This research study examines the impact of information technology on firm profitability and stock returns. Using a comprehensive dataset of firms across various industries, this research employs rigorous statistical analysis techniques to investigate the relationship between IT investments, firm profitability metrics, and stock returns. The study focuses at how IT investments affect financial performance measures including return on assets (ROA) and return on equity (ROE), with P-values of 0.34 and 0.12, respectively. Furthermore, the study investigates the influence of IT on stock returns, taking into account market capitalization, industry trends, and macroeconomic variables. This study's conclusions center on the beneficial association between IT investments and corporate profitability. The T-value for the IT investment has risen to 6.5. The analysis reveals that firms that strategically leverage IT investments tend to experience higher profitability metrics. Additionally, the research demonstrates the impact of IT on stock returns, highlighting the significance of IT as a driver of firm value and investor confidence. Moreover, this study delves into the mechanisms through which IT investments contribute to firm profitability and stock returns. It investigates the mediating role of factors such as process innovation, customer relationship management, and supply chain optimization, which facilitate the translation of IT investments into improved financial performance. The implications of this research are significant for both practitioners and policymakers. The findings provide valuable insights for firms seeking to enhance their profitability and create shareholder value through strategic IT investments. Additionally, policymakers can use these findings to formulate policies and initiatives that promote the adoption and effective utilization of IT in businesses across various sectors

Keywords: IT, firm profitability, stock returns, return on assets, return on equity

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THE INFLUENCE OF INFORMATION TECHNOLOGY (IT) ON FIRM PROFITABILITY AND STOCK RETURNS

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1. Introduction

In today's digital age, information technology (IT) has become an integral part of running a business and shaping how businesses function and compete. Because of the rapid pace of globalization, new technological advances are being made every day [1]. Rapid evolution leaves many business owners pondering whether or not to reevaluate and revise their methods. Information and communication technology (ICT) has opened up new opportunities for generating new jobs in the modern economy [2]. The link between IT innovation and organizational performance [3] is complex, with moderating factors including the innovativeness of entrepreneurs and the nature of the corporate environment. Opportunities and platforms for new ventures can be identified thanks to ICT innovations. Using information technology (IT) to develop new markets, lower transaction costs, and improve lines of communication with business partners and customers are all examples of novel approaches to problem solving.

Due to their smaller size and more volatile circumstances, SMEs in poor nations struggle to innovate new technologies [4]. In order to stay competitive, increase efficiency, and succeed in today's dynamic marketplaces, businesses increasingly rely on information technology. Technological innovation aimed at productivity gains is fueled by these changes. Despite extensive usage of ICT by enterprises across industries, several polls have shown that many organizations fail to advance through the business lifecycle stages. Kenya's many online government services have been consolidated and made easier to use through the e-Citizen web portal and customer service centers set up by the Kenyan government. According to the estimations provided by the Information and Communications Technology Authority, the information and communications technology (ICT) industry made a significant contribution to the gross domestic product (GDP) in 2012. This contribution amounted to a large amount. The primary aim of the national information and communications technology (ICT) strategy is to enhance the availability of ICT infrastructure in rural areas. To accomplish this purpose, the country's National Broadband plan has allocated a substantial budget of billions of dollars [5].

Despite the significant progress made in the field of information and communication technology, small and me-

dium-sized enterprises (SMEs) in developing countries continue to encounter significant obstacles. The challenges encompassed in this context consist of sluggish progress, a declining trajectory in technical advancements, and a notable rate of failure [6]. Based on the results of a study conducted by the Kenya Institute of Public Policy Research and Analysis (KIPPRA), it has been observed that small and medium-sized firms (SMEs) do not make significant contributions to the Gross Domestic Product (GDP) [7]. Small and medium-sized enterprises (SMEs), commonly referred to as SMEs, play a significant role in the manufacturing and employment sector, accounting for around 60 % of its overall contribution. A significant number of small and medium-sized enterprises (SMEs) in developing nations have a scarcity of financial resources, which hinders their ability to engage in innovative activities or take advantage of the opportunities presented by technical advancements [8].

Therefore, the study that is devoted on the development of profitability in businesses and the impact on their stock returns, based on the effect of information technology, are scientific relevance.

2. Literature review and problem statement

Previous studies have shown that SMEs are slower to integrate IT compared to large organizations [9]. Important challenges to ICT deployment in rural SMEs include inadequate top-level support, resistance to change, a lack in creative thinking, a lack of qualified workforce, and an increasing digital divide between developing and developed countries [10]. While most studies have looked at how environmental uncertainty impacts the performance of small and medium-sized firms (SMEs), a study by [11] indicated that environmental factors also influence how businesses approach innovation. How new IT developments effect SMEs in economically deprived areas is a topic of insufficiently studied consistency. This study tries to fill this information vacuum by analyzing the effect that IT innovation has on company performance in Kenya, a country with a high rate of business closures and a low rate of technical innovation.

Different technological systems are used for different purposes [12], such as transmission, storage, processing, displaying, creating, and automating the flow of information. What we have here is an example of what is meant by "information communication technology." Email, video conferencing, blogs, and social networking are all examples of tools and services linked with this tech. Television, landlines, cell phones, radio, satellite TV, video, computers, networking software, and hardware are all included. Technologists must apply insights from the humanities, the sciences, and the applied arts in novel ways if they are to increase an organization's production. Information and communication technology (ICT) help businesses increase their output and market share by facilitating the launch of novel products and services, enhanced customer attention, responsiveness to market changes, and ground-breaking innovation [13]. But if it is not deployed creatively and if organizational structures and work processes are not altered or enhanced, ICT will not help a company perform better or maintain a competitive advantage. To innovate in the information and communication technology (ICT) sector, as defined by the social, political, or ecological context, involves a wide range of activities. By introducing novel products, services, solutions, and methods of operation, innovation enhances the value chain and increases productivity. Entrepreneurial innovation was considered crucial to the development of the firm [14, 15]. It coined the term "disruptive innovation," which refers to the destructive creativity that arises when a company seeks to maximize profits by introducing ground-breaking new products or services that upend established markets and necessitate a reallocation of resources. According to Schumpeter, innovation includes creative thinking, the launch of new processes, products, or services, funds allocated to R&D, and technological advancements. When it comes to economic growth and competitive advantage, businesses aren't the only ones that benefit from innovation [16]. Entrepreneurs who think outside the box can increase their bottom line by introducing new ideas, processes, products, or services, or by enhancing the value of an existing one. Small and medium-sized enterprises (SMEs) are increasingly being recognized as an essential innovation engine. Standard criteria for identifying SMEs include total number of employees, total amount of capital invested, and total annual revenue. According to the European Commission, small and medium-sized enterprises (SMEs) are those with 10 to 49 employees and medium-sized enterprises (MEs) have 50 to 250 workers. The SMEs Act of 2012 in Kenya classifies SMEs according to their industry, number of employees, and total investment [17].

On top of that, the models treat people as inert social groups that are separate from the object itself, rather than highlighting how contexts and structures influence innovation [18]. The models also ignore the role that innovative entrepreneurs play in shaping how businesses engage with technological progress. The five-stage growth model and the product-process model of innovation serve as the primary theoretical frameworks used in this investigation. Using a framework that is useful for emerging and developing companies, [19] proposes a five-stage growth model. In the first stage, the company is up and running and working to build a clientele and deliver its services. Startup companies have grown in popularity in recent years due to their potential to hasten the development of cutting-edge technologies. The process of starting a firm from scratch can be difficult, time-consuming, and loaded with risk [20]. Competition based on novel concepts and technologies has led to the failure of about 25 % of startups in their first year of operation. These days, businesses don't only buy what they need; they also use cutting-edge technical innovation to augment and improve the products and services they provide. As a result, during the company's "firm existence" phase, innovation and entrepreneurialism can boost performance. The second phase, called "survival," is characterized by a functional business process, with primary considerations centred on how the company can sustain itself financially. That is to say, when comparing innovative SMEs to non-innovative SMEs, the latter exhibit more sustained growth and performance. There is an alarmingly high percentage of startup failure, therefore it's crucial that we focus on helping small and medium-sized enterprises (SMEs) thrive. Technology improvement can boost the survival rate [21]. In order to ensure their company's continued success and viability, entrepreneurs must encourage a culture of constant innovation. Thus, a wider range of businesses will benefit from the expansion of technical innovation's application if SMEs' chances of survival are increased. In the third phase, the company has achieved success and the owners must make

a decision: capitalize on the company's growth by expanding, or keep the company profitable by diversifying its revenue streams [22]. If environmental changes don't wipe out the company's niche market or bad management doesn't cripple its competitive powers, the company can remain in this stage eternally. The old adage "big eat small" is being superseded by the newer adage "fast beats slow" as a result of developments in corporate procedures. Successful businesses always find a way to go ahead of the competition. Businesses can expand their customer base and generate new revenue streams with the aid of technology. The success phase of business development has been hastened by the use of technology, particularly in the forms of social media, computerized record-keeping, and online advertising. Small and medium-sized enterprises (SMEs) today must concentrate their technical analysis skills on the issues connected to maximum efficiency and production. The fourth phase, growth or take-off, focuses on accelerating the company's development and finding funding to support that growth. During their expansion phase, SMEs must prioritize growth and development because it boosts earnings, fortifies the company against risk, and creates a self-sustaining cycle of successful business activity [23]. Small and medium-sized enterprises (SMEs) need to develop and implement plans for technology innovation, marketing, and cost management. Since the technology is maturing and being regularly updated at this point, the technology innovation strategy is very important for developing SMEs [24]. The fifth phase, resource maturity, occurs when a company has reached a point where its size, managerial skills, and financial resources all work to its favour. Mature SMEs' primary objective is stability, not growth, in terms of market share, technological superiority, employee composition, revenue, and other metrics of success. SME's ability to innovate technologically is correlated with their economic output and its potential for long-term growth. At the mature stage, a company's innovation performance is founded on its capability for technological innovation [25]. Entrepreneurial organizations that prioritize innovation tend to dominate their industries, whereas those that don't risk falling into the sixth stage of ossification, where they stop taking chances and stop making creative decisions. The owner's marketability, productivity, and inventiveness are crucial. In this framework, the spread of new technologies within an organization is just as important as their development through time. Technology is a key factor in new developments, and it reflects an ongoing pattern of enhancements to previously developed technologies [26]. Companies are encouraged to embrace technology to create new ideas and enhance performance by the five-stage growth model, which depicts a steep exponential development period followed by a final fall in economic returns. Starting with an entrepreneurial mindset, SMEs proceed through stages of team building and innovativeness, ultimately leading to firm performance, each of which presents its own unique difficulties, opportunities, resource needs, and management styles. Information and communication technologies facilitate the creation, integration, development, and improvement of essential resources throughout an organization's life cycle. According to [27] product-process model of innovation, the rate of product or process innovation depends on and should reflect the stage of company development reflected by the product. The idea aims to differentiate between process and product innovations in order to establish a connection between technological advancement and the three phases of a company's evolution. The model describes in detail the procedures involved in making and delivering the good or service. The processes, resources, and tools used to create, promote, distribute, and maintain a good or service. Companies in the manufacturing sector create real, material products that can be kept in stock until they are required. Companies that focus on providing services, in contrast, make immaterial goods that can't be made in advance. Most consumers do not interact directly with a manufacturer's activity. Customer input can be utilized to enhance product-process innovation in service industries, such as transportation and the hair and beauty industries, because clients are often present during the creation of the service. Since IT innovation opens the road for reaching strategic company objectives including operational excellence and the introduction of new products and services [28], both models work well with this research. In order to increase the value and competitiveness of their businesses, owner-managers should embrace the changes brought about by advances in information technology with an entrepreneurial mindset [29]. The models help bring the study's theoretical framework into focus. IT innovation, the innovativeness of business owners, the business environment, the structure of organizations, and the performance of businesses are all included.

All this allows to assert that it is expedient to conduct a study on evaluate the influence that information technology has on the profitability of businesses as well as the returns on the stocks of these firms. Specifically, the research may be look at how information technology affects both of these metrics.

3. The aim and objectives of the study

The aim of the study is to investigate the effect of the information technology on the Firm Profitability and Stock Returns.

To achieve this aim, the following objectives are accomplished:

– to investigate the effect IT on firm performance indicators;

– to study correlation analysis between IT investments and profitability metrics;

– to investigate regression analysis of IT investments and stock returns.

4. Materials and methods

4. 1. Object and hypothesis of the study

The object of research is effects of Information Technology (IT) on two distinct dimensions of a company's performance: profitability and stock returns. This research entails examining different IT strategies, technologies, and their relationship with financial results in order to gain a deeper understanding of how investments in IT might impact a company's financial performance and influence investor sentiment.

A positive correlation exists between the extent of Information Technology (IT) implementation, use, and efficiency within an organization and its profitability and stock returns. In essence, companies that successfully incorporate and use Information Technology are more likely to achieve elevated levels of profitability and superior stock

performance in comparison to companies with limited IT integration.

4. 2. Research modeling based on information technology

The IT Investments variable is the key focus of attention in these models [30]. The control variables Industry and Firm_Size are Industry and Firm Size, respectively. These variables are used to account for the effects on firm profitability and stock returns that are tied to the particulars of the industry and the size of the company, respectively. The (β1, β2, β3, γ1, γ2, γ3) give an estimation of the amount and importance of the relationships that exist between the variables that are considered independent and the variables that are considered dependent. These estimates are provided by the (β1, β2, β3, γ1, γ2, γ3). This model is going to be utilized for all upcoming as well as ongoing experiments.

Profitability of the Company (ROA):

$$ROA=\beta0+\beta1*IT\_Investments+\beta2*Industry+\\+\beta3*Firm\_Size+\varepsilon,$$

where ROA – return on assets (dependent variable);

IT_Investments – IT investments (independent variable);

Industry – categorical control variable representing the industry of the firm;

Firm_Size – categorical control variable representing the size of the firm;

β0, β1, β2, β3 – coefficients to be estimated;

ε – error term capturing unexplained variation;

$$Stock\_Returns=\gamma0+\gamma1*IT\_Investments+\\+\gamma2*Industry+\gamma3*Firm\_Size+\varepsilon',$$

where Stock_Returns – stock returns (dependent variable);

IT_Investments – IT investments (independent variable);

Industry – categorical control variable representing the industry of the firm;

Firm_Size – categorical control variable representing the size of the firm;

γ0, γ1, γ2, γ3 – coefficients to be estimated;

ε' – error term capturing unexplained variation.

4. 3. Research design

These statistical analysis techniques enable researchers to investigate the impact of IT on financial performance in a rigorous and quantitative manner. By utilizing these techniques, insights can be gained into the strength, significance, and direction of the relationship between IT investments and financial performance indicators as shown in Fig. 1.

Through the application of these methodologies, it is possible to obtain comprehension of the nature, relevance, and course of the connection that exists between IT investments and financial performance indicators.

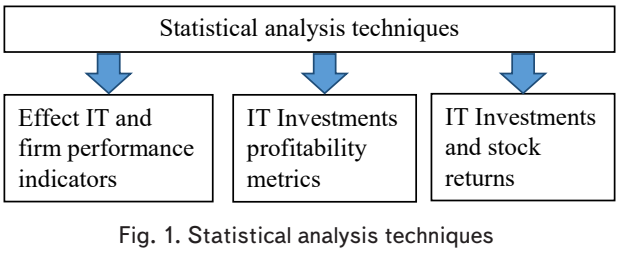

Fig. 1. Statistical analysis techniques

4. 4. Measurement of variables

To assess the variables in the study, the researcher made modifications to many variable constructions that were derived from previous investigations. This enabled the researcher to modify the variable constructions in order to better align them with the requirements of the present study. The study altered the variable structures to account for the specific characteristics of the technological environment, including its complexity, relative advantage, and compatibility. The driving forces behind technical innovation encompass investments in information technology (IT), returns on stock markets, and returns on assets (ROA). The research employed a diverse array of various To assess the variables of the study, the researcher made modifications to several variable constructions that were derived from previous studies.

4. 5. Statistical analysis techniques

Calculate the mean, standard deviation, and range of IT investments, profitability indicators (ROA and ROE), and stock returns for a sample of organizations using descriptive statistics. This offers a summary of the central tendencies as well as the variability in these variables.

Analyze the correlation by computing the correlation coefficients between IT investments and profitability indicators (ROA and ROE) as well as between IT investments and stock returns. Also, compute the correlation coefficients between IT investments and stock returns. This helps establish the strength of the relationships between these variables as well as the direction those relationships are headed in.

An examination of regression: it is possible to carry out an investigation using multiple linear regression, with IT investments serving as the independent variable and profitability measurements (ROA and ROE) serving as the dependent variables. Adjust for any other important criteria such as the business sector, the size of the company, and the current market circumstances. Determine the relevance of the coefficients and their size in order to comprehend the effect that IT investments have on a company's profitability.

5. Results of the impact of information technology (it) on firm profitability and stock returns

5. 1. Effect IT on firm performance indicators

The use of information technology has a considerable influence on the amount of money brought in. The total amount of money that an organization brings in as a direct result of its day-to-day activities is referred to as its revenue. The amount of money left over after paying all of the firm's bills is known as the net income, and it may be used to determine how profitable the company is. In addition to having an effect on, IT also has an affect on the company's gross profit, which is the profit that remains after the cost of goods sold (COGS) is reduced from revenue. Gross profit is defined as the profit that remains after revenue has been taken from COGS. Earnings Per Share, often known as EPS, is a financial statistic that indicates the amount of net income made in relation to the total number of outstanding shares of common stock. EPS may also be shortened as EPS.

The data shown in Fig. 2 is shown as a percentage. It is helpful in establishing how lucrative the firm is on a per-share basis by using the information provided by this factor. Return on Investment, abbreviated as ROI, is a statistic that compares the amount of gain or return produced by

an investment to the total amount of money that was spent on the investment. This comparison is used to determine how lucrative an investment is. It makes a contribution to the evaluation of the efficiency of the choices that are made regarding investments.

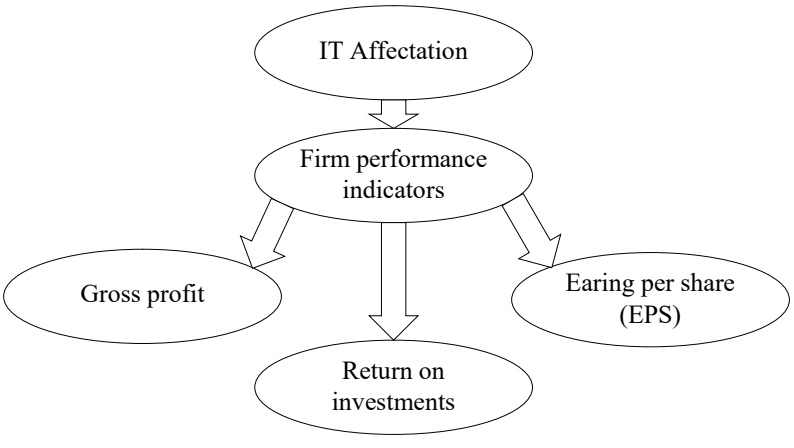

Fig. 2. Effect of IT on firm performance indicators

The firm's capacity to generate revenue, profitability, and efficiency, as well as its overall financial health, may all be gleaned from these financial performance metrics. They are essential for determining the firm's financial performance, which includes determining whether or not to make investments and determining the firm's level of competitiveness in the market.

5. 2. Correlation analysis between IT investments and profitability metrics

The correlation analysis between IT investments and profitability metrics (ROA and ROE):

CORREL=(IT:ROA, IT:ROE).

It would obtain the correlation coefficients for each metric after applying the CORREL; (IT:ROA, IT:ROE) function. According to the findings of the statistical analysis, the correlation coefficient for Metric ROA is 0.85, and the correlation coefficient for Metric ROE is 0.92 as shown in Table 1.

To interpret these findings, a correlation coefficient of 0.85 between IT investments and Profitability Metric ROE suggests a high positive link between the two variables. According to this, it appears that an increase in IT investments will likely result in an increase in the Profitability Metric ROA. A correlation coefficient of 0.92 suggests a high positive link between IT investments and Profitability Metric ROA. In a similar vein, the phrase "Profitability Metric ROA" It deduces that increased expenditures on information technology are correlated with increased levels of ROA for profitability metrics.

Table 1

Correlation Analysis between IT investments and profitability metrics

Items	IT Investments	Profitability Metrics	ROA (%)	ROE (%)
R square	0.34	0.54	0.334	0.33
Degree of freedom	3	5	5	8
Residual standard error	0.003	0.0112	0.093	0.12
P value	0.22	0.34	0.12	0.12
Adjusted R-squared	0.873	0.9837	0.873	–

On the basis of the p-value and the degree of freedom, an investigation into the association that exists between IT investments and profitability indicators (ROA and ROE) has been carried out. It is also calculated a number of other statistical parameters.

5. 3. Regression analysis of IT investments and stock returns

The standard deviation and T value have been used as the foundation for statistical analysis of the IT investment. The investigation yielded the following findings: the standard error is 0.012 and the T value is 6.5. The level of significance that was chosen for this investigation was 0.05, whereas the p-value for the coefficient was 0.001, which is an extremely significant reduction from that level as shown in the Table 2. As a consequence of this, it is possible to arrive at the conclusion that investments in information technology have a significant impact on the returns on stock investments.

Table 2

Regression analysis of IT investments and stock returns

Coefficients	Estimate	Std. Error	t-value	Pr(>|t|)
(Intercept)	0.125	0.345	0.362	0.732
IT Investments	0.078	0.012	6.500	0.001**
Residual standard error: 1.241 on 8 degrees of freedom. Multiple R-squared: 0.8415, Adjusted R-squared: 0.8192. F-statistic: 42.25 on 1 and 8 DF, p-value: 0.0013				

The coefficient for IT Investments is 0.078, which indicates that there is a projected increase in stock returns of 0.078 % for each additional million dollars invested in IT. This is indicated by the fact that the coefficient is positive. The significance level for this study was set at 0.05, while the p-value for the coefficient was 0.001, which is significantly lower than that. As a result, it is possible to draw the conclusion that investments in information technology have an important bearing on stock returns. The multiple R-squared value of 0.8415 implies that about 84.15 % of the volatility in stock returns can be explained by IT investments. This is indicated by the fact that the value of the multiple R-squared is 0.8415. The F-statistic is a test that determines whether the regression model as a whole is statistically significant. It returns a p-value of 0.0013, which indicates that the model as a whole is statistically significant.

6. Discussion of the impact of information technology (IT) on firm profitability and stock returns

As can be seen in Fig. 2, research on the impact that information technology has on key performance indicators of businesses has focused on three primary aspects. As can be seen in Table 1, a correlation study between IT investments and profitability indicators was researched, and ROA and ROE were analyzed appropriately. As shown in Table 2, an inquiry into a regression analysis of IT investments and stock returns has been carried out. The T-value has been used as the primary indicator, and it has been set at a value of 6.5.

The data were evaluated in line with the model that was presented, and a statistical approach was applied in order to

evaluate the potential link that exists between investments in information technology and returns on stock investments. The model that was proposed was used to interpret the data. The factors have been analyzed, and the results suggest that there is a connection between them.

The study's limitations arise from the use of certain components, including dependent and independent variables, where IT investment is the primary independent variable, inside a defined framework and on a particular date. Company size has been regarded as an independent variable. The research has considered industry as a dependent variable.

Regarding the investigation at present, it's possible that certain disadvantages will be found. The investigation is suitable for the application of the current model, with the exception of their use of IT investment. There are three categories of variables that need additional statistical investigation.

It is possible to develop a new mathematical model in order to arrive at a more satisfactory result. In addition, new dependent variables can be proposed with the purpose of making the study more inclusive. The most difficult obstacle that may be encountered is the process of installing the analyzing software.

7. Conclusions

1. The earnings per share, the gross profit, and the return on investment were the three primary metrics utilized in the analysis of how information technology (IT) influences business performance indicators.

2. The correlation analysis between IT investments and profitability metrics has been conducted using a statistical model. It shows the maximum profitability metrics reach 0.9.

3. The investigation of the regression analysis of IT investments and stock returns. T-value was used as the primary inductor for the analysis and reach 6.5.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, copyright or other, which could affect the research and its results presented in this paper.

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Data availability

Data cannot be made available for reasons disclosed in the data availability statement.

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