

**INTELLECTUAL CAPITAL, EARNINGS QUALITY AND INVESTMENT
EFFICIENCY: A STUDY OF LISTED FIRMS IN NAIROBI
SECURITIES EXCHANGE, KENYA**

BY

CHEMUTAI SCHOLAR

**A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF BUSINESS
AND ECONOMICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF MASTER IN BUSINESS
ADMINISTRATION (FINANCE OPTION)**

MOI UNIVERSITY

2025

DECLARATION

Declaration by the Candidate

This research project is my original work and has not been presented for a degree in any other institution or any other university or any other award.

Signature: _____ Date: _____

Chemutai Scholar

MBA/4870/23

Declaration by the Supervisors

This research project has been submitted for examination with my approval as
University supervisor:

Signature: _____ Date: _____

Dr. Joel K. Tuwey

Department of Accounting & Finance

Moi University

Signature: _____ Date: _____

Dr. Japheth Kogei

Department of Accounting & Finance

Moi University

DEDICATION

This project is dedicated to my family members for their patience and encouragement throughout my studies and to my friends for their insights, advice and continued encouragement that I greatly appreciate. I also dedicate this project to School of Business and Moi University.

ACKNOWLEDGEMENTS

First, I thank the Almighty God for giving me the energy, wisdom, and perseverance to pursue my studies and undertake this research project. I am also grateful to my first supervisor, CPA Dr. Joel Tuwey, for his invaluable guidance, suggestions, corrections, and critiques. Additionally, I would like to express my appreciation to my second supervisor, Dr. Japheth Kogei, for his support and positive insights.

I extend my gratitude to the chair of the department and the dean for their contributions and support throughout this process.

Special thanks also go to my classmates, friends, and colleagues, whose encouragement and assistance have been instrumental in the successful completion of this project.

ABSTRACT

Company's investment activities are the most important basis for firms to achieve the goal of maximizing their value, and to guarantee for the survival and development of firms. However, investment in the developing countries remains below the pre-crisis level and in Kenya there has been an alarming increase of investment inefficiencies. Most firms in emerging economies including Kenya have displayed declining stock returns over time which is a challenge to investors. Thus, to fill this knowledge gap, the study seeks to establish the effect of intellectual capital, on investment efficiency of listed firms in Nairobi Securities Exchange (NSE) and whether earnings quality moderates the relationship. Specifically, the study was to determine the effect of the human capital, structural capital, relational capital and innovation capital on investment efficiency of listed firms in NSE and whether there is any moderating effect of earnings quality on this relationship. The study was anchored on agency theory, stewardship theory and earnings management theory. Both explanatory and longitudinal research design was adopted in the study. The study targeted 30 listed firms from 2016 to 2023. Panel regression analysis results indicated that human capital ($\beta_1 = .190, \rho < .05$), structural capital ($\beta_2 = .868, \rho < .05$), and relational capital ($\beta_3 = .190, \rho < .05$) had a positive and significant effect on investment efficiency of selected listed firms. In addition, the findings indicated that innovation capital ($\beta_4 = .395, \rho > .05$) had a positive and insignificant effect on investment efficiency in Kenyan firms. Further, earning quality positively moderated the relationship between human capital ($\beta_{5a} = 0.029, \rho < .05$), structural capital ($\beta_{5b} = .009, \rho < .05$), relational capital ($\beta_{5c} = .011, \rho < .05$) and investment efficiency. Similarly, the overall R^2 of the moderated model showed a joint contribution of 62.7% of predictor variables that explain investment efficiency. The study concludes that human capital, structural capital and relational capital are key predictors of investment efficiency. In addition, earning quality is an enhancing moderator in human capital, structural capital and relational capital in relation to investment efficiency. On the contrary, earning quality is a buffering moderator in the relationship between innovation capital and investment efficiency. The results validate the propositions of stewardship, agency, and earnings management theories. The study recommends that firms needs to invest in human resource and talent development, focus on optimizing operational frameworks, build and maintain strong relationship and collaborations with stakeholders as a strategic initiative to foster investment efficiency.

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DEFINITION OF TERMS

Earnings quality	refers to the degree to which reported financial earnings reflect the true value a company. Thus can be seen as a vehicle to acquire competitive advantage and superior performance (Duarte, Lisboa, & Carreira, 2022)
Human Capital	refers to the employees' knowledge, experience, education, and skills that is integral to sustaining an organization's competitive advantage (Alhassan and Asare, 2016; Anosa, 2021).
Innovation capital	refers to the intangible assets and capabilities within a firm that drive its ability to innovate and develop new products, services, technologies, or processes (Liu, et al., 2021).
Intellectual capital	refers to the intangible assets and knowledge-based resources within an organization that contribute to its overall value and competitiveness (Abdallah, <i>et al.</i> , 2024)
Investment Efficiency	refers to the projected investment level based on sales growth potential and serves as a measure of how effectively a firm's manager can make investment decisions without falling into the traps of underinvestment or overinvestment (Al-hadi et al., 2017)

Relational Capital	refers to an essential intangible asset derived from an organization's interactions with external entities, such as consumers, shareholders, and banks. It encapsulates elements such as customer and brand loyalty, market image, goodwill, bargaining power, strategic alliances, and coalitions (Kaplan and Norton, 2004; Buallay, 2018).
Structural Capital	refers to the effective utilization and management of an organization's tangible and intangible assets, including processes, technologies, patents, and organizational culture (Ismail and Karem, 2011).

ABBREVIATIONS

ATR	Asset Turnover Ratio
ATR	Asset Turnover Ratio
DEA	Data Envelopment Analysis
ERM	Enterprise Risk Management
FEM	Fixed Effect Model
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IE	Investment efficiency
KBRM	Knowledge-based Risk Management
MFI	Microfinance Institutions
MVAIC	Modified Value-Added Intellectual Coefficient
MVAIC	Modified value-added intellectual coefficient
PLS-SEM	Partial Least Squares-Structural Equation Modeling
PLS-SEM	Partial Least Squares-Structural Equation Modeling
RCE	Relational Capital Efficiency
REM	Random Effects Model
ROA	Return on Assets
ROCE	Return on Capital Employed
ROE	Return on Equity
SCE	Structural Capital Efficiency
VAIC	Value Added Intellectual Coefficient

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter entails background of the study, statement of the problem, research objectives, hypotheses, significance, and the scope of the study

1.1 Background of the Study

Investment efficiency is a critical aspect of financial management and corporate strategy that plays a pivotal role in determining a company's long-term success and competitiveness (Moradi et al., 2022). It refers to the ability of an organization to allocate its financial resources, such as capital and assets, in a manner that maximizes returns and minimizes risks. High investment efficiency means that an organization is adept at selecting and executing projects or investments that generate substantial returns relative to the resources committed (Yoshino et al., 2019). The decisions made regarding investment actions play a crucial role in maximizing the value and ensuring the sustainability and growth of companies (Salehi et al., 2022; Ricupero, 2017). The value, performance, and survival of a firm heavily rely on the efficiency of its investment decisions (Bayat et al., 2020; Mengesha, 2014). Increasing a firm's value is contingent upon its ability to raise capital at low costs and generate higher returns through investments. Therefore, firms continue to invest until the marginal cost of investment equals the marginal benefit (Salehi et al., 2022). Investment efficiency is the result of managing the relationship between risk, return, and the costs associated with investment, considering both financial and non-financial constraints (Safi et al., 2022).

One of the key factors that contribute significantly to investment efficiency is intellectual capital. Intellectual capital encompasses the intangible assets within an organization, such as knowledge, skills, innovation, and the ability to create and leverage on intellectual property (Haris et al., 2019). Globally, Intellectual capital plays a pivotal role in enhancing investment efficiency through several key mechanisms. Firstly, it supports informed and strategic decision-making by providing the knowledge and insights necessary for assessing opportunities, risks, and market trends, enabling effective resource allocation (Kengatharan, 2019). Secondly, it fosters innovation and research capabilities, creating a culture of continuous improvement that can lead to the development of innovative products or services, thereby improving investment efficiency (Duho, 2022). Thirdly, intellectual capital, particularly human capital, contributes to prudent investment decisions and efficient project execution, as knowledgeable and skilled employees enhance project management. Additionally, intellectual capital can be a source of sustainable competitive advantage, making companies more attractive for investment opportunities (Kim & Tran, 2023). It aids in risk management by empowering the workforce to identify and mitigate risks associated with various investments, ultimately contributing to more effective resource allocation and enhanced investment efficiency (Sowaity, 2022).

Global, regional, and local studies have linked various components of intellectual capital with characteristics of investment efficiency. For instance, in Bangladesh, Si (2019) linked dimensions of intellectual capital—human capital, structural capital, and relational capital—to return on equity (ROE) and asset turnover in the textile industry. In the Indonesian Stock Exchange (ISE), Madyan and Fikir (2019) found that human capital had a significant negative effect on ROA but no notable negative

effect on Tobin's Q. Structural capital exhibited a positive, but not significant, effect on ROE and Tobin's Q. In Thailand, Martens (2023) found that intellectual capital enhances efficiency and revenue growth but has intricate effects on profitability. Vetchagool (2023) revealed that MVAIC and its components (human capital, structural capital, and relational capital) had a significantly positive impact on firm profitability.

In India, Balaji and Mamilla (2022) used a fixed-effect regression model to analyze the repercussions of intellectual capital on the sustainable growth rate (SGR). The findings revealed that human capital, structural capital, and innovation capital did not have a significant impact on companies' sustainable growth rates. These diverse studies, although not directly linking intellectual capital with investment efficiency, underscore the complex and varying effects of different intellectual capital components on investment efficiency and firm performance across different contexts and industries.

Regionally, in Ghana, Onumah and Duho (2020) provided evidence suggesting that intellectual capital enhances efficiency in banks. Similarly, Duho (2020) found that intellectual capital positively impacts slack-based technical efficiency (SBM-TE) in Ghanaian banks, with human capital being the primary driver of technical efficiency. In Nigeria, Anifowose et al., (2018) demonstrated a significant positive relationship between overall intellectual capital efficiency and corporate book value, specifically cash flow from operations and economic value added (EVA). This study contributes to the growing body of evidence on the value relevance of IC information for investors and other stakeholders. Furthermore, Bala et al., (2021) found that in Nigeria, structural capital efficiencies significantly and positively influence

investment efficiency, while, the positive effect of relational capital efficiency is relatively mild. However, human capital efficiency does not appear to have a relationship with investment efficiency. These findings are significant, providing two key contributions to the literature: they highlight the importance of intellectual capital in enhancing firm efficiency and value, and they underscore the varying impacts of different components of intellectual capital across different regional contexts.

In Kenyan context, Githaiga et al., (2023) confirmed the relative importance of intellectual capital, which includes both tangible and intangible assets, as significant positive contributors to the financial sustainability of microfinance institutions (MFIs). Wanambiro (2019) established a significant and positive relationship between human capital initiatives, structural capital initiatives, relational capital initiatives, and value creation in public universities in Kenya. Similarly, Peters and Okech (2020) found that there was a significant and positive relationship between human capital, relational capital, and structural capital attributes of managerial intellectual capital and the internationalization of commercial banks in Kenya.

Their study also indicated that these forms of capital significantly influence the success of internationalization strategies for commercial banks. Thus, structural capital, human capital, and relational capital key attributes of managerial intellectual capital jointly impact the success of internationalization efforts among commercial banks in Kenya. However, despite studies examining the various aspects of intellectual capital and its impact on firm performance, stock return, and value creation, there remains a scarcity of empirical research specifically linking intellectual capital to investment efficiency, particularly within the Kenyan context. Therefore,

the current study aims to fill this research gap by investigating the potential influence of intellectual capital on investment efficiency in Kenya.

1.1.1 Firms Listed in Nairobi Security Exchange

The Nairobi Securities Exchange (NSE), a prominent African exchange located in Nairobi, Kenya, has played a significant role in the country's economic development since its establishment in 1954 (NSE). Over its six-decade history, the NSE has evolved through various reforms and transformations to become a world-class securities exchange. It has attracted both local and international investments, effectively promoting savings and investment in Kenya. As a full member of the World Federation of Exchanges (ASEA) and a founder member of the African Securities Exchange Association (EASEA), the NSE has positioned itself to international standards, facilitating access to cost-effective capital for local and international firms (Ngugi, 2003). Notably, the NSE is recognized as a crucial source of long-term finance for companies trading within its ambit, serving as a backbone for their financial needs (Mukras, 2015). The NSE's growth has been underscored by government-initiated reforms, including divestiture of commercial and industrial sectors and innovative measures such as automated trading systems. As of 2016, the Nairobi 20-Share Index had surpassed the 5000 points mark, signifying its substantial capital potential (NSE, 2015). Additionally, the NSE has facilitated substantial bond issuances, and listed firms have significantly contributed to Kenya's Gross Domestic Product (GDP), accounting for an average of 18% of annual revenue during the period from 2013 to 2018 (NSE, 2019).

1.2 Statement of the Problem

Investment efficiency affirms that firms and investors will receive the anticipated returns of their capital outlay which heightens growth and survival of firms and projects even in times of crisis and stiff competition (Moradi et al., 2022; Yoshino *et al.*, 2019). The company's investment activities are the most important basis for firms to achieve the goal of maximizing their value, and also the source guarantee for the survival and further development of firms (Salehi, et al., 2022; Ricupero, 2017). Investment efficiency decisions are crucial aspects in determining the value, performance and consequently the survival of a firm (Bayat et al., 2020; Mengesha, 2014). Increasing the value of a firm depends on its ability to raise capital for investment at the cheapest cost and earn higher returns. Thus, firms invest until the marginal cost of investment equals the marginal benefit (Salehi, et al., 2022).

However, investment in developing countries remains below pre-crisis levels (Naeem & Li, 2019), and in Kenya, there has been a concerning rise in investment inefficiencies (Capital Market Authority, 2021). Many firms in emerging economies, including Kenya, have shown declining stock returns over time, presenting a challenge for investors (Capital Market Authority, 2018). Recently, Kenya's stock market has suffered significant losses, making it the worst performing globally (Bloomberg, et al., 2023) and the third worst performing in Africa (Business Daily, 2023). The weak performance has persisted: the Nairobi Securities Exchange 20-share index stood at about 1,420 on 10 November 2023, down from 1,509 on 29 September 2023, a drop of 6% over six weeks. In better days, the index had risen above the psychological 5,000 mark; for instance, it was at 5,491 on 23 February 2015. Leading the stock market to its fourth quarterly drop is KCB Group. The worst performing

lender at the NSE in 2020 was Housing Finance Company of Kenya (HFCK), whose share price declined by 45% year-to-date (Kenya Wallstreet, 2023).

Due to these inefficiencies in corporate investment, many companies over the past few decades have been delisted, gone bankrupt, taken over, closed, or phased out completely by intense competition due to inefficient investment plans that have swept across the country. Firms such as ARM Cement PLC, Deacons (EA) PLC and Atlas have been suspended from trading owing to huge loss making with high outstanding debts while Kenol Kobil was delisted after acquisition by Rubis Energy as of 2019. Mumias Sugar Company was placed under statutory management for defaulting on debts. The investment efficiency of firms listed at the Nairobi Securities Exchange is a barometer of national economic performance. When a large number of companies record reduced revenue and earnings as evidenced by profit warnings, it means investors' money is doing less than expected.

This therefore, calls for more studies to investigate the factors that influence investment efficiency. For example, Previous research has identified several determinants of investment efficiency, such as corporate social responsibility (Lin et al., 2021), corporate governance (Bimo et al., 2021; Ellili, 2022), financial reporting quality (Ellili, 2022), ownership concentration (Dinh et al., 2022), and earnings quality (Tahat et al., 2022), among others. However, except for Kweh et al. (2021), studies investigating the link between intellectual capital and investment efficiency have been insufficient and have yielded mixed findings. Locally, studies have indicated positive effects of intellectual capital on firm performance (Chelogoi et al., 2021), market valuation (Njoroge, 2013), and income diversification (Githaiga, 2020) of listed firms in Kenya. However, none of these studies have attempted to establish

the effect of intellectual capital on the investment efficiency of listed firms, highlighting a gap in the research. Furthermore, despite studies such as Tahat et al. (2023) and Hung et al. (2020) showing the importance of earnings quality in intellectual capital disclosure and investment efficiency, the moderating effect of earnings quality on the relationship between intellectual capital and investment efficiency has yet to be studied. Therefore, the current study is aim to fill this critical gap in the existing literature.

1.3 General Objectives

The main objective of the study was to determine effect of intellectual capital, and earnings quality on investment efficiency of listed firms in NSE.

1.3.1 Specific Objectives

The specific objectives for the study were;

1. To examine the effect of the human capital on investment efficiency of listed firms in NSE.
2. To determine the effect of the structural capital on investment efficiency of listed firms in NSE
3. To investigate the effect of the relational capital on investment efficiency of listed firms in NSE
4. To establish the effect of the innovational capital on investment efficiency of listed firms in NSE
5. a) To examine the moderating effect of earnings quality on the relationship between human capital and investment efficiency of listed firms in NSE.

- b) To determine the moderating effect of earnings quality on the relationship between structural capital and investment efficiency of listed firms in NSE.
- c) To investigate the moderating effect of earnings quality on the relationship between relational capital and investment efficiency of listed firms in NSE.
- d) To establish the moderating effect of earnings quality on the relationship between innovation capital and investment efficiency of listed firms in NSE.

1.4 Hypotheses of the Study

The hypotheses were as follows:

- H₀₁:** Human Capital has no significant effect on investment efficiency of listed firms in Nairobi Securities Exchange.
- H₀₂:** Structural Capital has no significant effect on investment efficiency of listed firms in Nairobi Securities Exchange.
- H₀₃:** Relational Capital has no significant effect on investment efficiency of listed firms in Nairobi Securities Exchange.
- H₀₄:** Innovation capital has no significant effect on investment efficiency of listed firms in Nairobi Securities Exchange.
- H_{05a}:** Earning quality does not significantly moderate the relationship between human capital and investment efficiency of listed firms in Nairobi Securities Exchange.
- H_{05b}:** Earning quality does not significantly moderate the relationship between structural capital and investment efficiency of listed firms in Nairobi Securities Exchange.

H_{05c}: Earning quality does not significant moderate the relationship between relational capital and investment efficiency of listed firms in Nairobi Securities Exchange.

H_{05d}: Earning quality does not significantly moderate the relationship between innovation capital and investment efficiency of listed firms in Nairobi Securities Exchange.

1.5 Significance of the Study

The significance of this study was to explore the effect of intellectual capital on investment efficiency of listed firms in Nairobi Securities Exchange, moderated by earnings quality, extends to various stakeholders:

This study offers valuable insights into the role of intellectual capital in optimizing investment efficiency. Understanding how intellectual capital impacts investment decisions can help firms better allocate resources and make informed choices, ultimately leading to improved financial performance and competitiveness.

Financial professionals, such as investment analysts, financial advisors, and fund managers, can benefit from the study's findings. It can provide them with a more comprehensive understanding of the factors influencing investment efficiency, allowing for more informed investment strategies and portfolio management decisions.

They can use the study's results to inform economic and financial policy decisions. Insights into the relationship between intellectual capital and investment efficiency can guide policies aimed at promoting a conducive environment for investment and economic growth.

Academics and scholars in the fields of finance, economics, and business management can build upon this study's findings. It contributed to the body of knowledge in financial management and intellectual capital by examining their interplay and impact on investment efficiency, paving way for further research and academic exploration.

1.6 Scope of the Study

The study determined the impact of intellectual capital on investment efficiency, with a particular focus on the moderating role of earnings quality. This research was carried out in the context of the National Securities Exchange (NSE). The study was restricted to four key dimensions of intellectual capital: human capital, structural capital, relational capital and innovation capital. The study was based on agency theory, stewardship theory and earning management theory. The study utilized secondary sources; predominantly the annual reports of the listed firms for a period of eight years from 2016 to 2023.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In a bid to establish sound theoretical, empirical and conceptual bases for the study, this chapter reviews literature on theories and variables of the study. The chapter begins by giving an overview of the key concepts of the study then discusses the key theories underlying dependent, independent, moderating and control variables, discusses empirical study, develops a conceptual framework and expounds on the research gaps on cash flow management activities and investment efficiency.

2.1 Concept of Investment Efficiency

Investment Efficiency (IE) is a crucial concept in the realm of financial management. It is defined as the anticipated level of investment, quantified as the projected investment level based on sales growth potential. Essentially, it serves as a measure of how effectively a firm's managers can make investment decisions without falling into the traps of underinvestment or overinvestment (Al-hadi et al., 2017).

Overinvestment, on one hand, occurs when management allocates excessive resources, sometimes even into projects with negative net present values (Agyei-Mensah, 2021; Assad & Alshurideh, 2020). Conversely, "underinvestment" refers to the neglect of investment opportunities expected to yield a positive net present value (Agyei-Mensah, 2021).

In simpler terms, a positive departure from the intended investment level, where investments exceed expectations, is labeled as overinvestment. Conversely, when investments fall short of the anticipated level, it's termed underinvestment.

Importantly, both overinvestment and underinvestment are indicative of inefficiency in investment decisions (Majeed et al., 2018).

Investment activities play a pivotal role in a firm's operations and serve as a significant signal of its overall performance. In an ideal world devoid of financial market imperfections, all investment opportunities with positive net present values would be promptly pursued and implemented by companies. However, reality tells a different story. Financial market failures are substantial, leading to inefficient corporate resource allocation. Factors such as external financing costs, conflicts of interest between managers and stakeholders, and information asymmetry contribute to deviations from the optimal investment level (Yildiz, 2021).

Naeem and Li (2019) employ a conceptual framework to highlight that overinvestment scenarios are frequently associated with agency problems, while underinvestment scenarios are often linked to financial constraints, including capital restrictions (Biddle et al. 2009).

Understanding a firm's investment efficiency holds immense importance for its stakeholders. It directly correlates with the firm's sustainable growth and economic value. Overinvestment jeopardizes a firm's economic value because it involves pursuing investment plans with negative net present values (NPV), while underinvestment erodes the firm's value as it entails overlooking investment opportunities with positive NPVs (Biddle et al., 2009). It's worth noting that, at times, managers may utilize corporate investments to further their personal interests.

In essence, investment efficiency is a critical aspect of financial management that has far-reaching implications for a firm's financial health and, by extension, the interests

of its various stakeholders. Understanding the factors that lead to overinvestment and underinvestment is essential for making informed decisions in the corporate world.

2.2 Concept of Intellectual Capital

Intellectual capital (IC) is a conceptual framework that encompasses the valuable knowledge assets possessed by a firm (Bayrak-taroglu et al., 2019). IC. Bell (1997) describes IC as a crucial intangible resource that shapes a firm's strategic posture. Brooking (1996) highlights IC as a valuable resource in wealth and value creation. Stewart (1997) defines IC as the intellectual agility of employees. Yi and Davey (2010) view IC as a business philosophy, management processes, employees' competence and business relations. Despite these interpretations, IC remains the most valuable resource for creating wealth and driving the knowledge economy (Dalwai et al., 2021; Rehman et al., 2021; Cheng, Liu, & Chang, 2022). It has garnered substantial scholarly attention and is typically composed of three primary components: human capital, organizational capital, and social capital. This classification is instrumental for understanding and analyzing the diverse knowledge resources within organizations, recognizing them as valuable assets in specific contexts. The research in this domain has expanded significantly, consistently demonstrating that these three components of intellectual capital substantially enhance firm performance (Mention and Bontis, 2013), underscoring their pivotal role in organizational success (Youndt and Snell, 2004).

Traditional models for assessing IC efficiency primarily revolve around three key components: human capital efficiencies (HCE), relational capital efficiencies (RCE), and structural capital efficiencies (SCE). One widely recognized measurement tool is Pulic's (1998) VAICTM model, celebrated for its simplicity, which enables effective

cross-enterprise or cross-country comparisons (Xu, 2019). However, the original VAIC model faced criticism for concentrating solely on labor and capital investment efficiency rather than IC efficiency. It also overlooked a firm's relational and innovation capital (Sthle et al., 2011; Smriti and Das, 2018). To address these limitations, Ulu et al. (2017) enhanced Pulic's model by incorporating relational capital efficiency (RCE), resulting in the modified VAIC (MVAIC) method.

The Value-Added Intellectual Coefficient (VAIC) model offers a range of methods for measuring IC, including Tobin's Q, the Skandia Navigator, the Intangible Assets Monitor, the balanced scorecard approach, market capitalization methods, and the VAIC model. Among these, Pulic's (1998) VAIC model stands out for its widespread use in both academic research and practical applications (Mohapatra et al., 2019; Xu & Liu, 2019). VAIC comprises three efficiency elements: relational capital efficiency (RCE), human capital efficiency (HCE), and structural capital efficiency (SCE). This indicator-based financial method is considered unbiased and relies on publicly available data derived from audited financial statements (Clarke et al., 2011). Moreover, it facilitates industry-wide comparisons (Meditinos et al., 2011).

However, the VAIC model has limitations. It primarily focuses on labor and capital investment efficiency, disregarding IC efficiency (Ståhle et al., 2011). The model also fails to account for a firm's relational capital (RC) and innovation capital (Ståhle et al., 2011; Smriti & Das, 2018). Additionally, the measurement of structural capital (SC) in the original VAIC model may not be comprehensive (Chen et al., 2005). Nimtrakoon (2015) introduced market costs as a component of RC to address these shortcomings.

To overcome these limitations, Xu and Liu (2020) modified and extended the original VAIC model to better measure IC efficiency. Several other studies have also modified the VAIC model to include neglected IC components. For example, Nazari and Herremans (2007) replaced SC with customer capital, renewal capital, and process capital. Chang (2007) introduced innovation capital and intellectual property capital. Chen et al. (2005) incorporated innovation capital and RC as control variables. Vishnu and Gupta (2014) introduced RC as a new IC component. Nadeem et al. (2019) replaced SC with innovation capital, and Bayraktaroglu et al. (2019) proposed an extended VAIC model with the introduction of innovation capital and customer capital.

These modifications and extensions to the VAIC model aim to capture a more accurate picture of a firm's intellectual capital and its impact on performance. In line with the evolution of research on intellectual capital measurement, this study employed a modified VAIC model that accounts for the essential components of intellectual capital: relational capital (RC), human capital (HC), innovation capital (IC), and structural capital (SC).

2.3 Concept of Earning Quality

Earnings quality, as defined by Dechow et al. (2010), is characterized by "higher quality earnings that provide more information about the features of a firm's financial performance that are relevant to a specific decision made by a specific decision-maker." This comprehensive definition suggests that earnings quality is a multifaceted concept, with its interpretation varying depending on the context of specific decision models (Dechow et al., 2010). Earnings quality occurs when reported information

reflects current performance, is a good indicator of future performance, and reflects the firm's intrinsic value (Duarte, Lisboa & Carreira, 2022).

According to Dechow et al. (2010), measures of earnings quality can be broadly categorized into three main groups: properties of earnings, investor responsiveness to earnings, and external indicators of earnings misstatements. Many previous studies exploring the relationship between earnings quality and performance have primarily focused on measures related to the properties of earnings (e.g., Chih et al., 2008; Kim et al., 2012). In such studies, higher earnings quality, particularly concerning earnings properties, is often associated with lower volatility, reduced discretionary accruals, and smoother time series of earnings.

Earnings quality is a crucial topic that has gained prominence in literature, particularly following a series of global crises and accounting scandals. This is because earnings serve as essential tools for assessing operational performance, financial health, and overall financial soundness (Hasan, Omar, and Hassan, 2018). An earnings quality report is a vital document used for making critical contractual agreements and financial decisions, including executive compensation, gauging growth potential, and influencing commercial and political choices (Kamarudin and Ismail, 2014).

At its core, earnings quality refers to the degree of integrity in financial reporting, characterized by the absence of earnings management practices and manipulation. Roychowdhury (2006) emphasizes that earnings quality relates to the precision in disclosing a company's income statement, which should accurately reflect its true earnings. The concept of aligning accounting choices with economic reality is fundamental in reducing information asymmetry between a corporation and its

stakeholders (Francis et al., 2004; Hadi et al., 2023). Earnings quality is closely tied to the principle of prudence in financial reporting since it facilitates a swifter evaluation of losses and potential risks compared to anticipated gains (Basu, 1997).

Earnings quality is a multifaceted concept with various dimensions (Burgstahler et al., 2006), leading to diverse measurement approaches (Schipper and Vincent, 2003). From a financial analysis perspective, Dechow and Schrand (2004) define high-quality earnings as those that accurately reflect the intrinsic value of the firm, annuitizing it effectively. Therefore, earnings are considered of high quality when they faithfully represent the company's current operating performance, serve as reliable indicators of future operating performance, and offer a valuable measure for assessing investment efficiency (Dechow and Schrand, 2004).

One of the significant attributes of accounting earnings is their role in mitigating agency conflicts between managers and shareholders or creditors by aligning their interests (Wang, 2006; Watts and Zimmerman, 1986). Consequently, various users of financial statements, including shareholders and creditors, demand high-quality financial reporting, specifically in terms of earnings quality, to facilitate efficient contracting and monitoring (Wang, 2006). This demand for superior financial reporting incentivizes firms to provide higher-quality financial statements, aiming to secure better contractual terms (Ball et al., 2003; Ball and Shivakumar, 2005; Wang, 2006). Reported earnings quality (EQ) is a multidimensional concept and can be measured and evaluated through various factors, including discretionary accruals (DA) quality, earnings smoothness, earnings predictability, earnings persistence, earnings timeliness and value relevance (Duarte et al., 2022)

2.4 Theoretical Framework

The study was anchored on agency theory, stewardship theory, and earnings management theory to examine the effect of intellectual capital (human capital, structural capital, relational capital, and innovation capital) on investment efficiency, with earnings quality as a moderating variable.

2.4.1 Agency Theory

Agency theory, developed by Jensen and Meckling (1976), posits that companies may deviate from ideal investment levels, experiencing either excess or insufficient investment due to the separation of ownership and control. In a perfectly efficient financial market, all projects with positive net present value (NPV) should naturally progress. However, historical literature challenges this notion due to market imperfections that can lead to the completion of projects with negative NPV (over-investment) or the rejection of projects with positive NPV (under-investment). Agency theory explains this phenomenon through the existence of asymmetric information among shareholders and managers.

In this context, the effectiveness of investments is scrutinized in light of information-related challenges aimed at mitigating moral hazards, undesirable choices, and maximizing investment efficiency. The moral hazard issue arises when there is a misalignment between shareholders' interests and a lack of managerial oversight. This situation may drive management to prioritize personal interests by making investments that do not align with the owners' objectives (Jensen, 1986), leading to subsequent over-investment (Hope and Thomas, 2008). Adverse selection occurs when better-informed managers may over-invest by selling expensive securities and raising additional funds. To counteract this, capital providers can offer quota capital

or increase its cost, leading to the rejection of potentially profitable projects due to budget constraints (Lambert et al., 2007), resulting in suboptimal investment levels.

Agency theory serves as a mechanism for regulating performance-based governance through incentives, particularly in situations where agent behavior depends on costs incurred and their impact on substantial expenditures (Eisenhardt, 1985). Conversely, remedial governance mechanisms rely on the disclosure of agents' behavior and actions through information systems. These mechanisms hinge on the establishment of rules and procedures, encompassing aspects such as reporting status, budgeting, financial systems, performance evaluation, and the monitoring of agent behavior (Eisenhardt, 1989; Zsidisin and Ellram, 2003).

According to Jensen and Meckling (1976), the primary focus of agency theory, aimed at mitigating agency conflicts, revolves around establishing contracts that govern the relationships between principals and agents regarding funding. Contracts are metaphorically used to describe these relationships in several ways: Principals can align the interests and personal goals of agents by offering contracts that tie compensation to outcomes, shifting from fixed salaries to performance-based pay structures. This aligns the interests of principals and agents, fostering a shared focus on organizational performance (Crocker & Slemrod, 2007; Holmström, 1979; Shavell, 1979). Principals engage in stringent monitoring of agents to enhance their information and reduce shirking behavior (Chang & Lai, 1999; Dickinson & Villeval, 2008; Frey, 1993).

Agency theory can be combined with stewardship theory as an alternative approach to management. In this scenario, managers are incentivized to maximize organizational benefit rather than prioritize personal objectives. Agents must possess the requisite

abilities, commitment, and service orientation as expected by the principal (Crocker & Slemrod, 2007). The fusion of agency theory with intellectual capital, particularly human and structural capital, ensures that agents possess the competence and skills required for effective organizational governance. This allows them to operate in accordance with established mechanisms and rules (Crocker & Slemrod, 2007)..

2.4.2 Stewardship Theory

Rooted in psychology and sociology, Stewardship theory aims to elucidate scenarios in which a manager, acting as an agent, aligns with the principal's interests (Donaldson & Davis, 1989, 1991). According to this theory, the manager acts in the pursuit of common interests. When the principal's objectives harmonize with those of the agent, cooperation prevails over conflict. This inclination is driven by the agent's perception of shared interests, leading them to comport themselves in accordance with the principal's goals. This rational behavior stems from the principal's strong orientation toward achieving organizational objectives.

The essence of Stewardship theory lies in fostering enhanced stewardship behavior. This is achieved by empowering individuals through human capital development and employee engagement (Puig et al. in Zahra et al., 2008; Zahra, 2017). Organizations that align with the principles of Stewardship theory argue that employee empowerment can guide managers toward stewardship-oriented policies rather than self-serving agency actions (Davis et al., 1997). Stewardship theory, in essence, complements the Intellectual Capital theory by emphasizing the vital role of employee involvement in enhancing a company's performance. This emphasis extends to individual empowerment in areas of innovation, skills development, and knowledge enhancement.

2.4.3 Earnings Management Theory

Earnings management theory, developed by Healy and Wahlen (1999), focuses on the manipulation of financial reports by managers to achieve specific objectives. Earnings management theory posits that managers may manipulate financial statements to meet targets, influence stock prices, or achieve personal bonuses. This manipulation can be achieved through accounting choices, discretionary accruals, and real activities. Earnings management theory is used to understand how and why managers manipulate earnings and the impact of such practices on financial reporting quality and market perceptions. It also explores the consequences of earnings management on investment decisions and organizational performance. Organizations often employ earnings management in their financial transactions to shape shareholders' perceptions of the financial outcomes resulting from production activities (Hong & Andersen, 2011). Earnings management theory encompasses both negative and positive accounting strategies utilized in business transactions. Managers exercise their discretion to communicate their insights, often based on privileged insider information, regarding the company's future profit prospects.

There are two underlying intentions behind managers' engagement in earnings management. Firstly, when management aligns reported earnings with investor expectations, the company's performance appears stable. Secondly, organizations with promising prospects may seek to maximize this year's earnings while accepting the risk of diminished earnings in the following year. This strategy is employed cautiously since a subsequent drop in earnings could have adverse consequences (Tucker & Zarowin, 2005).

Earnings management involves the strategic use of accounting accruals to convince potential and existing shareholders of the firm's ability to generate future operating cash flows. This, in turn, has a broader impact on the development of the capital market and, by extension, the overall economy. The theory posits that the presence of high earnings quality can enhance the positive impact of intellectual capital on investment efficiency. In other words, when a firm possesses both robust intellectual capital and high-quality earnings, the synergy between these two factors is expected to result in more efficient investment decisions.

Conversely, low earnings quality may weaken the relationship between intellectual capital and investment efficiency. When earnings quality is poor, it could potentially hinder the translation of intellectual capital into effective investment strategies. In this scenario, even if a firm has valuable intellectual capital, the lack of reliable and transparent earnings reporting may limit its ability to make efficient investment choices.

The study seeks to shed light on the complex interplay between intellectual capital, earnings quality, and investment efficiency within firms. It aims to provide insights into how these factors collectively influence decision-making processes and potentially offer guidance to firms aiming to optimize their investment strategies in light of their intellectual capital and earnings quality.

2.5 Empirical Review

The study offers empirical analyses on the relationship between human capital and investment efficiency, structural capital and investment efficiency, relational capital and investment efficiency, and innovation capital and investment efficiency, while also examining the moderating effect of earning quality.

2.5.1 Human Capital and Investment Efficiency

Human Capital representing employees' knowledge, experience, education, and skills, is integral to sustaining an organization's competitive advantage (Alhassan and Asare, 2016; Anosa, 2021). Investments in human capital are widely acknowledged for enhancing work quality, contributing to national wealth, and driving economic growth (Eniola et al., 2015). The Organization for Economic Cooperation and Development underscores that HCE fuels economic activity, competitiveness, and prosperity (Anaduaka et al., 2014). Human capital stands out as the most vital intangible asset within the realm of business enterprises (Hashim et al., 2018). It serves as a fundamental cornerstone of business performance (Ahamad et al., 2020). This encompassing concept revolves around activities like training, education, and other professional endeavors aimed at nurturing employees' knowledge, skills, values, and social assets. Such investments not only contribute to heightened employee satisfaction and performance but also ultimately bolster the overall performance of the firm itself (Ahamad et al., 2016). Ahamad et al. (2020) assert that firms can attain elevated growth and profitability by effectively harnessing various forms of human capital within their operations.

Rahman et al. (2024) evaluated the impact of human capital investment, encompassing training, education, knowledge, and skills, on the efficiency of banks in Bangladesh. Utilizing a simple random sampling method, data was gathered from 309 respondents using a seven-point Likert scale. The analysis employed measurement modeling and structural equation modeling with the PLS-SEM approach. The findings revealed a positive association between human capital investment and bank efficiency. The study suggested that by investing in training, education, knowledge, and skills, banks can enhance their investment efficiency, recognizing the varying

performance levels of employees. This implied a need for aligning human capital through strategic investments. Institutional investors utilize investment management frameworks to operationalize investment policies, where efficiency integrates risk, return, and total cost. Despite these insights, the study did not establish a direct link between human capital and investment efficiency.

Sisodia et al. (2021) investigated whether human capital affects investment efficiency by following a positive methodological approach. According to the classical theory of economic growth, a country's output depends on its human and physical capital. At the micro-level, the same theory holds true for firm output. Thus, the human capital of a firm should play a significant role in firm performance and valuation. Their results showed a positive relationship between human capital and investment efficiency. Human capital creates value by better utilization of current growth opportunities, creating future growth opportunities, and reducing the volatility associated with the firm growth rate. However, the study did not explicitly link human capital to investment efficiency.

In their study, Ahamad et al. (2023) delved into the impact of human capital on the financial and social efficiency of microfinance institutions (MFIs). To assess these effects, they employed the Truncated Regression model and Data Envelopment Analysis (DEA), with the Tobit model and Generalized Method of Moments (GMM) serving as tools to verify the robustness of their estimations. The study drew upon panel data encompassing 661 MFIs from 86 countries, spanning the period from 2010 to 2018. The findings indicated that MFIs tend to exhibit greater financial efficiency than social efficiency, although MFIs endowed with substantial human capital tend to

fare better in terms of financial efficiency. Despite these findings, a direct link between human capital and investment efficiency remains unexplored.

Oppong et al. (2019) set out to explore the influence of human capital on the DEA-based MPI (Malmquist Productivity Index). Their study focused on productivity changes observed in 33 insurance firms operating in Ghana over the span of 2008 to 2016. Their results revealed that human capital exerts a significant and positive impact on the productivity change experienced by insurance companies. Nevertheless, the study did not address the specific relationship between human capital and investment efficiency.

2.5.2 Structural Capital and Investment Efficiency

Structural Capital pertains to the effective utilization and management of an organization's tangible and intangible assets, including processes, technologies, patents, and organizational culture (Ismail and Kareem, 2011). It involves creating a conducive environment that encourages experimentation, learning, and the integration of knowledge. Structural Capital Efficiency (SCE) is a critical component of intellectual capital and has been shown to influence organizational performance and financial outcomes. Research on SCE has produced varied results, with some studies indicating a positive relationship between structural capital and corporate performance (Saleem et al., 2022; Olarewaju and Msomi, 2021), while others report negative or inconclusive findings (Ting and Lean, 2009). Structural capital represents knowledge that has been converted into corporate assets, such as patents (Hsu & Wang, 2010). Moreover, it encompasses a reservoir of interrelated knowledge and infrastructure that persists within a company, even in the face of employee turnover or resignations (Yaseen et al., 2016). Companies that effectively harness their structural

capital can significantly enhance their overall value (Chen et al., 2005). Given the intense competition among businesses, the optimization of structural capital becomes imperative for augmenting a company's value (Hsu & Wang, 2010; Yaseen et al., 2016). Nevertheless, in Indonesia, the utilization of structural capital as a component of investment to elevate a company's worth remains relatively low (Welly et al., 2021). Several studies have even indicated a negative correlation between structural capital and firm performance and value (Mohammad et al., 2018; Forte et al., 2019). Deep and Narwal (2014) contend that structural capital has no bearing on investment or investment efficiency. Furthermore, as an intangible asset, structural capital is frequently overlooked in decision-making processes and has minimal impact on a company's value (Mehralian et al., 2012). Despite these findings, the studies do not explicitly link structural capital to investment efficiency.

Thien and Hung (2023) investigated the relationship between structural capital and investment efficiency (IE). Using secondary data and primary data from a questionnaire survey of 127 Vietnamese listed companies, this work applied the PLS-SEM approach. The empirical results show a direct connection between structural capital (a measurement of IC) and IE, as firms likely use structural capital representing a well-organized structure to facilitate efficient capital allocation. However, the study does not establish a broader context for structural capital's impact on investment efficiency beyond these firms.

Midiantari and Agustia (2020) examined the effect of structural capital on investment efficiency through corporate reputation as a mediating variable. This study used 340 observations of companies that received an excellent category on the Indonesian Corporate Image Award (IMAC) listed on the Indonesia Stock Exchange from 2013

to 2017 with Partial Least Square (PLS) test processed with warpPLS version 5.0 software. The study shows that structural capital has a significant effect on investment efficiency and corporate reputation. Nonetheless, it does not provide a direct link to investment efficiency.

Amrizah and Rashidah (2013) advocate for the notion that a well-structured organization enhances the efficiency of microfinance institutions. This efficiency is achieved through the contributions of proficient staff delivering their services effectively and with quality. Khalique et al. (2015) argue that even if an organization possesses knowledgeable and skilled staff, the absence of a robust structural capital component implies that not all intellectual capital is fully and effectively utilized. Despite these insights, a direct connection to investment efficiency is not established.

Kasoga (2020) highlights a significant positive correlation between Structural Capital Efficiency (SCE) and various performance metrics, including Return on Assets (ROA), sales growth, Asset Turnover Ratio (ATR), and Tobin's Q, within Tanzanian service and manufacturing enterprises spanning the years 2010 to 2019. Vidyarthi and Tiwari (2019), using a panel of 37 Indian banks, find that the aggregate Intellectual Capital (IC) has a minor yet positive impact on cost efficiency, revenue efficiency, and profit efficiency. These studies, however, do not make an explicit connection between structural capital and investment efficiency.

In a recent development, Bayraktaroglu et al. (2019) introduced an extended model called the Value-Added Intellectual Coefficient (VAIC) for the Turkish manufacturing sector. This model incorporates innovation and customer capital, revealing that Structural Capital Efficiency (SCE) exerts a positive influence on firms' profit growth, while innovation capital efficiency directly affects their productivity.

Despite these findings, the study does not address the specific relationship between structural capital and investment efficiency.

2.5.3 Relational Capital and Investment Efficiency

Relational Capital represents an essential intangible asset derived from an organization's interactions with external entities, such as consumers, shareholders, and banks. It encapsulates elements such as customer and brand loyalty, market image, goodwill, bargaining power, strategic alliances, and coalitions (Kaplan and Norton, 2004; Buallay, 2018). Within Relational Capital Efficiency (RCE), Relational Capital (RC) defines the network of relationships an organization maintains with its external stakeholders. The strategic cultivation of these relationships significantly enhances an organization's competitiveness and long-term success, improving its understanding of the industry and enhancing decision-making processes. Theoretically, elevated RCE is expected to positively correlate with efficiency (Nimtrakoon, 2015). When assessing RC, factors like longevity and its positive impact on an organization's competitive edge are considered key indicators. Relational capital, often referred to as customer capital, represents the vital connections that exist among employees, customers, sourcing partners, and even competitors (Bontis et al., 2000; Ling, 2012). These connections, when nurtured and maintained through good relations and customer satisfaction, foster company loyalty.

A study by Al-Shami et al. (2013) conducted in Malaysia underscored the positive impact of relational capital on customer well-being, ultimately contributing to the institution's overall efficiency. It's important to note that relational capital encompasses expenses related to advertising and other communication efforts with

relevant stakeholders. Despite these findings, the study did not establish a direct link between relational capital and investment efficiency.

Mohammad Shafiee et al. (2024) aimed to investigate the key roles of relational capital in the export orientation and competitiveness of knowledge-intensive cooperative companies. Data from 552 managers at 86 companies, selected from knowledge-intensive export cooperatives, were analyzed using structural equation modeling with the partial least squares approach. The results indicated that relational capital has a significant impact on competitiveness and enhances the effects of export orientation on competitiveness. However, the study did not explicitly connect relational capital to investment efficiency.

In a study conducted by Barak and Sharma (2023), the investigation delves into the influence of relational capital on the sustainable financial performance of private sector banks (PSBs) in India. The data utilized for this study were collected from 17 banks, spanning the years 2010 to 2021, sourced from Prowessiq (CMIE) and their annual financial reports. The modified value-added intellectual coefficient (MVAIC) methodology was applied. The findings unequivocally reveal a statistically significant relationship between RC and return on capital employed (ROCE) and return on equity (ROE). Despite these insights, a direct link to investment efficiency was not established.

In the context of Bangladeshi banks, the research conducted by Zheng et al. (2022) reveals an interesting dynamic. While relational capital demonstrates a positive relationship with banks' performance, the study did not address investment efficiency specifically. Furthermore, Taha et al. (2022) explored the influence of relational capital on banks' operational and financial performance, treating them as dependent

variables. Data collected from 136 bank employees, employing previously validated questionnaires, was subjected to analysis using the partial least squares-structural equation modeling (PLS-SEM) technique. The results underscore the positive impact of relational capital on financial performance and operational efficiency within banks. Nonetheless, the study did not explicitly link relational capital to investment efficiency.

2.5.4 Innovation Capital and Investment Efficiency

Recent research highlights that innovation capital is the newest kind of capital, playing a pivotal role in a drastically changing world such as the one we inhabit today (Wu et al., 2010). Innovation capital is related to corporate research and development (R&D) activities (Liu et al., 2021). Agostini et al. (2017) defined innovation capital as the structure that can transform employees' valuable ideas into new products. According to Hsu and Fang (2009), it is the structure that sustains the generation and storing of employees' valuable ideas and their transformation into new products. The codification of this knowledge is the premise for sharing and disseminating it within the organization. Indeed, an up-to-date, reliable, and accessible database of internal knowledge could support the development of new ideas, the sharing of information, and the identification of problem solutions (Cabello-Medina et al., 2011). Innovation capital uses, similar to Nazari and Herremans' renewal capital, R&D expenses as a proxy. Chang (2007) defines innovation capital as "the ability to build on previous knowledge and generate new knowledge" and protective capital as "legally protected rights concerning ownership of specific intellectual assets, such as patents, copyrights, trademarks, and trade secrets."

In emerging economies, innovation capital plays a crucial role in firm development. Previous research defines it as the intangible assets or capabilities that enhance innovation in areas such as knowledge, services, and technology (Chen et al., 2015). Agostini et al. (2017) explored the relationship between the strength of innovation capital and the innovation performance of small and medium-sized enterprises (SMEs). They collected primary data from 150 SMEs in the medium-high tech manufacturing sector through a survey, finding that innovation capital significantly boosts both radical and incremental innovation performance. Despite these findings, the study did not establish a direct link between innovation capital and investment efficiency.

Bayraktaroglu et al. (2019) investigated the relationship between innovation capital and firm performance in Turkish manufacturing firms. Using data from financial reports covering 2003–2013, they employed multiple regression analysis and found that innovation capital efficiency has a significant relationship with structural capital efficiency (SCE) and profitability. Additionally, innovation capital efficiency directly improves firms' productivity. However, the study did not explicitly connect innovation capital to investment efficiency.

Nadeem et al. (2019) demonstrated that innovation capital is a key driver of improved firm performance. Xu and Liu (2020) examined the impact of innovation capital and its components on the performance of Korean manufacturing firms from 2013 to 2018. Their regression analysis revealed that innovation capital and relational capital negatively affect firm profitability. Despite these insights, a direct link between innovation capital and investment efficiency remains unexplored.

Bayraktaroglu et al. (2019) also extended the VAIC model to include innovation capital, confirming that SCE positively impacts firms' profitability, while innovation capital efficiency directly enhances firms' productivity. Despite these findings, the study did not address the specific relationship between innovation capital and investment efficiency.

2.5.5 Moderating Effect of Earning Quality

Investment efficiency (IE) includes all the benefits brought about by the implementation of the investment, as a result of a comparison between the outputs and the input costs of the investment process. Investment decisions have an impact on the use of capital as well as the benefits and returns; therefore, before deciding to invest, investors need to carefully master the information through a variety of tools and measures (Hung et al., 2020). One of the most convenient, available and useful information channels for organizations and individuals to analyze and appraise an enterprise's investment is its financial statement. A proper financial statement can help businesses and investors best assess the firm, thereby selecting projects with appropriate scale and level of investment, bringing in high efficiency. The following papers offered several explanations of the impact of EQ on IE.

Tahat, et al., (2023) examined the association between earnings quality (EQ) and investment efficiency (IE) using the conditional effect of legal origin. Further, we assess the influence of the institutional ownership (IOW) on the relationship between EQ and IE within different legal environments, using a sample of 22,446 firm-year observations from the US, the UK, Germany and Japan over the period of 2001–2018. In general, the results provide cross-country evidence that a higher EQ enhances IE. Further, the results indicate that higher EQ can mitigate overinvestment and

underinvestment problems by ensuring that firms move toward their optimal level of investment. In addition, the findings reveal that a country's legal environment affects IE with EQ having a stronger association with IE in common law countries as compared to code law economies. In terms of the conditional role of IOW, the findings illustrate that the effect of IOW on the relationship between EQ and IE varies within different legal origins.

Hung, et al., (2020) analyzed the impact of earnings quality (EQ), debt maturity, investment efficiency (IE) of listed companies on Vietnam stock market thanks to the regression methods of FEM, REM and GLS and data of enterprises in the period of 2010 - 2018. The research findings have shown that EQ and debt maturity have a positive impact on EI, in which EQ has a stronger influence than debt maturity. A review of both EQ and the debt maturity for overinvestment or underinvestment indicated a positive impact and the stronger impact on overinvestment

In recent years, there have been several related studies such as (Cherkasova & Rasadi, 2017) studying the relationship between EQ and IE. The study was conducted on a sample of 7546 companies from Eastern Europe in the period of 2010-2015. Research findings have shown that a higher EQ minimizes both overinvestment and underinvestment. The relationship between EQ and under-investment is stronger in the industrial sector. Meanwhile (De Carvalho et al., 2014) conducted this study to verify whether the EQ of Latin American companies had an influence on IE decisions, overinvestment and underinvestment or not? The authors used logit model and data from those companies of seven Latin American countries. The results indicated that poor EQ reduced the possibilities of effective investment decisions and increased the likelihood of underinvestment. (Li, 2011) considered a new approach to measure EQ.

The author measured EQ as a concurrent relationship between changes in capital levels and labor investment as well as the change in reported earnings. The author discovered that EQ measures based on managerial labor and capital decisions are positively correlated with the sustainability of earnings. (Houcine, 2017) reviewed the impact of financial statements quality on corporate IE. The sample was based on 25 companies listed in Tunisia in the period of 1997-2013. The study found the confirmation that certain characteristics of financial information, in particular reliability and stability, were positively related to IE, while EQ was in principle of prudence and the appropriateness of earnings information had no significant influence on the investment decision

2.6 Summary of Literature and Gaps

The literature review examines the multifaceted relationships between different forms of capital and investment efficiency within the context of various industries and countries. It begins by emphasizing the significance of capital employed in enhancing a company's investment efficiency, although some studies reveal a negative impact on firm performance and value. The role of human capital is highlighted as a fundamental driver of business performance, with a focus on its impact on microfinance institutions' efficiency. Additionally, the review delves into structural capital, discussing its importance in corporate knowledge and its potential to influence a firm's value, though it is often underutilized and overlooked. Finally, relational capital, or customer capital, is explored, emphasizing its role in fostering customer loyalty and its positive influence on financial and operational performance in various banking contexts.

The existing literature review presents a comprehensive overview of the relationships between various forms of capital (including human capital, structural capital, relational capital and innovation capital) and their influence on investment efficiency and firm performance across diverse global contexts. However, several critical gaps become apparent when considering the study's specific aim of assessing the impact of intellectual capital and earnings quality on investment efficiency within the NSE. These gaps include the limited focus on intellectual capital within the literature, the need for studies specific to the Kenya or African context, the integration of earnings quality into the analysis, the requirement for longitudinal research to capture long-term effects, the necessity to diversify across industries, and the consideration of consistent methodologies tailored to the Kenyan capital market.

2.7 Conceptual Framework

Based on theoretical and literature review, the conceptual framework for this study comprises a series of hypotheses. H_{01} to H_{04} examine the individual effects of human capital, structural capital, relational capital and innovation capital on the investment efficiency of listed firms in the NSE. These hypotheses aim to understand the direct impact of different forms of capital on investment efficiency. H_{05a} to H_{05d} introduce the moderating variable, earnings quality, and explore its effect on the relationships between the respective forms of capital and investment efficiency. This framework serves as the foundation for analyzing the complex interplay between these variables.

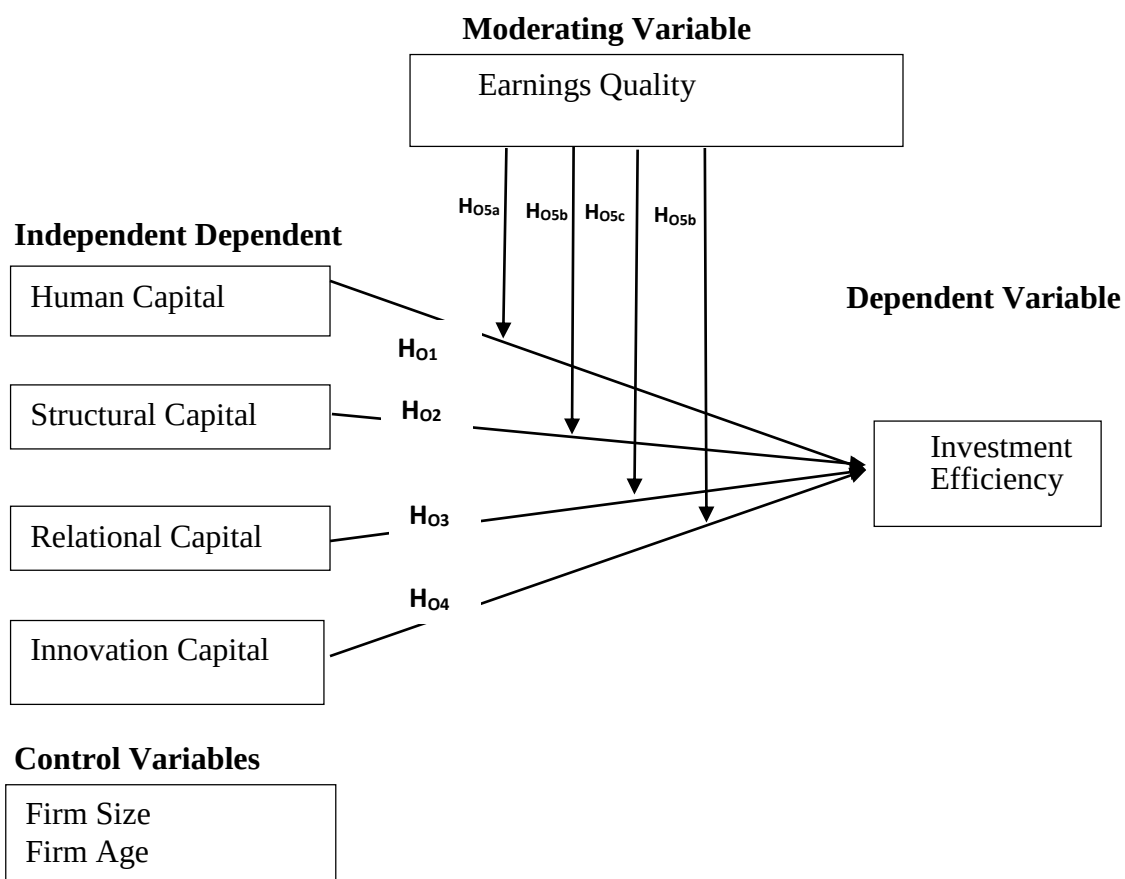


Figure 2.1 Conceptual Framework

Source: (Author, 2024)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives a description of research methodologies used in this study. It explains the following methods. Research design, target population, data collection instruments and procedures, data analysis and presentation, model specification, diagnostic tests, and ethical considerations.

3.2 Research Design

Research design refers to the overall strategy and approach used to conduct a research study. Research design is a way of collecting, measuring and analyzing data to arrive at a solution (Sekaran & Bougie, 2010). According to Creswell (2009), structural inquiry is defined as a set of research plans and methodologies that vary from broad suspicions to specific techniques for data collection and analysis. Saunders et al., (2003) asserts that a quantitative technique is significantly associated with deductive theory testing via hypotheses, whereas a qualitative strategy to research usually is associated with inductive testing.

This study used a combination of explanatory research design and longitudinal research design. The choice of explanatory research design is because it explains the cause effect relationship between the study variables (Cohen, Manion & Marison, 2011). Explanatory research is a form of investigation employed to understand the causal factors and mechanisms behind a phenomenon (Hoddy, 2019).

This study also adopted longitudinal design, a correlation study recurrent observations of the same items continuously over a sustained period of time (Sekaran, 1992). It entails monitoring transformations over time on a wide variety of population

members. Given that the review is broadly descriptive (concerned with finding out “by how much”) sample statistics are employed to oversimplify the scope of the target group. This review was centered on intellectual capital of several firms listed in the NSE and their effect on investment efficiency as moderated by earnings quality to establish if there was any evidence of the overreaction hypothesis.

3.3 Target Population

The concept of population in research pertains to a group of objects, individuals, or events that share common characteristics and serve as the primary subjects of the researcher's investigation. Gravetter and Forzano (2012) concisely define population as comprising all the items or observations that fall within the scope of inquiry that piques the researcher's interest. In the context of this study, the target population under scrutiny encompasses all 65 companies listed on the National Securities Exchange (NSE). The chosen time frame for empirical analysis spans eight years, commencing in 2016 and concluding in 2023. The study period was chosen because of the consistent and sufficient dataset for analysis. The data for NSE-listed companies during this timeframe is readily accessible, minimizing potential gaps or variations that could arise in longer or more sporadic timeframes. The selected time frame also facilitates the identification of trends and patterns within NSE-listed companies, enabling a more nuanced exploration of how intellectual capital and earnings quality influence investment efficiency. Notably, a significant number of firms were unregistered, signaling inefficiencies in investment practice.

Table 3.1 Target Population

	Target population
Agricultural	7
Automobiles and Accessories	1
Banking	12
Commercial and Allied Services	11
Construction and Allied	5
Energy and Petroleum	4
Insurance	6
Investment	5
Investment Service	1
Manufacturing and Allied	9
Telecommunication and Technology	1
Real Estate Investment Trust	2
Exchange Traded Fund	1
Total	65

Source: NSE, 2024

3.4 Inclusion and Exclusion Criteria

The study employed inclusion and exclusion criteria to ensure the selection of relevant and consistent data for analysis. These criteria helped focus on firms that have consistent trading records and provide necessary data for the study, while excluding those that do not meet the required standards. Specifically, the study included all firms listed on the Nairobi Securities Exchange (NSE) during the period of 2016-2023 to cover a broad spectrum of industries and provide a comprehensive view of market trends and investment efficiency. However, the study excluded financial firms due to their different regulatory requirements and financial structures, which can skew the analysis of investment efficiency. Additionally, firms that did not trade consistently throughout the period from 2016 to 2023 was excluded, as consistent trading is necessary to observe trends and patterns accurately, and inconsistencies can introduce problem into the data. Furthermore, firms that do not provide relevant data was excluded, as the availability of complete and accurate data is crucial for analyzing intellectual capital, earnings quality, and investment

efficiency. These inclusion and exclusion criteria are designed to ensure the study focuses on firms that can provide reliable and consistent data over the selected time frame, thereby avoiding potential distortions and ensuring the accuracy and completeness of the analysis.

Table 3.2 Inclusion and Exclusion Criteria

Total population	65
Exclude all listed financial firms	17
Exclude all firms that did not trade consistently for 8 years (2016-2023)	5
Exclude firms that did provide relevant data	13
Firms selected for the study	30

3.5 Data Collection Instruments

This study employed content/document analysis guide as a data collection instrument. The study collected data from secondary sources which were attained by reviewing information on financial reports of listed firms at the NSE. This was ideal since all the audited financial information regarding the firms was easily accessible to the public as stipulated by the company law of Kenya Act. Based on Oso and Onen (2009), document analysis is an instrument for collecting secondary information. Document analysis was used because the data being collected is secondary in nature. Corbetta (2003) who recognized that document analysis is a non-reactive technique where data presented is not subject to distortion. However, Patton (2002) argued that document guide may have certain constraints regarding accuracy of data precision and completeness.

The study collected data from secondary sources with the help of a data collection sheet (Appendix I). Kothari (2004) offered a definition of secondary data as the

already available and existing data. Polit and Beck (2003) argues that in secondary studies, data is collected from previous studies with the aim of testing given formulated hypotheses, thus, help determine the relationship between the study variables. It is widely acknowledged that unlike primary data, the information sought and collected from secondary sources is usually economical and efficient.

3.6 Data Collection procedures

Data collection, according to Burns and Grove (2003), is the correct and efficient gathering of knowledge pertaining to the research subtopics. The information used was confined to data from the NSE in order to achieve the research's stated goals. The researcher went to the websites of each of the companies chosen to acquire their audited financial statements, from which the essential figures was taken and processed for further analysis. To verify data collection accuracy, the information acquired from the mentioned businesses audited financial statements would be compared to the figures in the NSE handbooks.

3.7 Measurement of variables

3.7.1 Dependent Variable

The dependent variable of the study is investment efficiency. Following Biddle *et al.*, (2009); Gomariz and Bellesta (2014) to estimate investment efficiency for firm *i* in year *t*, the study specified a model that predicts investment efficiency based on growth opportunities (measured by sales growth). Deviations from the model, as reflected in the error term of the investment model, represent the investment inefficiency.

$$Invest_{i,t} = \beta_0 + \beta_1 salesGrowth_{i,t-1} + \varepsilon_{i,t}$$

Where;

$Invest_{i,t}$ = is the total investment of firm i in year t , defined as the net increase in tangible and intangible assets and scaled by lagged total assets.

$Sales\ Growth_{i,t-1}$ is the percentage change in sales of firm i from year $t-2$ to $t-1$

(Sales –is the gross inflow of economic benefits arising from the ordinary operating activities of an entity)

β_0 = Constant; β_1 = Coefficients of regression; ε_{it} = Error term

The study estimated the investment model for each year and firm. The residuals from the regression model reflected the deviation from the expected investment level, and residuals were used as a firm-specific proxy for investment inefficiency.

3.7.2 Independent Variables

The independent variable in this study is intellectual capital. The variables under intellectual capital include human, structural, innovation and relation capital, all was measured using the previously tested scales.

Human capital was measured using human capita efficiency ratio (HCE) calculated as value added (VA= sum of Operating profit (operating profit) +Employee costs (personnel expenses) +Depreciation (depreciation)+amortization) divided by Human capital (Total wages and salaries expense)

Structural capital was measured using structural capita efficiency ratio (SCE) calculated as Structural capital (value added -human capital) divided by value added

Relation capital is calculated as a ratio of total VA divided by total capital employed (CA), where CA is the book value of the firm's assets (Pulic, 1998). While, Innovation capital was measured through R&D expenses (Nadeem et al., 2019)

3.7.3 Moderating Variable

Earnings quality was measured as ratio of the cash flow from operating activities to EBIT, as follows: $EQ = CFO/EBI$ (Ramadan, 2015).

3.7.4 Control Variables

The study incorporated control variables to mitigate potential confounding factors that could affect the outcomes. Firm Age (FA), defined as the number of years a firm has been in operations, (Eriki 2015). This variable aims to account for the influence of a firm's operational maturity on investment efficiency. Additionally, Firm Size (FS), represented by the natural logarithm of total assets, was utilized following the approach recommended by Laeven et al. (2014). Firm size serves as a crucial control to adjust for the impact of financial scale on investment decisions and efficiency. These control variables are essential in ensuring that the study accurately assesses the relationships between intellectual capital, earnings quality, and investment efficiency by controlling for the effects of firm age and size across the sample.

Table 3.3 Measurement of Variables

Variables	Sym bols	Measurement	Empirical Studies
Dependent Variable			
investment efficiency	IE	Residuals from model that predicts investment efficiency based on growth opportunities (measured by sales growth)	Biddle et al., (2009); Gomariz and Bellesta (2014)
Independent Variable			
Human Capital	HC	Value added (Operating profit + Depreciation + Amortization + Employees' salaries and wages) divide by human capital	Xu, J., & Liu, F. (2020), Pulic, (1998).
Structural capital	SC	(Employees' salaries and wages) Structural capital (value added - human capital) divided by value added	Xu, J., & Liu, F. (2020), Pulic, (1998).
Relational Capital	RC	VA divided by total capital employed (CA), where CA is the book value of the firm's assets	Xu, J., & Liu, F. (2020), Pulic, (1998).
Innovational Capital	IC	R&D expenses)	Nadeem et al. (2019)
Moderating Variable			
Earnings quality	EQ	ratio of the cash flow from operating activities to EBIT	Ramadan, (2015)
Control Variable			
Firm Age	FA	Number of years a firm has been in operation since registration	Eriki (2015)
Firm Size	FS	natural log of total assets	Laeven <i>et al</i> (2014)

3.8 Data Analysis and Presentation

Data cannot be of any value or meaning when it is not processed through analysis using appropriate methods. Data analysis is the process of creation of meaning from the raw data collected in the field. Data analysis is the process of extraction of critical variables, establishing anomalies and testing any assumption (Kombo & Tromo, 2009). Several activities are carried out during the analysis of data where the analyst edits, classify and tabulate the information collected after which it is entered into appropriate statistical software (Kothari, 2009). The collected research data was checked for any errors and omissions, coded, defined and then entered into STATA.

Descriptive statistics including means, standard deviation, Kurtosis and skewness was used to analyse the data. Descriptive statistics was used to portray the sets of categories created from the data. The mean and standard deviation on the dependent and independent constructs was employed to demonstrate how grouped or dispersed the constructs are. Through descriptive statistics, an analyst is able to explore and provide how the variables and measurements under consideration are distributed (Creswell & Clark, 2011) and also to describe, organize and summarize data (Jonker & Pennink, 2010).

In addition to the descriptive statistics, it also included inferential statistics; Pearson correlation and evaluation of multiple regressions. Pearson correlation assumes that the information is linear and demonstrates the relationship / association between the dependent variable and the autonomous variable, whereas moderated regression demonstrates the magnitude of the impact of the autonomous factors on dependent variable. First, the information was assessed for correlation using the association coefficient r and the determination coefficient R^2 to determine the extent to which the intellectual capital accounts for the investment efficiency of the 65 companies listed in the NSE. The analyzed data was presented using tables, charts, graphs etc.

3.8.1 Model Specification

A panel data was used to evaluate the hypotheses. As mentioned by Hsiao (1986), panel data has several distinct advantages: it provides more degrees of liberty, reduces information differences and thus reduces the probability of multicollinearity and enables control of fixed effects, panel data has the ability to accommodate more observations and thus reduces the degrees of liberty. It also reduces the problem of collinearity with regressors and modeling behavioral differences within and among

countries and organizations (Biwott, 2011; Hsiao, 2007). The panel data was analyzed using the Fixed Effect Model (FEM) and the Random Effects Model (REM). The fixed effect model is used to monitor omitted variables that differ but are constant between individuals over time. If some omitted variables may be continuous over time, but differences between people and others may be settled between people but vary over time, then the random effect model has been evaluated to take into account both types. The random effects model would be appropriate if data were representative of a sample rather than the entire population, as the expression of the individual effect could be a random outcome rather than a fixed set parameter.

Lee (2008) argues that the Hausman test is efficient in comparing the usefulness of these models. Therefore, a comparison of both the fixed and random impacts was implemented in the present Hausman test; hence the null hypothesis was dismissed if there is no important correlation in this test between the individual impacts and the regressors at a meaning point of 0.1%. The general guiding principle for the appropriate model is that if the p value is less than 0.05 then the appropriate model to be used in the study is fixed effect model and vice versa is also true.

The study employed the hierarchical multiple regression model (Baron and Kenny 1986). Where the hypothesis was tested using a series of hierarchical linear regression analysis as specified in the equation below;

$$IE_{it} = \beta_{0it} + \beta_1 fa_{it} + \beta_2 fs_{it} + e_{1it} \dots \dots \dots \text{model 1}$$

$$IE = \beta_{0it} + \beta_1 fa_{it} + \beta_2 fs_{it} + \beta_3 HC_{it} + \beta_4 SC_{it} + \beta_5 RC_{it} + \beta_6 IC_{it} + e_{2it} \dots \text{model 2}$$

$$IE_{it} = \beta_{0it} + \beta_1 fa_{it} + \beta_2 fs_{it} + \beta_3 HC_{it} + \beta_4 SC_{it} + \beta_5 RC_{it} + \beta_6 IC_{it} + e_{2it} + \beta_7 EQ_{it} + e_{3it} \dots \dots \dots \text{model 3}$$

$$IE_{it} = \beta_{0it} + \beta_1 fa_{it} + \beta_2 fs_{it} + \beta_3 HC_{it} + \beta_4 SC_{it} + \beta_5 RC_{it} + \beta_6 IC_{it} + \beta_7 EQ_{it} + \beta_8 HC_{it} * EQ_{it} + e_{3it} \dots \dots \dots \text{model 4}$$

$$IE_{it} = \beta_{0it} + \beta_1 fa_{it} + \beta_2 fs_{it} + \beta_3 HC_{it} + \beta_4 SC_{it} + \beta_5 RC_{it} + \beta_6 IC_{it} + \beta_7 EQ_{it} + \beta_8 HC_{it} * EQ_{it} + \beta_9 SC_{it} * EQ_{it} + e_{3it} \dots \dots \dots \text{model 5}$$

$$IE_{it} = \beta_{0it} + \beta_1 fa_{it} + \beta_2 fs_{it} + \beta_3 HC_{it} + \beta_4 SC_{it} + \beta_5 RC_{it} + \beta_6 IC_{it} + \beta_7 EQ_{it} + \beta_8 HC_{it} * EQ_{it} + \beta_9 SC_{it} * EQ_{it} + \beta_{10} RC_{it} * EQ_{it} + e_{3it} \dots \dots \dots \text{model 6}$$

$$IE_{it} = \beta_{0it} + \beta_1 fa_{it} + \beta_2 fs_{it} + \beta_3 HC_{it} + \beta_4 SC_{it} + \beta_5 RC_{it} + \beta_6 IC_{it} + \beta_7 EQ_{it} + \beta_8 HC_{it} * EQ_{it} + \beta_9 SC_{it} * EQ_{it} + \beta_{10} RC_{it} * EQ_{it} + \beta_{11} IC_{it} * EQ_{it} + e_{3it} \dots \dots \dots \text{model 7}$$

Where;

IE Measure of investment efficiency

β_0 *i* The constant of equation (represents the changes in investment efficiency that cannot be explained by independent variables in the model)

HC = Human Capital

SC = Structural Capital

RC = Relational Capital

IC = Innovational Capital

EQ = Earning Quality

$\mathcal{E}$ = Error term

i = Represent the firm observation

t = Measure of time

3.9 Diagnostic Tests

Some econometric issues have the potential to render the findings of regression biased and spurious unless they are discovered and dealt with as a result. Different econometric tests were performed to diagnose these prospective econometric issues and ultimately needed steps were taken to fix them. Some econometric problems have the capacity of making the regression outcome subjective and contrived if they are not covered and addressed accordingly. Several econometric tests are conducted to distinguish these possible econometric issues and ultimately the relevant steps are followed to mitigate them. Commonly, there are several ways of tackling econometric issues once they are perceived. While, taking into account the comparability of our regression techniques it is predicted that the same possible econometric issues for all hypotheses. A comprehensive deliberation on predominant econometric issues was conducted for the purpose of simplicity and brevity. Typically, when identified or suspected, there are various methods to deal with econometric issues. Therefore, all hypotheses were anticipated to have the same prospective econometric issues due to the comparable nature of the regression processes in this research. A general discussion on significant econometric problems was addressed in this study.

3.9.1 Multicollinearity

Multicollinearity happens when there is a similarity in the relative movement of two or more independent variables. In this, it becomes impossible to differentiate between variables by standard OLS estimates. Since many other independent variables in this research can be suspected of multicollinearity, Variance Inflation Factor (VIF) was assessed to examine the nature of correlation between variables after each normal OLS regression. According to Gupta 2018, argued that VIF score that exceeds 10

indicates the presence of multicollinearity, while tolerance a value greater than 0.10 implies presence of multicollinearity.

3.9.2 Heteroscedasticity

Heteroscedasticity happens when the regression residuals are heteroskedastic. That is, for all observations, the residual variance is not constant. In such a situation, minimum variance is no longer produced by the standard OLS estimators. The coefficients standard error provides erroneous estimates. In the presence of heteroscedasticity, the calculated parameters can remain coherent but inefficient. The study used white's test to diagnose this problem. The guiding principle is that if the P value is greater than 0.05, then it implies that there is no presence of Heteroscedasticity in the residuals.

3.9.3 Autocorrelation

One of the basic assumptions of the classical linear regression model (CLRM) is that the covariance between the error terms is equal to zero over time, or that the conditions of error terms are not correlated (Brooks 2010). Durbin-Watson statistic examined independence of errors. Assumption of independence was derived from,

$$D = \frac{\sum_{i=2}^n (e_i - e_{i-1})^2}{\sum_{i=2}^n e_i^2} \text{ where } e_i = y_i - a - bx_i \text{ (} i = 1, 2, \dots, n \text{) are the term errors. } D$$

values fall in between 0 and 4 with a close to 4 indicating that the residual errors are highly correlated. Other values of D between 1 and 3 demarcate an acceptable range with the median 2 showing an absolute independence of residual terms (Kothari & Garg, 2014). Serial correlation can be tested using Durbin Watson, however, if the error term conditions are related, then it suggest serious issues with auto-correlation or serial correlation. Additionally, the graphical approach is often used to determine the nature of autocorrelation as a first-hand tool. But the presence of autocorrelation

needs to be verified through a formal statistical test. This research adopted Wooldridge test for autocorrelation method to detect auto-correlation. The rule of thumb for autocorrelation is if the probability value is greater than the 0.05, it indicates absence of autocorrelation.

3.9.4 Normality Test

The normal distribution of data is a requisite to dissection of most statistics, for instance, multilinear regression. Normality yields data that prescribes a single peaked bell shaped when dependent variable is plotted against the explanatory variable, this is of importance because the validity of any parametric tests require that the data is normally distributed for reliable and accurate results about the reality (Ghasemi & Zahediasl, 2012). The errors in predicting the dependent variable should be equidistant from the goodness of fit line. Contradiction of normality brings forth results which cannot draw inferences (Razali & Wah, 2011). Common statistical techniques in testing normality include: normality methods, numerical methods, and visual methods (such as Q-Q, quantile-quantile plot, P-P, probability - probability plot and histograms), Visual inspection of the distribution cannot guarantee accuracy is more often unreliable. Numerical method is more organized and examines kurtosis and skewness coefficients of the distribution curves. Normality tests are supplementary to both numerical and graphical tests (Razali & Wah, 2011). Kolmogorov-Smirnov (K-S) test and Shapiro-Wilk test, both of them being commonly used to test normality (Ghasemi & Zahediasl, 2012). K-S test has a few shortcomings; low power and is highly sensitive to extremities (Thode, 2002).

This study performed a normality test using the Jarque-Bera, as Jarque and Bera (1987) suggested for omnibus testing, skewness and kurtosis. The rule of the thumb is that the P value should be greater than 0.05 for data to be normal

3.9.5 Panel Unit Root Test

Because this study used panel data, it was necessary to assess if the variables under consideration are stationary or non-stationary. Finite variance and uniform oscillations from the mean are observed wherever a stationary series exists (Hsiao, 2014). As a result, it's necessary to check whether the variables have the same mean and variance throughout time. If the data is not steady, false conclusions might be drawn, and regression models can be erroneous or influenced by unequal regression difficulties. The Levin-Lin-Chu, Harris-Tzavalis and Im-Pesaran-shin test was used in the current study to determine whether the variables are stationary. The decision rule is that if the P value is less than 0.05 then the variables are stationary. According to Ayat & Burridge (2000), this test has gained favor among academics due to its suitability for use in a balanced panel. Because the panel under investigation is balanced, this study applied these tests. According to Brockwell, (2001), only stationary data allows for time series data analysis.

3.10 Ethical Considerations

The researcher remained ethical throughout the research by respecting the rights of others and maintaining honesty. The researcher maintained honesty by ensuring that data presentation, analysis and interpretation are strictly based on the data collected. The project is presented to Moi University, School of Business and Economics for approval and issuance of introductory letter. Once these approvals are obtained, the researcher applied for National Commission for Science, Technology and Innovation

(NACOSTI) permission for data collection and analysis. At the end of the study, the findings were disseminated to the relevant stakeholders through publications in peer review journals. The researcher undertakes the responsibility to only collect and analyze data required to fulfill /achieve the objectives of the study.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

4.1 Introduction

In this section, the study's data analysis and findings are discussed, aligning with the study objectives. The data was summarized and displayed through tables, while various statistical techniques, with the assistance of Stata, were employed to analyse the collected data in accordance with the study's goals. Additionally, this chapter outlines the process of data analysis, presentation, and interpretation of the results, which directly correlate with the study's guiding objectives.

4.2 Descriptive Statistics

Descriptive analysis allows researchers to gain insights into the distribution of variables across different time periods and entities (individuals, firms etc.) in the panel. This understanding helps identify patterns, trends, and potential outliers in the data.

4.2.1 Descriptive Statistics for Investment Efficiency

The investment efficiency analysis of NSE-listed companies between 2016 and 2023 in Table 4.1 reveals that the investment efficiency scores for all years range from negative to positive values, with the highest recorded efficiency being 4.669 in 2021 and the lowest at -1.299 in the same year. A negative residual indicates that in those instances, the real investments were lower than what was expected based on the sales growth, representing underinvestment situations. Conversely, positive residuals imply that firms were making investments at rates exceeding what sales growth would predict, leading to potential overinvestment.

The mean investment efficiency across all the years around was 0.866, indicating that, on average, firm's exhibit slightly positive investment efficiency. This suggests a tendency towards overinvestment in general; however, volatility is present, as shown by the calculated standard deviations (ranging from 0.985 in 2016 to 1.297 in 2021), which indicate variability in investment efficiency among the firms. Notably, the skewness values for most years are positive, suggesting a rightward asymmetry in the distribution of investment efficiency scores. This indicates that there are some firms with much higher investment efficiencies that are skewing the average upwards. For example, the skewness of 1.115 in 2018 reflects higher efficiency scores for a few firms compared to others.

Furthermore, the kurtosis values exceed 3 for several years, indicating that the distribution of scores is leptokurtic, meaning there are more extreme outliers (both high and low investment efficiencies) than are typically found in a normal distribution. For instance, the kurtosis for 2018 at 4.675 suggests that there are many firms with very low and very high efficiencies, leading to concerns about overall investment health in those cases. the data suggests that while the average investment efficiency across the years is positive, indicating a general tendency toward overinvestment, there is significant variability in efficiency among firms, with some years revealing a greater degree of underinvestment risk as highlighted by the negative residuals.

Table 4.1 Descriptive Analysis for Investment Efficiency

Year	N	Min	Max	Mean	P50	Sd	Skewness	Kurtosis
2016	30	-0.553	3.352	0.857	0.757	0.985	0.576	2.837
2017	30	-0.552	4.272	1.100	1.092	1.216	0.616	2.994
2018	30	-0.553	4.506	0.860	0.649	1.132	1.115	4.675
2019	30	-0.993	3.692	0.875	0.906	1.177	0.615	2.897
2020	30	-0.611	3.303	0.844	0.562	1.212	0.452	1.879
2021	30	-1.299	4.669	0.795	0.659	1.297	0.791	3.720
2022	30	-0.553	3.186	0.753	0.609	1.130	0.709	2.531
2023	30	-0.548	3.259	0.840	0.848	1.032	0.567	2.593
Total	240	-1.299	4.669	0.866	0.780	1.139	0.692	3.134

Source: (Field Data, 2024)

4.2.2 Descriptive Statistics for Human Capital

The results presented in Table 4.2 offer a comprehensive descriptive analysis of human capital efficiency as measured by the human capital over eight years. Findings showed that the minimum value recorded over this period is 0.114, while the maximum is 8.764, indicating a substantial diversity in human capital efficiency among the firms analyzed. The mean human capital across the total period is 1.858, suggesting that, on average, firms are generating more value than the costs associated with their human capital. However, the median (or 50th percentile) values for individual years typically align closely with the mean, indicating that the data is somewhat symmetrically distributed around this central tendency, though skewness suggests otherwise. The standard deviation (sd) values vary year by year, with the highest standard deviation recorded in 2018 at 1.754, indicating considerable variability in efficiency across firms within that year compared to others. Particularly, as seen from the data, the standard deviation demonstrates how widely the human resource values are dispersed around the mean, reflecting differences in how effectively firms leverage their human capital.

The positive skewness values, especially noted in 2018 (2.001) and 2016 (1.306), indicate that there is a longer tail on the right side of the distribution, suggesting that a subset of firms achieved relatively high HC ratios compared to the majority. On the other hand, the high kurtosis values (notably 8.488 in 2018) signify a sharp peak in the distribution, suggesting that while several firms performed exceptionally well in terms of human capital efficiency, many others lagged behind. This points to the presence of both stars and underperformers within the same industry sector. Notably, the trend in mean values shows fluctuations over the years, with 2022 and 2023 having higher mean values (2.099 and 2.115, respectively) than prior years. This upward trend can indicate improvements in how firms are utilizing human capital, possibly due to changes in management strategies, increased training, or better alignment of personnel with organizational goals. Table 4.2 illustrates significant variability in human capital efficiency across the sampled firms, with some years experiencing higher mean HC ratios that suggest improved utilization of human resources. The skewness and kurtosis metrics highlight the presence of outliers and the concentration of values, emphasizing the complexity of measuring human capital efficiency in the context of investment efficiency.

Table 4.2 Descriptive Analysis for Human Capital

Year	N	Min	Max	Mean	P50	Sd	Skewness	Kurtosis
2016	30	0.213	5.927	1.892	1.508	1.387	1.306	4.528
2017	30	0.213	6.522	1.773	1.282	1.577	1.280	4.079
2018	30	0.114	8.764	1.981	1.818	1.754	2.001	8.488
2019	30	0.188	3.600	1.512	1.212	1.050	0.534	1.938
2020	30	0.271	3.850	1.779	1.749	0.923	0.306	2.439
2021	30	0.116	3.486	1.713	1.570	0.901	0.171	1.992
2022	30	0.303	6.264	2.099	2.067	1.419	0.917	3.815
2023	30	0.213	5.889	2.115	1.687	1.560	1.021	3.021
Total	240	0.114	8.764	1.858	1.651	1.349	1.417	6.180

Source: (Field Data, 2024)

4.2.3 Descriptive Statistics of Structural Capital

The analysis in Table 4.3 offers insights into structural capital efficiency, findings showed that with values ranging from a minimum of -2.687 to a maximum of 1.902. The presence of negative values across all years suggests that some firms are potentially underperforming with regard to their structural capital, indicating inefficiencies or insufficient investment in this area. The overall mean structural capital for the period is 0.349, with a median (p50) of 0.501. This suggests that, on average, firms are slightly above a neutral performance level regarding structural capital, but the distribution includes values below zero, reflecting a mix of efficiency across different firms. The mean values indicate a slight decline over the years, especially noteworthy from the 2016 to 2021 periods, with a drop to 0.271 in 2021, indicating potential challenges in structural asset management. The standard deviations (sd) range from 0.533 in 2016 to 0.849 in 2018, showing variability in the structural capital efficiency among firms in different years. Notably, higher standard deviations imply inconsistency in how effectively firms exploit their structural capital, suggesting that while some firms thrive, others struggle significantly. Skewness

values are generally negative, particularly notable in 2019 with a skewness of -1.838, indicating that the distribution of structural capital is left-skewed or negatively skewed. This means that most firms have relatively low structural capital efficiency, but there are outliers with higher efficiency. The kurtosis values, especially high in 2019 at 9.023, suggest a leptokurtic distribution, indicating more extreme outliers than would be expected in a normal distribution. This highlights the presence of firms that have either very high or very low structural capital efficiency relative to their peers. Observing the trends in means and medians provides valuable insights into the dynamics of structural capital within the examined firms. For example, 2022 and 2023 show a slight rebound in mean values (0.332 and 0.378, respectively) after the dip in 2021. This recovery may point to improved strategies or shifts in organizational focus towards enhancing structural capital efficiency as companies adapt to changing market conditions. The findings from Table 4.3 elucidate important trends regarding structural capital efficiency in firms. The persistence of negative values indicates that many organizations are potentially under-investing in this critical area, which could hinder operational effectiveness.

Table 4.3 Descriptive Analysis for Structural Capital

Year	N	Min	Max	Mean	P50	Sd	Skewness	Kurtosis
2016	30	-0.902	0.970	0.389	0.518	0.533	-1.378	3.608
2017	30	-1.131	1.640	0.428	0.537	0.695	-0.580	3.201
2018	30	-2.164	1.580	0.349	0.576	0.849	-1.157	4.304
2019	30	-2.687	1.902	0.320	0.473	0.775	-1.838	9.023
2020	30	-0.982	1.649	0.324	0.366	0.600	-0.160	3.165
2021	30	-2.164	1.504	0.271	0.438	0.761	-1.096	4.649
2022	30	-0.977	1.649	0.332	0.518	0.655	-0.078	2.548
2023	30	-1.043	0.977	0.378	0.614	0.563	-1.220	3.215
Total	240	-2.687	1.902	0.349	0.501	0.678	-1.067	5.276

Source: (Field Data, 2024)

4.2.4 Descriptive Statistics of Relational Capital

Table 4.4 provides a comprehensive descriptive analysis of relational capital across a span of years from 2016 to 2023. The dataset includes 240 observations, with a minimum value of 0.013 and a maximum value of 2.831 in 2023. The positive values suggest that, on average, firms have established beneficial stakeholder relationships, although the minimum values indicate the existence of firms that are struggling in this aspect. The overall mean relational capital for the dataset is 0.604, with a median of 0.548. This suggests that most firms operate with moderate relational capital, with the mean being higher than the median, indicating a slight right skew in the distribution of relational capital scores. The year 2021 recorded the highest mean at 0.675, showing that firms might have intensified their efforts in relationship management during this period. The standard deviation (sd) values range from 0.207 in 2016 to 0.483 in 2021, reflecting variability in relational capital among firms. The increases in standard deviation over the years indicate that while some firms are enhancing their stakeholder relationships, others may struggle, leading to an uneven distribution of relational capital efficiency across the sector.

The skewness values demonstrate variability, with positive skewness noted in several years, particularly 2018 (3.123) and 2019 (2.608). This positive skewness indicates that a number of firms possess exceptionally high relational capital relative to their peers. The kurtosis values generally exceed 3, especially notable for 2018 at 15.646, suggesting a distribution that is peaked with heavy tails, meaning there are significant outliers that indicate some firms excel in fostering relational capital compared to the majority.

The observed increase in mean values over time, particularly from 2017 to 2021, reveals that firms have likely prioritized relational capital, potentially responding to market demands for better customer engagement or supplier relationships. The slight decline in mean values in 2022 and 2023, however, suggests that firms may need to continuously innovate and invest in their relational capital strategies to maintain or enhance these relationships in an evolving business context.

The findings from Table 4.4 highlight the significance of relational capital in influencing investment efficiency. While the average scores suggest that many firms are successfully leveraging their stakeholder relationships, the variability and skewness metrics reveal the presence of high-performing outlier firms.

Table 4.4 Descriptive Statistics for Relational Capital

Year	N	Min	Max	Mean	P50	Sd	Skewness	Kurtosis
2016	30	0.013	0.876	0.486	0.467	0.207	-0.074	2.762
2017	30	0.042	1.390	0.553	0.513	0.282	0.702	4.024
2018	30	0.074	2.446	0.591	0.530	0.407	3.123	15.646
2019	30	0.039	2.446	0.670	0.618	0.436	2.608	11.054
2020	30	0.054	1.994	0.593	0.570	0.327	2.571	12.504
2021	30	0.035	2.498	0.675	0.576	0.483	2.160	8.340
2022	30	0.066	2.321	0.637	0.555	0.451	2.271	8.593
2023	30	0.052	2.831	0.625	0.516	0.468	3.596	17.849
Total	240	0.013	2.831	0.604	0.548	0.392	2.841	14.181

Source: (Field Data, 2024)

4.2.5 Descriptive Statistics for Innovation Capital

Table 4.5 presents a descriptive analysis of innovation capital across the years 2016 to 2023. The analysis includes a total of 240 entries, with values recorded from a minimum of 0.001 to a maximum of 1.290 in 2023. The presence of low minimum values indicates that some firms may be struggling with their innovation efforts, while

the maximum values highlight instances of strong innovation practices. The overall mean innovation capital for the period is 0.252, with a median (p50) of 0.177. This suggests that, on average, firms are maintaining a moderate level of innovation capital. The mean is higher than the median, which may indicate that a small number of firms are driving the mean upward while many others have lower innovation capital scores.

The standard deviation (sd) ranges from 0.122 in 2016 to 0.336 in 2021, reflecting variability in innovation capital efficiency among firms. The higher standard deviations indicate that there is considerable divergence in innovation across firms, with some firms outperforming others significantly in their innovation initiatives. The skewness values are all positive across the years, with 2017 showing the highest skewness at 1.868 and 2019 at 1.881, indicating that the distribution of innovation capital is right-skewed. This suggests that there are a few firms that achieve exceptionally high innovation capital relative to others. The kurtosis values, particularly notable in 2019 at 8.237, indicate a leptokurtic distribution, suggesting a tall peak and heavy tails, which show the presence of both high achievers and underperformers in terms of innovation.

The mean values exhibit a general upward trend over the years, reaching a high of 0.337 in 2023. This upward shift indicates that firms have increasingly prioritized innovation strategies, likely prompted by the need to adapt to a rapidly changing market environment. The slight fluctuations in mean values suggest that while overall innovation may be improving, firms are experiencing varying degrees of success in their innovation efforts. The data from Table 4.5 highlights the critical role that innovation capital plays in driving investment efficiency. While the average scores

indicate a moderate level of innovation capital among firms, the significant variability and presence of outliers point to diverse practices and outcomes within this area. The positive skewness and high kurtosis further illustrate this diversity, suggesting that while some firms capitalize on innovation effectively, others may lag behind.

Table 4.5 Descriptive Analysis for Innovation Capital

Year	N	Min	Max	Mean	P50	SD	Skewness	Kurtosis
2016	30	0.004	0.556	0.161	0.141	0.122	1.207	4.848
2017	30	0.002	0.925	0.236	0.158	0.250	1.868	5.432
2018	30	0.005	0.963	0.236	0.142	0.249	1.640	4.613
2019	30	0.003	0.774	0.205	0.189	0.149	1.881	8.237
2020	30	0.005	0.932	0.263	0.167	0.249	1.689	4.882
2021	30	0.003	1.202	0.317	0.191	0.336	1.365	3.470
2022	30	0.003	0.945	0.261	0.189	0.240	1.770	5.386
2023	30	0.001	1.290	0.337	0.201	0.335	1.417	3.876
Total	240	0.001	1.290	0.252	0.177	0.253	1.910	6.040

Source: *(Field Data, 2024)*

4.2.6 Descriptive Analysis for Earnings Quality

Table 4.6 presents a descriptive analysis of earnings quality for the years 2016 to 2023, findings showed a minimum earnings quality score of -5.587, indicating that some firms faced severe earnings distortions, while the maximum value of 6.024 in 2023 showcases that others achieved robust earnings quality. The diversity in these values suggests mixed results across the sector in terms of financial reporting. The overall mean earnings quality score is 0.364, with the median (p50) at 0.269. The relatively low mean indicates that, while some firms manage to maintain higher earnings quality, the average is dragged down by those reporting poorer quality earnings. The median being lower than the mean indicates a right-skewed distribution, where a few firms outperform significantly, thus elevating the mean.

The standard deviation (sd), which ranges from 0.546 in 2017 to 1.723 in 2020, points to significant variability in the data. A higher standard deviation suggests that there are firms with either exceptionally high or low earnings quality, reflecting inconsistent practices within the industry. This variation in earnings quality captures the challenges firms face in achieving reliable and sustainable earnings. The skewness values are primarily positive, particularly in the years 2016 (1.843) and 2018 (1.977), which indicates that most firms have lower earnings quality scores, but there are outlier firms with high earnings quality, thus skewing the distribution positively. The kurtosis values also exceed 3 in most years, especially in 2016 (7.764) and 2018 (7.880), indicating a leptokurtic distribution with a high peak and heavy tails. This signifies a concentration of firms around the lower and higher ends of earnings quality, showing that while some firms exhibit strong earnings management, many others do not.

Over the years, the mean value of earnings quality shows fluctuations, particularly an increase to 0.709 in 2023. This suggests a positive trend, possibly indicating improvements in financial practices or regulatory awareness among firms that prioritize accurate and transparent reporting. However, the dip in mean values in 2017 and 2019 suggests substantial challenges during specific economic conditions that impacted earnings. The findings from Table 4.6 reveal critical insights about earnings quality within the analyzed firms. The average earnings quality scores indicate a general need for improvement, as negative values point to potential earnings management issues. The variability in the results, indicated by high standard deviations and kurtosis, underscores the presence of firms struggling significantly with earnings quality alongside those that excel.

Table 4.6 Descriptive Analysis for Earnings Quality

Year	N	Min	Max	Mean	P50	Sd	Skewness	Kurtosis
2016	30	-0.439	2.655	0.437	0.319	0.596	1.843	7.764
2017	30	-1.051	2.008	0.262	0.247	0.546	0.656	5.557
2018	30	-1.728	4.782	0.371	0.262	1.277	1.977	7.880
2019	30	-2.905	2.091	0.235	0.335	0.854	-1.468	7.838
2020	30	-5.587	4.880	0.427	0.381	1.723	-0.573	7.603
2021	30	-1.932	1.386	0.186	0.184	0.718	-0.905	4.559
2022	30	-2.023	1.483	0.282	0.267	0.582	-1.704	9.826
2023	30	-0.919	6.024	0.709	0.292	1.285	2.812	11.505
Total	240	-5.587	6.024	0.364	0.269	1.027	0.860	14.575

Source: (*Field Data, 2024*)

4.2.7 Descriptive Analysis for Firm size

Table 4.7 presents a descriptive analysis of firm size measured from 2016 to 2023 showed a minimum of 4.806 to a maximum of 8.260 across the years. The overall mean firm size across the dataset is approximately 7.104, with a median (p50) value of 7.204. These values indicate that the average firm in the sample is relatively large, which could correlate with enhanced capabilities for investment, innovation, and human capital. The mean being lower than the median in certain years indicates a right-skewed distribution where a handful of larger firms are influencing the average.

The standard deviation (sd) across the years varies from 0.478 in 2022 to 0.663 in 2017. This variability acknowledges the differences in firm sizes; a higher standard deviation points to a wider spread of firm sizes within those years. In general, as years progress, firms appear to be operating within a tighter size range, particularly noted in 2022. Skewness values for firm size are negative across the data range, with 2017 showing the most significant skewness at -1.338. This indicates that the distribution of firm sizes is left-skewed, meaning that while most firms fall within a certain size category, there are some notably larger firms that affect this distribution. The kurtosis

values generally exceed 3, especially the value of 6.028 in 2021, suggesting a leptokurtic distribution. This indicates that many firms clustered around the mean size while also having outlier firms on both ends of the size spectrum, representing some very small and large organizations.

A gradual increase in average firm size is noted from 2019 to 2021, where the mean size peaked at 7.161. However, the slight decreases in 2022 and 2023 suggest varying operational capacities potentially influenced by shifting market dynamics, economic conditions, or specific industry challenges.

Table 4.7 Firm Size

Year	N	Min	Max	Mean	P50	Sd	Skewness	Kurtosis
2016	30	5.139	8.108	7.102	7.244	0.639	-0.968	4.156
2017	30	4.806	8.089	7.084	7.199	0.663	-1.338	5.764
2018	30	5.014	8.172	7.131	7.220	0.652	-1.065	4.859
2019	30	4.875	8.260	7.160	7.299	0.672	-1.210	5.566
2020	30	5.036	8.192	7.117	7.164	0.661	-0.912	4.488
2021	30	4.990	8.165	7.161	7.382	0.628	-1.348	6.028
2022	30	6.006	7.865	7.072	7.075	0.478	-0.304	2.361
2023	30	4.986	7.896	7.007	7.139	0.690	-1.276	4.561
Total	240	4.806	8.260	7.104	7.204	0.631	-1.120	5.073

Source: (Field Data, 2024)

4.2.9 Descriptive Analysis for Firm Age

Table 4.8 provides a descriptive analysis of firm age across the years from 2016 to 2023, findings showed that firm ages ranging from a minimum of 16 years to a maximum of 154 years. The considerable range highlights a diverse mix of both young and long-established firms, indicating a varied competitive landscape wherein both innovative start-ups and legacy firms coexist. The overall mean age of firms in the dataset is approximately 74.848 years, and the median (p50) is 67 years. This

suggests that, on average, the firms analyzed are relatively mature, which can imply experience and established market presence. The close proximity of the mean and median values indicates a relatively symmetric distribution of firm ages, although there are firms with considerable longevity that could slightly pull the average upwards.

The standard deviation (sd) is reported at 32.267, reflecting a substantial variability in the ages of firms. This high standard deviation indicates a wide range of firm ages within the dataset and suggests that the investment efficiency across this demographic may vary significantly, with younger firms potentially displaying innovation while older firms may rely on established practices and customer loyalty. The skewness values are generally positive, particularly noted in 2018 (0.689) and 2019 (0.556), indicating a slight rightward skew in firm age distribution. This suggests the presence of a few younger firms within an aging population, although the majority of firms still tend to be older. The kurtosis values, which all around 2.5 to 2.6, suggest a platykurtic distribution, implying that while most firms cluster around the average age, the likelihood of extreme ages is somewhat moderate compared to a normal distribution.

An interesting trend emerges when observing the average ages over the years. For instance, the year 2018 reflects the highest mean age at 86.750, indicating a significant presence of mature firms in that year. However, there is also notable variability in the maximum age, from 147 years in 2016 to 154 years in 2023. This stability in the maximum age over time signifies that the oldest firms continue to thrive despite evolving market conditions. The results from Table 4.8 reveal critical insights into the age structure of the firms within the study. The substantial average age indicates a dominance of established players that may benefit from experience

and market familiarity. However, the variability and positive skewness reveal the presence of younger entrants who may innovate and disrupt traditional practices.

Table 4.8 Firm Age

Year	N	Min	Max	Mean	P50	Sd	Skewness	Kurtosis
2016	30	26	147	76.172	66.000	30.721	0.598	2.603
2017	30	27	148	77.172	67.000	30.721	0.598	2.603
2018	30	46	149	86.750	76.500	33.337	0.689	2.493
2019	30	16	150	70.179	63.500	33.150	0.556	2.620
2020	30	17	151	72.517	67.000	33.341	0.462	2.448
2021	30	18	152	70.429	61.000	33.890	0.641	2.593
2022	30	24	153	77.345	69.000	32.904	0.492	2.397
2023	30	25	154	76.467	68.000	33.183	0.564	2.442
Total	240	16	154	74.848	67.000	32.267	0.539	2.537

Source: (Field Data, 2024)

4.2.8 Overall Descriptive Statistics

Table 4.9 presents a comprehensive overview of the overall descriptive statistics for essential variables related to intangible capital components across the sample of firms. These variables include Investment Efficiency (IE), Human Capital (HC), Structural Capital (SC), Relational Capital (RC), Innovation Capital (IC), Firm Size (FS), and Firm Age (FA). This table serves as a critical foundation for understanding the interplay between these factors and their potential influence on investment efficiency. The analysis is based on data from 240 observations for all variables. This sizable sample enhances the statistical power and reliability of the results, offering a robust basis for analysis. Findings showed that the investment efficiency scores range from a minimum of -1.299 to a maximum of 4.669, with a mean of 0.866 and a median of 0.780. The presence of negative values suggests that some firms are over-investing relative to their growth, while positive values indicate effective investment strategies. The relatively low skewness (0.692) indicates a slight right skew, meaning that a few

firms perform exceptionally well in terms of investment efficiency, driving the average upwards.

The human capital variable has a mean of 1.858 and a median of 1.651, with a range from 0.114 to 8.764. This suggests that most firms are efficiently leveraging their human resources to create value, though a small number of firms achieve particularly high levels of human capital benefits. The high kurtosis value (6.180) indicates that there are significant outliers, with some firms possessing exceptionally high human capital efficiency. The mean structural capital is 0.349, with a minimum of -2.687 and a maximum of 1.902. Negative values denote underperformance in the structural assets of certain firms, suggesting inefficiencies in leveraging their systems and processes. The skewness of -1.067 indicates a left-tailed distribution, revealing that while many firms underperform, a select few maintain good structural capital efficiency.

The mean score for relational capital is 0.604, ranging from 0.013 to 2.831. This indicates moderate effectiveness in managing stakeholder relationships, while the skewness of 2.841 suggests that there are a few firms with significantly high relational capital, positively influencing overall mean values. The mean for innovation capital stands at 0.252, highlighting a need for improvement in how firms harness their innovative capabilities; the range from 0.001 to 1.290 indicates that many firms may not fully capitalize on innovation. The kurtosis of 6.040 suggests that while many firms lag behind, there are notable outliers performing well in this area.

For earnings quality ranging from a minimum of -5.587 to a maximum of 6.024. The mean score of 0.364 indicates slightly positive earnings quality, while the median of 0.269 suggests that half of the firms report lower quality earnings, highlighting a

right-skewed distribution (skewness = 0.860) with a few firms achieving exceptionally high scores. The standard deviation of 1.027 indicates considerable dispersion and the presence of outliers, as evidenced by the high kurtosis value of 14.575, suggesting a distribution with heavy tails and extreme values.

The average firm age is 74.848 years, with a range between 16 and 154 years. This suggests a predominance of established firms within the dataset, which typically benefit from experience and may have more stable operations. The variability indicated by the standard deviation of 32.267 highlights a mixture of both mature entities and newer entrants within the market. Firm Size showed a mean of 7.104 and an overall range from 4.806 to 8.260, indicating that most firms in the dataset are large, which often correlates with better resource allocation, greater market presence, and increased financial capabilities. The negative skewness (-1.120) indicates that the majority of firms are smaller relative to the few large firms that may be influencing the average. The above findings suggest that while firms exhibit strengths in areas like human capital and relational capital, challenges persist in structural and innovation capital. The variability, presence of outliers, and skewness metrics reveal the diversity of experiences across firms, underscoring the need for tailored strategies to leverage these intangible assets more effectively.

Table 4.9 Overall Descriptive Statistics

Stats	N	Min	Max	Mean	P50	Sd	Skewness	Kurtosis
IE	240	-1.299	4.669	0.866	0.780	1.139	0.692	3.134
HC	240	0.114	8.764	1.858	1.651	1.349	1.417	6.180
SC	240	-2.687	1.902	0.349	0.501	0.678	-1.067	5.276
RC	240	0.013	2.831	0.604	0.548	0.392	2.841	14.181
IC	240	0.001	1.290	0.252	0.177	0.253	1.910	6.040
EQ	240	-5.587	6.024	0.364	0.269	1.027	0.860	14.575
FA	240	16.000	154.000	74.848	67.000	32.267	0.539	2.537
FS	240	4.806	8.260	7.104	7.204	0.631	-1.120	5.073

Source: (Field Data, 2024)

Key

IE	=	Investment Efficiency
HC	=	Human Capital
SC	=	Structural Capital
RC	=	Relational Capital
IC	=	Innovation Capital
EQ	=	Earnings Quality
FS	=	Firm Size
FA	=	Firm Age

4.3 Diagnostic Tests

In this section, various diagnostic tests have been employed to assess the data distributions in terms of normality, autocorrelation, heteroscedasticity, multicollinearity, and unit root.

4.3.1 Test of Normality

The results of the normality tests for the residuals and other multivariate normality tests are presented in Table 4.9. The normality assumption is a fundamental requirement in multivariate analysis, as it ensures the validity of statistical results. Deviations from normality can lead to invalid conclusions. Therefore, it is essential to examine the normality of individual quantitative data variables as well as the residuals

in multivariate analysis. The Skewness and Kurtosis tests were conducted to assess the normality of the residuals. Skewness measures the balance of the distribution, while Kurtosis indicates the "peakedness" or "flatness" compared to a normal distribution. The probabilities of Skewness ($\text{Pr}(\text{Skewness})$) and Kurtosis ($\text{Pr}(\text{Kurtosis})$) for the residuals were 0.164 and 0.2036, respectively. These results suggest that the skewness and kurtosis of the residuals are asymptotically normally distributed, as both p-values (> 0.05) indicate.

The chi-square test was also performed for Skewness and Kurtosis, yielding a $\chi^2(2)$ value of 0.99 with a probability of 0.61. The non-significant result further supports the normality assumption, indicating that the null hypothesis of normality cannot be rejected. In addition to the above tests, other multivariate normality tests, such as the Mardia mSkewness and Mardia mKurtosis tests, were conducted. The Mardia mSkewness value was 0.01796 with a $\chi^2(1)$ value of 0.976 and a probability of 0.3231. The Mardia mKurtosis value was 3.2742 with a $\chi^2(1)$ value of 1.003 and a probability of 0.3167. Both tests indicate that the multivariate skewness and kurtosis are asymptotically distributed, as the p-values are greater than 0.05.

Furthermore, the Doornik-Hansen test was conducted with a $\chi^2(2)$ value of 2.281 and a probability of 0.3197, showing that the null hypothesis of normality is not rejected. Finally, the Jarque-Bera test was performed to assess the overall normality of the residuals. The Jarque-Bera normality test yielded a value of 3.269 with a $\chi^2(2)$ value of 0.195, indicating that the null hypothesis cannot be rejected. Collectively, these normality tests provide strong evidence supporting the assumption of normality for the residuals

Table 4.10 Normality Test Results

				----- joint -----	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
Myresid	239	0.164	0.2036	3.58	0.1668
Jarque-Bera normality test: . 3.269 Chi (2) . 195					
Test for multivariate	Normality				
Mardia mSkewness	.0179694	chi2(1)	0.976	Prob>chi2	0.3231
Mardia mKurtosis	3.274218	chi2(1)	1.003	Prob>chi2	0.3167
Doornik- Hansen		chi2(2)	2.281	Prob>chi2	0.3197

Jarque-Bera test for Ho: normality:

Source: (Field Data, 2023)

4.3.2 Test for Autocorrelation

The Wooldridge test for autocorrelation is a statistical test used to assess the presence of correlation between error components across different time periods. In the context of regression analysis, this condition violates the classical assumption of independence of error terms. However, in time series analysis, it is a reasonable characteristic of the error term.

Table 4.11 presents the findings of the Wooldridge test for autocorrelation in the panel data used in this research. The test is conducted with the null hypothesis (H0) that there is no first-order autocorrelation, meaning that the error terms are not correlated across time periods. The alternative hypothesis (Ha) is that there is first-order autocorrelation. The test yields an F-statistic of 0.121 with degrees of freedom (1, 4) and a probability (Prob > F) of 0.7458. The p-value represents the probability of observing the test statistic (F-statistic) or a more extreme value, given that the null hypothesis is true. In this case, the p-value is greater than the conventional significance level of 0.05 (5 percent level of significance).

Since the p-value is greater than 0.05, we fail to reject the null hypothesis. Therefore, it can be concluded with 95 percent confidence that there is no first-order autocorrelation in the panel data used in this research. In other words, the error terms are not significantly correlated across time periods.

The absence of first-order autocorrelation is an essential finding as it confirms the validity of the classical assumption of independence of error terms in the regression analysis conducted in this study. It suggests that the model used adequately captures the relationships between the variables without any systematic correlation of error terms over time.

Table 4.11 Autocorrelation Test Results

Wooldridge test for autocorrelation in panel data

H0: no first order autocorrelation

$F(1, 4) = 0.121$

Prob > F = 0.7458

Source: (Field Data, 2024)

4.3.3 Test for Homoscedasticity

The assumption of homoscedasticity in regression analysis requires that the variance of the errors (residuals) is constant across all levels of the independent variables. To assess this assumption, the White's test for heteroscedasticity is conducted for the model (as shown in Table 4.12). The results from the White test for homoscedasticity indicate a Chi-squared statistic of **32.29** with **1** degree of freedom, yielding a p-value of **0.2214** for the overall test of homoscedasticity. This p-value significantly exceeds the conventional alpha levels of **0.05** and **0.01**, leading us to fail to reject the null hypothesis of homoscedasticity. Thus, we conclude that there is sufficient evidence to support the assumption that the variance of the residuals is constant across levels of the independent variables in the regression model. Additionally, the

Heteroscedasticity score, also calculated as **32.29** with **27** degrees of freedom and a corresponding p-value of **0.2214**, further reinforces this conclusion, indicating no strong evidence for the presence of heteroscedasticity. Overall, these findings suggest that the regression model used is appropriate with respect to the homoscedasticity assumption, which is essential for validating the reliability of inference statistics in the analysis.

Table 4.12 Homoscedasticity Test Results

White's test for Ho: homoscedasticity			
Against Ha: unrestricted heteroscedasticity			
Chi2(1) = 32.29			
Prob > chi2 = 0.2214			
Cameron & Trivedi's decomposition of IM-test			
Source	chi2	df	P
Heteroscedasticity	32.29	27	0.2214
Skewness	21.35	6	0.0016
Kurtosis	0.18	1	0.6743
Total	53.82	34	0.0167

Source: (Field Data, 2024)

4.3.4 Test for Multicollinearity

Multi-collinearity refers to a high correlation between two or more independent variables in a regression model. When multi-collinearity is present, it becomes challenging to obtain reliable estimates for each variable's coefficients, which can compromise the model's effectiveness and interpretability (Cooper & Schindle, 2014). Imperfect multi-collinearity can lead to poorly defined regression coefficients and exaggerated or infinite standard errors and confidence intervals for predictors, potentially affecting the accuracy of hypothesis testing.

In this study, the researchers used two methods to assess multi-collinearity: the variance inflation factor (VIF) and Tolerance. According to Tabachnick and Fidell (2007) and Hair et al. (2006), a multicollinearity problem is indicated if the

correlation between independent variables exceeds 10. Additionally, the VIF test is performed, as examining the correlation matrix alone may not always detect or rule out multicollinearity (Hamilton, 2009). The VIF measures the impact of other independent variables on the standard error of the regression coefficient, and a VIF exceeding 10 suggests collinearity problems.

The VIF test conducted in this study on the independent variables yielded VIF values ranging from 1.11 to 1.46, with a mean VIF of 1.20. These results indicate that there is no significant multi-collinearity problem among the independent variables. The VIF values are well below the threshold of 10, indicating that the variables can be included in a single regression model without concerns about multi-collinearity.

Overall, the absence of multi-collinearity among the independent variables enhances the reliability and validity of the regression results, allowing for accurate interpretation and inference. The researchers' approach in evaluating and addressing multi-collinearity contributes to the robustness of the study's findings.

Table 4.13 Multicollinearity Test Results

Variable	VIF	1/VIF
RC	1.460	0.683
IC	1.400	0.713
FS	1.310	0.765
HC	1.270	0.790
SC	1.210	0.823
FA	1.110	0.898
Mean VIF	1.200	

Source: *(Field Data, 2024)*

4.3.5 Panel Unit Root Test

The results depicted in Table 4.14 pertain to unit root tests conducted on a variety of variables within a time series dataset, specifically aimed at evaluating the stationarity of those variables. Stationarity is critical in time series analysis because it ensures that

the statistical properties of the series, such as mean and variance, remain constant over time, which in turn facilitates more accurate modeling and forecasting. When a time series is non-stationary, patterns may change, making it challenging to analyze trends or make predictions.

In this study, three distinct unit root tests Levin-Lin-Chu, Harris-Tzavalis, and Im-Pesaran-Shin were employed to examine the variables, which include Investment Efficiency (IE), Human Capital (HC), Structural Capital (SC), Relational Capital (RC), Innovation Capital (IC), Earnings Quality (EQ), Firm Size (FS), and Firm Age (FA). The null hypothesis (H_0) for all three tests posits that these variables contain unit roots, indicating they are non-stationary. The alternative hypothesis (H_a) varies slightly among tests: for Levin-Lin-Chu and Harris-Tzavalis, it asserts that the panels are stationary; whereas for the Im-Pesaran-Shin test, it suggests that some panels are stationary.

The results indicate that for all variables, the p-values associated with each statistical test are reported to be less than 0.05, meaning that the null hypothesis of unit roots can be confidently rejected in favor of the alternative hypothesis of stationarity. This finding confirms that all variables (IE, HC, SC, RC, IC, EQ, FS, and FA) are integrated of order zero ($I(0)$), signifying they are stationary at levels. Additionally, upon taking the first difference ($I(1)$), these variables retain stationarity, suggesting a long-term relationship exists even after differencing.

The implication of these findings is significant. Stationary variables indicate reliability in the patterns they present over time, making them suitable for further analysis and modeling. According to scholars such as Phillips and Perron (1988), ensuring that time series data are stationary is a prerequisite for performing regression

analyses to avoid spurious results. Furthermore, Sargan and Bhargava (1983) emphasize that stationary data yield more consistent estimators that lead to valid statistical inferences, thus enhancing the robustness and reliability of the research conclusions differencing

Table 4.14 Unit root test Results

		Inverse chi-squared(60)	Inverse normal	Inverse logit t(154)	Modified inv. chi-squared
		P	Z	L*	Pm
IE	Statistic	185.621	-6.373	-7.436	11.468
	p-value	0.000	0.000	0.000	0.000
HC	Statistic	399.617	-11.947	-19.399	31.003
	p-value	0.000	0.000	0.000	0.000
SC	Statistic	296.119	-8.977	-13.704	21.555
	p-value	0.000	0.000	0.000	0.000
RC	Statistic	106.109	-4.658	-8.875	4.467
	p-value	0.000	0.000	0.000	0.000
IC	Statistic	151.013	-2.672	-5.156	8.308
	p-value	0.000	0.004	0.000	0.000
EQ	Statistic	143.062	-4.607	-5.326	7.583
	p-value	0.000	0.000	0.000	0.000
FS	Statistic	184.986	-5.022	-7.466	11.410
	p-value	0.000	0.000	0.000	0.000
FA	Statistic	1898.993	-39.762	-95.855	167.876
	p-value	0.000	0.000	0.000	0.000

Source: (Field Data, 2024)

4.4 Correlation Analysis

Table 4.15 presents the correlation results on the following key variables: investment efficiency, human capital, structural capital, relational capital, innovation capital, earnings quality, firm age and firm size. The correlations provide insights into the relationships between these variables, which are critical for understanding their collective impact on investment efficiency.

A notable finding is the significant positive correlation between investment efficiency and human capital ($r = 0.312$, $p < 0.01$), suggesting that firms that effectively manage

investment decisions are likely to also have stronger human capital outcomes. This relationship underscores the importance of investing wisely in human resources to enhance overall investment efficiency. Additionally, the correlation between investment efficiency and structural capital is strong ($r = 0.628$, $\rho < 0.01$), indicating that investments in organizational structures complement and enhance the effectiveness of capital utilization.

The correlation between relational capital and investment efficiency ($r = 0.371$, $\rho < 0.01$) further emphasizes the significance of stakeholder relationships in driving effective investment efficiency. Similarly, a moderate positive relationship is evident between innovation capital and investment efficiency ($r = 0.324$, $\rho < 0.01$), suggesting that firms that innovate tend to make more effective investment decisions.

Earnings quality is positively correlated with Investment Efficiency ($r = 0.245$, $\rho < 0.01$), indicating that better quality earnings are associated with more effective investment practices. This reinforces the idea that sound investments lead to sustainable earnings, further supporting investment efficiency.

Interestingly, firm age shows a weak negative correlation with Investment Efficiency ($r = -0.047$, $\rho > 0.05$), suggesting that older firms do not necessarily exhibit higher investment efficiency, which could indicate that practice and experience do not always lead to improved capital allocation. Conversely, firm size has a moderate positive correlation with Investment Efficiency ($r = 0.328$, $\rho < 0.01$), implying that larger firms tend to have better investment practices, potentially due to greater resource availability and market influence. It is crucial to interpret these correlation results with caution, as correlation does not necessarily imply causation. The findings

provide initial insights into the relationships between the variables, but further research is required to establish causal links.

Table 4.15 Correlation Results

	EI	HC	SC	RC	IC	EQ	FA	FS
EI	1							
HC	.312**	1						
SC	.628**	.149*	1					
RC	.371**	.240**	0.113	1				
IC	.324**	.134*	.177**	.504**	1			
EQ	.245**	.133*	0.063	0.074	0.057	1		
FA	-0.047	.150*	-0.064	-0.132	-.189**	0.07	1	
FS	.328**	-.203**	.333**	0.075	0.055	-0.041	-.220**	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Source: (Field Data, 2024)

4.5 Random-Fixed Effects GLS regression

The Random-Fixed Effects GLS Regression is a statistical technique used to explore and analyze the relationships between variables in panel data. Panel data combines both time-series and cross-sectional data, making it valuable for understanding how various factors affect outcomes over time. This method allows us to account for individual heterogeneity and time-specific effects, providing a more comprehensive view of the data. It's a powerful tool for uncovering patterns and relationships within the dataset.

4.5.1 Hausman Test

The use of a random-effects model assumes that there is little justification for the absence of correlation between individual effects and other regressors, as stated by Greene (2008). This lack of correlation may lead to inconsistencies within the random-effects model if present. The main distinction between fixed effects and random effects lies in the correlation between the error term and the included independent variables. To determine the existence of this correlation and choose the

appropriate method between fixed effects and random effects for panel data regression, researchers employ the Hausman specification test.

Recalling that the fixed effects model assumes a correlation between the independent variables and the error term, while the random effects model does not, researchers formulate the following hypotheses for testing:

H0: There is no correlation between unobserved effects and explanatory variables.

HA: There is a correlation between unobserved effects and explanatory variables.

The null hypothesis suggests the utilization of random effects, whereas the alternative hypothesis supports the use of fixed effects. By conducting the Hausman specification test on both fixed effects and random effects regression models (Baltagi, 2008), researchers can examine the correlation between the error term and the explanatory variables. If the Hausman test yields a significant p-value, it leads to the rejection of the null hypothesis, thereby indicating that the fixed effects model is more suitable.

Analyzing the results in Table 4.16, it is evident that the null hypothesis of no correlation between unobserved effects and explanatory variables is accepted. This finding is supported by the chi-square value of 3.47, resulting in a p-value of 0.7477. Consequently, researcher concludes that the random effects model is the appropriate choice for this analysis.

These results emphasize the importance of considering the correlation between the error term and the explanatory variables in order to obtain accurate estimations of the relationships. By opting for the random effects model, the analysis assumes that unobserved time-invariant factors are random.

Table 4.16 Hausman Test

	---- Coefficients ----			
	(b) RE	(B) FE	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
HC	0.169	0.172	-0.003	0.016
SC	1.051	1.010	0.040	0.035
RC	0.449	0.488	-0.038	0.061
IC	0.411	0.436	-0.025	0.097
FA	0.005	0.002	0.003	0.002
FS	0.269	0.309	-0.040	0.067
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)				
= 3.47				
Prob>chi2 = 0.7477				

Source: (Field Data, 2024)

4.5.2 Random Effects Model Regression (Hypothesis Testing)

The random-effects regression results presented in Table 4.17 offer valuable insights into the relationship between various independent variables and investment efficiency among listed firms on the Nairobi Securities Exchange. This methodology is appropriate as it allows for the inclusion of time-constant variables and provides an assessment of within-group and between-group variations while assuming that unobserved effects are uncorrelated with the independent variables.

The within R-squared of 0.519 indicates that approximately 51.9% of the variance in investment efficiency is explained by the independent variables within each firm across time. This suggests a strong explanatory power for the model in capturing variations at the individual group level. The between R-squared of 0.604 indicates that around 60.4% of the variance in investment efficiency is accounted for by the independent variables across different firms, further demonstrating the relevance of these variables in explaining differences in investment efficiency. The overall R-squared of 0.543 meaning that collectively, the independent variables account for

about 54.3% of the total variation in investment efficiency, highlighting moderate explanatory power across both dimensions of the analysis.

H01: Human Capital has no significant effect on investment efficiency of listed firms in the Nairobi Securities Exchange. The results reveal a statistically significant positive relationship between human capital and investment efficiency, with a coefficient ($\beta = 0.190$, $p\text{-value} = 0.000 < 0.01$). Given that the p -value is less than the significance level of 0.05, we reject the null hypothesis (H01). This indicates that higher investments in human resources correlate with enhanced investment efficiency, leading to investment efficiency. The findings support the hypothesis that human capital is essential in driving organizational success within the context of the Nairobi Securities Exchange, suggesting that firms prioritizing talent development tend to experience greater efficiencies in their investments.

H02: Structural Capital has no significant effect on investment efficiency of listed firms in the Nairobi Securities Exchange. The analysis finds that structural capital has a substantial positive impact on investment efficiency, with a coefficient ($\beta = 0.868$, $p\text{-value} = 0.000 < 0.01$). As the p -value is less than the significance level, we reject the null hypothesis (H02). This result demonstrates that effective organizational processes and systems significantly enhance investment efficiency, reinforcing the understanding that firms with well-established structures can better manage resources, facilitating investment efficiency.

H03: Relational Capital has no significant effect on investment efficiency of listed firms in the Nairobi Securities Exchange. The results indicate a meaningful positive association between relational capital and investment efficiency, with a coefficient ($\beta = 0.552$, $p\text{-value} = 0.000 < 0.01$). The significant p -value leads us to reject the null

hypothesis (H03). This finding highlights that firms fostering strong relationships with stakeholders, including customers and suppliers, enhance their investment efficiency, underlining the role of trust and collaboration in accruing greater value for listed firms.

H04: Innovation Capital has no significant effect on investment efficiency of listed firms in the Nairobi Securities Exchange. The findings for Innovation Capital (IC) reveal a positive but marginally significant relationship with investment efficiency, indicated by a coefficient ($\beta = 0.395$, p-value = 0.092). Since the p-value exceeds the typical significance level of 0.05, we do not reject the null hypothesis (H04). While this suggests that innovations can influence investment efficiency, it indicates that the effect is not as strong or reliable as the other capital dimensions, suggesting a need for firms to further promote their innovation initiatives to maximize their potential impact.

Table 4.17 Random Effects Model Regression Results

Random-effects GLS regression			Number of obs	=	240
Group variable: id			Number of zgroups	=	30
R-sq:	Within	0.519	Obs per group	min	8
	Between	0.604		avg	8.0
	Overall	0.543		max	8
			Wald chi2(6)	=	262.36
corr(u_i, x)	0 (assumed)		Prob > chi2	=	0.0000
FV	Coef.	Std. Err.	Z	P>z	[95% Conf. Interval]
HC	0.190	0.040	4.790	0.000	0.112 0.268
SC	0.868	0.083	10.430	0.000	0.705 1.032
RC	0.552	0.150	3.680	0.000	0.258 0.846
IC	0.395	0.234	1.690	0.092	-0.064 0.854
FA	0.000	0.002	0.060	0.954	-0.005 0.005
FS	0.303	0.102	2.990	0.003	0.104 0.502
_cons	-2.389	0.805	-2.970	0.003	-3.966 -0.812
sigma_u	.3384				
sigma_e	.7207				
Rho	.1806				

Source: (Field Data, 2024)

4.5.3 Hypothesis Testing for Moderating Effect of Earnings Quality on Intellectual Capital and Investment Efficiency

The results presented in Table 4.18 investigate the moderating effects of earnings quality (EQ) on the relationships between various forms of intellectual capital specifically, human capital, structural capital, relational capital, and innovation capital and investment efficiency in firms listed on the Nairobi Securities Exchange. This assessment employs a hierarchical regression model, as proposed by Baron and Kenny (1998).

Hypothesis H05a, which suggested that earnings quality does not significantly moderate the relationship between human capital and investment efficiency, was rejected based on the findings ($\beta=0.11$, $p < 0.01$). This indicates that earnings quality

significantly enhances the relationship between human capital and investment efficiency. The introduction of earnings quality into the model resulted in a 2.9% increase in R-squared ($R^2\Delta = 0.029$), signifying that higher earnings quality strengthens the positive effect that human capital has on investment efficiency.

Hypothesis H05b posited that earnings quality does not significantly moderate the relationship between structural capital and investment efficiency. Contrary to this hypothesis, the findings revealed a significant moderating effect of earnings quality ($\beta=0.16$, $p < 0.05$) in Model 5. Thus, H05b is rejected. Additionally, the introduction of earnings quality increased the explanatory power of the model by 0.9% ($R^2\Delta = 0.009$). This result suggests that firms with higher earnings quality are better positioned to leverage their structural capital to enhance investment efficiency.

Hypothesis H05c proposed that earnings quality does not significantly moderate the relationship between relational capital and investment efficiency. However, the results in Model 6 demonstrated a significant positive moderating effect of earnings quality on this relationship ($\beta=0.26$, $p < 0.05$). Consequently, H05c is rejected. The introduction of earnings quality also improved the model's fit, resulting in a 1.1% increase in R-squared ($R^2\Delta = 0.011$). This outcome implies that firms with higher earnings quality can effectively leverage their relational capital to boost investment efficiency.

Hypothesis H05d stated that earnings quality does not significantly moderate the relationship between innovation capital and investment efficiency. The results indicated a non-significant moderating effect of earnings quality ($\beta= -0.26$, $p>0.05$) on the relationship between innovation capital and investment efficiency. This lack of

significance leads to a failure to reject H05d, suggesting that earnings quality does not substantially affect the influence of innovation capital on investment efficiency.

Table 4.9 Hierarchical Random-effects GLS regression for Moderating Effect Earnings Quality on the Relationship between Intellectual Capital and Investment Efficiency

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Investment efficiency (IE)	β (se)	β (se)	β (se)	β (se)	β (se)	β (se)	β (se)
Constant	-3.26 (1.01) **	-2.39 (0.80) **	-2.61 (0.77) **	-1.86 (0.77) *	-1.82 (0.77) *	-1.69 (0.76) *	-1.72 (0.76) *
Firm Age (FA)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Firm Size (FS)	0.56 (0.13) **	0.30 (0.10) **	0.33 (0.10) **	0.24 (0.10) *	0.23 (0.10) *	0.22 (0.10) *	0.22 (0.10) *
Human Capital (HC)	-	0.19 (0.04) **	0.17 (0.04) **	0.14 (0.04) **	0.15 (0.04) **	0.15 (0.04) **	0.14 (0.04) **
Structural Capital (SC)	-	0.87 (0.08) **	0.86 (0.08) **	0.79 (0.08) **	0.78 (0.08) **	0.79 (0.08) **	0.77 (0.08) **
Relational Capital (RC)	-	0.55 (0.15) **	0.56 (0.15) **	0.56 (0.14) **	0.53 (0.14) **	0.38 (0.15) *	0.34 (0.15) *
Innovation Capital (IC)	-	0.39 (0.23) *	0.37 (0.23) *	0.24 (0.22)	0.28 (0.22)	0.28 (0.22)	0.44 (0.25)
Earning quality (EQ)	-	-	0.18 (0.05) *	0.15 (0.05) **	0.13 (0.05) **	-0.02 (0.08)	0.02 (0.08)
HC_EQ	-	-	-	0.11 (0.03) **	0.08 (0.03) **	0.08 (0.03) **	0.09 (0.03) **
SC_EQ	-	-	-	-	0.16 (0.07) *	0.17 (0.07) **	0.17 (0.07) **
RC_EQ	-	-	-	-	-	0.26 (0.10) *	0.31 (0.11) **
IC_EQ	-	-	-	-	-	-	-0.26 (0.20)
R-sq.	0.111	0.543	0.574	0.603	0.612	0.623	0.627
R-sq.Change		0.432	0.031	0.029	0.009	0.011	0.004
Wald Chi-squared (2)	18.95	262.36	294.07	327.41	338.98	352.27	355.18
Prob > Chi-squared	0.00	0.00	0.000	0.000	0.00	0.00	0.00

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

Source: (Field Data, 2024)

The research employed mod graph, as suggested by Jose (2008), to demonstrate enhancing moderating effects. Following the guidelines of Aiken and West (1991), a moderation graph was used to investigate the interaction between the variables of interest, specifically intellectual capital, across varying levels of the moderator. Figure 4.1 illustrated that higher levels of earning quality resulted in a steeper slope between human capital and investment efficiency, indicating an enhancing moderating effect. The interpretation of Figure 4.1 provides a visual understanding of how earnings quality moderates the relationship between human capital and investment efficiency. This suggests that company's emphasizing high earnings quality can significantly leverage their human capital investments, leading to improved operational efficiency and better investment efficiency.

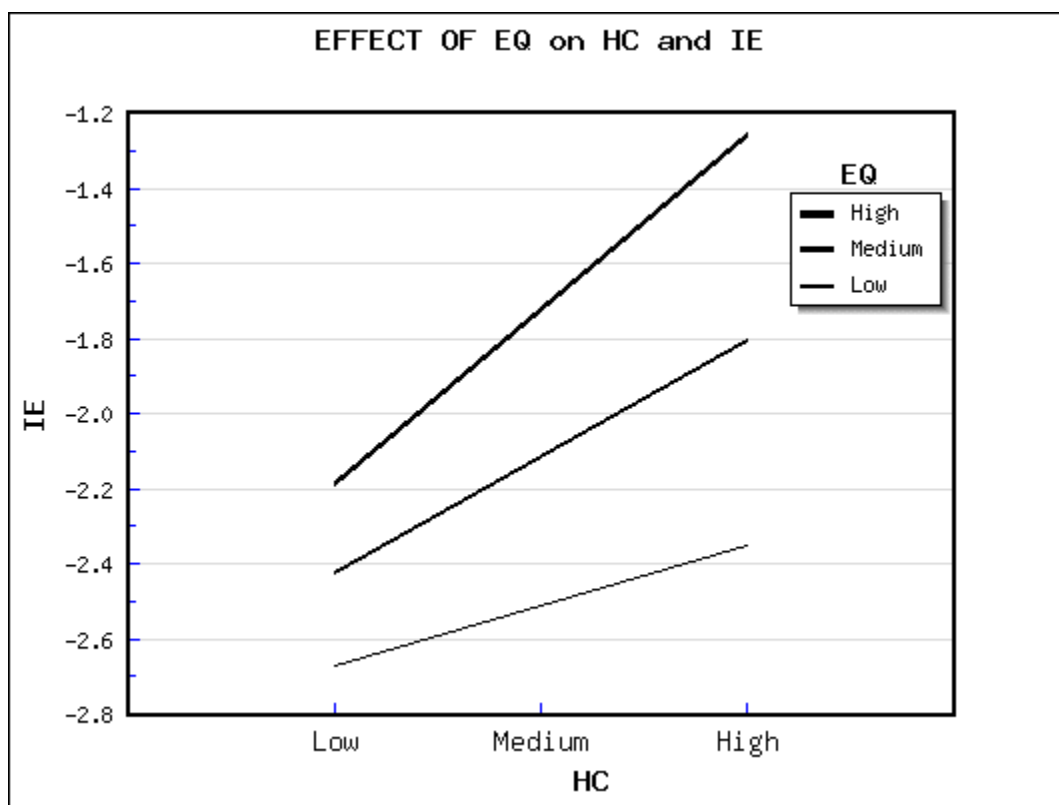


Figure 4.1 Mod graph Moderating effect of earning quality on Relationship between Human Capital and Investment Efficiency

Figure 4.1 illustrated those higher levels of earning quality resulted in a steeper slope between structural capital and investment efficiency, indicating an enhancing moderating effect. The interpretation of Figure 4.2 provides a visual understanding of how earnings quality moderates the relationship between structural capital and investment efficiency. This suggests that firms emphasizing high earnings quality can significantly leverage their structural capital investments, leading to improved operational efficiency and better investment efficiency.

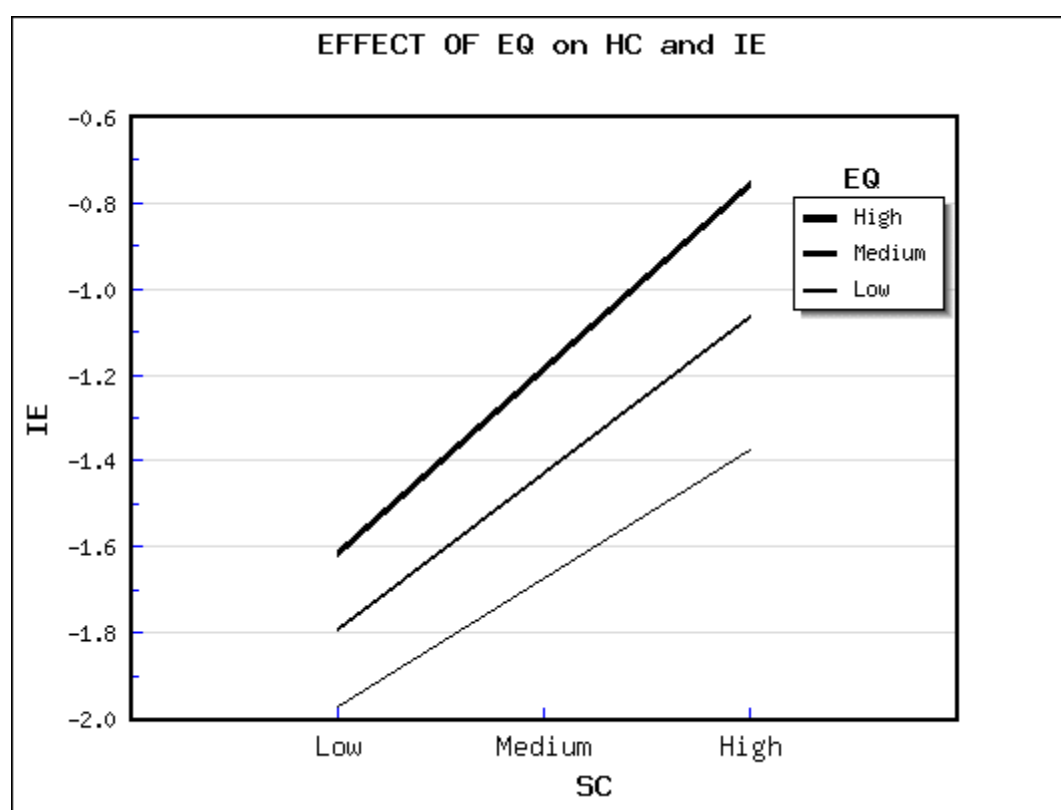


Figure 4.2 Modgraph Moderating Effect of Earning Quality on Relationship between Structural Capital and Investment Efficiency

Figure 4.2 illustrated those higher levels of earning quality resulted in a steeper slope between relational capital and investment efficiency, indicating an enhancing moderating effect. The interpretation of Figure 4.3 provides a visual understanding of how earnings quality moderates the relationship between relational capital and

investment efficiency. This suggests that firms emphasizing high earnings quality can significantly leverage their relational capital investments, leading to improved operational efficiency and better investment efficiency.

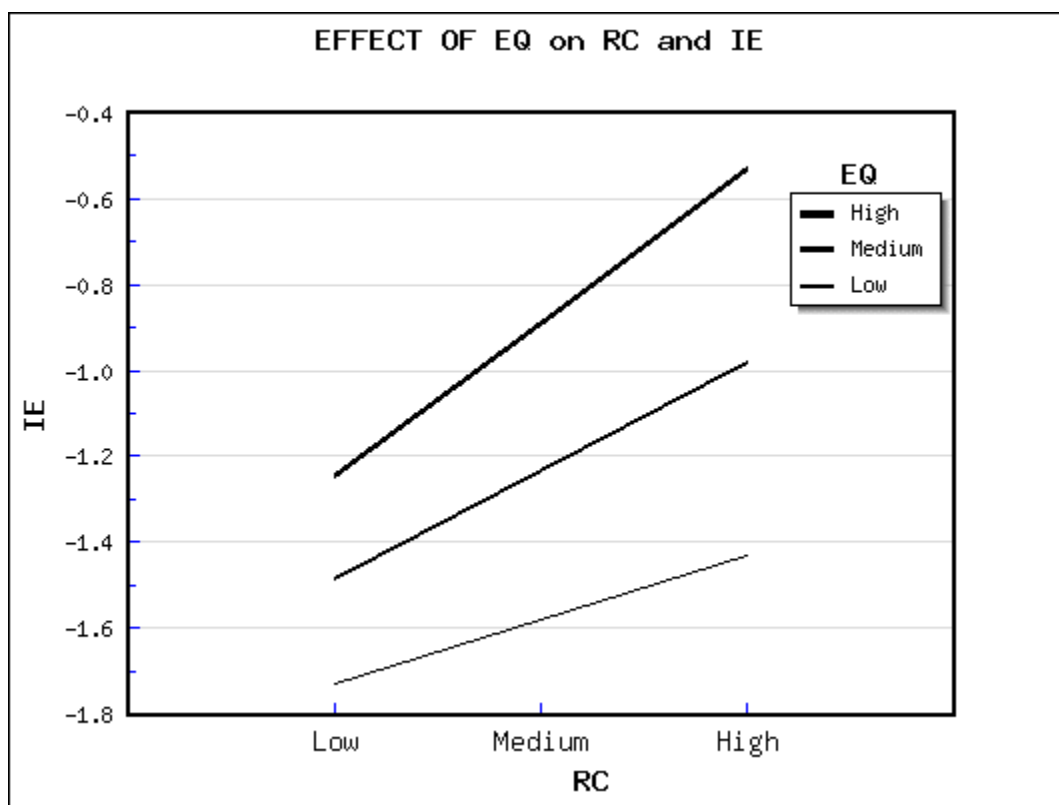


Figure 4.2 Modgraph Moderating Effect of Earning Quality on Relationship between Relational Capital and Investment Efficiency

4.6 Hypothesis Testing summary

Table 4.19: Summary of Hypotheses Testing Results

Hypothesis Formulated	R ²	Beta	ρ – values	Decision
H₀₁: Human capital has no significant effect on investment efficiency of listed firms in NSE		0.190	0.000	Rejected
H₀₂: Structural capital has no significant effect on investment efficiency of listed firms NSE	0.543	0.868	0.000	Rejected
H₀₃: Relational capital has no significant effect on investment efficiency of listed firms in NSE		0.552	0.000	Rejected
H₀₄: Innovation capital has no significant effect on investment efficiency of listed firms in NSE		0.395	0.092	Accepted
H_{05a}: Earning quality does not significantly moderate the relationship between human capital and investment efficiency of listed firms in NSE	0.029	0.110	0.00	Rejected
H_{05b}: Earning quality does not significantly moderate the relationship between structural capital and investment efficiency of NSE	0.009	0.160	0.000	Rejected
H_{05c}: Earning quality does not significant moderate the relationship between relational capital and investment efficiency of listed firms in NSE	0.011	0.26	0.000	Rejected
H_{05d}: Earning quality does not significantly moderate the relationship between innovation capital and investment efficiency of listed firms in NSE	0.04	-0.26	0.184	Accepted

4.7 Discussions

The results indicate a statistically significant positive relationship between human capital and investment efficiency, confirming that higher investments in human resources correlate with enhanced investment efficiency and improved firm performance. Such results align with existing literature that emphasizes human capital as a crucial component of a firm's competitive advantage (Alhassan and Asare, 2016; Anosa, 2021). Investments in employee knowledge, skills, and training not only

enhance work quality but also contribute to national wealth and economic growth (Eniola et al., 2015). The Organization for Economic Cooperation and Development (OECD) underscores the importance of human capital investment, noting that it fuels economic activity, competitiveness, and prosperity (Anaduaka et al., 2014). Additionally, human capital is often seen as the most vital intangible asset within business enterprises, serving as a fundamental cornerstone of business efficiency (Hashim et al., 2018). Investing in human capital through activities like training, education, and professional development not only increases employee satisfaction and productivity but also enhances the firm's overall effectiveness in pursuing its strategic objectives (Ahamad et al., 2020). These findings are consistent with previous studies, such as Rahman et al. (2024), who evaluated the impact of human capital investment in the banking sector of Bangladesh, revealing a positive correlation between such investments and operational efficiency. Thus, firms that prioritize talent development and align human capital strategies with their investment activities are likely to experience greater efficiencies, thereby driving substantial returns on their investments.

The analysis reveals that structural capital has a substantial positive impact on investment efficiency. This significant finding suggests that effective organizational processes, systems, and structures significantly enhance firms' ability to allocate and utilize resources efficiently. The literature supports this conclusion, highlighting that well-established organizational frameworks not only facilitate improved resource management but also foster innovation and agility within organizations (Ismail and Karem, 2011). Structural capital encompasses various elements, including organizational culture, processes, technologies, and intellectual properties, which together form a foundation for sustained competitive advantage (Saleem et al., 2022;

Olarewaju and Msomi, 2021). Firms that successfully leverage their structural capital can create environments conducive to experimentation and learning, which are critical in navigating today's fast-paced and competitive market landscape. Notably, the ability of structural capital to influence investment efficiency is supported by studies indicating that companies with better-defined processes and structures are better positioned to respond to market demands and optimize performance outcomes (Hsu & Wang, 2010). Nonetheless, some researchers have posited that despite these advantages, structural capital can be overlooked in strategic decision-making processes, potentially limiting its impact on overall investment efficiency (Mehralian et al., 2012). This highlights the necessity for firms to regularly assess and optimize their structural capital to fully capitalize on its potential benefits, ultimately improving investment efficiency.

The findings indicate a meaningful positive association between relational capital and investment efficiency. This result underscores the significance of fostering strong relationships with stakeholders, including customers and suppliers, in enhancing investment efficiency. Relational capital encompasses vital intangible assets derived from the organization's interactions and relationships, such as loyalty, trust, strategic alliances, and goodwill (Kaplan and Norton, 2004; Buallay, 2018). The literature suggests that relational capital can lead to greater competitive advantages as firms that cultivate strong stakeholder relationships are often better positioned to understand market dynamics and consumer needs, which in turn enhances decision-making and resource allocation (Nimtrakoon, 2015). Moreover, effective relational capital can facilitate collaboration and information sharing, thus driving innovation and improving operational efficiency (Al-Shami et al., 2013). The positive relationship observed in this study aligns with findings from Mohammad Shafiee et al. (2024),

who highlighted the importance of relational capital in enhancing competitiveness. Nonetheless, while many studies indicate the critical role of relational capital in achieving high performance, fewer have directly linked it to investment efficiency, suggesting a gap in the literature that warrants further exploration. By prioritizing relational capital strategies, firms can significantly enhance their investment efficiency and, consequently, overall firm efficiency, emphasizing the need for continued investment in building and maintaining strong stakeholder relationships.

In contrast, the findings for innovation capital present a more nuanced picture indicating that innovation capital does not have a statistically significant effect on investment efficiency at the conventional level of significance. This result suggests that while there may be some positive influence of innovation capital on investment efficiency, it is not strong or reliable compared to other forms of capital, such as human, structural, and relational capital. Given the rapid pace of technological advancements, it is critical for firms to bolster their innovation initiatives to maximize their potential impact on investment efficiency (Wu et al., 2010). Previous research has highlighted the significance of innovation capital in improving firm performance, particularly in dynamic markets, where the ability to innovate is essential for growth (Agostini et al., 2017; Chen et al., 2015). However, the non-significance of innovation capital in this context indicates that firms may need to reassess their innovation strategies and investment priorities to optimize their innovation capabilities effectively. By fostering a culture of innovation and leveraging the knowledge and skills of their workforce, organizations can potentially convert innovative ideas into actionable solutions that enhance overall firm efficiency and create long-term value. Continuing to invest in innovation capital may ultimately allow firms to realize its full potential in driving investment efficiency, although further research is needed to

clarify the specific mechanisms through which innovation influences investment outcomes.

The analysis results reveal that earnings quality significantly moderates the relationship between human capital and investment efficiency, as indicated by a positive coefficient ($\beta = 0.11$, $p < 0.01$). This finding suggests that higher earnings quality strengthens the positive impact of human capital on investment efficiency, highlighting the crucial role that quality earnings play in realizing operational improvements when firms invest in their workforce. Such results echo the conclusions drawn by Tahat et al. (2023), who examined the association between earnings quality and investment efficiency across firms in multiple legal contexts, affirming that higher earnings quality enhances investment efficiency while alleviating challenges related to overinvestment and underinvestment. Similarly, structural capital demonstrates a substantial positive moderating effect of earnings quality, with a coefficient of ($\beta = 0.16$, $p < 0.05$), underscoring that firms with higher earnings quality are better positioned to leverage their structural capital for improved investment efficiency. This aligns with findings from Hung et al. (2020), which identified that earnings quality has a greater influence on investment efficiency than debt maturity and emphasizes the importance of effective organizational processes.

Moreover, prior work by Hsu and Wang (2010) supports the notion that well-structured organizations can better manage resources effectively, enhancing performance metrics. The analysis further reveals a meaningful positive association between relational capital and investment efficiency, demonstrated by a coefficient of ($\beta = 0.26$, $p < 0.05$), indicating that firms with elevated earnings quality can more effectively utilize relational capital to enhance investment efficiency. This underlines

the importance of strong stakeholder relationships, a view reinforced by Bontis et al. (2000), who found that relational capital contributes substantially to firm competitiveness. Conversely, the analysis for innovation capital presents a more nuanced scenario, revealing a negative coefficient ($\beta = -0.26$) and indicating a non-significant moderating effect ($p > 0.05$). This suggests that earnings quality does not meaningfully influence the relationship between innovation capital and investment efficiency, which contrasts with previous studies indicating that innovation often drives performance (Chen et al., 2015; Wu et al., 2010).

The results from De Carvalho et al. (2014), which indicated that poor earnings quality reduces the effectiveness of investment decisions, resonate with this finding, suggesting a need for firms to bolster their innovation initiatives while ensuring high-quality earnings to maximize overall investment efficiency. Thus, the findings emphasize the critical role of earnings quality in enhancing the relationships of human, structural, and relational capitals with investment efficiency while signaling that innovations should be pursued more vigorously to capture their full potential, thereby warranting a comprehensive strategy that integrates all aspects of intellectual capital aligned with high earnings quality to improve investment efficiency.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The primary focus of this study was to determine the effect of the human capital on investment efficiency of listed firms in NSE, effect of the structural capital on investment efficiency of listed firms in NSE, effect of the relational capital on investment efficiency of listed firms in NSE , effect of the innovational capital on investment efficiency of listed firms in NSE and To examine the moderating effect of earnings quality on the relationship between human capital and investment efficiency, relationship between structural capital and investment efficiency of listed firms, relationship between relational capital and investment efficiency of listed firms in NSE, relationship between innovation capital and investment efficiency of listed firms in NSE. This chapter presents the summary of the findings, conclusions derived from these findings, recommendations, and recommendations for future research.

5.2 Summary of the Findings

The findings indicated a statistically significant positive relationship between human capital and investment efficiency, as evidenced by a coefficient ($\beta = 0.190$, $p\text{-value} = 0.000$). This finding leads to the conclusion that higher investments in human resources correlate with enhanced investment efficiency and improved overall investment efficiency. This underscores the importance of human capital as a critical driver of organizational success in the context of firms listed on the Nairobi Securities Exchange, suggesting that companies that prioritize talent development are likely to experience greater efficiencies in their investments. Similarly, structural capital shows a substantial positive impact on investment efficiency, with a coefficient ($\beta = 0.868$, $p\text{-value} = 0.000$). This indicates that effective organizational processes and systems

significantly enhance investment efficiency, reinforcing the understanding that firms with well-established structures can better manage resources hence facilitating investment efficiency. The analysis also highlights a meaningful positive association between relational capital and investment efficiency, represented by a coefficient ($\beta = 0.552$, $p\text{-value} = 0.000$). This significant p -value indicates that firms fostering strong relationships with their stakeholders, including customers and suppliers, enhance their investment efficiency, underlining the role of trust and collaboration in accruing greater value for listed firms. Conversely, the findings for innovation capital reveal a positive but marginally significant relationship with investment efficiency, indicated by a coefficient ($\beta = 0.395$, $p\text{-value} = 0.092$).

The analysis results reveal that earnings quality significantly moderates the relationship between human capital and investment efficiency, as indicated by a positive coefficient ($\beta = 0.11$, $p < 0.01$), which suggests that higher earnings quality strengthens the positive impact of human capital on investment efficiency. Similarly, structural capital also demonstrates a substantial positive moderating effect of earnings quality, with a coefficient of ($\beta = 0.16$, $p < 0.05$), highlighting that firms with higher earnings quality are better positioned to leverage their structural capital to enhance investment efficiency. Additionally, the relationship between relational capital and investment efficiency is positively influenced by earnings quality, as evidenced by a coefficient of ($\beta = 0.26$, $p < 0.05$). This indicates that firms with elevated earnings quality can more effectively utilize relational capital to boost their investment efficiency. In contrast, the analysis indicates a non-significant moderating effect for innovation capital, demonstrated by ($\beta = -0.26$, $p > 0.05$), revealing that earnings quality does not meaningfully affect the relationship between innovation capital and investment efficiency. Overall, these findings emphasize the critical role

of earnings quality in enhancing the relationships of human, structural, and relational capitals with investment efficiency while suggesting that its impact on innovation capital remains negligible.

5.3 Conclusion of the Study

In conclusion, the higher investments in human resources correlate with enhanced investment efficiency and improved overall investment efficiency. This underscores the importance of human capital as a critical driver of organizational success in the context of firms listed on the NSE, suggesting that companies that prioritize talent development are likely to experience greater efficiencies in their investments.

Findings on structural capital have significant positive impact on investment efficiency conclude that effective organizational processes and systems significantly enhance investment efficiency. This indicates that firms with well-established structures are better equipped to manage their resources effectively, thereby facilitating higher performance and investment efficiency.

The analysis also highlights a meaningful positive association between relational capital and investment efficiency concluding that firms that cultivate strong relationships with their stakeholders, including customers and suppliers, enhance their investment efficiency, emphasizing the crucial role of trust and collaboration in generating greater value for listed firms.

Conversely, the findings for innovation capital has insignificant relationship with investment efficiency concluding that while innovation can potentially influence investment efficiency, its impact is not as substantial or reliable as the contributions of human, structural, and relational capital. Consequently, firms may need to bolster

their innovation initiatives to fully realize the benefits of this capital dimension, thereby maximizing its potential effect on investment efficacy.

In conclusion, the analysis emphasizes the crucial role of earnings quality as a moderator in enhancing the relationships between human, structural, and relational capital and investment efficiency. Higher earnings quality significantly strengthens the impact of human capital and structural capital, enabling firms to leverage their resources more effectively for improved firm value, as noted by Tahat et al. (2023), who indicate that better earnings quality enhances investment decisions. Furthermore, the positive relationship between earnings quality and relational capital underscores the importance of cultivating strong stakeholder relationships to maximize value creation, aligning with the findings of Bontis et al. (2000), which highlight the value of trust and collaboration in achieving organizational goals. Conversely, the lack of a significant moderating effect of earnings quality on innovation capital suggests that firms may need to address earnings quality to fully realize the potential of their innovation initiatives. This notion is supported by De Carvalho et al. (2014), who found that poor earnings quality negatively influences effective investment decisions. Overall, prioritizing earnings quality in conjunction with strategies related to human, structural, and relational capital is essential for optimizing investment efficiency and achieving sustained competitive advantages, as reinforced by the findings of Houcine (2017) and Eniola et al. (2015), who indicate that a robust earnings quality framework is vital for long-term organizational success and firm efficiency.

5.4 Recommendations of Study

5.4.1 Managerial Implications

The findings of this analysis carry significant implications for management practices within firms listed on the Nairobi Securities Exchange. Firstly, the positive correlation between human resources investments and enhanced investment efficiency emphasizes the need for companies to prioritize talent development as a strategic initiative. By investing in training, upskilling, and fostering a positive work environment, managers can cultivate a workforce that contributes to improved overall investment efficiency.

Additionally, the significant impact of structural capital on investment efficiency highlights the importance of establishing effective organizational processes and systems, suggesting that leaders should focus on optimizing operational frameworks to ensure efficient resource management. Furthermore, the positive association between relational capital and investment efficiency indicates that building and maintaining strong relationships with stakeholders including customers, suppliers, and other partners should be a key managerial focus.

Trust and collaboration not only enhance investment efficiency but also create a competitive advantage for the firm. Conversely, the findings regarding the marginal significance of innovation capital signal that while innovation is important, it may not generate immediate impacts on investment efficiency without complementary investments in human, structural, and relational capital. Therefore, managers should consider integrating innovation initiatives with their broader strategies, ensuring that they align with the organization's objectives and the development of other capital type.

5.4.2 Policy Implications

From a policy perspective, the results of this analysis suggest several avenues for stakeholders in the regulatory and economic environments surrounding firms listed on the Nairobi Securities Exchange. Policymakers should encourage organizations to prioritize human capital development through incentives that promote training and skill enhancement programs. Such initiatives could lead to a more skilled workforce that boosts overall investment efficiency. Additionally, policies that support the establishment of best practices for structural capital management can enhance investment efficiency. This could include guidelines for effective governance structures and efficient processes to optimize resource allocation. Moreover, the findings emphasize the need for policies that foster the development of relational capital through networking opportunities, partnerships, and collaborations among firms and their stakeholders. By enhancing stakeholder engagement, firms can improve their investment efficiencies and drive greater value creation. Conversely, recognizing the insignificant relationship between innovation capital and investment efficiency, policymakers may need to formulate strategies that encourage firms to not only invest in innovation but also ensure that these investments are accompanied by strong human and structural support systems. Overall, promoting a holistic approach to capital development through regulatory support can lead to sustainable growth and improved investment efficiency in the market.

5.4.3 Theoretical Implications

The results of the study have significant theoretical implications, particularly in the context of agency theory, stewardship theory, and the broader intellectual capital framework. The positive effects of human capital, structural capital, and relational capital on investment efficiency underscore the critical importance of these forms of

intellectual capital for achieving higher organizational performance. This supports the idea that when agents, such as managers, effectively leverage their skills and knowledge, they can enhance governance and operational efficiency, aligning with agency theory principles that emphasize the need for agents to prioritize organizational benefit over personal interests (Crocker & Slemrod, 2007).

Moreover, The moderation of earning quality on the relationships between human capital, structural capital, relational capital, and investment efficiency highlights the importance of high-quality earnings as a critical factor that can enhance the positive impacts of intellectual capital. This aligns with earnings management theory, suggesting that when organizations maintain high standards of earnings quality, they can significantly amplify the benefits derived from their intellectual capital investments.

The study sheds light on the complex interplay between intellectual capital, earning quality, and investment efficiency within firms. It suggests that integrating these theoretical perspectives can lead to a more comprehensive understanding of how organizations can leverage their intellectual resources to improve performance. The findings imply that firms should focus on developing human and structural capital while ensuring high earnings quality to optimize their investment outcomes and achieve sustainable success.

5.5 Suggestions for Further Research

The study has yielded important findings regarding the effect of intellectual capital on investment efficiency, moderated by earnings quality. However, it is not without limitations, which provide opportunities for further research. First, the study was confined to examining only four dimensions of intellectual capital; therefore, future

research should consider incorporating additional areas such as process capital, and customer capital. Second, this study relied primarily on secondary data, which can limit the comprehensiveness of the analysis. Future studies should prioritize the use of primary data to gain more accurate insights. Lastly, the research focused exclusively on firms listed on the Nairobi Securities Exchange (NSE), so replicating the study with firms that are not listed would provide a broader understanding of intellectual capital's impact on investment efficiency across different contexts.

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APPENDICES

Appendix I: Document Analysis Guide

SNo.	Company	HC	SC	RC	IC	EQ
1	Eaagads Limited					
2	Kakuzi Limited					
3	Kapchorua Tea Company Limited					
4	Limuru Tea Company Limited					
5	Sasini Tea and Coffee					
6	Williamson Tea Kenya Limited					
7	Rea Vipingo Plantations Ltd					
8	Car and General Kenya					
9	Absa Bank Kenya Plc					
10	Stanbic Holdings					
11	Diamond Trust Bank Group					
12	Equity Group Holdings Limited					
13	HF Group Ltd					
14	I & M Holdings Limited					
15	KCB Group Ltd					
16	National Bank of Kenya					
17	NCBA Group PLC					
18	Standard Chartered Bank Ltd					
19	The Cooperative Bank of Kenya Ltd					
20	BK Group PLC					
21	Express Kenya Limited					
22	Sameer Africa PLC					
23	Kenya Airways					
24	Longhorn Publishers Ltd					
25	Nation Media Group					
26	WPP Scangroup Ltd					
27	Standard Group Limited					
28	TPS (EA) Serena Ltd					
29	Uchumi Supermarkets Ltd					
30	Deacons (EA) Plc					
31	Nairobi Ventures Ltd					
32	Athi River Mining Limited					
33	Bamburi Cement Limited					
34	Crown Paints Kenya PLC					
35	East African Cables Limited					
36	East Africa Portland Cement Company					
37	Kengen Ltd					
38	Kenya Power and Lighting Company					
39	Total Kenya Limited					
40	Umeme Ltd					
41	Britam Holdings Ltd					
42	CIC Insurance Group					

43	Liberty Kenya Holdings Limited					
44	Jubilee Holdings Limited					
45	Kenya Reinsurance Corporation					
46	Sanlam Kenya Plc					
47	Centum Investment Company					
48	Olympia Capital Holdings					
49	TransCentury Investments					
50	Home Afrika					
51	Kurwitu Ventures					
52	Nairobi Securities Exchange					
53	BOC Kenya Limited					
54	British American Tobacco Limited					
55	Carbacid Investments Limited					
56	East African Breweries					
57	Eveready East Africa					
58	Kenya Orchards Limited					
59	Mumias Sugar Company Limited					
60	Unga Group					
61	Flame Tree Group Holdings Ltd					
62	Safaricom					
63	StanlibFahari I-REIT					
64	New Gold Issuers Ltd					
65	Laptrust Imara-REIT					

Source: Nairobi Securities Exchange (2024)

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