



The Impact of Digital Transformation on Firms' Financial Performance **(An Empirical study on Egyptian stock listed Firms)**

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**The Impact of Digital Transformation on Firms' Financial Performance
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Abstract:

Purpose – Digital transformation (DT) is a strategic, long-term organizational initiative aimed at enhancing competitiveness and adaptability through the integration of digital technologies. This study aims to examine the impact of DT on firm performance from a financial perspective, using Return on Assets (ROA) as a key indicator.

Methodology – This paper constructs a Digital Transformation Index based on keyword frequency and disclosure analysis in annual reports and websites. The study analyzes a sample of 40 non-financial companies listed on the Egyptian Exchange (EGX 100) from 2020 to 2024. A pooled simple linear regression model was employed to test the relationship between digital maturity (measured by digital score per year) and financial performance (ROA). Introducing a new scaled index as a proxy for measuring digital transformation.

Findings – The results indicate that DT has a statistically significant positive effect on ROA, suggesting that firms with higher levels of digital engagement tend to achieve slightly better financial outcomes. However, the effect size is modest, with DT explaining only a small portion of profitability variation, reflecting the complex nature of firm performance. The study emphasizes that while digital efforts contribute positively, their full financial benefits likely depend on integration with broader strategic and operational capabilities.

Originality/value – This paper offers a novel approach to measuring DT by combining qualitative disclosure analysis with quantitative scoring. It contributes to the limited empirical literature on digital transformation in emerging markets especially in Egypt and provides practical insights for managers and policymakers seeking to link digital initiatives with measurable financial gains.

Contribution- Introducing a new scaled index as a proxy for measuring digital transformation.

Keywords – Digital transformation, Return on Assets, Financial performance, Disclosure analysis, Emerging markets

1. Introduction

The spread of COVID-19, coupled with supportive government policies, has further embedded digital technologies (DTs) into the real economy. To enhance resource allocation efficiency and create a novel competitive edge for businesses.

Definition of Digital Transformation: Digital transformation refers to the comprehensive integration of digital technologies, processes, and strategies within an organization to fundamentally alter its operations, culture, and value delivery in response to the rapidly evolving business environment. It involves leveraging digital tools to reshape how businesses operate, innovate, and create value, ultimately enabling organizations to adapt, remain competitive, and capitalize on the opportunities presented by the digital age. This transformation is not a one-time event, but an ongoing process that requires continual adaptation and the re-engineering of business models, processes, and organizational capabilities.

Digital technology forms the backbone of digital transformation (DT). A strong positive correlation exists between the adoption of DTs and business performance (Shen, et al,2021). The role of DT in optimizing internal business processes has attracted considerable attention. The rapid advancement of DTs has impacted all types of organizations. These technologies not only promote operational efficiency but also drive innovation in products, services, and business models. By adopting DTs, businesses can enhance their competitiveness and unlock new opportunities for growth. To achieve this, organizations must use digital capabilities, enabling managers to analyze digital ecosystems, spotting on opportunities, and optimize resource allocation to improve performance.

DT not only transforms operational processes but also redefines business models, supply chains, and customer interaction strategies, significantly impacting firm performance. (Verhoef, 2021). notes that companies successfully implementing DT achieve notable improvements in productivity, cost efficiency, and customer satisfaction. However, despite its potential, DT adoption remains uneven, with only 9% of companies worldwide having fully embraced digital transformation (Verhoef, 2021).

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As businesses endeavor to remain competitive in this dynamic landscape, the finance department—a key organizational pillar—faces growing pressure to adapt. Traditionally, financial management has focused on fundamental roles like accounting and oversight, prioritizing accurate record-keeping and regulatory compliance. However, such conventional practices are often labor-intensive, intricate, and insufficient to meet modern business demands. The rigidity of these systems impedes efficiency, creating barriers for organizations seeking to align with digital transformation trends reshaping industries worldwide. Consequently, financial management must evolve beyond its traditional boundaries and adopt innovative digital strategies (Kane, G.C., 2015; Kraus, S., 2022; Zoppelletto, A., 2024).

Financial digitization represents a transformative change in how organizations collect, process, and utilize business data. Through advanced digital technologies, companies can achieve greater transparency, reduce costs, and streamline operations. This approach not only improves the efficiency of financial processes but also fosters value creation by aligning financial management with broader organizational strategies.

For instance, financial digitization enables the establishment of data driven management systems, shifting businesses from merely measuring value to actively creating it. This transition empowers organizations to realize the full potential of their financial functions, ultimately driving sustainable growth and innovation (Chen, Y., 2024; Peng, Y., 2022; Zhang, Y., 2024).

Industry reports on the connection between digital transformation and organizational performance, such as those by Some organizations have highlighted these dynamics.

Recognizing the significance of financial digital transformation, policymakers and industry leaders emphasize its role as a foundation for broader digitalization efforts. National initiatives, such as the Fourteenth Five-Year Plan for Accounting Reform and Development and the Accounting Informatization Development Plan (2021–2025), stress the need for accountants and financial managers to adopt advanced digital technologies. These initiatives advocate for integrating accounting functions with macroeconomic management, corporate strategy, and operational processes, aligning financial practices with the evolving requirements of the digital era (Ancillai, C., 2024).

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The terms “digitization” and “digitalization” are frequently used interchangeably. According to the Oxford Learner’s Dictionaries, digitization is the process of converting data into a digital format that computers can easily read and process. Conversely, digitalization refers to broader transformations that create significant opportunities for businesses and society. It adopts new business models, enhances customer experiences, designs operational processes, and improves cross-sector collaboration. Furthermore, digitalization helps reduce costs and human errors, giving businesses a competitive advantage.

1.1 Research Problem

The rapid adoption of digital transformation offers significant potential for enhancing operational processes, creating value, and reshaping business models. Despite its recognition as a key driver of organizational competitiveness and success, the precise impact of digital transformation on financial performance remains unclear. While prior research highlights positive effects of digital transformation on organizational performance, there is limited empirical evidence regarding its influence on crucial financial metrics such as Return on Assets (ROA), Return on Equity (ROE), and Tobin’s Q. This gap in understanding raises critical questions about whether firms can effectively capture the anticipated financial benefits from digital initiatives.

Further complicating this issue are the short-term financial challenges that many firms face during the digital transformation process, which warrant deeper empirical exploration. While academic literature often presents an optimistic view of digital transformation’s potential benefits, industry reports suggest a significant gap between these expectations and actual outcomes. Many firms struggle to achieve the desired financial returns, with obstacles arising from the complexities of integrating digital technologies into their operations with high costs limiting its short term gains. This issue is particularly pronounced in emerging economies like Egypt, where rapid adoption of digital technologies occurs alongside limitations in existing accounting frameworks, making it difficult to accurately measure the financial impact.

Thus, the need for a more comprehensive and nuanced understanding of how digital transformation influences financial performance is urgent specially in

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emerging markets like Egypt . In addition to setting a clear measure for digital transformation in firms .

1.2.Research Questions

- 1- How can the impact of digital transformation on key financial indicators of organizations be measured?
- 2- What are the different views on the impact of digital transformation on the financial performance of firms?
- 3- How can digital transformation be measured?

1.3. Research Objectives

- 1- Analyze the Impact of Digital transformation on key aspects of companies' financial performance like Profitability
- 2-Setting a digital score index with scale as a proxy.

1.4 Importance of the Research

- 1) Understanding Digital Transformation helping businesses recognize the potential benefits and challenges associated with such initiatives.
- 2) Contribution to Literature: It fills a gap in existing literature by linking digital transformation directly to financial performance using a dataset in Egypt, enhancing knowledge in accounting practice.
- 3) Introducing a new scaled index as a proxy for measuring digital transformation.

1.5 Research Limitations

- 1-The scope of the research is limited to measuring the financial performance only through measuring the perspective of profitability (the dependent variable)
- 2- Limited time range for the sample from 2020 till 2024.
- 3- Limited Data Availability

The lack of granular and standardized data on digital transformation efforts, particularly in financial performance metrics like return on assets (ROA) or return on equity (ROE), may limit the accuracy of the findings.

2. Literature review

The relationship between corporate digitalization and firm value has gained increasing attention to studies, particularly as firms navigate rapid technological advancements. Digital transformation is no longer merely a tool for operational efficiency , it has become a strategic imperative influencing financial performance, market valuation, and long-term sustainability. This literature review synthesizes recent empirical studies to explore the multidimensional impact of digitalization on firm value .The impact of digital transformation on financial performance is not well investigated by literature especially in Egypt .

(Hajli et al. 2015) study explored whether the IT productivity paradox still holds in the 21st century in light of modern technological advancements and economic shifts, the authors adopted a data-driven, empirical approach that combines macroeconomic analysis with insights from firm-level performance indicators. The study draws on publicly available national-level data, including GDP growth, labor productivity, and IT investment figures tracking trends over time and examining correlations between IT investment and productivity outcomes. The study revealed that Financial digital transformation is based on the financial sharing service model to help companies effectively obtain internal and external information, alleviate information asymmetry, and guarantee the effectiveness of companies in managing and controlling financial information.

(Nwankpa and Roumani 2016) study employs a quantitative research design to examine the relationship between IT capability, digital transformation, and firm performance. Grounded in the resource-based view (RBV) of the firm, the authors propose that IT capability serves as a strategic asset that influences performance outcomes, with digital transformation acting as a mediating mechanism. Empirical data were collected through a structured survey administered to Chief Information Officers (CIOs) and senior IT executives across a diverse sample of U.S.-based firms. The survey instrument was designed to capture perceptions of IT capability, the extent of digital transformation initiatives, and various dimensions of firm performance, including innovation and operational efficiency. IT Capability was operationalized through indicators such as IT infrastructure flexibility, IT human resources, and IT relationship management. Digital Transformation was measured by the degree to which firms

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had adopted digital technologies to reconfigure business processes, enhance customer engagement, and drive innovation. The authors employed structural equation modeling (SEM) to test the hypothesized relationships among the constructs.

(Abbasi and Weigand 2017) study adopts a systematic literature review approach to investigate the relationship between digital financial services (DFS) and firm performance. The authors aim to synthesize existing research findings. The review focuses on scholarly articles published within the last decade. A total of 39 peer-reviewed journal articles the inclusion criteria emphasized empirical studies that explicitly examined the impact of DFS on financial metrics such as profitability, market share, and operational efficiency. The authors classified the studies according to their methodological orientation (e.g., quantitative, qualitative, mixed methods), industry focus (e.g., banking, telecom, fintech), and geographic context .The review employed a thematic synthesis to identify recurring patterns and conceptual frameworks used in the literature. The review acknowledges a concentration of studies within the banking sector, with limited attention to non-bank entities .

(Bughin and Zeebroeck 2017). employs a mixed-methods approach that integrates large-scale survey data with strategic case analysis to identify patterns of successful digital adaptation. The authors base their findings on a proprietary dataset derived from McKinsey's global executive survey, encompassing responses from over 2,000 senior leaders across diverse industries and geographies. This dataset captures firms' strategic orientations, digital maturity levels, and performance outcomes, allowing for comparative analysis across sectors and organizational types. Quantitative analysis is used to correlate the archetypes with key performance indicators, including revenue growth, innovation output, and market share dynamics. This study contributes significantly to the digital strategy literature by empirically validating the link between proactive digital investment and superior performance outcomes. It underscores the importance of strategic intentionality and organizational readiness in responding to digital disruption, offering a framework that subsequent research can build upon or refine.

(Weill and Woerner, 2018) study explores how companies can prepare for a digital future by offering a practical framework that helps leaders assess their organization's digital readiness. Based on extensive surveys and executive interviews, the study identifies four distinct transformation pathways, showing how firms evolve, especially from the banking sector to illustrate how strategic choices around customer experience and operational efficiency shape digital success.

(Wang et al. 2020) investigated how digital transformation strategy (DTS) influences organizational performance, with a particular focus on the moderating role of cognitive conflict within top management teams. Using a large sample of Chinese enterprises, the authors conduct an empirical study grounded in multiple linear regression analysis to test their hypotheses. The methodology combines survey data with statistical modeling to explore both short and long term financial outcomes. The study reveals that moderate levels of cognitive conflict can enhance the positive impact of DTS on short-term performance, while excessive conflict may hinder long-term gains.

(Chen et al. 2021) conducted an empirical study using panel data from Chinese share listed firms between 2011 and 2019 to investigate whether digital transformation improves the capital market's information environment. They constructed a digital transformation index based on firms' annual disclosures and applied multiple regression models to examine its impact on analysts' forecasting behavior specifically forecast accuracy, dispersion, and timeliness. Their findings reveal that digital transformation significantly enhances forecast accuracy and reduces dispersion, indicating more consistent and reliable information for analysts.

(Guo and Xu, 2021) have examined the benefits and costs of digital transformation and have found a positive correlation between the intensity of digital transformation and the process-based operating performance and profit-oriented financial performance. The study found that a company's level of digitalization had a positive link with process-based business success and a U-shaped relationship with profit-oriented financial performance after analyzing panel data from 2254 manufacturing enterprises in China from 2010 to 2020.

(Verhoef et al. 2021) presents a multidisciplinary reflection on digital transformation, conducting empirical analysis, adopting a conceptual and integrative methodology, drawing from diverse academic disciplines including marketing, information systems, strategy, and operations. The study critically reviewed prior studies to propose a unified framework that distinguishes between digitization, digitalization, and digital transformation. The paper outlines future research directions across multiple levels of analysis (individual, organizational, and societal).

(Wu et al. 2021) analyze data from Chinese-listed firms (2007–2018) to investigate how digital transformation affects a company's performance in the capital market, with a particular focus on stock liquidity. The study finds that companies embracing digital technologies tend to enjoy more liquid stocks. This is largely because digital transformation improves transparency and operational efficiency, which helps reduce information asymmetry and builds investor trust. As firms become more digitally mature, they communicate better with stakeholders and provide more timely, accurate financial information making them more attractive to investors and encouraging more active trading. The study offers compelling evidence that digital innovation isn't just about internal efficiency it also plays a crucial role in shaping how companies are perceived and valued in the financial markets.

(Jardak and Ben Hamad 2022) investigated the relationship between digital maturity and financial performance using data from 23 firms listed on Sweden's stock exchange between 2015 and 2018. The results showed that digital maturity negatively impacts return on assets (ROA) and return on equity (ROE) in the short term. However, it positively affects Tobin's Q, a measure of firm performance and market value, in the long term. This indicates that while digital transformation may pose initial financial challenges, it leads to enhanced performance and increased market value over time.

Chen and Srinivasan (2024) expand this discussion by examining a diverse sample of firms undergoing digital transformation. The findings confirm a statistically significant correlation between digital investments and both short-term financial performance and long-term market valuation. Importantly, the study distinguishes between digital strategy alignment and execution effectiveness, suggesting that merely investing in digital tools is insufficient without coherent implementation across functional units.

Chen and Zhang (2024) robust panel data that links digital transformation to key financial indicators such as return on assets (ROA), net profit margins, and earnings volatility. Their results suggest that firms with higher degrees of digital integration tend to outperform peers in terms of financial stability and scalability, especially in tech-intensive sectors.

(Xu et al. 2024) explored the relationship between digital transformation and corporate investment efficiency in Chinese-listed companies (2007–2019). Their findings revealed that inefficient investment hinders digital transformation, with financial constraints exacerbating this negative effect. This challenge is especially pronounced for firms facing high financial pressure .

One of the critical findings from Liu et al,(2024) study is the role of mediating mechanisms specifically, information symmetry and operational cost reduction, analyzing data from Chinese share listed companies,. Digital transformation fosters transparency within firms by enhancing the flow of information, thereby reducing asymmetry between stakeholders. This improvement enables more accurate decision-making, which in turn drives profitability. Similarly, digital transformation reduces operational costs by streamlining business processes and integrating advanced technologies such as automation and data analytics. By addressing inefficiencies, firms can allocate resources more effectively, resulting in higher financial returns , the study finds that digital transformation significantly boosts financial performance and that this improvement is sustainable over time.

Santosa and Salma (2024) establish a foundational perspective by analyzing how digital adoption contributes to firm valuation. Their study highlights that digitalization improves organizational responsiveness and enhances information flow, which in turn positively influences investor perceptions and firm market value. The study also points out intangible benefits, such as improved brand reputation and customer engagement, as indirect value drivers.

Using a robust dataset of Shanghai and Shenzhen A-share-listed companies from 2010 to 2021, (Zhao et al.2024) employ keyword frequency analysis from annual reports to quantify DT intensity, then applies regression models to test the relationship between DT and firm performance, controlling for firm size, ownership type, and production factor intensity. The results found that DT

significantly enhances firm performance, small and medium-sized enterprises (SMEs) benefit more visibly from DT than larger firms and also found that state-owned enterprises (SOEs) experience stronger performance gains from DT compared to non-SOEs.

(Bughin and N. van Zeebroeck, 2025) explore how strategic renewal and organizational change influence incumbent firms' decisions to reinvest in digital technologies. Rather than relying solely on quantitative data, the authors adopt a conceptual and reflective methodology, drawing on prior empirical studies, industry observations, and strategic theory to build their argument. The analysis focuses on the interplay between internal organizational dynamics such as leadership mindset, structural flexibility, and legacy systems and external pressures like market disruption and technological evolution. The study highlights that successful digital reinvestment is often shaped by a firm's ability to align strategic intent with adaptive organizational capabilities.

(Zhang ,et al. 2025) adopt a mixed-method approach to investigate how digitalization contributes to firm value in China's manufacturing sector. Using grounded theory, they identify five key dimensions of digital transformation service, environmental, middleware, marketing, and R&D and then apply Qualitative Comparative Analysis (QCA) to examine how different combinations of these dimensions influence performance outcomes. The findings reveal that firms embracing a comprehensive digital strategy across all five areas are significantly more likely to achieve high value creation, with the "comprehensive empowerment" model showing the strongest consistency. In contrast, companies that neglect service, marketing, or R&D digitalization tend to fall into low-value categories, suggesting that partial digital efforts may hinder performance. The study highlights the strategic importance of integrated digital initiatives and offers a nuanced framework for understanding how digitalization drives value in complex industrial environments.

2.1 Research Gap

While digital transformation is widely recognized as a critical driver of organizational competitiveness, its precise impact on financial performance remains underexplored. Existing research primarily focuses on its positive effects on overall organizational performance but offers limited empirical evidence regarding its influence on key financial metrics such as Return on Assets (ROA) specially in Egypt. This lack of clarity raises important questions about whether firms can effectively realize the anticipated financial benefits of digital initiatives.

Moreover, the short-term financial challenges associated with digital transformation are often overlooked in academic literature, despite their significance for businesses undergoing these transitions. While theoretical studies present an optimistic outlook on digital transformation's potential, industry reports reveal a notable gap between expectations and actual financial outcomes. Many firms struggle to achieve desired financial returns due to the complexities of integrating digital technologies, which can disrupt operations and strain resources. This challenge is especially pronounced in emerging economies, such as China, where rapid digital adoption coincides with limitations in existing accounting frameworks, making it difficult to measure financial impacts accurately.

Given these gaps, there is an urgent need for comprehensive empirical research to better understand how digital transformation affects financial performance, addressing both the short-term challenges and long-term implications especially in Egypt. Such research also consider regional and economic contexts to provide a nuanced perspective on the financial outcomes of digital transformation initiatives. Most studies used words in an index to analyze the content of firms' reports to measure the level of digital transformation ,but the wide variety of the range of the number of words could cause confusion while analyzing the results. So, there is no clear proxy to measure digital transformation.

3. Research Methodology

3.1 Research Model

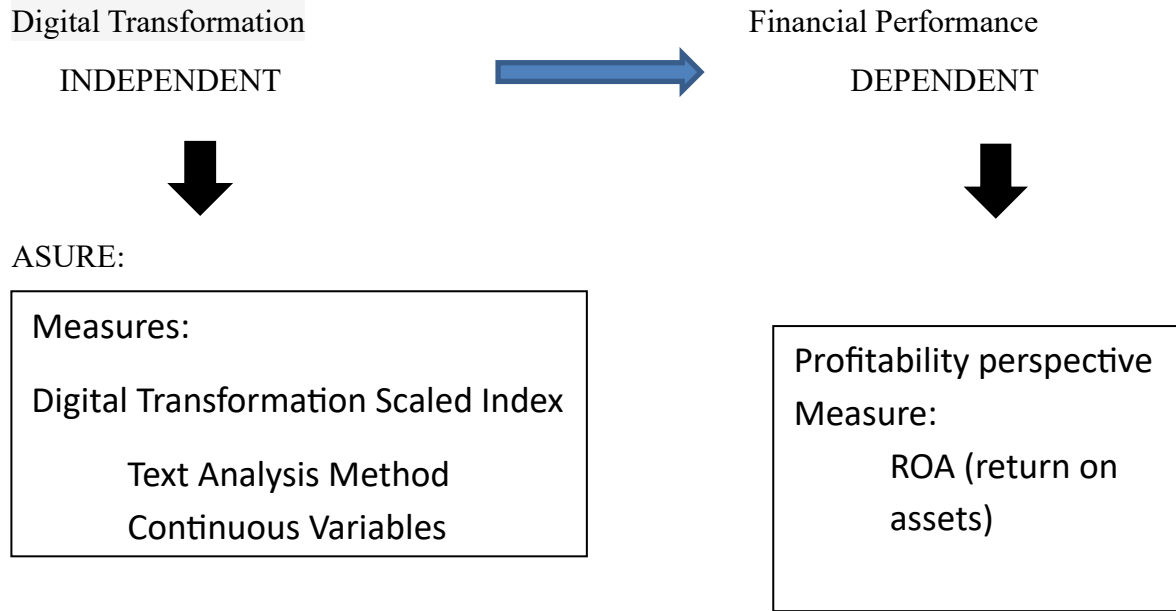


Figure (1) Research model

3.2 Data and Sample Selection

This research utilizes a quantitative approach by conducting empirical analysis on a sample of companies listed on the Egyptian Exchange (EGX 100). Specifically, the study focuses on the EGX 100 index, which represents the top-performing and most liquid companies in Egypt. To maintain sectoral consistency and eliminate biases associated with industry-specific financial structures, the sample excludes banks, insurance companies, and other financial institutions. These sectors operate under different regulatory frameworks and typically follow distinct accounting practices, particularly in relation to digital infrastructure investments and reporting, which could distort the comparability of results.

After applying the exclusion criteria, a final sample of 40 companies was selected from the EGX 100. The selection was based on:

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- Availability of annual reports and financial statements for the period 2020 to 2024.
 - Accessibility of company websites and investor relations content where digital transformation efforts could be traced and evaluated.

Data collection involved manual extraction and content analysis from the publicly available annual reports, board of directors' reports, and corporate websites of each firm. The data collection process spanned both quantitative financial data (e.g., net income, total assets) and qualitative textual content (e.g., references to digital transformation initiatives).

- Financial performance data (i.e., Net Income and Total Assets) were extracted from audited financial statements published on the companies' official websites and the Egyptian Financial Regulatory Authority's public disclosures.
- Digital transformation indicators were measured using a custom-built Digital Score Index, which was developed through textual analysis of annual reports and corporate disclosures, capturing the frequency and context of relevant digital transformation keywords

The sample size of 40 firms across a 5-year span (2020–2024) provides 200 firm-year observations both the early and post-pandemic shifts in digital investment behavior among Egyptian firms.

This selection strategy ensures the study captures a representative cross-section of non-financial sectors in the Egyptian economy while maintaining a manageable and analytically sound dataset.

3.3 Research Hypothesis

Digital Transformation has a significant positive effect on financial performance.

3.4 Variables

As many previous studies used linear regression model with panel data to analyze similar variables, this study as well employs a linear regression model to examine the effect of digital transformation on corporate financial performance. The variables are categorized as follows:

3.4.1 Independent Variable: Digital Transformation

To quantify the level of digital transformation in each company, a Digital Transformation Index (DTI) was constructed, resulting in a variable labeled Digital Score Per Year. This score serves as a proxy for the company's digital maturity and integration of digital technologies. Chen et al. (2021) and Yuan (2023) used word lists or textual analysis to measure digitalization but the contribution of this research added a scaled range to the index of the number of words in order to smooth the data range for statistical analysis.

Keyword Frequency Component

The index was created by performing a manual content analysis of each company's annual reports and official website. A list of 11 keywords was selected based on common digital transformation terminology found in academic literature and industry reports:

Digital, Digital Transformation, Digitization, Information Technology (IT), Artificial Intelligence, Cloud (Computing/Infrastructure), Automation, Cybersecurity, Big Data, Blockchain, and Robots.

To address the variation in how frequently digital transformation was referenced across firms, we created a Digital Score Per Year as a standardized measure of digital maturity. Instead of using raw keyword counts, which varied widely, the total number of digital related keywords found in each company's annual reports and website was categorized using a 0–5 scale:

- 0 = 0 mentions
- 1 = 1–50 mentions
- 2 = 51–100 mentions
- 3 = 101–150 mentions
- 4 = 151–200 mentions
- 5 = more than 200 mentions.

This method ensured greater consistency and comparability across observations, while minimizing the influence of outliers and extreme values.

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In addition to keyword frequency, qualitative emphasis on digital strategy in the company's report was also assessed. Companies were awarded extra points depending on whether digital transformation was explicitly addressed in a dedicated section or slide:

- 0 = No mention or dedicated section
- 2 = One paragraph
- 4 = One slide
- 5 = More than one slide

While both components were initially tracked, the final aggregated digital score (0–5 scale) was used as the independent variable in the regression model.

3.4.2. Dependent Variable: Firm Financial Performance

As stated in the Research Limitations that the scope of the research is limited to measuring the financial performance only through measuring the perspective of profitability (the dependent variable) with the Return on Assets (ROA) ratio, which is widely recognized as a key indicator of how efficiently a company is using its assets to generate earnings.

ROA was calculated using the following formula: (According to Giannopoulos et al. (2022):

Return on Assets = Net Income / Total Assets

Both components (Net Income and Total Assets) were extracted from each firm's audited financial statements for each year from 2020 to 2024. ROA values were calculated annually for each firm and used as the response variable in the linear regression analysis.

This approach provides a comparable, continuous metric that reflects firm-level profitability over time, making it suitable for evaluating the financial implications of digital transformation initiatives.

3.5 Model

As many previous studies used linear regression model with panel data to analyze similar variables, this study as well employs a linear regression model to examine the effect of digital transformation on corporate financial performance (with limited scope of measuring profitability only).

This study employs a simple linear regression model to examine the impact of digital transformation—measured through a custom-built digital score on firm-level financial performance, specifically Return on Assets (ROA). The goal is to determine whether a statistically significant relationship exists between the extent of digital engagement and profitability among publicly listed Egyptian companies.

3.5.1 Model Specification

The regression model is specified as follows:

$ROA_{it} = \beta_0 + \beta_1(DigitalScore_{it}) + \epsilon_{it}$ Where:

- ROA_{it} = Return on Assets for firm i in year t
- $DigitalScore_{it}$ = Digital Transformation Score for firm i in year t
- β_0 = Intercept (constant term)
- β_1 = Coefficient representing the impact of the digital score on ROA
- ϵ_{it} = Error term capturing the residual variance not explained by the model

3.5.2 Justification for the Model

The use of a simple linear regression is justified for the following reasons:

1) Focus on Direct Impact: The primary objective of this study is to investigate the direct effect of digital transformation on financial performance, specifically ROA. A simple linear model isolates this relationship, making interpretation straightforward and focused.

2) Quantitative Nature of Variables: Both the dependent (ROA) and independent (Digital Score) variables are continuous and numerical, which meets the assumptions of linear regression.

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3) This simple model offers clarity and avoids overfitting with too many control variables. It serves as a foundation for future multivariate or panel-based studies.

4) Timeframe and Sample Structure: The data spans four years (2020–2024) across 40 firms, providing 200 firm-year observations. This panel structure allows each observation to represent a firm’s performance and digital score in a given year, ensuring variation in both dimensions.

3.5.3 Analysis Tool

The regression analysis was conducted using SPSS software, which provided outputs for:

- Model Fit (R , R^2 , Adjusted R^2)
- ANOVA F-test for model significance
- Coefficient estimates (B-values), t-statistics, and p-values

All significance levels were evaluated at the 5% confidence threshold

($\alpha = 0.05$)

5. DATA ANALYSIS

This section presents and interprets the results of the linear regression analysis conducted to examine the effect of digital transformation on financial performance, specifically Return on Assets (ROA), using data collected from 40 non-financial EGX-listed firms over the period 2020–2024. The regression was carried out using SPSS, with Digital Score Per Year as the independent variable and ROA as the dependent variable.

Table 1: Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Digital Score Per Year	None	Enter

This confirms that only one predictor—Digital Score Per Year—was entered into the model, aligning with the study’s use of a simple linear regression framework

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Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.159	0.025	0.019	8.3438531720000001

Interpretation:

- $R = 0.159$: There is a weak positive linear correlation between digital transformation and ROA. Although the relationship is in the expected direction (positive), it is relatively weak.
- $R^2 = 0.025$: Only 2.5% of the variability in ROA across the sample can be explained by the Digital Score Per Year. While this seems low, it is not unusual in social science and business research, especially when modeling complex outcomes like profitability with a single independent variable.
- Adjusted $R^2 = 0.019$: This adjusts R^2 to account for the number of predictors in the model. It remains low, reaffirming that the model explains a small portion of the variance.
- Standard Error of the Estimate = 8.34: This shows the average distance that the observed values fall from the regression line.

A high value may be attributed to differences in industry characteristics or firm-specific financial structures.

Table 3: ANOVA (Analysis of Variance)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	284.865	1	284.865	4.092	0.045
Residual	10999.942	158	69.620		
Total	11284.806	159			

Interpretation:

The ANOVA table tests whether the overall regression model is a good fit for the data.

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F-statistic = 4.092, p-value (Sig.) = 0.045: The model is statistically significant at the 5% level ($\alpha = 0.05$). This means that

- the model as a whole provides enough evidence to conclude that the Digital Score has a statistically significant effect on ROA.
- The hypothesis in ANOVA is that the model has no explanatory power (i.e., all regression coefficients are zero). Since $p < 0.05$, we accept the hypothesis.

Table 4: Coefficients

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	5.018	0.804	—	6.241	0.000
Digital Score Per Year	1.473	0.728	0.159	2.023	0.045

Interpretation:

- Constant (Intercept) = 5.018: If a company scores 0 in digital transformation, the model predicts an average ROA of 5.018%.
- Unstandardized Coefficient (B) for Digital Score = 1.473: For each one-unit increase in the Digital Score (on a 0–5 scale), the ROA increases by 1.473 percentage points, holding all else constant.
- Standardized Beta = 0.159: This tells us that a one standard deviation increase in the digital score leads to a 0.159 standard deviation increase in ROA. Again, this reflects a weak but positive relationship.
- $t = 2.023$, $p = 0.045$: The relationship is statistically significant at the 5% level. The result supports the hypothesis : Digital transformation has a significant positive effect on financial performance.

Overall Interpretation and Discussion

The results indicate a statistically significant but economically modest relationship between digital transformation (as measured by the Digital Score Per Year) and ROA. Companies with higher levels of digital engagement—indicated by frequent mentions of digital related keywords and the presence of dedicated digital strategy sections—tend to achieve slightly higher profitability.

This finding is consistent with prior literature that associates digital investments with improved operational efficiency, better resource utilization, and ultimately stronger financial outcomes. However, the low R^2 value (2.5%) suggests that digital transformation alone does not explain the majority of variation in ROA. Other firm-specific variables, such as capital structure, leadership quality, industry competitiveness, and macroeconomic conditions, likely play significant roles.

The positive direction and statistical significance of the coefficient nonetheless provide empirical support for the strategic importance of digital transformation. Even modest improvements in ROA, when scaled across firms and years, can represent meaningful gains— especially in emerging markets where digital maturity is still evolving.

Digital transformation often requires significant upfront investments, and its benefits may only materialize in the long term. This creates difficulties in assessing the immediate financial impact or capturing the full range of performance improvements.

5- Recommendations:

- Firms should link digital transformation to financial goals like profit and cost savings.
- Train employees to use digital tools effectively.
- Sector-specific digitalization strategies
- Improve the role of organizational culture in tech adoption
- Longitudinal studies to assess sustainability of digital gains over time.
- Start with small , measurable digital projects then expand.
- Use data analytics to monitor and adjust digital strategies .
- Choose industry specific digital solutions for better results.

6. Conclusion

This study confirms that digital transformation is no longer an option but a strategic necessity for improving financial performance and ensuring long-term business sustainability. By analyzing companies listed on the Egyptian Exchange (EGX 100), the research provides empirical evidence of a positive relationship between digital initiatives and financial outcomes, particularly Return on Assets (ROA). Although the relationship is modest in magnitude, its statistical significance reinforces the value of investing in digital technologies to enhance operational efficiency, innovation, transparency, and competitiveness.

The findings also acknowledge the challenges organizations face during digital transformation, such as high implementation costs, difficulties integrating new technologies with existing legacy systems, and delayed realization of short-term financial benefits. These challenges highlight the need for a more nuanced and comprehensive evaluation of digital maturity, incorporating multiple financial indicators like Return on Equity (ROE), Tobin's Q, and Net Profit Margin, to better capture the full impact of digital efforts.

Ultimately, this study contributes to the growing literature on digital transformation's financial implications, especially within emerging markets like Egypt, where digital infrastructure is still developing. It demonstrates that strategic digital initiatives can drive sustainable growth and create lasting value even in such environments. Future research should expand upon this foundation by applying advanced analytical methods, considering firm-specific variables, and focusing on the quality of digital disclosures alongside their frequency.

In conclusion, digital transformation is a fundamental pillar for any organization aiming to strengthen its competitive advantage in today's rapidly evolving business landscape, when it is assigned correctly in order to make best use of this cost paid to fund it.

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تأثير التحول الرقمي على الأداء المالي للشركات

دراسة تطبيقية على الشركات المدرجة بسوق الأوراق المالية المصرية

ملخص البحث:

الهدف من الدراسة:

تهدف هذه الدراسة إلى تحليل أثر التحول الرقمي على أداء الشركات من منظور مالي، وذلك باستخدام العائد على الأصول كمؤشر رئيسي لقياس الأداء.

المنهجية:

يعتمد البحث على بناء مؤشر للتحول الرقمي استنادًا إلى تكرار الكلمات وتحليل الإفصاحات في التقارير السنوية والمواقع الإلكترونية. تم تطبيق الدراسة على عينة مكونة من ٤٠ شركة غير مالية مدرجة في البورصة المصرية (EGX 100) خلال الفترة من ٢٠٢٠ إلى ٢٠٢٤. واستخدم نموذج الانحدار الخطي البسيط المجمع لاختبار العلاقة بين النضج الرقمي (المقاس بالدرجة الرقمية السنوية) والأداء المالي (ROA). كما تم تقديم مؤشر رقمي جديد كمقياس للتحول الرقمي.

النتائج:

أظهرت النتائج أن التحول الرقمي له تأثير إيجابي ذو دلالة إحصائية على العائد على الأصول، مما يشير إلى أن الشركات ذات التحول الرقمي الأعلى تحقق نتائج مالية أفضل نسبيًا. ومع ذلك، فإن حجم التأثير كان محدودًا، حيث يفسر التحول الرقمي جزءًا صغيرًا فقط من تباين الربحية. وتؤكد الدراسة أن تحقيق الفوائد المالية الكاملة من التحول الرقمي يتطلب دمجها ضمن القدرات الاستراتيجية والتشغيلية الأوسع.

الأصالة والقيمة:

تقدم هذه الورقة البحثية نهجًا مبتكرًا لقياس التحول الرقمي من خلال الجمع بين تحليل الإفصاحات النوعية والتقييم الكمي. وتسهم في سد الفجوة في الأدبيات التجريبية المتعلقة بالتحول الرقمي في الأسواق الناشئة، لا سيما في مصر، كما توفر رؤى عملية للمديرين وصناع السياسات حول كيفية ربط المبادرات الرقمية بنتائج مالية قابلة للقياس.

المساهمة العلمية:

تقديم مؤشر رقمي جديد كمقياس للتحول الرقمي.

الكلمات المفتاحية:

التحول الرقمي، العائد على الأصول، الأداء المالي، تحليل الإفصاحات، الأسواق الناشئة.