International Journal of Instructional Cases
ISSN: 2399-830x

The Relationship and Impact Between the Levels of Disclosure Digital Transformation Indicators Information Asymmetry: A Field Study of Iraqi Stock Exchange-Listed Banks

Alaulddin Abdul Wahab Hassoon Al-Sabti*
Assistant Professor, Accounting Department, Shatt Al-Arab University College, Basrah, Iraq
Email: aalsabti1@gmail.com

*Corresponding Author Email: aalsabti1@gmail.com

Received Date: 08-11-2023; Accepted Date: 10-12-2023; Publication Date: 18-01-2024

Abstract
This study seeks to investigate the correlation between the extent of disclosure of the digital transformation indicator (DTI) by commercial banks listed on the Iraqi Stock Exchange and the presence of information asymmetry. To accomplish this, a thorough examination of the literature review was conducted to formulate the study hypotheses. A practical study was also carried out on a sample of 15 banks for the period 2018–2023. Even though Iraqi banks are just starting to implement digital transformation disclosure, the study's findings indicate that the digital transformation disclosure index has a positive impact on reducing information asymmetry. Other variables such as bank size, efficiency, capital adequacy, liquidity, and profitability also exhibit this effect. Furthermore, we found a significant percentage of 0.529 for the multiple correlation coefficient between the model variables. This suggests a strong correlation between the study variables.

Keywords: Level of Disclosure, Digital Transformation Indicators, Information Asymmetry, Commercial Banks.

Introduction

The Iraqi financial sector (banks and financial companies) is currently undergoing significant changes, with a particular focus on digital advancements. Due to the technological revolution and its impact on various economic sectors, including banking, digital transformation has become essential for banks. They now rely on technology to enhance the quality, speed, efficiency, and effectiveness of their operations. Modern technological services and tools play a crucial role in the

How to cite (APA):
Al-Sabti, A. A. W. H. (2024). The Relationship and Impact Between the Levels of Disclosure Digital Transformation Indicators Information Asymmetry: A Field Study of Iraqi Stock Exchange-Listed Banks. *International Journal of Instructional Cases*, *8*(1), 29-54.

International Journal of Instructional Cases
ISSN: 2399-830x

development of current and potential financial investments in banks. They are an integral part of digital transformation (DT). The digital transformation process has captured the interest of all decision centres. The Iraqi Central Bank has recently released guidelines on streamlining services to facilitate the digital transformation and embrace financial technological advancements in the banking industry. These instructions were outlined in policy Al-Waqa`e Al-Iraqi No. 4771, dated 4/29/2024. One of the outcomes of this process is the emergence of accounting issues, the measurement and disclosure of these indicators, and their impact on information in general. The aim is to reduce information asymmetry and provide objective and relevant information to all internal and external stakeholders (Malar, Arvidsson, & Holmstrom, 2019; Tjondro et al., 2021).

Although numerous studies have explored the process of (DI), there remains a lack of research on the level of disclosure of transformation indicators and information asymmetry. There may be a lack of specific rules for disclosing transformation indicators, which could be the reason for this (Aben et al., 2021; Agostino, Saliterer, & Steccolini, 2022; Eisazadeh Roshan & Abdi, 2022). The development of a framework for standard DTI disclosure in banks motivated researchers. Various studies have supported the idea that banks disclosing DTI can help reduce information asymmetry. Khan (2017), Rajapathirana and Hui (2018), Shihadeh et al. (2018), Yao et al. (2018), Kretschmer and Khashabi (2020), Valentinetti and Flores Muñoz (2021), Tjondro et al. (2021), and Asongu et al. (2019) have all highlighted the benefits of digital transformation technology in providing immediate information to financial report preparers. This, in turn, leads to a shorter period for preparing and disclosing financial reports to external parties, ultimately limiting the information advantage of certain parties. It also helps reduce information asymmetry in the stock market and offers a framework for prompt information disclosure. This gives users greater flexibility in finding information about their investments or potential investments in banks. It also contributes to enhancing the liquidity of capital markets and expediting the release of financial reports and necessary information. It is seen as a contributing factor to information asymmetry.

Several studies have found that banks' disclosure of the DT process is crucial for explaining changes in information asymmetry. This is because the disclosure of DTI by banks reflects the changes that occur when users of financial reports require accounting information, and it is provided at the appropriate time when the relevant event takes place. The increase in quantity and quality leads to improved information delivery by banks to stakeholders, resulting in greater transparency, accuracy, and reduced asymmetry. Although there is a limited amount of research on the connection between banks' disclosure of DT and asymmetry, existing studies have consistently found that DTI play a crucial role in explaining changes in information asymmetry. This study aims to examine the correlation between the extent of banks' disclosure of DTI and information asymmetry.

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Study Problem

There is limited research on the correlation between the extent of accounting disclosure regarding DT and information symmetry (Agostino et al., 2022; Asongu et al., 2019). Despite the varying settings of these studies, they reached a consensus that higher levels of disclosure of DTI can help reduce information asymmetry and strengthen the reliability of accounting information provided in financial reports. This is evident in the correlation between the level of DTI disclosure and increased transparency. The study addresses the challenge of determining whether there is a correlation between the level of disclosure of DTI by Iraqi banks and information asymmetry. Additionally, it aims to identify the nature of this relationship, if it exists.

Purpose and Importance

This study investigates the relationship between Iraqi private commercial banks' disclosure of DTI ratios and the presence of information asymmetry. The study period spans from 2018 to 2023. The significance of this study lies in its examination of a case that has garnered attention in foreign literature reviews. However, the absence of Iraqi studies on this case underscores the significance of this investigation. It aims to investigate the relationship between the level of accounting disclosure (DT) and its impact on information asymmetry. Additionally, it seeks to provide empirical evidence regarding the validity of this process. This study enhances the understanding of accounting practices and raises awareness among those who prepare and use accounting information. The findings are applicable and can be generalised, provided that appropriate controls are implemented when selecting the research population and sample.

Literature Review

The concept of DT is widely discussed in the current era of technological revolution, particularly due to the growing disclosure of DTI by commercial banks. Hence, it is imperative to address this concept and emphasise the significance of disclosing it and its benefits to the overall information environment, specifically in reducing information asymmetry. According to Reis et al. (2018), DT is defined as the use of digital technology, data, and digital information to improve management efficiency by transforming business processes, business models, and work procedures into digital business models. A group of researchers has come to a consensus on defining DT as strategic interventions that aim to enhance an organisation's digital capacity in order to improve its operations, products, services, and business model, all with the goal of satisfying its customers. Others argue that DT's process goes beyond simply adopting technology within the company. Instead, it encompasses a comprehensive program for improving internal and external work methods, as well as providing efficient and fast public services. As a result, the DT process compels units to modify their business models and adjust to the demands of emerging technology.

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Many people also agreed that the process of DT reflects technological advancements utilised in the realm of traditional financial services and provided by banks to enhance the quality and accessibility of these services for individuals and companies. It is known for its convenience, speed, and affordability, as well as its positive influence on the financial markets (Ozili, 2018; Stark, 2020). Therefore, the process of digital transformation is "introducing digital technology and its techniques into all banking activities to improve the quality of these services and creating new products that enable banks to compete locally and internationally." In relation to the disclosure of DTI, it encompasses both quantitative and qualitative information about all digital services provided by the bank. It is a mandatory disclosure as per accounting standards, the law, and instructions from the Central Bank. Any additional information beyond that is considered voluntary disclosure. In addition, the analysis of the informational content of sustainability reports for a sample of Iraqi private commercial banks reveals that there are no significant variations in the practices of disclosing DTI.

When it comes to the level of disclosure, Iraqi banks, including private commercial banks, have similar practices in disclosing their DTI ratios. However, it is worth noting that most of these banks are still in the early stages of implementing DTI disclosure. Regarding the timing of disclosure, the DT is made public through their annual reports. In terms of the credibility of the disclosure, it is important to verify the non-financial information provided in this disclosure. Based on the mentioned DTI, it is evident that private commercial banks' disclosure has certain deficiencies in its pillars and components. The primary objective of this disclosure is to provide stakeholders with high-quality accounting information through financial reports. Consequently, the integrity of accounting information is ensured by the valuable feedback received from stakeholders. Many studies have examined the impact of commercial banks' disclosure regarding DTI. These studies have found that when banks disclose their DTI, it can enhance the content of informatics in financial reports and increase the value of appropriate accounting information. It also involves providing stakeholders, particularly investors, with more comprehensive, transparent, and relevant information. This helps to address information imbalances, enhance bank control measures, and decrease risks for investors while increasing their understanding of growth prospects (Chen & Wang, 2021; Kumar, 2013).

Several studies have found that higher levels of banks' disclosure of DTI can enhance the effectiveness of management, control, and governance. It also reduces the ability of bank managers to conceal important information, thereby minimising the information asymmetry between management and investors. This, in turn, helps investors make more informed decisions about investment by analysing the relationship between risk and return. Ultimately, as banks become more transparent about their digital transformation efforts, it can lead to reduced financing costs and a smoother flow of capital (Shan & Troshani, 2021). In addition, the disclosure of DTI

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has a significant impact on the precision of financial analysts' predictions, resulting in a prompt rise in transparency and disclosure levels. It effectively reduces forecast errors, while also enhancing the efficiency of information preparation and reducing associated costs (Khatali, 2020; Li, 2020). Several studies have examined the factors influencing banks' disclosure of DTI ratios. These studies have found that key determinants include banking governance mechanisms such as the board of directors, the audit committee, internal audit, and ownership structure (Zhang et al., 2022). Several studies have examined the operational characteristics of banks as factors influencing disclosure levels. These characteristics include size, number of branches, nature of bank transactions, capital adequacy, asset quality, liquidity, and profitability (Bose et al., 2017; Christine, 2022; Gaoual & Geryville, 2021; Guan et al., 2019). Private commercial banks' disclosure of the DT index to regulatory authorities improves financial reporting transparency. The system activates the supervisory role of competent authorities and assists in allocating capital resources for financial policy officials to meet the bank's regulatory requirements, including laws and instructions pertaining to risks associated with the Basel III Accord (Bose et al., 2017).

Principle 28 of Basel III focuses on "disclosure and transparency requirements" in the banking sector. It emphasises the need for central banks to require financial institutions to regularly publish both quantitative and qualitative information about their digital banking transformation. Central banks should publish this information to facilitate easy access and verification of its status, performance, and risk exposure. It is important for financial institutions to adopt risk strategies and adhere to accounting standards, while also activating disclosure requirements for DT. It is important to provide both quantitative and qualitative information in relation to their risk data, as emphasised by Aryani (2016). It is crucial for supervisory authorities to consider the distinction between the two. When considering the risks associated with financial institutions and electronic money providers, it is important to also examine these entities' disclosure practices, including their information technology systems. The Sustainability Accounting Standard No. (FNO101) for banks focuses on four important disclosures. These include financial inclusion and absorptive capacity, customer privacy and data security, managing the legal and regulatory environment, and systemic risk management. The purpose of these disclosures is to provide valuable information that helps in assessing the bank's contribution towards sustainable development. An essential element of this standard focuses on the section that necessitates banks to reveal data security risks, customer privacy, and the methods and approaches employed to handle risk and safeguard customer rights. The failure of banks to adequately protect this data puts them at risk of losing customer confidence and experiencing a decline in revenues. Based on the professional publications and literature review, it can be inferred that there is a lack of specific frameworks for disclosing DTI in Iraqi commercial banks. It is possible to envision setting a framework for disclosing DTI in banks, which is divided into three axes:

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One important aspect is the bank's transparency in sharing information about its digital channels and banking services. These digital channels allow customers to conveniently carry out banking transactions without the need to visit a physical branch. It is crucial for the bank to disclose this information and compare it to previous periods to track progress and improvements. The second aspect pertains to the disclosure of the risk associated with DT and the strategies employed to effectively manage it. The literature review concludes that the bank should disclose information about risks, including management strategies and comparisons to previous periods. However, the disclosure must be sufficient and specific to the bank's DT risks. It is also important to ensure that this disclosure does not compromise the bank's ability to maintain data privacy and security (Zabala Aguayo & Ślusarczyk, 2020). There are several risks to consider, with strategic risks, operational risks, outsourcing risks, cyber risks, and systems risks being the most significant. Bank and compliance risks. Additionally, it concerns the disclosure of the parties involved in the Digital Transformation (DT) procedures and the implementation of financial technology. According to the literature review, the DT process necessitates banks engaging in a series of agreements with various relevant entities. Information and communications technology companies, which meet the needs of financial report users and require disclosure, are the most crucial among these entities (Buch & Goldberg, 2020). Indicators for disclosure regarding digital transformation in commercial banks in Iraq have been formulated, along with the disclosure of associated risks and methods for managing them (see Table 1).

Table 1: Disclosure of the DTI index in Iraqi banks listed on the Iraq Stock Exchange.

First: Disclosure of the (DT) Index in Iraqi Banks Listed on the Iraq Stock Exchange	
1	The number of electronic bank branches, their geographical distribution, and whether they have entered new regions
2	The number of bank ATMs, their geographical distribution, and whether they have reached new areas
3	Number of bank transfer subscribers to other local or international bank accounts via the Internet
4	Number of subscribers to submit loan applications via the Internet and digital lending platforms
5	number of digital credit forms
6	Number of subscribers to the speaking bank's services
7	Number of electronic account statement transactions via the Internet
8	Number of cards/payment instruments issued by the bank, classified according to their type
9	The number of card/payment instrument transactions that were completed without entering the PIN
10	The number of electronic sales points that accept cards or the bank's payment tools

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11	Number of subscribers, activity rate, rules, fees, and value of transactions through the application of electronic systems
12	Number of subscribers, rules and fees for transactions via the smartphone application
13	Correspondence exchange services between the bank via e-mail
14	Electronic trading platform for trading foreign currencies
15	Digital linkage of certificates and deposits
Second: Disclosing the Risks of Digital Banking Transformation and How to Manage It	
16	(DT) strategy and its relationship with the bank's general strategy
17	The bank plans to maintain continuous operation of its technological infrastructure
18	Data management and cybersecurity
19	Number of detected cases of card fraud and fraud through applications
20	Number of cards blocked due to suspicious and fraudulent transactions, with no actual losses
21	Number of cards blocked due to suspicious and fraudulent transactions with actual losses
22	Strategies, plans and procedures for securing customer systems and data
23	Crypto assets owned by the bank, if any, and the technology underlying them
24	Plans to support new digital systems
25	Risk management plans modern technology to secure their use, and continuous communication with customers
26	Strategies for educating customers about digital financial services and how
27	Plans to overcome operational challenges associated with new digital systems
28	Corrective measures taken by the bank due to security breaches and hacking, which may impede the provision of systems and services related to electronic operations
29	Number of data security breaches and the number of unauthorized accesses resulting from staff or process failures or deficiencies in systems and technology
30	Appropriate protection systems that comply with applicable standards and rules to ensure customer identity, electronic distribution, encryption, etc.
31	Training plans for banking cadres to keep pace with successive developments in light of digital transformation and achieve its requirements
32	Number of cases of non-compliance with digital banking services rules
Third: Disclosure of Agreements with Digital and Financial Technology Companies	
33	Contracts signed with ICT companies include confidentiality and accuracy in collecting and using customer information
34	Methods and objectives of cooperation and alliance with financial technology companies
35	Percentages of the bank's contributions to financial technology companies
36	Controls for securing infrastructure when outsourcing services to financial technology companies (Internal Controls Report for Service Providers)

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Based on the information provided, the disclosure of banks' DTI is crucial due to the significant number of digital transactions involved. There is a pressing need for a cohesive framework that ensures thorough disclosure of DTI in financial reports. This framework should reflect the significance of DTI in uncertain conditions and address the requirement of report users for relevant information. Accurate and consistent, pertaining to liquidity, profitability, and risk levels, to assist in decision-making and comprehending the metrics of DT and its related aspects. Hence, it is crucial for financial reports to accurately depict the indicators and their impact on bridging the information gap and its consequences on banks' performance.

Several researchers have explored the topic of information asymmetry, covering its definition, associated risks, and factors influencing it (Asongu et al., 2019; Khatali, 2020; Nuanpradit, 2018). In the realm of academia, there is a lack of consensus regarding the precise definition of information asymmetry. However, there is agreement on the notion that it occurs when the information available to different parties involved in a transaction varies, either before or after the release of a financial report. This discrepancy in information leads to increased uncertainty in the stock market, enabling some individuals to avoid losses or achieve gains that others are unable to. Ultimately, this has a negative impact on the overall market (Tsindeliani & Mikheeva, 2022). Some argue that internal parties have a greater understanding of the company's true value and prospects compared to external parties. This gives them an advantage in making profitable decisions and predicting the company's future. Many experts view asymmetry as a disparity in financial markets, where one party involved in a transaction has a greater amount, better quality, or more timely information than the other party (Moore, 2019).

When it comes to measuring asymmetry, there are three different measures to consider. The first measure pertains to market stock trading, emphasizing factors such as price range and trading volume. The second measure looks at the accuracy of predictions made by financial analysts. Lastly, the third measure considers available investment opportunities and stock returns, specifically looking at the fluctuation of stock returns. The price range approach is a commonly used measure for addressing the issue of information asymmetry. It entails determining the highest price an investor is willing to pay for buying a stock, as well as the lowest price they are willing to accept for selling it. This approach is effective in highlighting the extent of price differences. This suggests a rise in information asymmetry due to investors with more knowledge exploiting price differences to maximize their profits from trading with less informed investors. This approach is known for its user-friendly nature and its ability to minimise measurement errors (Juniarti, 2019; Kiswanto & Fitriani, 2019; Loureiro & Silva, 2018). When considering the potential risks of assimilation, it is important to note that they can be categorised into two main parts: ethical risks that arise from conflicts of interest between management and owners. Management has the potential to prioritise its own interests over those of the owners. This can happen

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when the principal lacks the necessary information to effectively monitor the agent, and when shareholders make poor choices in selecting management. These issues can lead to inefficiency and misallocation of resources, ultimately harming the owners.

The determinants of information asymmetry in Iraqi private commercial banks can be classified into three categories. The first aspect to consider is the bank's characteristics, which encompass operational factors such as size, financial leverage ratio, profitability, management efficiency, and the level of ownership concentration and dispersion. The second factor influencing auditing is the size of the audit office and the opinion of the auditor. The third factor is specific to the environment. The professional practices discussed include variables in the legal system, investor protection, governance mechanisms, the role of information brokers, and the expansion of voluntary disclosure. Researchers have highlighted the advantages of banks disclosing their DTI. This disclosure reduces information asymmetry and supports the development of new banking services that provide timely information to financial report preparers. As a result, the informational advantage of informed parties is limited and the level of uncertainty in information symmetry in the market is reduced (Eisazadeh Roshan & Abdi, 2022; Valentinetti & Flores Muñoz, 2021). Some argue that disclosing DTI allows banks to directly communicate information to the online community of stakeholders, reducing the need for intermediaries and lowering costs, thus reducing information asymmetry. The process of digital transformation will convert financial reports from a unidirectional medium to a bidirectional medium, enabling engagement with stakeholders, enhancing transparency and accuracy, and mitigating the issue of information asymmetry. Several studies (Broby, 2021; Chen & Wang, 2021; Shan & Troshani, 2021; Yunita, 2021) have highlighted the factors that drive commercial banks to expand in this field. One such factor is the disclosure of DTI ratios, which can help bridge the information gap between bank management and financial report users. This disclosure can also assist in assessing a bank's risk management capabilities and provide users with information to evaluate the bank's potential for generating future Some scholars argue that disclosing DTI can improve the accessibility of accounting information for end users, reducing information asymmetry for both internal and external users. Cloud computing technology can enhance the quality of financial reports and reduce information asymmetry by ensuring consistent accounting treatments with accounting standards and minimising errors, resulting in more accurate and efficient financial reports. Some scholars argue that increasing the disclosure of digital DTI can lower the cost of capital by reducing information asymmetry between investors and management. This increased transparency also allows users to more easily search for and evaluate investment opportunities, thereby enhancing the liquidity of capital markets.

Broby (2021) and Agostino et al. (2022) some experts argue that banks' disclosure of DTI can be valuable for financial analysts. They believe that this information can

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help analysts build models to predict future cash flows. By considering the uncertainty and risks associated with DT, disclosure of DTI can reduce the differences in opinions among analysts and minimise information imbalances (Li, 2020). Chanias, Myers and Hess (2019) highlight the importance of DTI in evaluating a bank's adherence to laws and regulations, and instilling confidence in stakeholders regarding the bank's ongoing operations. Nevertheless, certain parties' express concerns about the difficulties banks may encounter in disclosing their DTI, particularly given the increasing risks associated with cybercrime and fraud. Many worry that the disclosure may not be adequate and could impact the accuracy of accounting information, exacerbating the existing asymmetry (Zabala Aguayo & Ślusarczyk, 2020). In addition, the indicators that are disclosed may only have a limited effect on reducing the asymmetry. This is because the gap is influenced by various factors, including the bank's characteristics and the economic conditions like growth and inflation. Several studies have discovered a correlation between banks' disclosure of DTI and information asymmetry. This correlation is particularly pronounced in banks that exhibit profitability, high liquidity, larger size, and capital adequacy (Christine, 2022).

The process of digital transformation is widely discussed in the era of the technological revolution. Considering the rise in commercial banks' disclosure of DTI, it is crucial to recognise the concept and significance of disclosing it. This disclosure can greatly benefit the information environment by reducing the asymmetry in DTI. DT was described by Reis et al. (2018) as the utilisation of technology, digital tools, data, and digital information to revolutionise business processes, models, and work procedures, ultimately enhancing management efficiency through the creation of digital business models. Another way to define the DT process is by looking at strategic interventions that can enhance an organization's digital capacity. This can lead to improvements in the unit's operations, products, services, and overall business model, all with the goal of satisfying customers. Others argue that the process of digital transformation involves more than just adopting technology within the company. Instead, it encompasses a comprehensive programme for improving internal and external work methods and delivering services to the public with ease and efficiency. The process of digital transformation compels units to modify their business models and adjust to the demands of emerging technology. Many experts argue that the process of DT is a reflection of technological advancements in the realm of traditional financial services. These services, offered by banks and other financial institutions, aim to enhance the quality and accessibility for users. DT is known for its convenience, speed, affordability, and positive influence on financial markets (Stark, 2020).

Based on what was mentioned, the DT process can be defined as "the introduction of digital technology and its techniques into all banking activities to improve the

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quality of services and create new products that enable banks to compete locally and internationally." In terms of disclosing DTI, the focus is on providing comprehensive information about all digital services, both in terms of quantity and quality, without any financial aspects. It is a requirement within the bank, and on the commitment side, it is obligatory in accordance with accounting standards, legal regulations, and instructions from the Central Bank. Voluntary disclosure is a significant aspect to consider. Upon analysing the informational content of sustainability reports from a sample of Iraqi private commercial banks, it becomes evident that there is a notable disparity in the practices of disclosing DTI among these banks. When it comes to the content and use of digital transformation technology, Iraqi banks are similar in their practices of disclosing DTI. Every bank is located at the start of the DT. The timing for disclosing the DT is included in the bank's annual reports. When it comes to establishing credibility, verification is essential, especially in non-financial matters. Summarising the discussion on DTI, it is important to note that commercial banks' disclosure has certain pillars and components that have some limitations. The objective of banks' DTI disclosure is to provide financial reports with high-quality accounting information that is beneficial for stakeholders. Thus, the assessment of the accounting information's quality is based on how it benefits stakeholders through disclosure. In light of the above, the research hypotheses can be formulated as follows.

H1: There is no significant relationship between the level of disclosure of DTI provided by Iraqi private commercial banks and information asymmetry.

To answer this, three secondary variables were created (capital adequacy, bank liquidity, and bank profitability) as monitoring variables to answer the study's questions and they branch off from this hypothesis. The following sub-hypotheses.

H1.1: There is no significant relationship between the level of disclosure of digital indicators provided by Iraqi private commercial banks regarding DTI on information asymmetry and capital adequacy.
H1.2: There is no significant relationship between the level of disclosure of digital indicators provided by Iraqi commercial banks regarding DTI on information asymmetry and bank liquidity.
H1.3: There is no significant relationship between the level of disclosure of digital indicators provided by Iraqi private commercial banks regarding DTI on information asymmetry and bank profitability.

To provide greater clarity regarding the relationship between the variables, it is essential to incorporate additional fundamental variables that align with the study (Christine, 2022). The study highlighted the potential for categorising factors influencing information asymmetry into two groups: those associated with management, such as management efficiency, and those directly affecting information asymmetry. In addition, there is a connection to operational characteristics, such as

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the bank's size. This allows for the inclusion of two additional variables in the model: management efficiency and bank size. It is important to consider them as control variables that impact the information asymmetry variable, commonly referred to as complementary analysis. Therefore, the second main hypothesis was formulated as follows.

H2: The significant relationship of the level of disclosure provided by Iraqi private commercial banks to DTI on information asymmetry does not differ depending on the efficiency of management and the size of the bank together.

In a recent study by Li (2020), an interesting finding was highlighted regarding alternative measures for the dependent variable, asymmetric information (ASY). Instead of relying on the price range, the study focused on the accuracy of financial analysts' forecasts to gauge ASY. Therefore, the third hypothesis is formulated as follows.

H3: There is no significant relationship between Iraqi private commercial banks' disclosure of the digital transformation index and information asymmetry as measured by the accuracy of financial analysts' predictions.

Methodology

Study Sample

The sample includes private commercial banks that are listed on the Iraq Stock Exchange from 2018 to 2023. This control sample is based on various factors. Specifically, their financial statements, along with all the necessary clarifications, were listed on the market during the study period. Additionally, the study included a total of 15 banks. Furthermore, the size of the bank and the total number of observations (90) are taken into account.

Study Procedures

The data necessary for the studies were obtained from the financial reports available in the financial market, as well as the information published on the websites of the banks included in the study sample. The data for the independent variable on the level of banks' actual disclosure of DTI was prepared by dividing the disclosure items. Based on a thorough analysis of the financial reports published on the index of standard practices for disclosing the DT index, which is derived from theoretical study. In terms of the dependent variable - information asymmetry, it was determined based on the price range. Thus, the study model will be presented in Figure 1.

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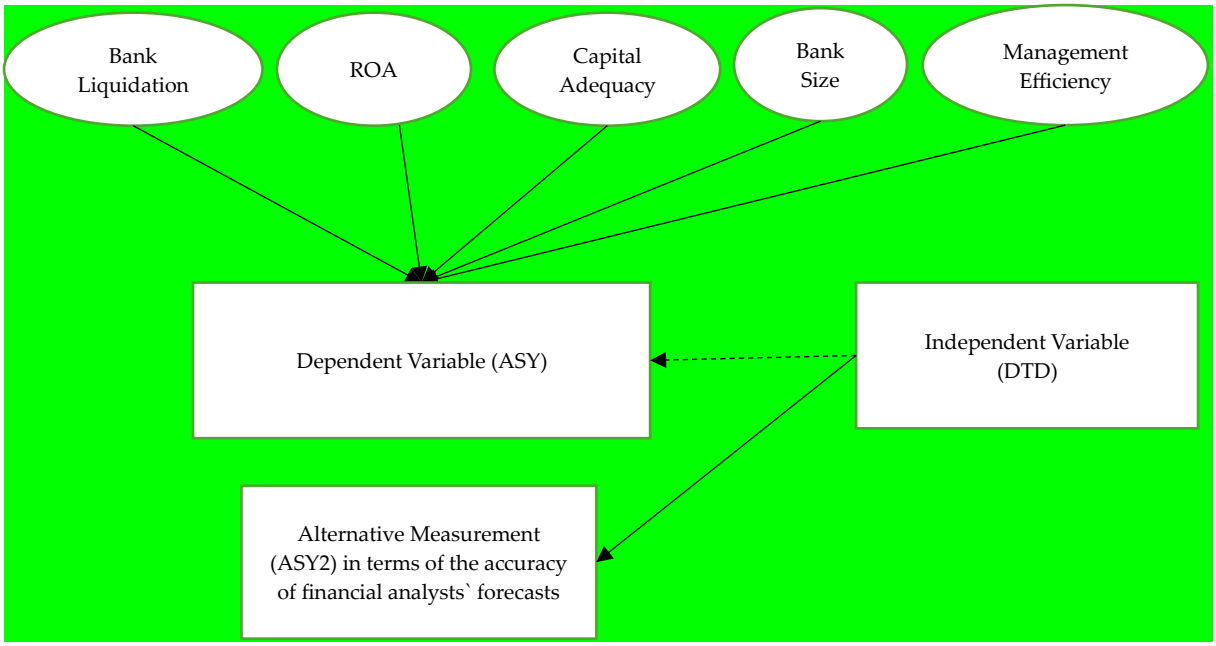

Figure 1: Study Model.

Measuring Study Variables

The level of disclosure regarding DTI is considered an independent variable that serves as an indicator of the extent to which information about the DT indicator is shared. This disclosure can take the form of quantitative or qualitative data and is measured using the following equation.

$$WD_I = \frac{(\sum_{i=1}^{n} Xit)}{n}$$

whereas
WD: The level of disclosure of the bank's DTI in year t
X: The paragraph of the information is disclosed in the bank I in the year T, and the value is taken when disclosing the paragraph, and zero otherwise.
N: The maximum number of disclosure paragraphs for the DT index that make up the index, which is equal to 36 paragraphs.

Information asymmetry occurs when the information in a paragraph varies among the parties involved in a transaction, either before or after the financial report is published. It is calculated using the price range ratio according to the model below.

$$ASYI\ it = \{(\sum_{n=1}^{n} BDit - Aki, t)/pit)\} / n$$

where:
ASY1; annual average of the daily bid and ask price differences for the stock divided by the company's daily stock closing price I in the year from the first day of dealing in the stock t=I, until the last day of dealing in the stock during the year n,
BD: The highest price of bank I's stock during day t
AK: The lowest price of Bank I stock during day t
n: The number of trading days on the stock during the year.

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For additional analysis purposes, the accuracy model of financial analysts' forecasts is used as a measure of prior literature through the following form:

ASY2 it = [EPS it – mean forecasted EPS] / Pit

Where ASY2 is the absolute number (the difference between the actual earnings per share and the average forecast of financial analysts divided by the closing per share for bank I in year t

EPS: Actual earnings per share of bank I in year t
mean forecasted EPS:
P: is the price of the lowest share of Bank I in year t

Regulatory Variables

In this study, there are certain regulatory variables to consider, such as management efficiency or H2 rate. This refers to the bank's board of directors and executive management's ability and efficiency in conducting the bank's business and managing its risks. It is calculated by dividing operating expenses by total assets. In addition, the size of the bank refers to its financial, human, and technological capabilities, which are quantified by the natural logarithm of total assets (Christine, 2022). Additionally, capital adequacy refers to the bank's capacity to handle losses that may arise from various risks. Gaoual and Geryville's (2021) research determines it by dividing the total capital by the total assets and liabilities, assigning risk weights. Additionally, bank profitability refers to the bank's capacity to generate a satisfactory return for its stakeholders. This is measured by calculating the rate of return on assets (ROA), which is obtained by dividing the total net income by the total assets. Ultimately, bank liquidity refers to the bank's capacity to meet its short-term obligations, including loans. It is assessed by comparing the cash balances held at the central bank and other banks to the total assets.

Applied Study

This study seeks to examine the impact of the digital transformation disclosure index on information asymmetry in Iraqi banks. The study focuses on defining the study population, identifying the study variables, explaining the data collection and analysis methods, testing the study hypotheses, and drawing conclusions. The study population includes all Iraqi banks that are under the supervision of the Central Bank of Iraq. The researcher selected a sample of 15 commercial banks that are dedicated to disclosing indicators of digital transformation. A researcher utilised the banks' annual financial reports, which were publicly available on the stock market, over a span of six years from 2018 to 2023. The objective was to identify the variables for the study, conduct statistical hypothesis testing, and draw appropriate conclusions.

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Here are the variables of the study. The sample banks include the disclosure indicator and digital transformation as independent variables. In addition, the variable being studied is information asymmetry. To measure information asymmetry, the study utilised the relative price range measure. This measure calculates the difference between the highest and lowest prices, divides it by the closing price, and then further divides the result by the number of trading days. In addition, the study utilised an alternative measurement to assess the accuracy of financial analysts. This study utilised several regulatory variables obtained from prior research, the most important of which are:

1. Bank size: natural logarithm of total assets
2. Capital adequacy ratio: ratio of capital to total assets
3. Bank liquidity: ratio of current assets to total assets
4. Bank profitability: return on assets.

In order to examine the impact of the digital transformation disclosure indicator on the level of information asymmetry, we will employ both a multiple correlation analysis method and a multiple regression method. The following procedures will be followed. Multiple correlation is a useful method for examining the relationship between the disclosure of digital transformation and the level of information asymmetry, while also considering a set of control variables. In addition, multiple regression, as a form of regression analysis, can be used to assess whether the act of disclosing digital transformation will have an impact on reducing information asymmetry. In the regression model, the dependent variable is represented by information asymmetry, while the independent variable is the disclosure of digital transformation. Bank liquidity is also included in the capital adequacy criterion. The bank's profitability contributes to the variation in information asymmetry.

The researcher utilised the SPSS programme to solve the multiple regression model. The multiple regression model was then formulated using a specific equation to analyse the impact of disclosing digital transformation on information asymmetry.

$ASYit = \beta0 + \beta1\ DTD\ it + \beta2\ Management\ efficiency\ it + \beta3\ Bank\ size\ it + \beta4\ Capital\ adequate\ it + \beta5\ Bank\ liquidity\ it + \beta6\ ROA\ it + eit$

Findings

The data of this research was thoroughly analysed to measure the relationships among variables. The researcher utilised various measures, including the mean, standard deviation, largest value, and lowest value for each of the study variables. Table 2 displays the findings of the descriptive analysis of the study variables.

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Table 2: Results of Descriptive Statistics.

Variables	N	Mean	St.DIV	Max	Min
ASY1	90	0.0027	0.0102	0.0739	0.0000
ASY2	90	- 0.0699	0.1915	0.3500	- 0.7920
DTD	90	24.51	1.921	30	22
Efficiency	90	0.0215	0.0132	0.0489	0.0023
Size	90	10.3938	0.8273	12.3200	9.5940
Liquidity	90	64.0257	13.8517	87.1247	34.3600
Capital	90	23.3451	7.8520	37.0780	12.78748
ROA	90	0.0127	0.0394	0.3390	- 0.0587

Table 1 displays the descriptive statistics for the study variables. The indicator measuring information asymmetry, ASY1, had a mean value of 0.0027 and a standard deviation of 0.0102. The highest value of ASY1 was 0.0739 in the United Bank in the financial year 2022, while the lowest value was 0.000 in the Inter-Develop Bank in the financial year 2018. The mean of the index ASY2 was -0.0699 with a standard deviation of 0.1915. The largest value of the index was 0.3500 in Iraqi Investment Bank in the financial year 2023, while the lowest value was -0.7920 in Erbil bank in the financial year 2018. The mean index DTD was 24.51 with a standard deviation of 1.921. The highest value of 30 was observed in Al-Aheli Bank in the financial year 2023, while the lowest value of 22 was observed in the majority of the banks in the study sample across different years.

Correlation Analysis

The researcher performed a Pearson correlation analysis to assess the strength and significance of the relationship between the study variables (including independent, adjusted, and controlled variables) and the dependent variable (informational asymmetry). The analysis result is presented in Table 3.

Table 3: Results of Pearson Correlation.

Variables	ASY1	DTD	Efficiency	Size	Liquidity	Capital	ROA
ASY1	1						
DTD	- 0.446 (0.012)	1					
Efficiency	- 0.214 (0.043)	0.259 (0.014)	1				
Size	- 0.473 (0.005)	0.538 (0.000)	0.505 (0.000)	1			
Liquidity	- 0.392 (0.007)	0.055 (0.609)	0.155 (0.146)	0.023 (0.833)	1		
Capital	- 0.278 (0.049)	- 0.312 (0.003)	0.022 (0.836)	- 0.184 (0.083)	0.488 (0.000)	1	
ROA	- 0.164 (0.255)	0.068 (0.526)	0.087 (0.417)	- 0.197 (0.064)	0.014 (0.897)	- 0.123 (0.253)	1

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Table 2 provides evidence supporting a negative correlation between the digital transformation disclosure index and the price range, which serves as an indicator of information asymmetry. In addition, there is a negative correlation coefficient (-0.4464) indicating that a greater degree of digital transformation disclosure is associated with a reduced level of information asymmetry. The relationship is statistically significant, with a significance level of 0.0012, which is below the commonly used threshold of 5%. Additionally, a negative correlation exists between the management efficiency variable and the relative price range, which serves as an indicator of information asymmetry. This implies that higher efficiency in bank management results in a reduced level of information asymmetry. The negative correlation coefficient of -0.214 and the significant p-value of 0.043 at a 5% significance level indicate a clear relationship.

In the same vein, a correlation exists between the size of the bank and the relative price range, which serves as an indicator of information asymmetry. Specifically, larger banks tend to have lower levels of information asymmetry. It is clear from the sign of the correlation coefficient, which is (-0.473), that there is a significant relationship. This is supported by the p-value of (0.005) at a significance level of 5%. Furthermore, a correlation has been observed between the bank's liquidity and the relative price range, indicating that higher liquidity levels in the bank result in reduced information asymmetry. Likewise, it is clear from the correlation coefficient of (-0.392) that there is a significant relationship. The p-value of (0.007) at a 5% significance level further supports this conclusion.

In addition, there is a clear inverse correlation between the bank's capital adequacy and the relative price range, which serves as an indicator of information asymmetry. This means that as the bank's capital increases, the level of information asymmetry decreases. It is clear from the sign of the correlation coefficient, which is (-0.278), that there is a significant relationship. This is supported by the P-Value of (0.049) at a significance level of 5%. There exists a correlation between the bank profitability variable and the relative price range as a measure of information asymmetry. It has been observed that an increase in bank profitability is associated with a decrease in the level of information asymmetry. Meanwhile, it is clear from the sign of the correlation coefficient (-0.164) that there is a relationship, but this relationship was not statistically significant since the p-value (0.255) is greater than the 5% level of significance.

Results of Regression Analysis

H1 hypothesises that there is no significant relationship between the level of disclosure of digital indicators provided by Iraqi private commercial banks and information asymmetry. Three secondary variables (capital adequacy, bank liquidity, and bank profitability) were created as monitoring variables to address this question. In order to test the three sub-hypotheses derived from the first

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hypothesis, the researcher used multiple regression analysis to examine the effect of the digital transformation disclosure indicator on the degree of information asymmetry. This analysis was conducted in three steps. This study examines the impact of the digital transformation disclosure index on information asymmetry, considering supervisory variables such as bank size and banking efficiency, as well as a monitoring variable, bank liquidity. Table 4 shows the results of testing the first sub-hypothesis.

Table 4: Testing the First Sub-Hypothesis.

Variables	B	Std. Error	Beta	T	Sig	VIF
Constant	- 0.024	0.041		- 2.589	0.035	
DTD	- 0.084	0.011	- 0.127	- 5.788	0.004	1.413
Bank Size	- 0.017	0.022	- 0.086	- 3.563	0.021	1.777
Efficiency	- 0.199	0.096	- 0.258	- 2.085	0.040	1.381
Bank Liquidity	- 0.062	0.144	- 0.099	- 1.305	0.061	1.032
R = 0.532 **R2** = 0.283 **Adj- R2** = 0.279 **F** = 16.242 **Sig** = 0.000 **Durbin- Waton** = 1.876						

It is clear from the data presented in the previous Table 3 that certain results can be observed. The level of disclosure about digital transformation in Iraqi commercial banks has an inverse effect on information asymmetry, specifically in relation to relative price range. This effect is observed in the presence of variables such as bank size, efficiency, and bank liquidity. It is found that an increase in the level of disclosure leads to a decrease in the degree of asymmetry. The information accounts for 8.4% and the B coefficient is -0.084. The multiple correlation coefficient between the model variables was 0.532, which suggests a significant correlation between the study variables. The coefficient of determination R2 was (0.283), indicating that the model variables account for 28.3% of the variation in the price range, serving as a measure of information asymmetry. All variables included in the model have a variance inflation factor less than 10, suggesting no linear correlation between them.

In addition, the Durbin Watson value of (1.876) falls within the optimal range (1.5 to 2.5), suggesting that there is no autocorrelation between the variables. After analysing the previous results, the first sub-hypothesis is not supported, and we can confidently accept the alternative hypothesis. There is a notable correlation between the extent of digital indicator disclosure by Iraqi commercial banks in relation to DTI, information asymmetry, and bank liquidity. Investigating the impact of the digital transformation disclosure index on the level of information asymmetry, considering supervisory variables such as bank size and banking efficiency, along with a monitoring variable like bank capital adequacy. Table 5 displays the findings from testing the second sub-hypothesis.

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Table 5: Testing the Second Sub-Hypothesis.

Variables	B	Std. Error	Beta	T	Sig	VIF
Constant	- 0.019	0.042		- 1.453	0.074	
DTD	- 0.142	0.019	0.295	- 4.062	0.010	1.508
Bank Size	- 0.013	0.022	0.076	- 2.543	0.039	1.775
Efficiency	- 0.195	0.095	- 0.253	- 2.055	0.043	1.368
Bank capital	- 0.075	0.016	- 0.180	- 3.716	0.023	1.129
R = 0.629 **R2** = 0.396 **Adj- R2** = 0.393 **F** = 21.353 **Sig** = 0.000 **Durbin- Waton** = 1.887						

From the previous Table 4, the following results can be observed. The digital transformation disclosure index has a significant impact on reducing information asymmetry in Iraqi commercial banks. This effect is observed when considering variables such as bank size, efficiency, and bank capital. Specifically, an increase in the level of disclosure about digital transformation leads to a decrease in the degree of asymmetry, as indicated by the relative price range. The information accounts for 14.2% and the B coefficient is -0.142. The multiple correlation coefficient between the model variables was 0.629, indicating a strong correlation between the study variables. The coefficient of determination R2 was (0.396), indicating that the model variables account for 39.6% of the variation in the price range, serving as a measure of information asymmetry. All variables included in the model have a variance inflation factor less than 10, suggesting no linear correlation between them.

In addition, the Durbin Watson value of 1.887 falls within the optimal range of 1.5 to 2.5, suggesting that there is no autocorrelation between the variables. After analysing the previous results, it is evident that the second sub-hypothesis is not supported. Instead, we find support for the alternative hypothesis: There is a strong correlation between the level of disclosure of digital indicators provided by Iraqi commercial banks regarding DTI on information asymmetry and bank capital adequacy. Investigating the impact of the digital transformation disclosure index on the level of information asymmetry, considering supervisory variables such as bank size and banking efficiency, along with a monitoring variable like bank profitability. Table 6 displays the findings from the evaluation of the third sub-hypothesis.

Table 6: Testing the Third Sub-Hypothesis.

Variables	B	Std. Error	Beta	T	Sig	VIF
Constant	- 0.012	0.034		- 1.814	0.067	
DTD	- 0.064	0.007	0.111	- 2.062	0.047	1.740
Bank Size	- 0.013	0.003	0.065	- 2.014	0.049	1.014
Efficiency	0.004	0.087	0.051	0.987	0.147	1.214
Profitability	- 0.123	0.016	- 0.197	- 1.246	0.088	1.565
R = 0.432 **R2** = 0.187 **Adj- R2** = 0.184 **F** = 12.189 **Sig** = 0.001 **Durbin- Waton** = 1.675						

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Based on the information provided in the previous Table 5, the following results are apparent. The digital transformation disclosure index has been found to have an interesting impact on information asymmetry in Iraqi commercial banks. Specifically, when there is a higher level of disclosure about digital transformation, there is a decrease in the degree of asymmetry. This relationship holds true even when considering other variables such as bank size, efficiency, and bank profitability. The information accounts for 6.4% of the total, with a B coefficient of -0.064. The multiple correlation coefficient between the model variables was 0.432, which suggests a significant correlation between the study variables. The coefficient of determination R2 was 0.187, indicating that the model variables account for 18.7% of the variation in the price range, serving as a measure of information asymmetry.

All variables included in the model have a variance inflation factor of less than 10, suggesting that there is no linear correlation between them. The Durbin Watson value was 1.675, falling within the optimal range of 1.5 to 2.5. This suggests that there is no autocorrelation between the variables. After analysing the previous results, it has been determined that the second sub-hypothesis is not supported. Instead, the alternative hypothesis is accepted: There exists a noteworthy correlation between the extent of digital indicator disclosure by Iraqi commercial banks regarding DTI, information asymmetry, and bank profitability.

Investigating the impact of the digital transformation disclosure index on the level of information asymmetry, considering supervisory variables such as bank size and banking efficiency, as well as monitoring variables like capital adequacy, bank liquidity, and bank profitability. Table 7 displays the findings from testing the initial hypothesis.

Table 7: Testing the First Hypothesis.

Variables	B	Std. Error	Beta	T	Sig	VIF
Constant	- 0.016	0.045		- 4.343	0.003	
DTD	- 0.029	0.017	0.168	- 6.037	0.001	1.622
Bank Size	- 0.044	0.072	- 0.167	- 3.441	0.009	2.033
Efficiency	- 0.193	0.100	- 0.250	- 1.928	0.057	1.467
Capital adequacy	- 0.025	0.089	- 0.093	- 2.688	0.041	1.597
Liquidity	- 0.087	0.047	- 0.120	- 3.095	0.017	1.421
Profitability	- 0.057	0.030	- 0.190	- 1.164	0.061	1.180
R = 0.689 **R2** = 0.475 **Adj- R2** = 0.472 **F** = 30.504 **Sig** = 0.000 **Durbin- Waton** = 1.980						

Based on the data presented in Table 6, there is a relationship between the level of disclosure about digital transformation in Iraqi commercial banks and information asymmetry. Specifically, when the level of disclosure increases, there is a

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corresponding decrease in information asymmetry (2.9%). This relationship holds true even when considering other variables such as bank size, efficiency, capital adequacy, bank liquidity, and bank profitability. The coefficient for this relationship is -0.029. The multiple correlation coefficient between the model variables was 0.689, which suggests a significant correlation between the study variables.

In addition, the coefficient of determination R2 was (0.475), indicating that the model variables account for 47.5% of the variation in the price range, serving as a measure of information asymmetry. All variables included in the model have a variance inflation factor less than 10, suggesting no linear correlation between them. The Durbin Watson value of 1.980 falls within the optimal range of 1.5 to 2.5, suggesting that there is no autocorrelation between the variables. After analysing the previous results, it is evident that the first hypothesis is not supported, and we can confidently accept the alternative hypothesis: There exists a noteworthy correlation between the extent of information shared by Iraqi commercial banks regarding digital indicators, and the impact it has on factors such as information imbalance, capital sufficiency, liquidity, and profitability of the banks.

To test the second hypothesis of the study, the researcher utilised multiple regression analysis with the Forward method. This approach involves entering variables into the model in three distinct stages: During the initial phase, a basic linear regression analysis is performed to assess the impact of disclosure level regarding digital transformation on information asymmetry. No control variables are included in this analysis. As the analysis progresses, the bank size variable is incorporated. In the third stage, the variable for management efficiency is included. This study aims to investigate the correlation between the disclosure of digital transformation and information asymmetry, considering factors such as bank size and management efficiency. Here are the results of this analysis, as shown in Table 8.

Table 8: Testing the Second Hypothesis.

Variables	First Stage		Second Stage		Third Stage	
	B	Sig	B	Sig	B	Sig
Constant	- 0.052	0.079	- 0.160	0.037	- 0.250	0.014
DTD	- 0.012	0.023	- 0.029	0.019	- 0.035	0.008
Bank Size			- 0.052	0.063	- 0.087	0.044
Efficiency					- 0.131	0.038
R	0.408		0.445		0.633	
R2	0.166		0.198		0.401	
F	3.006		3.088		5.642	
Sig	0.013		0.009		0.000	

The results from Table 7 are evident. The initial analysis demonstrates a significant relationship between the digital transformation disclosure index and information

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asymmetry, with a significance level of 0.023. The coefficient of determination R2 is 0.166. When including the bank size variable in the second step, the significance of the impact of the digital transformation disclosure indicator on information asymmetry increased to a significant level (p = 0.019). Additionally, the coefficient of determination R2 increased to 0.198. When including the management efficiency variable in the third step, the significance of the effect of the digital transformation disclosure indicator on information asymmetry increased to a significant level (p = 0.008). Additionally, the coefficient of determination R2 increased to 0.401. Based on the previous findings, the second hypothesis is rejected in favour of the alternative hypothesis. The relationship between the level of disclosure provided by Iraqi private commercial banks to DTI and information asymmetry is not influenced by management efficiency or bank size.

This study examines the impact of the digital transformation disclosure index on information asymmetry, as indicated by the accuracy of financial analysts' predictions. The analysis also considers the influence of supervisory variables (bank size and banking efficiency) and monitoring variables (capital adequacy, bank liquidity, and bank profitability). The results of testing the third hypothesis are presented in Table 9.

Table 9: Testing the Third Hypothesis.

Variables	B	Std. Error	Beta	T	Sig	VIF
Constant	0.056	0.037		3.023	0.031	
DTD	0.094	0.013	0.136	2.267	0.049	1.622
Bank Size	- 0.038	0.035	- 0.165	- 1.101	0.247	2.033
Efficiency	0.026	0.049	0.158	3.242	0.028	1.467
Capital adequacy	0.019	0.007	0.076	4.075	0.012	1.597
Liquidity	0.009	0.003	0.086	2.481	0.042	1.421
Profitability	0.092	0.065	0.139	1.344	0.072	1.180
R = 0.529 **R2** = 0.280 **Adj- R2** = 0.275 **F** = 14.251 **Sig** = 0.003 **Durbin- Waton** = 1.628						

The results from the previous table are evident. The digital transformation disclosure index has a positive effect on information asymmetry, as measured by the accuracy of financial analysts' predictions. This effect is observed in the presence of various variables such as bank size, efficiency, capital adequacy, bank liquidity, and bank profitability. Specifically, an increase in the level of disclosure about digital transformation in Iraqi commercial banks leads to a corresponding increase in information asymmetry by 9.4%, as indicated by the B coefficient of 0.094. The multiple correlation coefficient between the model variables was 0.529, which suggests a significant correlation between the study variables. The coefficient of determination R2 was (0.280), indicating that the model variables account for 28.0% of the variation in the accuracy of financial analysts' predictions,

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serving as a measure of information asymmetry. All variables included in the model have a variance inflation factor less than 10, suggesting the absence of any linear correlation between them.

In addition, the Durbin Watson value of (1.628) falls within the optimal range of (1.5 to 2.5), suggesting that there is no autocorrelation between the variables. After analysing the previous results, it is evident that the third hypothesis is not supported. Instead, we find support for the alternative hypothesis: There appears to be no notable correlation between the disclosure of the digital transformation index by Iraqi private commercial banks and the level of information asymmetry, as indicated by the accuracy of financial analysts' predictions.

Conclusions and Recommendations

In conclusion, the digital transformation disclosure index has a positive impact on reducing information asymmetry among financial analysts' predictions. This effect is observed when considering various variables such as bank size, efficiency, capital adequacy, bank liquidity, and bank profitability. In addition, the multiple correlation coefficient between the model variables was found to be 0.529, which is a significant percentage. This suggests a strong correlation between the study variables. The results of the hypothesis testing indicated that the first and second hypotheses were supported, while the third hypothesis was not supported.

Based on the accomplishments thus far, we propose the following recommendations. The central bank should provide clear guidelines for regulating banks' disclosure of DTI ratios. These guidelines should ensure fair accounting disclosure and consistent communication of information to all stakeholders. Additionally, the auditor must possess an understanding of the risks involved to effectively provide confirmatory services for the accounting disclosure of DTI. Furthermore, it is necessary to prioritise accounting research in Iraqi universities and scientific conferences about banks' disclosure of DTI to gain a better understanding of the factors and determinants influencing them.

Future Directions

Further studies can be conducted by researchers to explore future directions. Future research should assess the influence of commercial banks' disclosure of debt-to-income ratio (DTI) on banks' value. Furthermore, it is suggested that researchers measure the effect of commercial banks' disclosure of DTI on financing costs. Furthermore, it is suggested that scholars assess the influence of commercial banks' disclosure of debt-to-income ratio (DTI) on stock prices. It is recommended that future studies measure the impact of commercial banks' disclosure of debt-to-income ratio (DTI) on the auditor's responsibility.

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