(Kim and Park, 2012; He and Wintoki, 2016)
	Inventory Intensity (INV)	(Haque et al., 2024)
	Operating Cycle (OPCYCLE)	(Asman et al., 2022)
	Loss Indicator (LOSS)	(Haga et al., 2018)
	Z-score (ZSCORE)	(Haga et al., 2018; Taffler, 1983)
	Governance Score (CG_Score)	(Honoré et al., 2015)
	earnings volatility (SD_ROA)	(Haga et al., 2018)

Source: Researcher's construction

3.3.3 Regression Models and Estimation Strategy

The quantitative analysis adopts a panel-data approach consistent with methodological practices reported in sustainability, governance, and innovation research (Danisman & Demirel, 2019; Mahmood et al., 2018; Rustam et al., 2019). These studies emphasise that panel regressions allow researchers to control for unobservable firm-specific characteristics and exploit both

cross-sectional and time-series variation—features essential when examining financial and ESG outcomes influenced by innovation.

Following this convention, the study estimates two separate fixed-effects (FE) regression models. The separation is necessary because R&D intensity and intangible asset intensity capture distinct innovation constructs governed by different recognition rules under IAS 38. Including both in a single model would introduce interpretational ambiguity and inflate multicollinearity, an issue also avoided in comparable research (Mahmood et al., 2018; Tauringana & Chithambo, 2016). The FE framework enables consistent estimation by eliminating time-invariant firm characteristics such as governance culture, reporting practices, and business model positioning.

Model 1: Effect of R&D Intensity

$$Y_{it} = \alpha + \beta_1 \text{R\&D} + \gamma' X_{it} + \mu_i + \delta_t + \varepsilon_{it}$$

Model 1 evaluates the effect of R&D investment on cash holdings, earnings management, and ESG performance. R&D is known to introduce information asymmetry, earnings volatility, and financing frictions, all of which may influence liquidity decisions and managers' reporting incentives (He & Wintoki, 2016). The literature reports inconclusive evidence regarding how R&D relates to ESG outcomes; some studies highlight innovation as an enabler of sustainability, whereas others document neutral or negative effects depending on industry characteristics and time horizons (Albitar, Liu, et al., 2023; Dicuonzo et al., 2022). This lack of consensus warrants an empirical investigation using a multi-year firm-level panel.

Model 2: Effect of Intangible Asset Intensity

$$Y_{it} = \alpha + \beta_1 \text{Intang} + \gamma' X_{it} + \mu_i + \delta_t + \varepsilon_{it}$$

Model 2 examines the effect of recognised intangible assets, capturing internally developed assets that meet IAS 38 capitalisation criteria. Intangibles often signal the firm's accumulated innovation capacity and forward-looking value creation but may also indicate managerial discretion in the timing and classification of development expenditure (Zhang & Zhou, 2025). Firms with higher intangible intensity typically face limited collateral and greater dependence on internal liquidity, resulting in higher cash ratios (Falato et al., 2022). Conversely, intangible-rich firms may also demonstrate stronger governance and sustainability engagement due to their

reliance on knowledge-based competitive strategies (Pham et al., 2024). Unlike R&D, which is expensed by default under IAS 38, intangible assets represent managerial recognition choices, making this variable an important indicator of both innovation and reporting discretion.

Estimation Technique

All models are estimated using industry fixed effects (μ_j) and year fixed effects (δ_t), with firm-clustered robust standard errors. Industry fixed effects control for unobserved, time-invariant sector characteristics that shape innovation intensity, disclosure norms, and ESG expectations. Year fixed effects capture macroeconomic shocks, regulatory developments and evolving sustainability reporting trends. Firm-clustered standard errors were applied to correct for serial correlation and unequal error variances within firms. This approach is widely used in multi-year corporate finance and sustainability studies and ensures reliable statistical inference (Albitar, Liu, et al., 2023; Falato et al., 2022).

- Y_{it} : dependent variables (cash holdings, earnings management, ESG scores).
- $R\&D_{it}$: R&D intensity.
- $INTANG_{it}$: Intangible asset intensity.
- X_{it} : vector of control variables including (firm size, Leverage, Profitability, Growth, Market-to-Book, Inventory Intensity, Operating Cycle, Loss Indicator, Z-score, governance score, and earnings volatility).
- μ_j : industry fixed effects.
- δ_t : year fixed effects.
- ε_{it} : idiosyncratic error term.

Multicollinearity among the explanatory variables was assessed using variance inflation factors (VIFs). All variables exhibit VIF values below commonly accepted threshold levels, indicating that multicollinearity does not pose a concern in this study. Following established econometric guidelines, VIF values below 10 and more conservatively below 5 suggest that coefficient estimates are not distorted by excessive linear dependence among regressors (Wooldridge, 2010).

3.4 Qualitative Method

The qualitative strand complements the quantitative analysis by providing interpretive depth and clarifying the organisational, institutional, and behavioural mechanisms underlying firms' innovation, reporting, and sustainability practices. While the regression models identify statistical associations among R&D intensity, intangible assets, earnings management, liquidity behaviour, and ESG performance, qualitative inquiry allows exploration of why these relationships emerge, how managers interpret innovation-related decisions, and what contextual factors shape reporting discretion and organisational behaviour. This mixed-methods logic follows the approach of Assenga et al (2018), Mahmood et al.(2018), Mbithi et al.(2022) and Rustam et al. (2019), all of whom used interviews to enrich and validate quantitative results.

3.4.1 Purpose of the Qualitative Component

The qualitative component was included because innovation reporting, intangible asset recognition under IAS 38, and ESG disclosure involve substantial managerial judgement and interpretive discretion. These decisions are influenced by uncertainty, sector-specific norms, regulatory expectations, governance structures, and internal reporting cultures which are factors not observable in secondary datasets.

Consistent with prior mixed-methods studies in accounting and sustainability research, interviews were used to:

- interpret quantitative findings,
- reveal mechanisms not measurable through panel data,
- provide contextual explanations for firm behaviour, and
- triangulate numerical observations with expert perspectives.

3.4.2 Interviewee Selection and Sampling Strategy

The qualitative component of this study employed a targeted purposive sampling strategy, supplemented by snowball sampling, to identify interviewees with advanced expertise in innovation accounting, intangible asset valuation, ESG reporting, and corporate finance within the UK context. This approach is appropriate when the research objective is to obtain informed,

experience-based insights into complex and judgement-driven reporting practices rather than to achieve statistical representativeness (Ahrens & Chapman, 2006; Patton, 2015).

Initial participant identification was facilitated through attendance at a UK-based academic and professional workshop focused on accounting-related topics. This setting provided direct access to domain experts with relevant research or professional experience. Several of these initial contacts subsequently referred the researcher to additional experts with complementary expertise, consistent with a snowball sampling approach. Snowball sampling is particularly effective in expert-based qualitative research, where knowledge networks are well defined and relevant participants may be difficult to identify through purely systematic searches (Noy, 2008). An overview of the interview participants, including their professional background and area of expertise, is provided in **Table 6**.

In total, nine experts were contacted. The number of potential interviewees was not determined *ex ante* by a fixed numerical target but evolved iteratively as interviews were conducted and additional experts were identified. This concurrent process of interviewing and expert identification aligns with qualitative research best practice, where sampling continues until sufficient informational depth is achieved (Guest et al., 2006). The search for additional participants was discontinued once a sufficient number of experts had agreed to participate and the interviews conducted provided adequate coverage of the study's key themes.

Out of the nine experts contacted, five agreed to participate, yielding a response rate of 55.6%. This response rate is considered acceptable for expert-based qualitative studies, particularly given the high level of specialisation and limited availability of the targeted participants. Moreover, the final number of interviews is consistent with prior qualitative and mixed-methods research in accounting and corporate governance, where a relatively small number of expert interviews is sufficient to generate rich, theoretically meaningful insights (Ahrens & Chapman, 2006; Assenga et al., 2018).

The decision to conclude data collection after five interviews was guided by thematic saturation, rather than by numerical considerations. As interviews progressed, recurring patterns and consistent interpretations emerged regarding innovation-related uncertainty, intangible asset recognition, precautionary financial behaviour, and ESG reporting incentives. The absence of substantively new themes in later interviews indicated that further data collection was unlikely

to yield additional analytical value. Achieving saturation with a limited number of expert interviews is well documented in qualitative research, particularly when participants possess deep, domain-specific knowledge and the research questions are narrowly focused (Braun & Clarke, 2021; Guest et al., 2006).

Overall, this targeted and referral-based sampling strategy ensured that the qualitative component provided contextual depth, interpretive validation, and theoretical triangulation of the quantitative findings, thereby strengthening the credibility and explanatory power of the mixed-methods design adopted in this thesis.

Table 6. Interview sample

NO.	Affiliation Type	Code	Gender	Qualification	Response
1	Academic	A	Male	Professor	Face to face
2	Academic	B	Male	PhD	Face to face
3	Academic	C	Male	PhD	Face to face
4	Academic	E	Male	PhD	Face to face
5	Professional	D	Female	PhD	Online
6	Academic	F	Male	Professor	Not applicable
7	Academic	G	Female	PhD	Not applicable
8	Academic	H	Male	Professor	Not applicable
9	Professional	I	Male	PhD	Not applicable

Source: Researcher's construction

The final sample presented in **Table 7** included four academics (four at UK business schools) and one professional from KPMG UK specialising in intangible asset valuation and ESG assurance. Their diverse backgrounds enhanced triangulation and ensured that multiple perspectives informed the interpretation of the quantitative results.

Table 7. Interview Participant Profiles

ID	A/P Title	Affiliation	Area of Expertise
A	Professor	Bangor University	Corporate narrative reporting, Corporate finance, Intangible assets, Standard-setting, ESG
B	Assistant Professor	Bangor University	Financial reporting, International accounting, CSR
C	Associate Professor	University of Glasgow	Corporate disclosure, ESG, Climate reporting
D	Associate Professor	ST. Andres University	Disclosure, Textual analysis, Governance, ESG
E	Professional Expert	KPMG UK	Intangible assets, Standard-setting, Blockchain, ESG

Source: Researcher's construction

3.4.3 Data Collection Procedures

Semi-structured interviews were selected because they provide structure while allowing flexibility to probe emerging ideas, an approach consistent with the qualitative components in the studies you shared. Interviews lasted 30–45 minutes and were conducted either online or in person. All interviews were recorded with consent and transcribed verbatim. In addition to the recorded interviews, participants were invited to complete a written open-ended questionnaire containing the same thematic questions as the interview schedule. This allowed participants additional time to reflect on technical issues, provide more detailed explanations, and clarify any points they wished to expand upon. This step enhanced the richness and clarity of expert insights.

Thematic saturation was achieved after the fifth interview, as no substantially new concepts emerged—consistent with expectations for expert-based qualitative studies where participants possess deep specialised knowledge. This dual-method approach improved the richness of the data by supplementing spoken responses with written justifications. The overall workflow

guiding the qualitative sampling, data collection, and analytical procedures is illustrated in **Figure 5**, which summarises the sequential stages from expert recruitment to thematic integration.

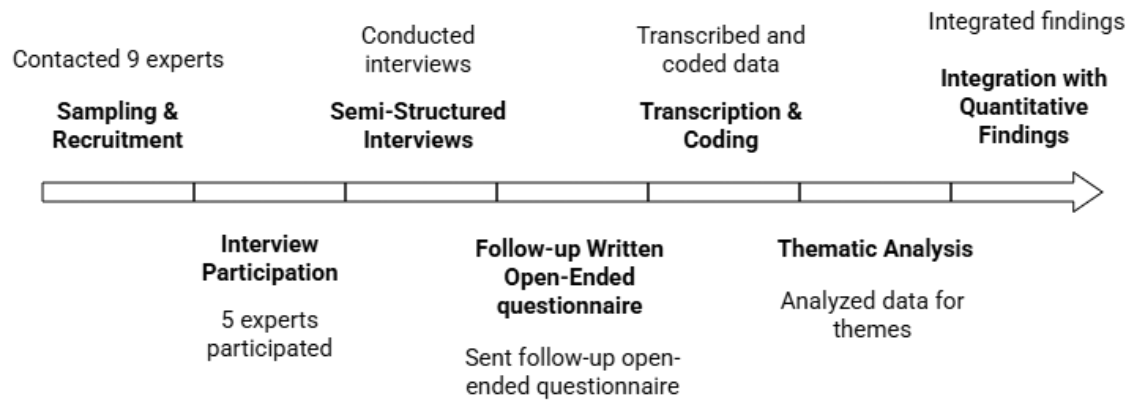


Figure 5. Qualitative Data Process

Source: Researcher's construction

3.4.4 Data Analysis: Thematic Analysis

Interview data were analysed using thematic analysis, following Braun & Clarke (2006, 2021) six-phase framework. This approach is widely applied in accounting and ESG research due to its systematic transparency and flexibility. Analysis involved: Familiarisation with transcripts, generating initial codes, developing preliminary themes, reviewing and refining themes, defining and naming themes and Synthesising findings into a narrative. represented in **Figur 6**.

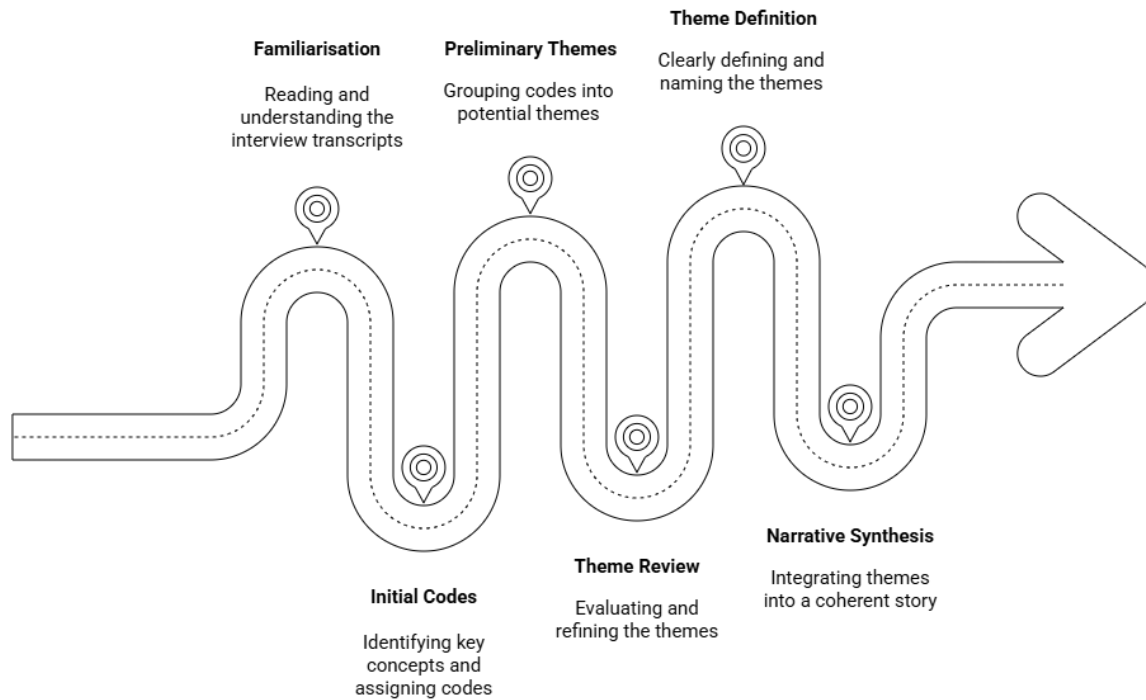


Figure 6. Thematic Analysis Process

Source: Researcher's construction

Coding followed a hybrid deductive–inductive approach:

- Deductive codes were informed by the quantitative findings (e.g., R&D uncertainty, capitalisation discretion, precautionary liquidity, ESG misalignment).
- Inductive codes captured emergent insights (e.g., innovation–sustainability tension, regulatory ambiguity, and cultural norms in UK reporting).

Semi-structured interviews were used to explore expert interpretations of the relationships identified quantitatively. The interview schedule was structured into six substantive sections (A–F), covering: Section A: Introduction & Context, Section B: R&D Investment and Financial Outcomes, Section C: R&D and ESG Performance, Section D: Intangible Assets and Firm Behaviour, Section E: Broader Implications and Section F: Closing. These questions directly correspond to the core constructs used in the quantitative models and were designed to explain, contextualise, or challenge the statistical results. The full interview protocol is provided in **Appendix A**.

3.5 Reliability, Validity, and Ethical Considerations

Ensuring the rigour and credibility of research findings is central to empirical work in accounting, finance, and sustainability. Because this study employs a mixed-methods design, reliability, validity, and ethical integrity must be demonstrated across both quantitative and qualitative components, as well as through their integration. This section outlines the steps undertaken to enhance methodological robustness and safeguard ethical compliance.

3.5.1 Reliability and Validity of the Quantitative Component

Quantitative reliability refers to the consistency and stability of measurements over time, while validity concerns the accuracy and appropriateness of the constructs being measured. In this study, several procedures were employed to enhance the reliability and validity of the quantitative analysis.

a. Measurement Reliability and Construct Validity

The financial, accounting, and ESG variables used in the econometric models were sourced primarily from Eikon, a database widely recognised for its standardised data architecture and extensive coverage. Using a consistent data source reduces measurement inconsistencies and enhances temporal comparability.

Construct validity was reinforced by adopting variable definitions widely used in established empirical studies. Measures for R&D intensity, intangible asset intensity, earnings management, and cash holdings follow standard conventions in the literature. ESG performance was measured using Eikon's combined ESG score, which has been validated in numerous recent sustainability studies.

b. Internal Validity

Internal validity concerns the credibility of causal inferences. To address unobservable sectoral characteristics that remain constant over time, industry fixed effects were included. Year fixed effects controlled for macroeconomic and regulatory shocks, including changes in sustainability reporting expectations. The inclusion of standard control variables: firm size, leverage, profitability, growth, market valuation, inventory intensity, operating cycle, governance score, and risk indicators further reduced omitted-variable bias.

c. Reliability Through Robust Estimation and Diagnostics

Several diagnostic tests were performed to ensure statistical reliability. The Wooldridge test indicated the presence of serial correlation, and the Breusch–Pagan test indicated heteroskedasticity—both common in panel datasets. To address these issues, firm-clustered robust standard errors were used. Variance Inflation Factor (VIF) analysis confirmed that multicollinearity was not a concern. Together, these steps enhance the reliability of coefficient estimates and the credibility of empirical results.

3.5.2 Trustworthiness of the Qualitative Component

Qualitative research does not rely on statistical generalisation but instead focuses on analytical depth and contextual understanding. To assess qualitative rigour, this study adopts the widely accepted framework of trustworthiness proposed by Lincoln & Guba (1985), comprising credibility, transferability, dependability, and confirmability (Nowell et al., 2017).

a. Credibility

Credibility refers to the truthfulness of qualitative interpretations. In this study, credibility was established through:

- Expert sampling: All interviewees were specialists with established expertise in corporate reporting, ESG, financial accounting, or intangible valuation. Their professional and academic backgrounds increased the reliability of insights.
- Triangulation: Qualitative findings were compared with quantitative results. Convergence between the two strands strengthened interpretive validity, while divergences informed nuanced discussion.
- Member contextual alignment: Interview questions were grounded in real UK reporting practices, IAS 38 requirements, and sustainability reporting standards, ensuring conceptual resonance with participants' expertise.

b. Transferability

Transferability refers to the applicability of findings to other contexts. Although the qualitative sample is intentionally limited to five expert participants, this is appropriate for the study's objective, which is to interpret statistical relationships rather than represent a broad population.

Rich descriptions of participants' roles, institutional environments, and areas of expertise enable readers to judge whether insights apply to similar corporate or regulatory contexts (Ahrens & Chapman, 2006). Given that the UK operates under IFRS and internationally aligned ESG frameworks, the insights are likely transferable to other IFRS jurisdictions.

c. Dependability

Dependability refers to the stability of qualitative procedures. To ensure dependability, the research followed a clear and replicable sequence:

- Development of an interview protocol (based on the uploaded instrument).
- Standardised interview procedures (semi-structured format, 30–45 minutes).
- Open-ended questionnaire containing the same thematic questions.
- Verbatim transcription of audio recordings.
- Systematic coding using Braun & Clarke (2006, 2021) thematic analysis framework.
- Maintaining consistent procedures across interviews enhances dependability, enabling future researchers to replicate or extend the analysis.

d. Confirmability

Confirmability refers to the objectivity of qualitative interpretations. To enhance confirmability, all coding decisions were documented, and representative extracts from transcripts were used to support thematic conclusions (presented in Chapter 4). Reflexive notes were kept during coding to identify potential researcher biases, consistent with current guidance on qualitative accounting research (Ahrens & Chapman, 2006). No incentives were provided to interviewees, and their responses reflected independent professional judgement.

3.5.3 Integration Validity in Mixed-Methods Research

Mixed-methods research requires explicit demonstration of integration validity, defined as the extent to which quantitative and qualitative components are coherently connected and mutually informative within a single research design. In explanatory sequential mixed-methods designs, integration is achieved when qualitative findings are purposefully used to explain, contextualise,

or reinterpret quantitative results, thereby strengthening the overall inferential quality of the study (Creswell & Clark, 2017).

Explanatory sequential designs typically involve two distinct but connected phases: an initial quantitative phase that identifies statistical patterns and relationships, followed by a qualitative phase that probes the underlying mechanisms, contextual factors, and interpretive meanings behind those patterns. The qualitative component does not function as a standalone inquiry; rather, it is explicitly shaped by the quantitative findings, ensuring complementarity and methodological coherence (Tashakkori & Teddlie, 2010). Integration validity is further enhanced when qualitative insights are used to clarify unexpected or ambiguous quantitative results, assess the plausibility of hypothesised mechanisms, and provide contextual explanations that are not directly observable in numerical data. This form of methodological triangulation increases the credibility and explanatory power of mixed-methods research by reducing the risk of misinterpretation based on single-method evidence (Fetters et al., 2013; Greene et al., 1989).

In this study, integration is achieved through the deliberate use of expert interviews to interpret the empirical relationships identified in the quantitative analysis, particularly those relating to R&D investment, intangible asset recognition, cash-holding behaviour, earnings management, and ESG performance. By linking expert insights directly to the quantitative findings, the qualitative phase provides theoretically informed explanations of observed statistical associations and enhances the substantive interpretation of the results. This sequential integration supports internal coherence and strengthens the overall validity of the mixed-methods design.

3.5.4 Reliability of the Qualitative Analysis

To enhance the reliability of the qualitative findings, the thematic analysis underwent a structured review process involving the research supervisors and two independent academic experts based in the UK, all of whom possess expertise in accounting, corporate reporting, and qualitative research methods. The review focused on the coherence of the coding structure, the transparency of theme development, and the alignment between interview evidence and analytical interpretations.

Overall agreement was reached regarding the core themes and their relevance to the study's research questions. However, some differences in interpretation arose during the review process,

which were addressed through analytical discussion and refinement. For example, one reviewer initially interpreted managers' cash retention behaviour primarily as a response to financing constraints, whereas another emphasised a precautionary motive linked to R&D uncertainty and intangible asset risk. Through discussion, this theme was refined to explicitly incorporate both mechanisms, reflecting the interaction between innovation-related uncertainty and liquidity management. Further discussion concerned the interpretation of ESG engagement. Initial interpretations varied between viewing ESG practices as largely compliance-driven versus strategically integrated into long-term value creation. Following reviewer feedback, the theme was refined to reflect a continuum of ESG motivations, influenced by governance quality and institutional expectations within the UK context.

These interpretive discussions resulted in the clarification, consolidation, and refinement of themes, strengthening the analytical rigour of the study. This process aligns with best practice in qualitative research, where reliability is enhanced through peer debriefing and reflexive dialogue, rather than through mechanical measures of inter-coder agreement (Braun & Clarke, 2021; Lincoln & Guba, 1985). Overall, the involvement of supervisors and independent academic experts provides assurance that the qualitative analysis is dependable, transparent, and not solely reliant on a single researcher's perspective, thereby enhancing the credibility of the mixed-methods findings.

3.5.5 Ethical Considerations

This study adhered to established ethical guidelines for research involving human participants and secondary data. All participants received an information sheet explaining the purpose of the study, procedures, risks, confidentiality measures, and their right to withdraw at any time without consequence.

Confidentiality and anonymity were ensured by assigning pseudonyms to participants (A–E). Interview recordings were stored securely, and transcripts were anonymised before analysis. No identifying details were included in the thesis or publications derived from this research. For quantitative data, all firm-level data used from Refinitiv Eikon complied with licensing and data-handling requirements.

3.6 Summary

This chapter outlined the mixed-methods design used to examine how R&D intensity and intangible asset intensity affect cash holdings, earnings management, and ESG performance in UK-listed non-financial firms. The quantitative analysis employed panel regressions on 160 firms (2011–2023) using industry and year fixed effects, firm-clustered robust standard errors, and established variable definitions to ensure reliability and validity.

Because quantitative results alone cannot capture the judgement, discretion, and contextual factors underlying innovation and reporting practices, semi-structured interviews with five experts were conducted. Thematic analysis provided explanations for the observed relationships and offered insights. Both methodological strands adhered to recognised standards of rigour, credibility, and ethical compliance. This chapter therefore provides a sound foundation for the quantitative results in Chapter 4 and the integrated interpretation presented in Chapter 5.

CHAPTER 4: RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This section presents and discusses the empirical findings of the study in light of the existing literature, highlighting both consistencies and deviations from prior research. Consistent with the mixed-methods design adopted in this thesis, the chapter integrates quantitative evidence derived from panel-data regression analysis with qualitative insights obtained from expert interviews. The quantitative analysis establishes the statistical relationships between the focal variables and evaluates the hypotheses developed in Chapter 2, while the qualitative findings complement these results by providing contextual explanations, interpretive depth, and deeper insights into the underlying mechanisms driving the observed empirical patterns. This integrated approach allows for a more comprehensive understanding of how R&D and intangible investments influence corporate financial behaviour and sustainability outcomes within the UK institutional context.

To guide the presentation of the findings, it is useful to briefly restate the empirical focus of the six hypotheses tested in this study. Hypotheses H1–H3 examine whether firms' R&D intensity is associated with their cash holdings, discretionary working-capital accruals, and ESG performance, while Hypotheses H4–H6 assess whether intangible asset intensity influences these same outcomes. Together, these hypotheses allow the study to evaluate how different forms of innovation investment relate to liquidity behaviour, earnings management practices, and sustainability performance within UK-listed firms.

The chapter is divided into four main sections. Section 4.2 presents the quantitative findings, beginning with descriptive statistics, followed by correlation analysis, and concluding with the regression results for R&D intensity (Model 1) and intangible asset intensity (Model 2). Section 4.3 then reports the qualitative findings drawn from the semi-structured interviews with academic and professional experts. Section 4.4 integrates the quantitative and qualitative insights into a unified discussion that situates the findings within the broader literature and theoretical context. Section 4.5 concludes the chapter with a summary of the main results and a transition to the final chapter.

4.2 Quantitative Findings

4.2.1 Descriptive Analysis

The descriptive statistics presented in **Table 8** offer an initial overview of the characteristics of the sample, which consists of 160 UK-listed non-financial firms observed over the period 2011–2023, yielding 2,075 firm-year observations. The variables exhibit substantial cross-sectional variation, reflecting differences in financial policies, operational structures, innovation strategies, and sustainability practices across firms.

R&D intensity displays pronounced heterogeneity, with a median of 0.019 and a mean of 1.169, compared with a maximum value of 262.803. The wide gap between the mean and median indicates a highly skewed distribution. This indicates that only a small subset of innovation-oriented firms invests heavily in R&D, while the majority spend little or nothing. Intangible asset intensity (Intang) also varies considerably, with a median of 0.177, a mean of 0.346, and values ranging from 0.000 to 66.019, suggesting that some firms operate with substantial intangible capital, while others possess virtually no intangible assets and rely predominantly on physical capital.

Cash holdings show a median ratio of 0.076 and a mean of 0.126, with values spanning from 0.000 to 0.972, highlighting notable differences in liquidity management across firms. Discretionary working-capital accruals (DisWCA), used to proxy earnings management, present a median close to zero (−0.001), a mean of −0.0028, and values between −0.606 and 0.623, indicating that firms engage in both income-increasing and income-decreasing accrual adjustments. The ESG scores range from 1.680 to 95.570, with a mean of 56.789, reflecting broad variation in sustainability performance across the sample.

The control variables also display meaningful dispersion. Firm size (SIZE), measured as the natural logarithm of total assets, exhibits a median of 14.65 and a mean of 14.63, suggesting a relatively balanced distribution of firm size, although the range (3.761 to 19.86) indicates the presence of both very small and very large firms. Leverage (LEV) has a mean of 0.260, while market-to-book ratios (MTB) range widely from −964.25 to 1,255, with a median of 2.022, indicating significant variation in firms' growth opportunities and market valuations. Investment (INV) ratios remain generally low, with a median of 0.046 and a mean of 0.095.

Growth (GROWTH) is similarly skewed, with a small median of 0.02 and extreme positive outliers (max = 14.324), consistent with occasional periods of rapid expansion for some firms.

Table 8. Descriptive Statistics

VARIABLES	N	Median	Mean	SD	Min	Max
R&D	904	0.019	1.169	12.784	0.000	262.803
Intang	2,044	0.177	0.346	1.822	0.000	66.019
Cash_holding	2,040	0.076	0.126	0.153	0.000	0.972
DisWCA	1,465	-0.001	-0.0028	0.064	-0.606	0.623
ESG	1,720	57.13	56.789	17.921	1.680	95.570
SIZE	2,044	14.65	14.63	1.956	3.761	19.86
LEV	2,034	0.233	0.260	0.222	0.000	2.367
MTB	2,016	2.022	4.009	45.378	-964.25	1255
INV	2,041	0.046	0.095	0.145	0.000	0.946
GROWTH	1,914	0.02	0.120	0.676	-0.999	14.324
OPCYCLE	2,075	114.294	180.553	319.618	0.000	7397.227
ROA	2,043	0.034	0.026	1.379	-6.628	60.950
LOSS	2,075	0.09	0.214	0.277	0.000	1.000
ZSCORE	2,008	9.111	8.08	13.770	-115.598	80.312
SD_ROA	2,075	0.005	0.158	0.886	0.006	17.620
CG_Score	1,720	62.85	60.412	20.028	0.930	98.890

Please see Table 4 for variable definitions

Source: Researcher's construction

The operating cycle (OPCYCLE) exhibits considerable heterogeneity, with a median of 114.294 days, a mean of 180.553 days, and a maximum exceeding 7,397 days, reflecting substantial differences in operating efficiency and working-capital dynamics across industries. Profitability (ROA) shows a median of 0.034 and a mean of 0.026, with values ranging from -6.628 to 60.950 , highlighting the presence of both highly profitable and loss-making firms. Loss incidence (LOSS) has a median of 0.09 and a mean of 0.214, indicating that approximately 21% of firm-year observations report negative earnings.

Measures of financial stability also vary notably. The Altman Z-score (ZSCORE) ranges from -115.598 to 80.312 , with a median of 9.111 and a mean of 8.080, suggesting that while most firms fall within a financially stable range, a subset faces substantial distress. Volatility in profitability (SD_ROA) shows a median of 0.005 and a mean of 0.158, indicating that for most firms, ROA remains relatively stable over time despite a few extreme cases.

Together, these statistics confirm that the sample exhibits substantial cross-sectional and temporal variation, supporting the appropriateness of panel-data estimation and motivating further investigation into the relationships between the study variables.

4.2.2 Correlation Analysis

The Pearson correlation matrix presented in **Table 9** provides preliminary insights into the associations among the key variables. These relationships offer an initial indication of how R&D and intangible assets may relate to cash holdings, earnings management, and ESG performance.

R&D intensity exhibits several meaningful correlations. It is positively and significantly associated with cash holdings ($r = 0.209$, $p < 0.10$), indicating that firms engaging more heavily in innovation tend to maintain higher liquidity buffers, possibly to accommodate the uncertainty inherent in R&D investment. R&D intensity is also positively correlated with earnings management ($r = 0.280$, $p < 0.10$), suggesting that R&D-active firms may experience greater reporting discretion or volatility, thereby relying more on accrual-based adjustments. In contrast, R&D intensity shows a negative correlation with ESG performance ($r = -0.166$, $p < 0.10$), indicating a potential divergence between innovation expenditure and sustainability practices. This pattern may imply that innovation-oriented firms allocate fewer resources to ESG-related activities or prioritize technological development over broader sustainability objectives.

Intangible asset intensity also demonstrates significant but weaker relationships. It is positively associated with cash holdings ($r = 0.102$, $p < 0.10$) and earnings management ($r = 0.092$, $p < 0.10$), suggesting that firms with larger intangible asset bases may maintain greater liquidity and exercise more discretion in financial reporting. However, its correlation with ESG performance is negligible, reflecting limited alignment between intangible capital and sustainability at the bivariate level.

Beyond R&D and Intangible assets measures, several notable correlations emerge among the control variables. Firm size (SIZE) shows strong positive associations with ESG ($r = 0.635$, $p < 0.10$) and CG_Score ($r = 0.361$, $p < 0.10$), consistent with the expectation that larger and better-governed firms are more likely to engage in sustainability initiatives. Cash holdings are negatively correlated with firm size ($r = -0.440$, $p < 0.10$), suggesting that larger firms rely less on precautionary cash reserves. LOSS exhibits positive correlations with cash holdings ($r = 0.392$, $p < 0.10$), R&D intensity ($r = 0.184$, $p < 0.10$), and earnings management ($r = 0.318$, $p < 0.10$), indicating that loss-making firms tend to hold more cash, engage more in accrual manipulation, and invest in innovation despite lower profitability. Profitability (ROA) is strongly and negatively correlated with earnings management ($r = -0.391$, $p < 0.10$) and R&D intensity ($r = -0.285$, $p < 0.10$), supporting the view that less profitable firms resort to accrual adjustments and that innovation activities often coincide with lower short-term returns. Growth opportunities (MTB) are positively correlated with R&D intensity ($r = 0.302$, $p < 0.10$), reflecting that firms with stronger future prospects tend to invest more in technological development.

Overall, the relationships in the matrix are generally low to moderate in magnitude, and no pairwise correlation approaches levels typically indicative of multicollinearity ($|r| \geq 0.80$). This suggests that the explanatory variables capture distinct aspects of firm characteristics and supports the appropriateness of proceeding with multivariate regression analysis. The observed patterns are consistent with theoretical expectations and provide confidence in the suitability and reliability of the dataset for subsequent empirical testing.

Table 9. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Cash_holding	1.000															
(2) DisWCA	0.357*	1.000														
(3) ESG	-0.180*	-0.139*	1.000													
(4) R&D	0.209*	0.280*	-0.166*	1.000												
(5) Intang	0.102*	0.092*	-0.006	-0.029	1.000											
(6) SIZE	-0.440*	-0.266*	0.635*	-0.150*	-0.083*	1.000										
(7) LEV	-0.178*	-0.074*	0.034	-0.115*	-0.044*	0.191*	1.000									
(8) MTB	0.023	0.061*	-0.031	0.302*	-0.006	-0.064*	0.005	1.000								
(9) GROWTH	0.241*	0.346*	-0.165*	-0.036	0.000	-0.048*	-0.077*	-0.007	1.000							
(10) INV	-0.121*	-0.066*	0.007	-0.075*	-0.057*	0.039	-0.208*	-0.031	-0.055*	1.000						
(11) OPCYCLE	0.193*	0.110*	0.033	-0.005	0.043	-0.073*	-0.093*	-0.046*	0.053*	0.214*	1.000					
(12) LOSS	0.392*	0.318*	-0.177*	0.184*	0.121*	-0.405*	0.022	0.018	0.038	-0.195*	0.153*	1.000				
(13) ROA	0.048*	-0.391*	-0.009	-0.285*	-0.016	-0.015	-0.038	-0.004	-0.020	0.008	-0.024	-0.055*	1.000			
(14) SD_ROA	0.161*	0.059*	-0.065*	0.036	0.002	-0.164*	-0.044*	0.008	-0.018	-0.058*	0.008	0.107*	0.388*	1.000		
(15) ZSCORE	-0.028	-0.176*	-0.019	-0.123*	-0.065*	0.072*	-0.192*	0.007	0.128*	0.149*	0.020	-0.326*	0.212*	-0.097*	1.000	
(16) CG_Score	-0.098*	-0.101*	0.680*	-0.128*	0.014	0.361*	-0.007	-0.009	-0.122*	0.013	0.040	-0.124*	0.000	-0.033	-0.012	1.000

* Indicates statistical significance at the 5% levels.

Source: Researcher's construction

4.2.3 Regression Analysis

This section presents the multivariate regression results used to test the study's hypotheses. Two main models are estimated: Model 1 examines the influence of R&D intensity, while Model 2 evaluates the role of intangible asset intensity. All regressions incorporate firm fixed effects and year fixed effects to control for unobserved heterogeneity, and robust clustered standard errors are reported. The findings below straightforwardly describe the empirical results, while detailed theoretical interpretation is provided in the subsequent discussion section.

Model 1: The Effect of R&D Intensity (Tables 10-12)

Model 1 tests hypotheses H1, H2, and H3 by evaluating whether R&D intensity influences firms' liquidity decisions, earnings management behavior, and sustainability performance.

$$Y_{it} = \alpha + \beta_1 \text{R\&D} + \gamma' X_{it} + \mu_i + \delta_t + \varepsilon_{it}$$

- ✓ H1: There is a relationship between R&D investment and cash holding.
- ✓ H2: There is a relationship between R&D investment and earnings management.
- ✓ H3: There is a relationship between R&D investment and ESG performance.

- H1: There is a relationship between R&D investment and ESG performance (**Table 10**)

The results reported in Table 4.3 provide clear empirical evidence supporting H1, which proposes a relationship between R&D investment and corporate cash holdings. R&D intensity is positively and highly significant ($\beta = 0.085$, $t = 7.45$, $p < 0.01$), indicating that firms with higher R&D expenditures tend to hold more cash. This finding confirms that innovation-related activities are an important determinant of firms' liquidity levels.

Several control variables also exhibit significant associations with cash holdings, including sales growth (GROWTH), LOSS, ROA, SD_ROA, and ZSCORE, while SIZE, LEV, MTB, INV, and CG_Score are not significant. The model explains 54% of the variation in cash holdings ($R\text{-squared} = 0.540$), and both industry and year fixed effects are included. Overall, the results strongly support H1 and demonstrate that firms investing more in R&D retain higher cash reserves.

- H2: There is a relationship between R&D investment and earnings management (**Table 11**)

Table 4.4 provides strong support for H2, which examines whether R&D investment influences earnings management behavior. The coefficient on R&D intensity is positive and highly significant ($\beta = 0.090$, $t = 3.26$, $p < 0.01$), indicating that firms with higher R&D expenditure tend to engage more in earnings management via discretionary working-capital accruals. This suggests that R&D-intensive firms operate in environments characterized by greater uncertainty and reporting discretion.

Among the control variables, GROWTH, INV, ROA, SD_ROA, and ZSCORE show significant associations with earnings management, whereas SIZE, LEV, MTB, OPCYCLE, LOSS, and CG_Score are not statistically significant. The model exhibits moderate explanatory power (R-squared = 0.376) and includes both industry and year fixed effects. These results provide strong empirical support for H2.

- H3: There is a relationship between R&D investment and ESG performance (**Table 12**)

Table 4.5 reports the results for H3, which tests whether R&D intensity affects ESG performance. The coefficient on R&D intensity is negative and significant ($\beta = -3.269$, $t = -2.35$, $p < 0.05$), indicating that higher R&D investment is associated with lower ESG scores. This finding supports H3 and suggests that firms prioritizing technological innovation may not simultaneously engage in sustainability activities at comparable levels.

Significant control variables include SIZE, GROWTH, OPCYCLE, LOSS, and ROA, while LEV, MTB, INV, SD_ROA, and ZSCORE are not significant. The model demonstrates strong explanatory power (R-squared = 0.693) with firm and year fixed effects. These results validate H3 and highlight a negative association between R&D intensity and ESG performance.

Table 10.The impact of R&D investment on cash holding

VARIABLES	Cash_Holding
R&D	0.085*** (7.45)
SIZE	-0.003 (-1.11)
LEV	0.008 (0.20)
MTB	0.000 (0.42)
GROWTH	0.030** (2.01)
INV	-0.022 (-0.51)
OPCYCLE	-0.000* (-1.95)
LOSS	0.112*** (4.96)
ROA	-0.469*** (-6.62)
SD_ROA	-0.010* (-1.77)
ZSCORE	0.008*** (5.89)
CG_Score	0.000 (0.84)
Constant	0.077* (1.76)
Observations	695
R-squared	0.540
Industry FE	Yes
Year FE	Yes

Robust t-statistics in parentheses
 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Researcher's construction

Table 11. The impact of R&D investment on earnings management

VARIABLES	DisWCA
R&D	0.090*** (3.26)
SIZE	0.000 (0.35)
LEV	0.006 (0.45)
MTB	-0.000*** (-3.44)
GROWTH	0.027*** (7.55)
INV	0.069*** (2.88)
OPCYCLE	-0.000* (-1.85)
LOSS	0.002 (0.19)
ROA	-0.191*** (-3.64)
SD_ROA	-0.027*** (-4.59)
ZSCORE	0.001** (2.44)
CG_Score	0.000 (0.70)
Constant	0.029 (1.49)
Observations	561
R-squared	0.376
Industry FE	Yes
Year FE	Yes

Robust t-statistics in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Researcher's construction

Table 12. The impact of R&D investment on ESG performance

VARIABLES	ESG
R&D	-3.269** (-2.35)
SIZE	6.517*** (25.37)
LEV	-2.592 (-0.59)
MTB	-0.006 (-1.56)
GROWTH	-5.171*** (-7.32)
INV	-3.898 (-0.83)
OPCYCLE	0.011*** (4.07)
LOSS	-6.518*** (-2.96)
ROA	2.989 (0.53)
SD_ROA	0.726 (1.49)
ZSCORE	-0.004 (-0.06)
Constant	-41.193*** (-8.29)
Observations	695
R-squared	0.693
Industry FE	Yes
Year FE	Yes

Robust t-statistics in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Researcher's construction

Model 2: The Effect of Intangible Asset Intensity (Tables 13–15)

Model 2 evaluates hypotheses H4, H5, and H6 by examining whether intangible asset intensity influences cash retention, earnings management, and sustainability outcomes.

$$Y_{it} = \alpha + \beta_1 \text{Intang} + \gamma' X_{it} + \mu_i + \delta_t + \varepsilon_{it}$$

- ✓ H4: There is a relationship between Intangible investment and cash holding.
 - ✓ H5: There is a relationship between Intangible investment and earnings management.
 - ✓ H6: There is a relationship between Intangible investment and ESG performance.
- H4: There is a relationship between Intangible investment and cash holding (**Table 13**)

Table 4.6 presents evidence supporting H4, which proposes that intangible asset intensity affects firms' cash holdings. The coefficient on intangible intensity is positive and significant ($\beta = 0.007$, $t = 2.43$, $p < 0.05$), indicating that intangible-rich firms tend to hold higher levels of cash. Given the limited collateral value of intangible assets, such firms may rely more on internal liquidity to mitigate financing frictions.

Control variables such as SIZE, LEV, GROWTH, INV, and ZSCORE also show significant associations with cash holdings, whereas MTB, OPCYCLE, ROA, SD_ROA, and CG_Score are not significant. The model explains 30% of the variation in cash holdings ($R\text{-squared} = 0.300$) and includes industry and year fixed effects.

- H5: There is a relationship between Intangible investment and earnings management (**Table 14**)

Table 4.7 provides strong support for H5, which examines whether intangible asset intensity influences earnings management behavior. The coefficient on intangible intensity is positive and highly significant ($\beta = 0.002$, $t = 3.02$, $p < 0.01$), indicating that firms with greater intangible assets

engage more frequently in discretionary accrual adjustments. This is consistent with the idea that intangible assets provide greater reporting flexibility due to valuation complexity.

Significant control variables include SIZE, GROWTH, LOSS, and ROA, while LEV, MTB, INV, OPCYCLE, SD_ROA, ZSCORE, and CG_Score do not show significant effects. The model explains 27.1% of the variation in earnings management ($R^2 = 0.271$), with industry and year fixed effects included.

- H6: There is a relationship between Intangible investment and ESG performance (**Table 15**)

Table 4.8 reports the results for H6, which evaluates whether intangible asset intensity affects ESG performance. The coefficient on intangible intensity is positive and highly significant ($\beta = 0.437$, $t = 4.72$, $p < 0.01$), confirming that firms with larger intangible asset bases achieve higher ESG scores. This suggests that intangible-rich firms may possess strategic or organizational characteristics that facilitate sustainability practices.

Control variables such as SIZE, LEV, GROWTH, INV, OPCYCLE, LOSS, ROA, and SD_ROA also exhibit significant associations with ESG scores. The model explains 52.7% of the variation in ESG performance ($R^2 = 0.527$) and includes industry and year fixed effects.

Across all models, the results consistently demonstrate that both R&D intensity and intangible asset intensity are significant determinants of corporate financial and sustainability behavior. All six hypotheses (H1–H6) are empirically supported. R&D intensity influences cash holding, earnings management, and ESG performance, while intangible assets similarly affect the same three outcomes. The inclusion of fixed effects enhances robustness, and the models exhibit strong explanatory power across all dependent variables. These empirical findings form the foundation for the theoretical interpretation and broader implications discussed in the discussion section.

Table 13. The impact of Intangible investment on cash holding

VARIABLES	Cash_holding
Intang	0.007** (2.43)
SIZE	-0.016*** (-7.17)
LEV	-0.045** (-2.24)
MTB	-0.000 (-0.06)
GROWTH	0.034** (2.22)
INV	-0.046* (-1.95)
OPCYCLE	0.000 (0.78)
LOSS	0.126*** (6.56)
ROA	0.001 (0.26)
SD_ROA	0.026 (1.64)
ZSCORE	0.002*** (2.70)
CG_Score	0.000 (0.60)
Constant	0.285*** (7.00)
Observations	1,563
R-squared	0.300
Industry FE	Yes
Year FE	Yes

Robust t-statistics in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Researcher's construction

Table 14. The impact of Intangible investment on earnings management

VARIABLES	DisWCA
Intang	0.002*** (3.02)
SIZE	-0.003*** (-3.26)
LEV	-0.004 (-0.29)
MTB	-0.000 (-0.10)
GROWTH	0.034*** (7.29)
INV	0.011 (1.04)
OPCYCLE	0.000 (0.97)
LOSS	0.024*** (2.75)
ROA	-0.098** (-2.53)
SD_ROA	-0.004 (-1.02)
ZSCORE	0.000 (1.41)
CG_Score	0.000 (1.34)
Constant	0.075*** (5.12)
Observations	1,257
R-squared	0.271
Industry FE	Yes
Year FE	Yes

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Researcher's construction

Table 15. The impact of Intangible investment on ESG performance

VARIABLES	ESG
Intang	0.437*** (4.72)
SIZE	7.265*** (36.39)
LEV	-5.382** (-2.51)
MTB	0.003 (0.42)
GROWTH	-4.566*** (-5.95)
INV	-6.929*** (-3.65)
OPCYCLE	0.003*** (2.69)
LOSS	-4.071*** (-2.67)
ROA	0.453*** (3.70)
SD_ROA	0.608* (1.76)
ZSCORE	0.016 (0.47)
Constant	-54.086*** (-13.55)
Observations	1,563
R-squared	0.527
Industry FE	Yes
Year FE	Yes

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Researcher's construction

4.3 Qualitative Findings

This section presents the qualitative findings derived from five semi-structured expert interviews conducted to complement and deepen the interpretation of the quantitative results. The interviewees consisted of three academics, one academic–practitioner, and one professional expert specialising in corporate reporting, intangible assets, R&D activities, and ESG practices. Their diverse backgrounds provided a broad view of the financial, reporting, and sustainability implications of innovation-related activities.

The qualitative data were analysed using Braun & Clarke (2006) six-phase thematic analysis approach. Following repeated reading of the transcripts, inductive coding was applied to identify meaning patterns related to R&D uncertainty, reporting discretion, sustainability alignment, and the role of intangible assets. The codes were then refined and grouped into overarching themes, which were reviewed for internal coherence and conceptual clarity. The final nine themes summarise the most prominent viewpoints shared across interviews and provide contextual depth to the econometric findings. The interview guide used to structure the conversations is provided in **Appendix A**.

Theme 1: R&D Uncertainty and the Strategic Need for Cash Buffers

A consistent theme across all interviews was the strong link between R&D intensity and the strategic accumulation of cash. Experts emphasised that R&D projects are characterised by uncertainty, long development horizons, and limited collateral value, making external financing difficult. As Interviewee A explained, “R&D projects are inherently uncertain... firms may hold more cash as a buffer to absorb potential losses.” Interviewee E similarly noted that R&D commitments require “continuous funding and precautionary liquidity.” These insights align with the quantitative evidence showing that R&D-intensive firms maintain higher cash reserves.

Theme 2: R&D and Increased Exposure to Earnings Management

All interviewees indicated that R&D expenditure increases exposure to earnings management because of the significant judgement involved in applying IAS 38. Managers operate within a grey area when distinguishing between R&D phases, which creates opportunities for discretion. Interviewee D observed, “Managers tend to classify R&D costs as capital investments even when they are still in the research phase, just to improve reported earnings.” Interviewee C added that

the subjective boundary between the two phases “allows room for manipulation.” These perspectives complement the finding that R&D intensity is positively associated with discretionary accruals.

Theme 3: Capital Market Pressures Intensify R&D Reporting Discretion

Experts highlighted that external expectations significantly influence reporting behaviour. Interviewee A explained that “firms under pressure to meet analysts’ forecasts may defer or reduce R&D spending to improve short-term earnings.” Interviewee D added that R&D becomes a tool for smoothing performance because “it is a grey area that managers adjust to meet forecasted numbers.” Capital market pressures, therefore, amplify the tendency of R&D-intensive firms to exercise reporting discretion, reinforcing the quantitative association between R&D and earnings management.

Theme 4: Negative Association Between R&D and ESG Through Resource Trade-Offs

Interviewees agreed that R&D activity does not necessarily enhance ESG performance and, in some cases, may hinder it. Experts noted that R&D is often oriented toward technological or commercial objectives rather than sustainability goals. Interviewee C stated, “R&D might focus on product innovation or cost reduction rather than environmental or social outcomes.” Interviewee D elaborated, “Building an EV factory might reduce emissions in the long term, but in the short term it has a large environmental footprint.” These insights echo the quantitative finding that R&D intensity is negatively associated with ESG performance.

Theme 5: The Conditional ESG Value of R&D (Green vs. Non-Green R&D)

Experts made clear that the ESG value of R&D depends on its direction. Interviewee A noted that “only targeted or green R&D aligns with ESG goals,” and Interviewee B cautioned against assuming that innovation automatically improves sustainability: “It’s not R&D per se, but the kind of R&D that matters.” Mission-driven R&D in renewable energy, social innovation, or sustainable materials can enhance ESG performance, but conventional R&D may have neutral or even adverse ESG effects.

Theme 6: Aligning Innovation Strategy with Sustainability Objectives

Interviewees proposed several ways firms can strengthen the alignment between innovation activities and ESG goals. Interviewee D recommended that firms “prioritise the ESG implications of R&D before committing to innovation strategies,” while Interviewee C emphasised integrating ESG metrics into early-stage project evaluation. Interviewee E highlighted the importance of governance coordination, noting that “cross-functional collaboration between sustainability, finance, and R&D teams is essential.” Collectively, these insights suggest that firms need intentional mechanisms to ensure that R&D supports sustainability rather than competing with it.

Theme 7: Intangible Assets Create Conditions That Support ESG Performance

Experts distinguished clearly between the ESG implications of R&D and those of intangible assets. Interviewees consistently described intangible assets such as brand value, corporate culture, human capital, and intellectual property as inherently aligned with ESG principles. Interviewee A explained that “human capital and corporate culture are directly linked to social and governance dimensions of ESG.” Interviewee D added, “Buying a copyright or brand has zero environmental impact.” These viewpoints help contextualise the strong positive association between intangible intensity and ESG performance in the quantitative results.

Theme 8: The Role of Intangibles in Strengthening Sustainability Practices and Disclosure

Interviewees also viewed intangible assets as crucial drivers of sustainability strategy and reporting quality. Interviewee B noted that “your brand is your public face—if it’s associated with poor ESG, you lose stakeholder trust.” Interviewee C emphasised that human capital enables effective sustainability implementation, stating that “trained, ethical employees enforce sustainability from within.” Interviewee E highlighted that intangible-intensive firms often invest in organisational systems and cultures that support credible ESG reporting. These perspectives reinforce the quantitative evidence that intangible assets positively influence ESG outcomes.

Theme 9: The UK Institutional and Reporting Environment Shapes R&D, Intangibles, and ESG Behaviour

The final theme relates to the UK’s regulatory and reporting environment, which interviewees described as principles-based, flexible, and increasingly centred on sustainability disclosure.

Interviewee A noted that “the UK’s Corporate Governance Code and ‘comply-or-explain’ culture create a unique environment for reporting.” Interviewee D commented that voluntary ESG reporting introduces variation: “How well ESG is reported depends on each firm's culture and incentives.” Interviewee E highlighted that the UK’s early adoption of climate disclosure frameworks, such as TCFD, encourages better sustainability integration but does not necessarily constrain R&D or intangible reporting practices.

Table 16 summarises the nine themes generated from the expert interviews, including the core insights and illustrative quotations that support each theme. Together, the nine themes provide a comprehensive understanding of how experts perceive the financial, reporting, and sustainability implications of R&D and intangible assets. The qualitative evidence complements and contextualises the regression results, revealing the managerial motivations, resource trade-offs, institutional influences, and strategic considerations that shape corporate behaviour.

Table 16. Summary of Themes Identified from Expert Interviews

Theme	Theme Title	Summary of Expert Insights	Illustrative Quotes
1	R&D Uncertainty and the Strategic Need for Cash Buffers	Experts emphasised that R&D is uncertain, long-term, and difficult to finance, leading firms to maintain precautionary cash reserves.	“R&D projects are inherently uncertain... firms may hold more cash as a buffer.” (Interviewee A)
2	R&D and Increased Exposure to Earnings Management	R&D accounting under IAS 38 involves judgement and discretion, encouraging managers to manipulate classification to smooth earnings.	“Managers classify R&D costs as capital investments... to improve reported earnings.” (Interviewee D)
3	Capital Market Pressures Intensify Reporting Discretion	Market expectations motivate managers to adjust R&D reporting to meet forecasts, reinforcing earnings management tendencies.	“Firms under pressure to meet forecasts may defer R&D spending to boost earnings.” (Interviewee A)

4	Negative Association Between R&D and ESG Performance	R&D often targets commercial efficiency rather than sustainability, and may generate short-term environmental burdens.	“R&D may focus on product innovation, not environmental outcomes.” (Interviewee C)
5	Conditional ESG Value of R&D (Green vs. Non-Green R&D)	Only mission-driven, sustainability-oriented R&D contributes to ESG improvement; traditional R&D may not.	“It’s not R&D per se, but the kind of R&D that matters.” (Interviewee B)
6	Aligning Innovation Strategy with Sustainability Objectives	Experts argued for integrating ESG criteria into R&D evaluation and enhancing governance coordination.	“Firms should consider the ESG implications of R&D before investment.” (Interviewee D)
7	Intangible Assets Create Conditions That Support ESG	Intangible assets (human capital, brand value, culture) naturally align with sustainability dimensions, unlike R&D.	“Human capital and culture link directly to social and governance ESG dimensions.” (Interviewee A)
8	Intangibles Strengthen Sustainability Practices and Disclosure	Intangible-rich firms tend to invest in systems and cultures that enhance ESG reporting and stakeholder trust.	“Your brand is your public face—poor ESG weakens it.” (Interviewee B)
9	UK Institutional and Reporting Environment Shapes Firm Behaviour	The UK’s principles-based system, ‘comply-or-explain’ culture, and early adoption of frameworks influence reporting diversity.	“How well ESG is reported depends on each firm’s culture and incentives.” (Interviewee D)

Source: Researcher's construction

4.4 Discussion

The purpose of this section is to interpret the quantitative results presented earlier and integrate them with the qualitative findings from expert interviews and insights from the literature. The discussion is organised around the six hypotheses specified in Chapter 2. For each hypothesis, statistical results are summarised briefly before exploring their conceptual, practical, and

contextual implications, drawing on expert perspectives and prior research within the context of the UK reporting environment. **Table 17** provides a clear overview of which hypotheses.

Table 17. Summary of Hypothesis Testing Results

Hypothesis	Statement	Expected Sign	Regression Result	Supported?
H1	R&D intensity is positively associated with cash holdings.	+	$\beta = 0.085, p < 0.01$	Supported
H2	R&D intensity is positively associated with earnings management.	+	$\beta = 0.090, p < 0.01$	Supported
H3	R&D intensity is negatively associated with ESG performance.	–	$\beta = -3.269, p < 0.05$	Supported
H4	Intangible asset intensity is positively associated with cash holdings.	+	$\beta = 0.007, p < 0.05$	Supported
H5	Intangible asset intensity is positively associated with earnings management.	+	$\beta = 0.002, p < 0.01$	Supported
H6	Intangible asset intensity is positively associated with ESG performance.	+	$\beta = 0.437, p < 0.01$	Supported

Source: Researcher's construction

4.4.1 H1: R&D Intensity and Cash Holdings

The quantitative findings show that R&D intensity is positively and significantly associated with cash holdings ($\beta = 0.085, p < 0.01$). This relationship aligns closely with precautionary motive theory, which argues that firms accumulate cash when they face uncertainty regarding future cash

flows or anticipate costly external financing (Opler et al., 1999). R&D activities are inherently risky, characterised by long time horizons, uncertain outcomes, and costly development processes. These attributes increase both business risk and financial constraints, making internal liquidity an essential buffer.

The literature review highlighted that firms with high information asymmetry, which is common in innovation-intensive sectors, rely more heavily on internal financing because external capital markets struggle to value uncertain projects (He & Wintoki, 2016; Magerakis et al., 2022). The low collateral value of R&D exacerbates this challenge. Because R&D rarely provides tangible assets that lenders can secure against, credit markets are less willing to fund such investments without charging high risk premia. This dynamic further strengthens the reliance on cash holdings, consistent with the pecking order theory (POT) of Myers & Majluf (1984), which predicts that firms prefer internal over external resources when asymmetric information is high.

The qualitative evidence strongly reinforces these mechanisms. Interviewees repeatedly described R&D as a domain of high uncertainty, continuous funding pressure, and limited financing options. Interviewee A observed, “R&D projects are inherently uncertain... firms may hold more cash as a buffer to absorb potential losses.” Interviewee E similarly emphasised that external financing for R&D is rarely straightforward, noting that, “Banks are reluctant to fund R&D because there’s nothing to secure against; firms rely on their own cash.” These insights confirm that precautionary liquidity accumulation is not merely a statistical pattern but a deliberate strategic response to the inherent characteristics of R&D-driven business models.

The UK context further shapes this behaviour. Several experts noted that the post-Brexit regulatory environment, combined with volatile financial conditions and rising interest rates, has increased the need for cash buffers among UK firms undertaking long-term innovation activities. This supports the argument that macro-institutional uncertainty interacts with firm-level innovation strategies to influence liquidity decisions, a relationship previously observed in the literature but given new nuance through the qualitative evidence provided here.

Taken together, the triangulated evidence confirms H1 and illustrates how R&D intensity amplifies the need for internal liquidity due to uncertainty, financing frictions, and institutional conditions.

4.4.2 H2: R&D Intensity and Earnings Management

Regression results show a positive and statistically significant association between R&D intensity and earnings management ($\beta = 0.090$, $p < 0.01$). This finding aligns with the information asymmetry and agency theory perspectives, which propose that when firms invest in activities that are difficult for outsiders to evaluate, managers may exploit reporting discretion to influence stakeholders' perceptions of performance. R&D activity increases informational complexity, making it harder for investors to assess firm value, which may lead managers to use accruals as a tool to manage earnings volatility or meet short-term performance targets.

The literature strongly supports this link. As highlighted in the review, intangible-intensive environments provide fertile ground for accrual manipulation because accounting classification between “research” and “development” stages under IAS 38 is subjective and relies heavily on internal managerial judgement (Cazavan-Jeny & Jeanjean, 2006; Marquardt & Wiedman, 2004). Prior studies also show that innovative firms experience greater earnings volatility, which managers may smooth to avoid negative market reactions (Markarian et al., 2008).

Interview evidence offers concrete examples of how such discretion operates in practice. Interviewee D noted, “Managers tend to classify R&D costs as capital investments even when they are still in the research phase, just to improve reported earnings.” Interviewee C described the ambiguity in R&D reporting as an enabler of manipulation: “The subjective distinction between R&D stages allows room for manipulation.” Experts also underlined external pressures, with Interviewee A commenting that firms may adjust R&D reporting when they are “under pressure to meet analysts' expectations.”

In the UK context, this relationship can be explained by the discretion embedded in IAS 38 and the broader principles-based nature of financial reporting. UK managers exercise considerable judgement in distinguishing between research and development phases, determining capitalisation timing, and assessing impairment. This discretion, combined with strong capital-market pressure and analyst scrutiny, creates incentives to manage earnings in order to smooth performance or meet market expectations.

These findings show that earnings management in R&D-intensive firms is not solely opportunistic but also structural, arising from the nature of R&D accounting, the volatility of innovation

investments, and the performance expectations imposed by capital markets. The consistency between statistical results, theory, literature, and expert commentary yields strong triangulated support for H2.

4.4.3 H3: R&D Intensity and ESG Performance

The regression results reveal a significant negative association between R&D intensity and ESG performance ($\beta = -3.269$, $p < 0.05$). At first glance, this finding appears counterintuitive, given the frequent assumption in ESG scholarship that innovation contributes positively to sustainability outcomes. However, both the qualitative findings and the literature review suggest that this assumption is overly simplistic. Experts emphasised that most R&D undertaken by UK firms is designed to achieve competitive, technological, or commercial objectives rather than environmental or social benefits. Interviewee C explained, “R&D might focus on product innovation or cost reduction rather than environmental or social outcomes.” Interviewee B reinforced that “it’s not R&D per se, but the type of R&D that matters”—highlighting that only green or mission-driven R&D aligns with ESG goals.

The literature similarly shows that the relationship between innovation and sustainability depends heavily on the direction of innovation. General R&D may increase energy consumption, resource use, or short-term environmental footprints, as noted in Flammer (2021). Experts echoed this distinction, with Interviewee D stating: “Building an EV factory might reduce emissions long term, but the short-term environmental impact is huge.” This temporal mismatch may explain why firms with high R&D intensity do not score highly on ESG metrics, which often emphasise current disclosures and short-term impacts.

Within the UK context, this negative association can be interpreted as reflecting the nature of R&D priorities rather than a rejection of sustainability. Interview evidence indicates that much R&D investment in UK firms is commercially oriented, focusing on productivity, efficiency, and product innovation rather than explicitly targeting environmental or social objectives. As Interviewee C explained, “R&D may focus on product innovation, not environmental outcomes.”

Another explanation highlighted in the interviews is the resource competition between innovation activities and sustainability programmes. R&D demands substantial financial and managerial resources, potentially crowding out investment in ESG initiatives unless sustainability forms part

of the R&D agenda. This reinforces the result found in quantitative analysis and confirms H3, demonstrating that R&D intensity may undermine ESG performance when not strategically aligned with sustainability goals.

4.4.4 H4: Intangible Asset Intensity and Cash Holdings

The regression results show a positive and significant link between intangible asset intensity and cash holdings ($\beta = 0.007$, $p < 0.05$). This relationship is strongly predicted by the financing frictions theory, which posits that intangible assets, due to their limited collateral value, reduce firms' ability to obtain secured debt financing (Almeida et al., 2004). As a result, intangible-intensive firms accumulate more cash to ensure operational flexibility and resilience.

Interview evidence supports this mechanism. Experts consistently highlighted the difficulty of external financing for intangible-rich firms. Interviewee E stated plainly: "Intangibles don't help you borrow. Banks want collateral, and intangibles rarely qualify." Interviewee A similarly observed that cash provides strategic freedom in intangible-heavy business models, especially in sectors dominated by intellectual property and human capital.

In the UK reporting environment, the subjectivity associated with intangible asset recognition under IAS 38 amplifies financing frictions. Although certain development costs may be capitalised, intangible assets remain difficult for lenders and investors to verify. Consequently, UK firms with high intangible intensity accumulate cash to preserve financial flexibility and mitigate external financing constraints. This behaviour reflects prudent liquidity management in a market characterised by strong disclosure requirements and investor scrutiny.

The literature review also noted that intangible-intensive firms face steeper financing constraints due to valuation uncertainty and asymmetric information. This finding supports the argument that intangible-intensive firms face greater external financing constraints due to the low collateralizability of such assets, leading them to rely more heavily on internal liquidity buffers (Falato et al., 2022; Peters & Taylor, 2017). Thus, the complementary insights from theory, quantitative results, and qualitative evidence confirm H4 convincingly.

4.4.5 H5: Intangible Asset Intensity and Earnings Management

The quantitative findings indicate a positive and significant relationship between intangible asset intensity and earnings management ($\beta = 0.002$, $p < 0.01$). This association is consistent with information asymmetry and intellectual capital theory, both of which highlight the opacity of intangible-driven business models.

Intangible assets such as software, brand value, or internally developed intellectual property are difficult for external stakeholders to evaluate and depend heavily on estimates of useful life, impairment, and recoverable value. This inherent subjectivity creates opportunities for managerial discretion in financial reporting. Interviewee C noted that, “Intangibles are subjective—they depend on management’s estimates,” while Interviewee D explained that managers have “freedom in deciding useful lives, impairments, and recognition,” which can be used to smooth performance.

Within the UK’s principles-based accounting system, intangible-intensive firms possess greater scope for discretionary reporting. Interviewees emphasised that intangible-rich firms often embed subjectivity into their accounting practices, particularly when managing performance expectations. However, qualitative evidence suggests that this discretion is often used to signal stability and long-term value creation rather than to conceal poor performance, consistent with the UK’s strong governance culture and monitoring mechanisms.

The literature review supports this interpretation, with multiple studies indicating that intangible-rich firms operate under greater information asymmetry and accounting subjectivity, which can facilitate opportunistic financial reporting (Bilal, 2022; Cazavan-Jeny and Jeanjean, 2006). The result supports the argument that intangibles, particularly those not subject to strict capitalisation criteria, provide managerial discretion that can be used to manipulate earnings. Moreover, this aligns with broader concerns about the opacity of intangible investments in financial statements, especially in settings with less stringent disclosure or valuation standards (Baruch Lev, Feng Gu, 2016). Intangible-heavy firms are more likely to manipulate accruals because external observers cannot easily verify reported valuations. The triangulated evidence, therefore, confirms H5 and clarifies that the mechanism relates to the intersection of reporting discretion, valuation challenges, and information asymmetry.

4.4.6 H6: Intangible Asset Intensity and ESG Performance

The regression results show a strong and positive relationship between intangible asset intensity and ESG performance ($\beta = 0.437$, $p < 0.01$). The qualitative findings provide clear insight into why intangible-rich firms tend to achieve higher ESG scores.

Experts repeatedly associated intangible assets with stakeholder-oriented strategies, organisational culture, human capital development, and brand reputation, all central components of ESG. Interviewee B emphasised that, “Your brand is your public face—if it’s associated with poor ESG, you lose stakeholder trust.” Interviewee C explained that human capital is “a key driver of the social and governance dimensions of ESG,” while Interviewee D contrasted intangibles with physical investment: “Buying a copyright or brand has zero environmental impact compared to constructing a factory.”

These insights align closely with the RBV and stakeholder theory, which suggest that firms with rich intangible resources leverage these assets to improve legitimacy, transparency, and sustainability engagement. The literature review highlighted that intangible-intensive firms often disclose more non-financial information, invest in sustainable culture, and develop stronger governance structures. For instance, recent research has highlighted that intangible assets, particularly brand value, serve as pivotal mediators in translating ESG efforts into market value, emphasizing the strategic importance of intangibles in corporate sustainability initiatives (Bai et al., 2025; Pham et al., 2024). A plausible explanation for this positive association is that many intangible assets, such as software, brand equity, R&D in clean technologies, and employee training, are inherently aligned with environmental and social goals. These assets often require lower physical resource consumption and are more adaptable to sustainability-oriented innovation (Agrawal et al., 2024; Oprean-Stan et al., 2020).

In the UK context, intangible assets such as human capital, organisational culture, brand reputation, and governance systems play a central role in supporting ESG engagement. Interviewees emphasised that intangible-rich firms are more likely to invest in reporting systems, stakeholder relationships, and sustainability governance structures. As Interviewee A noted,

“Human capital and culture link directly to social and governance ESG dimensions,” while Interviewee B highlighted that “your brand is your public face—poor ESG weakens it.”

The result aligns with the growing body of literature that views intangibles not just as sources of competitive advantage but also as facilitators of sustainable value creation. Intangible-intensive firms are often more stakeholder-oriented and innovation-driven, which enhances their ability to implement and report on ESG initiatives effectively (Lee, 2025). Furthermore, green-friendly intangibles, such as proprietary technologies focused on energy efficiency or emissions reduction, contribute directly to improved environmental performance metrics. The combined evidence explains why intangible assets, unlike R&D, consistently strengthen ESG performance and confirms H6.

4.5 Discussion of Control Variables

To complement the interpretation of the main explanatory variables, this section examines the behaviour of the control variables across the regression models. Understanding how these variables influence cash holdings, earnings management, and ESG performance strengthens the robustness of the empirical findings and provides deeper insight into firms’ financial, reporting, and sustainability behaviours. **Table 18** summarises the overall direction, significance, and theoretical interpretation of each control variable

Table 18. Summary of Control Variable Effects Across Models

Control Variable	Cash Holdings	Earnings Management	ESG Performance	Interpretation
SIZE	Negative (ns)	Mixed / mostly ns	Positive & significant	Larger firms face lower financing frictions but stronger ESG scrutiny.
LEV	Negative (ns)	Occasionally positive	Mixed / ns	Highly leveraged firms may face reporting pressure but weak ESG incentives.
MTB	ns	Often positive	ns	High-growth firms may smooth earnings to meet expectations.

GROWTH	Positive & significant	Positive in some models	ns	Growing firms retain liquidity and may signal stability.
INV	ns	ns	ns	Inventory levels do not materially affect outcomes.
OPCYCLE	Weak negative	ns	ns	Longer cycles create working-capital pressures affecting liquidity.
LOSS	Positive & significant	Positive	ns	Loss-making firms build precautionary cash buffers; may face manipulation incentives.
ROA	Negative	Negative	Positive	Profitability reduces cash needs but enables ESG investment.
SD_ROA	Negative (weak)	Negative	ns	Volatility limits ability to manage earnings.
ZSCORE	Positive & significant	Positive in some models	ns	Financially stable firms accumulate liquidity and signal performance.
CG_Score	ns	ns	Positive	Governance quality facilitates ESG engagement and disclosure.

(ns = not significant)

Source: Researcher's construction

The behaviour of the control variables across the models aligns closely with theoretical expectations and prior empirical literature, reinforcing the validity of the study's main findings.

- Firm size (SIZE) displayed a negative but insignificant association with cash holdings, consistent with classical liquidity theory, which suggests that larger firms have easier access to external finance and thus lower precautionary cash needs (Opler et al., 1999). However, SIZE exhibited a positive and significant effect on ESG performance, supporting

stakeholder and legitimacy theories (Suchman, 1995). Larger firms attract more regulatory attention, public scrutiny, and investor expectations, motivating them to adopt stronger sustainability practices. This dynamic was also emphasised in the interviews, where experts noted that larger firms “cannot afford reputational weaknesses in ESG.”

- Profitability (ROA) behaved in a theoretically consistent manner across all models. Its strong negative association with cash holdings reflects the pecking-order prediction that profitable firms rely on internal cash flows rather than precautionary reserves (Myers & Majluf, 1984). Conversely, ROA exhibited a positive relationship with ESG performance, supporting slack resource theory, which posits that profitable firms possess discretionary resources that can be allocated to sustainability initiatives (Bourgeois, 1981).
- Leverage (LEV) showed negative associations with cash holdings, although not statistically significant. This pattern aligns with the idea that highly leveraged firms rely more on debt financing and thus maintain lower cash reserves (Opler et al., 1999). In some earnings management models, leverage was positively associated with discretionary accruals, echoing agency theory predictions that firms facing debt covenants or financial pressure may engage in earnings manipulation (Jensen & Meckling, 1976). Interviewees supported this mechanism, noting that financially constrained firms often “push numbers” to avoid covenant violations.
- Growth variables (GROWTH and MTB) also behaved as expected. GROWTH was positively and significantly associated with cash holdings, consistent with the view that expanding firms require liquidity to support operational and investment demands (Almeida et al., 2004). MTB, representing growth opportunities, was positively associated with earnings management in some models, reflecting capital market pressures on high-growth firms to demonstrate stable performance trajectories (Markarian et al., 2008).
- Earnings volatility (SD_ROA) showed a negative relationship with earnings management, suggesting that firms with volatile performance may have reduced capacity or incentive to manipulate accruals. Volatility complicates prediction and limits managers’ ability to smooth earnings, reinforcing the importance of qualitative insights in interpreting quantitative behaviour (Marquardt & Wiedman, 2004).

- The Altman Z-score, a measure of financial stability, was positively associated with cash holdings, indicating that financially sound firms accumulate liquidity as part of prudent financial management (Opler et al., 1999). Experts highlighted that stability allows firms to adopt more disciplined liquidity strategies. The Z-score also exhibited some positive associations with earnings manipulation, consistent with the literature suggesting that firms may use accounting discretion to maintain a favourable stability signal (Markarian et al., 2008).
- Corporate governance quality (CG_Score) was a strong and positive predictor of ESG performance. This relationship aligns with the view that robust governance structures serve as an enabling mechanism for sustainability initiatives, improving transparency, accountability, and reporting reliability (Albitar, Abdoush, et al., 2023). Qualitative evidence reinforced the role of the UK Corporate Governance Code in shaping ESG engagement, particularly in promoting integrated reporting and stakeholder responsiveness.

The control variables behaved consistently with theoretical expectations and prior literature, providing a coherent backdrop for interpreting the effects of R&D and intangible asset intensity. Their patterns demonstrate that firms' financial, reporting, and sustainability behaviours emerge from the interaction between innovation characteristics and broader organisational, governance, and financial conditions. This strengthens the robustness of the study's findings and deepens understanding of the multifaceted drivers of corporate decision-making.

4.6 Summary

This chapter presented the empirical findings of the study by integrating quantitative regression analyses with qualitative insights from expert interviews. The quantitative results provided strong support for all six hypotheses. R&D intensity was found to increase firms' cash holdings (H1) and earnings management (H2), while exerting a negative impact on ESG performance (H3). These relationships were further illuminated by the qualitative evidence, which emphasised the inherent uncertainty, financing frictions, and reporting discretion surrounding R&D activities, as well as the limited alignment between general R&D and sustainability objectives. In contrast, intangible asset intensity was positively associated with cash holdings (H4), earnings management (H5), and ESG performance (H6). Experts highlighted that intangible-rich business models depend heavily

on internal liquidity, embed subjectivity in reporting, and simultaneously strengthen stakeholder-oriented capabilities that contribute to ESG outcomes.

The integration of qualitative and quantitative findings helped uncover the mechanisms underlying the observed statistical relationships. Interviewees provided rich explanations for why R&D-intensive firms experience heightened information asymmetry, discretionary reporting opportunities, and resource trade-offs with ESG initiatives, while intangible assets shape organisational culture, human capital, and governance structures that reinforce sustainability engagement. These perspectives enhanced the explanatory depth of the regression results and demonstrated how financial, reporting, and sustainability behaviours are embedded within broader innovation strategies and institutional environments.

The chapter also examined the behaviour of the control variables, revealing patterns consistent with established theories. Variables such as profitability, growth, earnings volatility, and financial stability showed significant associations with liquidity, reporting discretion, and ESG outcomes, while firm size and governance quality emerged as key determinants of sustainability performance. These results provided additional validation for the empirical models and highlighted the interplay between innovation-specific factors and broader organisational characteristics.

Overall, this chapter offered a comprehensive and triangulated analysis of how R&D intensity and intangible asset intensity shape corporate financial and sustainability outcomes. By integrating statistical evidence, theoretical perspectives, and expert insights, the findings lay the foundation for the extended discussion presented in Chapter 5, where their theoretical and practical implications are explored in greater depth.

CHAPTER 5: CONCLUSION

5.1 Introduction

This chapter provides a comprehensive discussion of the study's empirical findings by integrating quantitative regression results with qualitative insights obtained from expert interviews. The purpose is to interpret the relationships identified in the analysis within broader theoretical, organisational, and institutional contexts. To achieve this, the discussion draws on several theoretical frameworks, including agency theory, information asymmetry, precautionary liquidity theory, stakeholder and legitimacy theories, and the resource-based view.

Rather than treating the statistical results as isolated outcomes, this chapter positions them within the evolving scholarly debate on innovation, financial reporting, and sustainability, providing a multidimensional interpretation that explains not only whether relationships exist, but why they arise. The chapter also highlights the scientific contributions emerging from the findings, outlines implications for theory, practice, and policy, and acknowledges the limitations of the study before suggesting avenues for future research. The goal is to offer a holistic account of how R&D intensity and intangible asset intensity shape corporate behaviour across financial, reporting, and sustainability domains.

5.2 Summary of the Main Findings

The empirical analysis revealed several systematic and theoretically coherent relationships between innovation-related investments and firms' financial and sustainability outcomes. These findings were further enriched and clarified by the qualitative themes emerging from expert interviews, which articulated the organisational reasoning and contextual dynamics underpinning the statistical patterns. These findings are summarized in **Figure 7**.

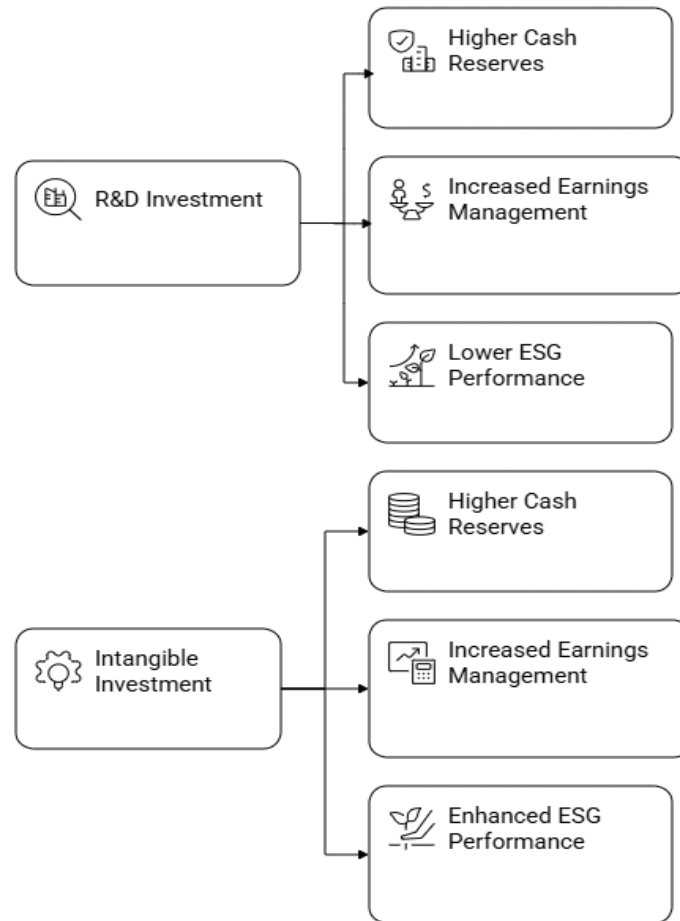


Figure 7. Impact of R&D and Intangible Investment

Source: Researcher's construction

The first research question explored how R&D investment relates to corporate cash holdings. The study found a strong positive association, indicating that firms with higher R&D intensity retain greater liquidity. Experts attributed this to the uncertainty and irreversibility of R&D projects, the absence of collateralisable assets, and the difficulty of securing external financing. These dynamics reinforce the precautionary motive theory, suggesting that innovation-driven firms rely on internal liquidity buffers to sustain long-term development cycles.

The second research question examined the relationship between R&D investment and earnings management. The results revealed a positive association, reflecting the significant discretion inherent in IAS 38 concerning the classification of R&D expenditure. The qualitative findings illustrated how managers sometimes exploit ambiguity around capitalisation, particularly in

response to earnings volatility or capital market pressure. This supports agency-theoretic predictions that firms facing higher information asymmetry may engage more frequently in accrual manipulation.

The third research question focused on how R&D investment affects ESG performance. Contrary to common assumptions, the study identified a negative association. Interviews confirmed that many R&D projects are commercially or technologically driven rather than sustainability-oriented, and that R&D often competes with ESG initiatives for financial and managerial resources. These insights highlight the conditional nature of innovation's sustainability impact, emphasising that R&D only enhances ESG performance when explicitly aligned with environmental or social goals.

The fourth research question investigated the impact of intangible asset investment on corporate cash holdings. Intangible intensity was also positively associated with liquidity, though for different reasons than R&D. Because intangible assets cannot typically serve as collateral, firms with high intangible intensity face financing frictions and therefore accumulate internal cash reserves. This reflects the structural influence of intangible business models on liquidity management.

The fifth research question examined how intangible investment influences earnings management. The results revealed a positive association, which aligns with the high degree of subjectivity inherent in valuing intangible assets such as software, trademarks, patents, and internally developed systems. Interviewees described how managerial discretion in impairment testing and useful-life estimation creates opportunities for accrual manipulation, consistent with information asymmetry theory.

The sixth research question considered the relationship between intangible investment and ESG performance. The study found a strong positive association, suggesting that intangible-rich firms are better positioned to pursue sustainability initiatives. Experts noted that human capital, organisational culture, governance quality, and brand reputation key components of intangible capital—support transparency, stakeholder engagement, and sustainable value creation. This result aligns with the resource-based view, intellectual capital theory, and legitimacy theory, which emphasise intangible resources as foundations for long-term sustainability.

These patterns demonstrate that innovation is not a uniform concept and that different innovation-related investments shape financial and sustainability behaviours in fundamentally different ways. The results also reinforce the theoretical expectation that organisational outcomes depend on the nature of underlying resources and the institutional rules governing their recognition and reporting.

5.3 Novel Findings (New Scientific Results)

This thesis makes several original contributions to academic research on innovation, financial reporting, corporate finance, and sustainability.

1. A central contribution lies in the conceptual and empirical distinction between R&D intensity and intangible asset intensity. Whereas prior studies frequently treat these constructs as interchangeable proxies for innovative activity, the present study demonstrates that they produce markedly different outcomes. R&D, driven by uncertainty and accounting discretion, increases liquidity needs and earnings management while exerting downward pressure on ESG performance. Intangible assets, rooted in organisational capabilities such as human capital and brand equity, enhance ESG performance and shape liquidity and reporting behaviour through different channels. This differentiation advances theoretical clarity and corrects a major ambiguity in the literature.
2. A second significant contribution is the identification of a negative relationship between R&D investment and ESG performance. This challenges the widespread assumption that innovation naturally enhances environmental and social outcomes. The study provides novel evidence that general R&D may reduce sustainability performance because it competes with ESG initiatives for resources and may create short-term environmental burdens. This insight deepens understanding within stakeholder and legitimacy frameworks and clarifies inconsistencies in prior empirical research by highlighting the difference between general and sustainability-oriented R&D.
3. A third contribution lies in uncovering two distinct mechanisms of earnings management in innovation-intensive firms. R&D-related earnings manipulation arises from classification ambiguity and earnings volatility, while intangible-related manipulation stems from valuation subjectivity and unverifiable managerial assumptions. This dual-pathway insight strengthens agency theory and information asymmetry models by showing

that managerial discretion is shaped by the type of intangible investment, not merely by managerial incentives.

4. The study also advances precautionary liquidity theory by distinguishing the reasons why different forms of innovation drive cash accumulation. R&D demands liquidity due to operational risk and financing frictions, whereas intangible assets impose liquidity needs due to structural funding rigidity. This refining of theory demonstrates that liquidity behaviour reflects the underlying asset structure of the firm.
5. Another major contribution concerns the demonstration that intangible assets function as ESG-enabling capabilities. The strong positive association between intangible intensity and ESG performance, supported by qualitative evidence, provides new insight into how human capital, culture, governance, and brand reputation form the organisational infrastructure necessary for sustainability engagement. This extends the resource-based view by showing that intangible assets create pathways for long-term stakeholder value creation.
6. Methodologically, the study contributes to mixed-methods research in accounting and finance by showing how qualitative insights provide depth and explanatory power to complement quantitative analysis. The expert interviews enhanced understanding of reporting discretion, financing constraints, and sustainability alignment, offering a richer explanation of statistical results and illustrating the value of methodological triangulation.
7. Finally, the study adds new institutional evidence from the UK IFRS context, demonstrating how principles-based reporting standards, governance codes, and evolving sustainability frameworks shape firms' innovation and reporting behaviour. The UK's regulatory environment provided a unique backdrop for identifying how institutional pressures interact with innovation to influence financial and sustainability outcomes.

5.4 Research Implications

5.4.1 Theoretical Implications

The findings of this thesis refine several foundational theories in corporate finance, accounting, and sustainability. A central theoretical implication is the clear distinction between the behavioural consequences of R&D intensity and intangible asset intensity. Whereas many prior studies treat these constructs as interchangeable proxies for innovation, the results demonstrate that they

produce markedly different financial and sustainability outcomes. This distinction strengthens the Resource-Based View and Knowledge-Based View by showing that innovation-related resources vary substantially in their uncertainty, strategic role, and organisational embeddedness, leading to divergent effects on corporate behaviour.

The results also extend precautionary liquidity theory by showing that different forms of innovation generate liquidity needs through different mechanisms. R&D increases uncertainty and financing frictions, prompting firms to accumulate precautionary cash reserves. Intangible assets, by contrast, necessitate higher cash holdings because their low collateral value restricts firms' access to external financing. This nuance reveals that liquidity decisions are not solely a function of investment risk but are shaped by the accounting and economic characteristics of the assets involved.

In earnings management research, the study advances agency theory and information asymmetry models by identifying two distinct pathways of manipulation. R&D-related earnings management arises from classification ambiguity under IAS 38, while intangible-related manipulation stems from valuation subjectivity and impairment discretion. This dual-pathway insight shows that managerial reporting behaviour is influenced not only by incentives but also by the nature of the resources being reported and the institutional rules governing them. Finally, the divergent ESG effects deepen stakeholder and legitimacy theory by highlighting that innovation enhances sustainability only when the underlying assets embody stakeholder-oriented capabilities, as in the case of intangible-rich firms.

5.4.2 Managerial and Organisational Implications

The study's findings have important implications for managerial decision-making and organisational strategy. Managers must recognise that R&D investment carries significant liquidity and reporting risks. Because R&D creates financial uncertainty and requires sustained internal funding, firms need to adopt proactive liquidity management practices, ensuring that long-term development cycles are adequately protected from external shocks. In addition, the discretion embedded in IAS 38 underscores the need for strong internal controls and transparent governance processes around the classification of development expenditure and the timing of capitalisation.

The results also suggest that firms should explicitly align R&D activities with their sustainability objectives. The negative association between R&D and ESG performance indicates that innovation can undermine sustainability unless environmental and social considerations are integrated into project-selection criteria and performance evaluations. In contrast, intangible-rich firms possess organisational assets—such as human capital, culture, and brand reputation—that naturally support sustainability engagement. Managers should therefore leverage these strengths to enhance ESG performance and communicate these capabilities clearly to investors.

From a strategic standpoint, the findings caution investors and analysts against assuming that R&D intensity signals sustainability commitment. Instead, intangible asset intensity appears to be a more reliable indicator of a firm's long-term orientation and stakeholder engagement. Firms should ensure that disclosures clearly articulate the relationship between innovation investments, organisational capabilities, and sustainability trajectories.

5.4.3 Policy and Regulatory Implications

Several policy implications emerge from the study's findings, particularly in relation to accounting standards and sustainability reporting frameworks. The discretion allowed under IAS 38 regarding the recognition and valuation of R&D and intangible assets creates opportunities for earnings manipulation and reduces comparability across firms. Regulators may need to refine guidance on capitalisation thresholds, impairment testing, and useful-life estimation to enhance reporting transparency and mitigate the risk of opportunistic classification decisions. Strengthening disclosure requirements around development expenditure and intangible valuation could improve the reliability of financial statements and reduce information asymmetry for investors.

The negative relationship between R&D intensity and ESG performance also highlights a gap in current ESG reporting frameworks. Policymakers could consider integrating innovation-related disclosures such as the proportion of environmentally oriented R&D expenditure or the sustainability impact of major innovation projects into ESG reporting guidelines. This would provide stakeholders with a clearer understanding of how innovation strategies contribute to or detract from sustainability objectives. The findings underscore the need for greater standardisation in ESG rating methodologies. Variability across rating providers can obscure the true sustainability performance of firms, particularly those with complex innovation profiles. Harmonising core ESG metrics and increasing transparency in scoring methodologies would enhance the comparability

and reliability of ESG ratings and support more informed decision-making among investors, regulators, and other stakeholders.

The findings also carry important implications that are specific to the UK's institutional and regulatory environment. As a principles-based IFRS jurisdiction, the UK provides managers with considerable discretion in applying IAS 38, particularly in distinguishing research from development expenditure and valuing intangible assets. This flexibility while intended to encourage judgement-based reporting, also creates fertile ground for variation in practice and the potential for accrual manipulation, as evidenced in the study. Strengthening guidance or requiring enhanced narrative disclosures could help UK regulators reduce ambiguity without undermining the principles-based philosophy of UK reporting. Furthermore, the UK's Corporate Governance Code and its growing emphasis on transparency and stakeholder accountability complement the positive link observed between intangible assets and ESG performance. Intangible-rich firms may therefore be especially well positioned to respond to UK governance expectations. At the same time, the negative association between R&D intensity and ESG performance suggests that UK firms may need clearer regulatory incentives or governance frameworks to align innovation strategies with national sustainability priorities, such as those embodied in the UK's Net Zero commitments and TCFD-aligned reporting requirements. Overall, the UK context reinforces the importance of institutional design in shaping how innovation, reporting discretion, and sustainability objectives interact in practice.

5.5 Research Limitations

Although the study offers meaningful theoretical and empirical insights, several limitations should be acknowledged in interpreting its findings. **Figure 8** summarises this limitation.

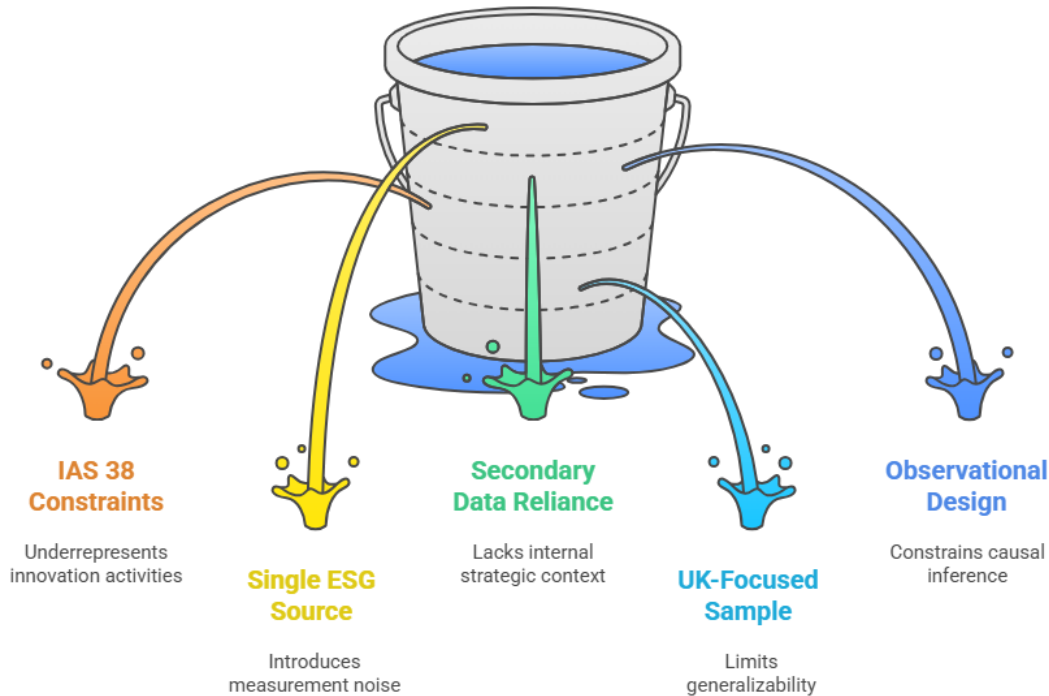


Figure 8. Research Limitations

Source: Researcher's construction

A first limitation concerns the inherent constraints of IAS 38 in capturing the economic substance of innovation-related activities. The accounting standard permits the recognition of certain development expenditures but requires that research expenditure be expensed immediately. This treatment introduces measurement bias by underrepresenting the true scale of firms' innovation assets and by embedding managerial judgement into recognition decisions. As a consequence, both R&D intensity and intangible asset intensity may imperfectly reflect firms' underlying innovation strategies, influencing the precision of empirical estimates.

A second limitation relates to the reliance on ESG scores provided by a single rating agency. While LSEG Data offers one of the most comprehensive ESG datasets, the ESG domain is characterised by substantial variation in methodology, weighting schemes, and indicator construction across

providers. Differences in how environmental, social, and governance dimensions are defined and aggregated may introduce noise into the measurement of sustainability performance. This methodological heterogeneity is an inherent challenge in ESG research and may affect the comparability and interpretability of the results.

A third limitation arises from the use of secondary financial and sustainability data, which, although extensive, cannot fully reflect the internal strategic considerations, managerial intentions, or organisational processes that shape innovation and reporting behaviour. Quantitative archives provide observable outcomes but do not capture the nuanced decision-making environments within firms. While the qualitative component of this study enriches interpretation, its reliance on an expert-based sample means that perspectives are drawn from those with sectoral or conceptual expertise rather than from within the firms being studied. This type of qualitative insight enhances theoretical depth but does not substitute for embedded organisational observation.

The fourth limitation is that the study focuses exclusively on UK-listed non-financial firms. The UK's institutional environment, principles-based IFRS, voluntary ESG reporting, and mature capital markets may limit generalisability to other contexts, particularly emerging markets or rule-based reporting regimes such as the U.S.

Finally, the observational nature of the panel-data design limits the extent to which causal relationships can be formally established. Although fixed-effects modelling mitigates unobserved heterogeneity and strengthens internal validity, causal inference remains constrained by potential endogeneity, reverse causality, and omitted variable concerns. The study, therefore, provides strong evidence of association rather than definitive causal claims. These limitations do not undermine the value of the findings but rather highlight opportunities for future research to complement this work using alternative methodological approaches.

5.6 Suggestions for Future Research

Future research could build on the findings of this study in several important ways. **Figure 9** represents this suggestion shortly. A first avenue concerns the refinement of innovation measurement. Because IAS 38 restricts the recognition of internally generated intangible assets and requires the expensing of research expenditure, future studies could explore alternative proxies for innovation activity such as, detailed R&D disclosures, patent data, intellectual capital indices,

or machine-learning-based textual analysis of innovation narratives. Such approaches could provide a more comprehensive representation of firms' innovation portfolios and reduce measurement limitations inherent in traditional accounting-based proxies.

A second direction involves differentiating between types of R&D activity. The negative relationship between R&D intensity and ESG performance observed in this study suggests that not all innovation contributes equally to sustainability. Future work could therefore distinguish between “green R&D” and commercially oriented R&D, examining the extent to which environmental or socially targeted innovation moderates the relationship between R&D and ESG outcomes. This more granular approach would help clarify the mechanisms through which innovation enhances or detracts from sustainable value creation and address inconsistencies in prior empirical research.

A third area for further inquiry concerns organisational processes and managerial decision-making. While this study used expert interviews to illuminate reporting discretion and strategic considerations, future research may benefit from in-depth case studies or survey-based designs that capture internal governance practices, managerial perceptions of IAS 38, and the integration of sustainability considerations within innovation planning. Such approaches would generate richer behavioural insights and help explain how firms operationalise innovation and ESG strategies in practice.

Future research could also investigate the institutional determinants of innovation-related reporting and sustainability behaviour. Comparing the UK findings with those from jurisdictions with different reporting regimes, governance structures, or sustainability mandates such as the United States, Continental Europe, or emerging economies, would provide valuable insight into the role of institutional context. Natural experiments, such as regulatory reforms affecting R&D subsidies, ESG disclosure requirements, or changes to intangible asset reporting standards, could further enhance causal inference and help isolate the impact of institutional variation. Researchers may deepen understanding of sustainability outcomes by examining the environmental, social, and governance dimensions separately rather than relying on aggregate ESG scores. Because intangible assets are closely linked to governance and human capital, while R&D may influence environmental metrics differently over time, disaggregated ESG analysis could reveal finer-grained patterns and illuminate distinct pathways of innovation-driven sustainability performance.

In addition to the opportunities for advancing research on sustainability outcomes, future studies should further expand the analysis to encompass the two other core dependent variables examined in this thesis: corporate cash holdings and earnings management. The findings revealed that both R&D intensity and intangible asset intensity are associated with higher levels of cash retention, albeit through different mechanisms, which highlights the need for deeper investigation into how various forms of innovation interact with firms' internal financing policies and financial flexibility across different industries and macroeconomic conditions. Similarly, the results showed that both innovation-related constructs are linked to increased earnings management, though through distinct pathways classification discretion in the case of R&D and valuation subjectivity in the case of intangible assets. Future research could therefore explore these dynamics using experimental designs, granular contract-level data, or enhanced disclosure analysis to identify the organisational and regulatory environments in which the risk of opportunistic reporting increases or decreases. Considering cash behaviour, earnings quality, and sustainability performance together may yield a more holistic understanding of how innovation shapes the financial architecture and behavioural patterns of firms, particularly within the evolving UK reporting landscape.

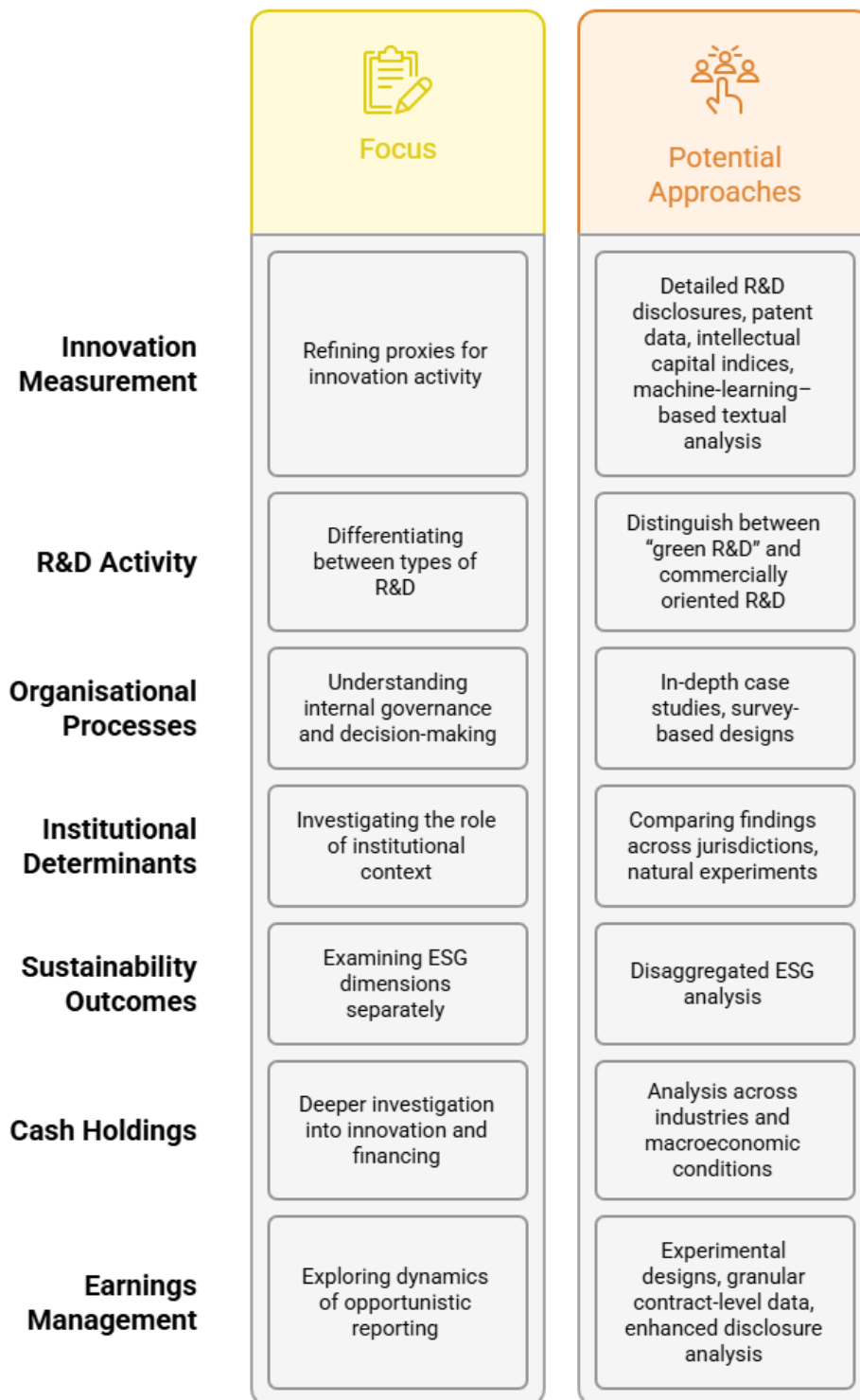


Figure 9. Future Research Direction

Source: Researcher's construction

5.7 Summary

This chapter has drawn together the overall insights of the thesis by integrating the empirical findings with their theoretical, managerial, and policy implications. The results demonstrated how R&D intensity and intangible asset intensity shape firms' financial behaviour and sustainability engagement in different ways, reflecting the distinct economic properties and reporting requirements associated with each type of innovation-related investment. The chapter highlighted the study's main contributions, showing how it advances academic understanding of innovation, financial reporting discretion, liquidity strategy, and ESG performance within the UK context. It also outlined the broader implications for theory development, organisational practice, and regulatory design, while acknowledging the study's methodological and contextual limitations. Finally, it identified several avenues for future research that can further refine and extend the insights generated. Taken together, the chapter underscores the thesis's contribution to a more nuanced understanding of the complex interplay between innovation, financial decision-making, and corporate sustainability.

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APPENDICES

Appendix A: Interview guide and Open-ended questionnaire

The Financial and Sustainability Consequences of R&D and Intangible Investments:

UK Evidence

The research explores the linkages between R&D and intangible investments with corporate financial and sustainability outcomes (cash holdings, earnings management, and ESG performance)

Questions for Academic and Professional Experts

Section A: Introduction & Context

1. Can you please tell me your affiliation, position, and gender?
2. Could you briefly introduce your academic background and research focus?
3. Have you worked specifically on issues related to R&D investment, intangibles, or ESG performance?

Section B: R&D Investment and Financial Outcomes

4. Our results show a positive relationship between R&D intensity and cash holdings. From your perspective, why might R&D-intensive firms prefer to hold more cash?
5. Do you believe R&D activities increase firms' exposure to earnings management? If yes, what mechanisms might explain this behavior?
6. How do you think capital market pressures or accounting discretion affect R&D-related financial reporting?

Section C: R&D and ESG Performance

7. In our study, R&D investment was negatively associated with ESG performance. Does this surprise you?
8. Should all R&D be expected to contribute to sustainability outcomes? Or does this depend on the type of R&D?
9. How might firms better align their innovation strategies with ESG objectives?

Section D: Intangible Assets and Firm Behavior

10. Intangible investment was found to be positively associated with both cash holdings and earnings management. What might explain this behavior?
11. Intangible investment was found to positively relate to ESG performance. Why do you think intangible assets unlike R&D may support ESG outcomes?
12. How do you view the role of intangibles (e.g., brand, IP, human capital) in shaping sustainability practices and disclosures?

Section E: Broader Implications

13. Based on your experience, do UK firms differ from global peers in how they manage or report R&D and ESG activities?
14. What implications do these findings have for:
 - Managers?
 - Investors?
 - Policymakers?
15. What future research directions would you suggest based on this topic?

Section F: Closing

16. Is there anything you believe researchers are overlooking in studying the R&D–ESG–finance nexus?
17. Would you be open to being contacted for follow-up or clarification?

Thank you very much for your time and consideration. I truly appreciate your help.

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Appendix C: Declaration on identity**DECLARATION ON IDENTITY**

I, the undersigned **Asma Mehta**, declare that **the printed and electronic versions** of the doctoral dissertation and thesis booklet **are identical in all respects**.

Sopron, 20_____ year _____ month _____ day

signature of PhD candidate

Appendix D: Legal Declaration

LEGAL DECLARATION

I, the undersigned **Asma Mehta**, by signing this declaration declare that my PhD dissertation was my own work; during the dissertation I complied with the Act LXXVI of 1999 on the rules of copyright and the rules of the doctoral dissertation prescribed by the Doctoral School, especially regarding references and citations.¹

Furthermore, I declare that I did not mislead the supervisor (s) or the program leader with the dissertation.

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