

## Article

# Information Technology Governance and Corporate Boards' Relationship with Companies' Performance and Earnings Management: A Longitudinal Approach

Harman Preet Singh \*  and Hilal Nafil Alhulail

Department of Management and Information Systems, College of Business Administration, University of Ha'il, P.O. Box 2440, Ha'il 81451, Saudi Arabia

\* Correspondence: h.singh@uoh.edu.sa

**Abstract:** In accordance with the segregation of oversight from management decision making, the board-level information technology governance is accountable for supervising managerial IT activities. This research empirically analyzes the impact of board-level IT governance on the performance and earnings management practices of Saudi Arabian stock exchange (Tadawul)-listed companies between 2008 and 2020. The study sample includes cross-sectional time-series data from 154 firms with 18,018 firm-year observations. This study used regression analysis and other econometric models to examine probable endogeneities. The findings show that only the return on assets' operational performance is positively and significantly related to board-level IT governance among the three performance metrics (return on assets, return on equity, and Tobin's Q). This indicates that a higher proportion of members with IT experience and the presence of a board-level IT professional as chief information officer/chief technology officer and an IT committee positively impact operational performance. Finally, board-level IT governance competence and other governance attributes do not deter earnings management practices. Therefore, countries like Saudi Arabia should enhance their corporate governance environment considering the increasing significance of IT governance (control, service, and monitoring). There is also a need to review provisions of the Saudi Arabia Corporate Governance Regulations, especially for board composition, the appointment of independent and IT-literate directors, and penalties for non-compliance with regulations.

**Keywords:** board of directors; corporate governance; earnings management; firm performance; IT governance; information technology; Saudi Arabia



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## 1. Introduction

Information technology (IT) has become a widely available instrument in the hands of corporate organizations to support and sustain a vital business strategy to compete advantageously, increase performance, and produce wealth for the company's shareholders by the managers entrusted with the company's resources [1,2]. According to Lazic [3], IT has become indispensable for organizations' support, viability, and expansion. However, despite the increasing significance of IT, its usage for maximum benefits and control in the business world remains a problem for corporate management and stakeholders, particularly in developing nations [4]. According to De Haes and Van Grembergen [5], the full adoption of IT in nearly all corporate segments and operations has necessitated an emphasis on information technology governance (ITG) and other corporate governance (CG) control measures. Ensuring ITG effectiveness by establishing pertinent mechanisms ensures adequate controls over IT management, enhances performance, and assures the integrity and transparency of financial recording and reporting processes [1].

In theory, CG mechanisms are meant to monitor and supervise the successful operation of corporate bodies. CG guarantees the transparency and accuracy of financial reporting, prevents earnings manipulation, and enhances the organization's performance [6,7].

Among these CG measures is establishing an independent board of directors (BOD) with additional attributes. In an IT-driven economy, all business operations have been impacted, and the burning question is whether or not the traditional BOD can still efficiently and appropriately supervise management activities without ITG mechanisms. Prior research [4,8] states that the traditional BOD place insufficient attention on risk management and perform ineffective oversight of IT due to their concentration on board structure and makeup, the board size, and the number of independent members. Sarbanes–Oxley and other nations' legal and legislative corporate requirements have further emphasized the need for a shift in emphasis, causing the modern BOD to consider ITG as a crucial function they must fulfill [9,10]. Therefore, board members' modest IT proficiency may not be sufficient, but it is required for the BOD to fulfill its crucial tasks (control, service, and monitoring) within ITG [11].

ITG falls within the purview of the BOD and executive management. It is a vital aspect of CG and comprises the management, structures, and procedures that ensure the firm's IT supports its plans and goals [12]. Corporate BODs play a crucial function in ITG because it is a component of the overall CG structure [13]. However, boards cannot reap the full benefits of IT investments because they lack competent ITG mechanisms to boost firm profitability through IT expertise [14]. This could be because each nation has its peculiar issues, is influenced by its own cultural and historical elements, and is frequently governed by legal and regulatory frameworks that impact the success or failure of ITG and CG systems [15–17].

Like most developing economies, Saudi Arabia places a premium on foreign direct investment in accordance with its Vision 2030 [18], but it also faces significant challenges in capitalizing on the growing importance of ITG (control, service, and monitoring) [4]. This issue is exacerbated by the economy opening up to international corporations (equity investors) with their advanced technology and IT expertise. The traditional (insufficiently IT literate or competent) BOD may be unable to handle the emerging IT control and monitoring functions. According to Hamdan et al. [4], Saudi Arabia must go beyond the traditional characteristics of CG because the country's recent economic openness is drawing a huge number of multinational enterprises, as well as their technology and advanced technical and managerial capabilities. Therefore, these Saudi Arabian enterprises must have effective ITG. Consequently, this research endeavors to identify and quantify the effect of existing ITG at the board level on the performance and earnings management practices of Saudi Arabian stock exchange (Tadawul) enterprises. Prior research in developed economies has demonstrated the relative effectiveness of ITG and CG in influencing business managers' accounting representations and improving corporate financial performance [19–21]. However, prior research indicated that traditional western CG mechanisms have little institutional support in developing nations [22,23]. In addition, there is a shortage of related research on emerging economies. Consequently, it is equally essential to evaluate the efficacy of these western-oriented CG concepts—in this case, ITG systems, in a different context, particularly at the company level in emerging economies like Saudi Arabia.

This study builds on past research, notably that of Benaroch and Chernobai [20], Hamdan et al. [4], and Joshi et al. [21], although the emphasis is different. The current study focused on boards' IT competency and other BOD mechanisms that contribute to companies' financial performance and that are likely to affect corporate managers' inappropriate financial behavior, reducing earnings management (EM) practices. Consequently, this study addressed the following main research question:

Does board-level IT competence (BITC), in particular, and other board characteristics, contribute to firms' financial performance and monitor corporate managers' EM practices in Saudi Arabia's publicly traded enterprises?

This study draws on three theoretical perspectives: agency, resource dependence, and stewardship theories, to examine the research question.

Prior research suggests that financial performance data may not have informational value if they are not reliable, credible, and transparent [24,25]. ITG's four pillars—account-

ability, translucence, participation, and predictability [26,27]—directly and substantially affect business performance and the financial reporting process [28–30]. Therefore, in this study, EM is examined alongside firm performance. This is also important because there is a minor demarcation between firm performance and the reliability of the financial recording and reporting procedures (devoid of earnings manipulations) in terms of the BOD monitoring and disciplining functions to align agents' efforts with stakeholders' interests [31–33].

The research contributes to the CG literature, particularly the ITG literature. First, this is one of the few studies using board ITG as a component of the CG mechanism that concurrently influences corporate financial performance and reporting procedures in unfavorable accounting and finance incidents. According to this study's empirical findings, ITG has the potential to boost firm performance and guarantee the accuracy of financial recording and reporting in emerging economies, provided the appropriate legislative and regulatory framework is established and put into place. Second, to understand the distinctive contexts in which different nations operate, it is essential to conduct research on each country individually [34–37]. This study fills this research vacuum and expands the board ITG literature by concentrating on an emerging economy with its unique characteristics and where informal ties and considerations other than solely economic criteria are given some weight. Third, the study utilized key theories (agency, stewardship, and resource dependence) typically employed in CG research in the Saudi Arabian context. This contribution fills a vacuum in the board ITG literature and expands the theoretical understanding of the relationship between ITG, company financial performance, and EM practices in emerging economies. Furthermore, Dalwai et al.'s [38] extensive literature review of the Gulf Cooperation Council (GCC) countries revealed various shortcomings of earlier research in CG, such as a single-period study and insufficient data. This research uses cross-sectional time-series data from 2008 to 2020 to ensure a large dataset, which may contribute to the accuracy of the analysis and results. It can expand empirical understanding of the association between ITG, business performance, and EM practices in emerging economies such as Saudi Arabia.

The rest of the study proceeds as follows: Section 2 addresses the theoretical framework, reviews the pertinent literature, and formulates the study hypotheses. Section 3 explains the data and methodology utilized to test the hypotheses. Section 4 focuses on the results and discussion. The last section discusses the conclusions, implications, and future research directions.

## 2. Literature Review and Hypotheses Development

### 2.1. Theoretical Framework

Several theories underpin the CG literature to expound the relationship between ownership (principal) and control (agent) [39,40]. This paper considers three theories (agency, resource dependence, and stewardship) as a theoretical guide to review and analyze the relationship between CG (board ITG), corporate financial performance, and EM. Furthermore, in line with Benaroch and Chernobai [20], this paper considers board-ITG functions under two perspectives—monitoring and service, which are also the central board functions in CG.

The first is the agency theory, which generally explains the relationship between parties (e.g., principals and agents). According to Benaroch and Chernobai [20], agency theory is the theoretical foundation for the board's ITG monitoring function. Jensen and Meckling [41] define agency theory as a contract in which two or more parties hire a third party to provide a service on their behalf and grant some rights over how to carry out the service. According to Al-Shattarat et al. [25], the opportunistic conduct of corporate managers causes them to aim to maximize their personal interests. Due to this conflict of interest, a company's financial performance may only be affected negatively [42–44]. In summary, it is assumed that both sets of actors (principals and agents) have conflicting objectives (to varied degrees) and suffer from information asymmetry [45].

The segregation of ownership from control and the attendant agency issues are also present in the domain of IT. Managers who act as agents may have interests that conflict with those of equity providers (owners). According to Ho et al. [46], managers may make disproportionate IT investments since a larger IT department leads to increased power, salary, and other advantages that may not accurately reflect the company's IT needs. This may not necessarily increase the firm's profitability or performance. ITG is an essential BOD function [47–49], particularly in firms where technology plays a pivotal role [50,51]. Effective monitoring in this context (ITG) can be affected not only by the independent characteristics of the BOD but also by the board's degree of IT competency, which is represented by directors on the board with IT expertise and experience [52]. The monitoring function of the board in this regard seeks to corroborate that IT resources are utilized effectively for the success of the business, which is reflected in a credible and reliable financial reporting process and firm performance [53,54].

This study's second theory is the resource dependence theory. It provides a theoretical basis for the BOD's position as a resource that may provide value to the company [55–57]. Qualified and experienced board members are regarded as a strategic resource that may not only contribute to the organization's performance, but also serve as a link to external resources [53,58]. In addition to ITG monitoring functions, the IT-competent board is also responsible for service functions. According to Benaroch and Chernobai [20], the board's service function would encompass a vast array of responsibilities, such as enhancing the company's image in the eyes of the public regarding its IT capabilities, providing IT expertise and counselling to management, securing special treatment from external IT providers, and contributing to the development of an IT strategy. The ability of the BOD to deliver these ITG control and service duties because of their IT knowledge, expertise, experience, and abilities affects the credibility and transparency of the financial reporting process and performance.

The stewardship theory is also relevant to this investigation. It holds that company leaders are stewards who pursue the same objectives as the firm's owners and should be exempt from excessive oversight not to impede the company's advancement [59]. It acknowledges that individuals can be organization-serving and have higher-order motivations than monetary gain or utility. In this scenario, ITG control and monitoring functions may be a required, but insufficient conditions for managers to strive toward the company's success in terms of the performance and dependability of the financial reporting process likely to maximize shareholder wealth. The stewardship theory views managers as dedicated stewards of the firm. Donaldson and Davis [60] argue that corporate managers, in their capacity as stewards of the firm, are organizational role models who are motivated by a desire to achieve, to find meaning in their work by rising to the challenges it presents, to lead by example, and to be viewed as competent and respected by their peers and superiors. Nonetheless, this study believes that the separation of ownership and control results in agency problems that necessitate CG procedures to address agency conflicts. In this context, BOD ITG monitoring and service functions over managers [20] may improve the credulousness of the financial reporting process and firm performance [61]. Therefore, these theories constitute the theoretical framework upon which the current research hypotheses were developed and how the data were interpreted in this study.

## 2.2. CG/ITG Mechanisms, Financial Performance, and Earnings Management

Previous research has examined the relationship between CG structures (such as board features) and EM [62,63]. Due to their personal interests, corporate managers tend to influence or distort the process of preparing financial statements [64]. Kwon et al. [65] argue that corporate managers are incentivized to manipulate financial earnings either directly or through indirect accounting procedures due to information asymmetry, opportunistic behavior, and discretionary decision-making power. Some studies have also considered CG structures and corporate performance [66–70]. Others have investigated the effect of board-level IT competency on corporate performance and EM [4,20,21,50,71,72].

Corporate responsibility, accountability, and transparency are fundamental characteristics of CG [73–75] that assist in regulating public firms not just in developed countries but also in emerging economies [76]. ITG is an integral component of CG [13], and its control spans technical, operational, and sometimes administrative procedures to ensure the integrity, confidentiality, and dependability of the information system [77,78]. The BOD should therefore be concerned with monitoring managerial IT decisions and resource allocation in light of the significance of IT and its application in nearly all parts of the company, not just as a management tool but also for business competitiveness [50].

In order to remain competitive, modern businesses largely rely on IT and increasingly employ it to manage business activities and procedures. In most firms, IT permeates all business operations and functional divisions. Therefore, the BOD should monitor managerial IT decisions as well as rules and processes for managing IT resources [50]. As a crucial component of the CG framework, ITG aids in the identification and control of IT-related business risks in enterprises [79]. ITG is also related to the evaluation of IT investment efficiency [11], which positively impacts the performance of the organization [72,80]. Companies with superior ITG may gain a competitive edge in driving technological decisions and reducing expenses [72]. ITG could serve as a check on corporate managers' EM practices [81].

Therefore, this study utilized the aforementioned research to identify potential board CG elements that could impact EM and firm performance in Saudi Arabia. Particularly, this research focused on three key board IT competency measures (board IT capital, a chief information officer (CIO)/chief technology officer (CTO) function on the board, and the creation of board-appointed IT committees). In addition, this study also considered three other BOD-related features (board size, director (executive) share ownership, and board independence).

### *2.3. Board ITG Mechanisms and Board Characteristics*

The relationship between the BOD and company management has frequently been examined in ITG research through the lens of classical agency and stewardship theories [20]. The agency theorists view the BOD as a tool for monitoring managers' opportunistic and discretionary behavior (e.g., EM), which results from a conflict of interests stemming from the segregation of ownership and control. As per the agency theory perspective, managers may incur IT expenditures for their own gain, but these expenditures may not result in a proportionate improvement in corporate performance [46]. In contrast, stewardship theorists view corporate managers as stewards who pursue the same objectives as the company's owners and, consequently, should be exempt from undue control not to impede the company's progress [59]. Despite these contradictory opinions, as part of its statutory duty, the BOD monitors ITG utilizing a variety of ITG mechanisms. These ITG mechanisms include board IT capital, function-specific responsibilities (e.g., CIO/CTO on the BOD), and board-level IT committees [20].

The first ITG mechanism is the proportion of board members with IT competence [50]. IT competence may comprise, among other things, an IT-related educational background, industry experience, and the capacity to articulate expert viewpoints on various issues pertaining to a company's IT operations. From the agency theory viewpoint, the monitoring function of the BOD ITG comprises the examination and pursuance of internal system controls and, occasionally, IT resources [9,82]. Based on the resource dependence theory, the IT expertise of directors is leveraged in service tasks such as providing IT guidance and counsel to management and employing experienced and competent IT managers [83]. According to Li et al. [9], organizations with sufficient IT-competent board members maintain effective IT controls and report fewer problems. According to Haislip et al. [84], companies with more experienced IT members on the BOD frequently achieve the optimal alignment of IT needs and budgets. According to Benaroch and Chernobai [20], board IT competence, a CIO on the BOD, and board ITG mechanisms impact firm performance through board service and monitoring functions. The Saudi Arabia Corporate Governance

Regulations (SACGR) asserts that a BOD composed of professionally competent managers with the required knowledge, experience, and skill contributes to the firm's profitability and enables the transparency of the financial recording and reporting processes [85], which works against opportunistic behavior of management and reduces EM practices [86].

Another board-level ITG mechanism is the presence of a CIO/CTO or another board-level IT executive [50]. The CIO/CTO is often saddled with the responsibility of developing and implementing a unique IT vision that can create wealth for the organization [9]. Agency and resource dependence theories view the presence of the CIO/CTO on the BOD as a monitoring mechanism that aids in professional service delivery [82]. An IT director as a resource enhances company performance due to their effective and efficient use of resources and services [87]. According to Wong and Bajuri [88], the possibility of companies having IT material weaknesses, vulnerabilities, or pitfalls is reasonably reduced when there are sufficient directors with IT knowledge and a CIO/CTO on the board.

The final ITG mechanism is the board IT committee appointed by the company's BOD. According to Karimi et al. [89], while the BOD in ITG is responsible for determining the general strategy, the IT committee focuses on horizontal coordination among organizational units. Typically, it comprises the internal IT department members and high-level executives from other important business divisions. Similar to other board committees (such as the audit committee) examined in the CG literature, the IT committee aids in monitoring IT issues, evaluating IT controls, executing the IT strategy, overseeing the day-to-day management of IT-service delivery, and driving IT decisions [90]. The IT committee restricts the IT-centered decision rights of management due to the board's delegation of IT-related decision initiation and ramification rights to IT committees [20]. In addition, like any other board committee appointed in its area of expertise, the IT committee is responsible for providing its professional opinion and oversight of the IT management process to ensure internal control effectiveness and transparency and to improve the quality of financial reporting, as well as for reporting to the BOD [91].

#### *2.4. Board-Level ITG and Firm Performance*

Prior research based in developed economies has demonstrated that a board's level of IT proficiency and other board characteristics (size, independence, and director ownership) contribute to a firm's performance [92,93] and also serve as a check on corporate managers' EM practices. The composition of the BOD, which includes IT specialists or at least those with IT experience, contributes to the efficacy of businesses' operational and/or financial performance. It also contributes to the avoidance of misuse and deception, which adds to the enhancement of the firm's performance [4].

The positive association between board-level ITG and the financial performance strand of studies base their arguments on resource dependence and stewardship theories [9]. These studies emphasized that IT-competent members of the BOD are valuable resources or assets with useful knowledge and skills in IT [72]. These studies also asserted that corporate managers are fundamentally trustworthy stewards who share the same goals as the company's owners [72]. These individuals work for the company's success and ensure the integrity and transparency of the financial recording and reporting process.

Lunardi et al. [13] demonstrated that a favorable market reaction is recorded when individuals with IT experience are assigned to the BOD of Internet firms and IT-strategy committees are established. Board-level IT competency reduces operational IT failures [20] and leads to favorable market reactions [13], which could lead to enhanced firm performance [4,20,21,94,95]. In addition, Kobelsky et al. [94], Henderson et al. [95], and Hamdan et al. [4] established a favorable correlation between the BOD's IT knowledge and future firm performance. The study by Li et al. [9] revealed that organizations with a combined CIO/CTO position and a bigger number of independent directors on the BOD had a reduced probability of system failure due to the effective monitoring and technical services provided by IT specialists. This ensured the reliability of the company's financial and other processes, resulting in enhanced firm performance. Benaroch and Chernobai [20]

linked inadequate BOD ITG to operational IT issues that resulted in a negative stock market reaction. This lack of control (degree of IT competency) on the part of the BOD may also impact other processes (such as the compilation of financial statements) in modern IT-driven organizations. They argued that IT failures motivate organizations to enhance their board-level IT competency, which could result in improved firm performance [20].

Scheeren et al. [80] and Chau et al. [96] reported that ITG fosters business–IT alignment and reduces IT risk, which leads to improved firm performance. Jewer and McKay [50] supported the notion that board capital (IT skills and expertise) is a resource that positively impacts a firm’s financial performance and reflects the organization’s operational quality. Hillman and Dalziel [53] asserted that board capital impacts firm performance through monitoring and provision of resources. Shapiro et al. [72] further emphasized that organizations with excellent ITG may have a competitive edge in boosting IT-related cost control decisions, hence enhancing firm performance. According to Higgs et al. [91], organizations with IT committees improved board ITG monitoring, resulting in fewer IT breaches over the course of a financial year. In accordance with agency theory, the IT committee, like any other committee created by the BOD, is expected to protect the shareholders’ interests and prohibit EM practices by corporate managers [97]. According to Joshi et al. [21] and Widharto et al. [98], ITG guided enterprises in the digital economy to deploy IT resources, create IT process capabilities, and update their IT infrastructure, resulting in improved firm performance. Menshawy et al. [31] and Ilmudeen [99] show that firms’ investments in superior IT capabilities leads to improved business performance. Solana-González [100] asserts that superior information quality leads to reduced information symmetry, which results in improved firm performance. Furthermore, Liu et al. [101] concluded that IT wisdom affects the operational performance of companies.

A few studies which depicted a negative relationship based their arguments on agency theory and its inherent conflict of interests, which resulted in the separation of ownership and control [102]. These conflicting interests underpinned every action of the managers, which hindered corporate performance and casted doubts on the financial recording and reporting processes. Carr [103] suggested that IT did not have a strategic impact on projects since it has become a generally available commodity; hence, it has not been viewed as strategically important by the directors of organizations. The empirical study conducted by Kaur et al. [104] on the relationship among ITG and corporate financial performance revealed no significant relationship. According to that study’s findings and conclusion, although ITG factors such as structures, processes, and relational mechanisms were related to firm performance, they accounted for only around 6% of the variation in firm performance [104].

In a nutshell, empirical research on the relationship among board-level ITG on EM and firm financial performance largely indicated a positive relationship [4,9,20,21,50,72,80,91,97], whereas a few studies suggested a negative or no relationship [102–104].

## 2.5. Hypotheses and Theoretical Model

Since the literature presented in previous sections largely indicated a positive relationship between ITG and firm performance, the first set of hypotheses for this study are as follows:

**H1.** *There is a positive relationship between board-level ITG competence and corporate operational performance in Saudi Arabian public companies.*

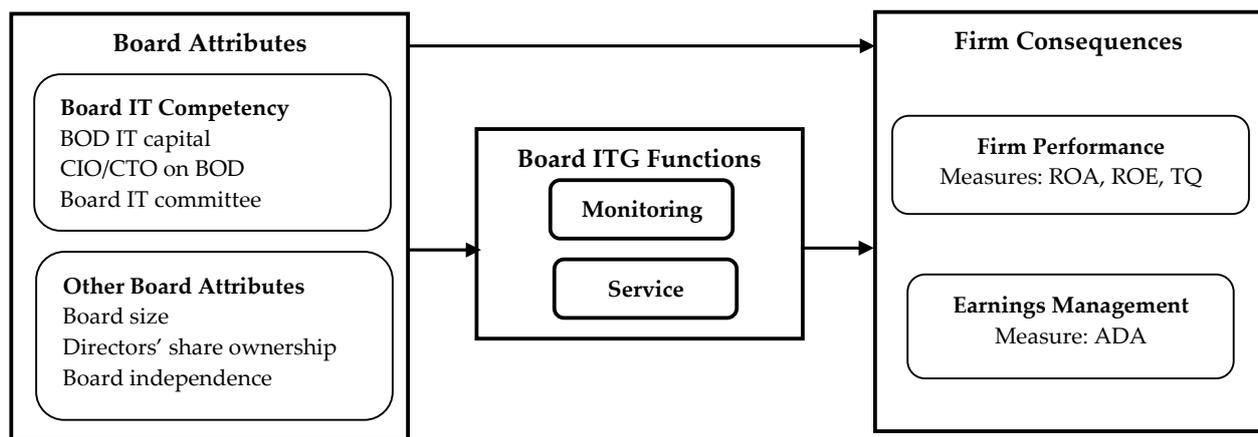
**H2.** *There is a positive relationship between board-level ITG competence and corporate financial performance in Saudi Arabian public companies.*

**H3.** *There is a positive relationship between board-level ITG competence and corporate market performance in Saudi Arabian public companies.*

On the transparent and reliable financial recording and reporting aspects and board-level ITG, the hypothesis is as follows:

**H4.** *There is a negative relationship between board-level ITG competence and earnings management practices in Saudi Arabian public companies.*

Figure 1 presents this study's theoretical model. The board attributes are comprised IT competence and other board attributes. In accordance with Benaroch and Chernobai [20] and Joshi et al. [21], this study considered three characteristics or variables of BITC: the proportion of board members with IT experience (capital), the presence of a CIO/CTO on the BOD, and the board's creation of an IT committee. The current research measured the IT competence using BOD's IT capital, CIO/CTO on the BOD, and the board IT committee. IT capital could be determined by the directors' IT qualifications, experience, and/or certifications [50,105]. The CIO/CTO should be an internal (executive) director on the board [106,107]. The proxy statement should document the board IT committee [4]. In accordance with Grada [108], this research incorporated three additional corporate board characteristics into the study model: size, independence, and director share ownership. As per Fama and Jensen [39], corporate board size should be determined by the complexity of a company. Directors'/managers' ownership of shares (equity) is also a part of the internal monitoring mechanism of a firm [109–111]. Davis et al. [59] and Becht et al. [109] considered director ownership as a means of associating the interests of shareholders and management but stated that further studies should be undertaken to identify and quantify the real effect. An independent BOD is represented by a greater proportion of outside (independent) directors and is viewed as a successful internal CG tool for monitoring the discretionary conduct of management [19,112,113].



**Figure 1.** Theoretical Model.

The present study measured firm performance using the return on assets (ROA), return on equity (ROE), and Tobin's Q (TQ). ROA indicates firm profitability vis à vis its total assets [114]. ROE underscores firm efficiency in utilizing shareholders' capital [115]. TQ is a market-based indicator of a company's performance. It is prospective, risk-aware, and less susceptible to changes in accounting practices [116,117]. This study measured earnings management (EM) using the absolute value of discretionary accruals (ADA) following the modified Jones model [118].

### 3. Methodology

#### 3.1. Data and Sample Selection

Data from Saudi Arabian stock exchange (Tadawul)-listed companies from 2008 to 2020 were acquired from its website to test the study's theoretical predictions. This study's IT and CG data were collected primarily from the directors' report section of the Saudi companies' annual financial reports. Article 87 of the Saudi Arabia CG Regulations (SACGR) [85] stipulates that a board's report must include the board's operations during the preceding fiscal year and all factors affecting the company's business, as well as the names, quali-

fications, and experience of the BOD, committee members, and executive management. Public companies also file annual reports and other documents with the Capital Market Authority (CMA) [119]. In Saudi Arabia, besides the audit committee, the SACGR also created provisions for forming other committees like risk management and CG [85]. Some technical committees have been formed, especially in the banking, telecommunication, and other IT-oriented companies or sectors, that assist the board and senior management to perform its ITG and other functions [4].

In accordance with prior research and the literature on corporate performance and EM, the financial sector was excluded due to its controlled financial reporting, namely in its recording and calculation of accrual-based earnings [108,120]. Moreover, companies with missing financial and/or governance data were excluded. After eliminating companies with missing data, the final sample was 154. We arrived at the number of firm-year observations using the total number of selected companies ( $N = 154$ ) multiplied by the total number of variables ( $V = 9$ ) multiplied by the sample period (2008 to 2020) ( $T = 13$ ). Therefore, this study sample consisted of 154 companies with 18,018 firm-year observations. The sectors of the companies included in the study sample are displayed in Table 1.

**Table 1.** Sample selection.

Sector	Sample	Percentage (%)	Total Observations
Petrochemicals	11	7.14	1287
Retail	14	9.09	1638
Cement	12	7.79	1404
Agriculture and Food	14	9.09	1638
Telecom and IT	4	2.60	468
Energy and Utilities	2	1.30	234
Hotels and Tourism	4	2.60	468
Industrial Investment	13	8.44	1521
Building Construction	15	9.74	1755
Multi-investment	7	4.55	819
Transport	5	3.25	585
Real Estate Development	8	5.19	936
Media and Publishing	3	1.95	351
Healthcare Services	6	3.90	702
Consumer Durables and Apparel	9	5.84	1053
Commercial and Professional Services	7	4.55	819
Metals and Mining	10	6.49	1170
Capital Goods	10	6.49	1170
Total	154	100	18,018

### 3.2. Variables and Measures

For the regression analysis, we applied the following five sets of variables: (i) performance variables: ROA, ROE, and Tobin's Q; (ii) EM variable; (iii) board-level ITG mechanisms; (iv) other board CG variables; and (v) control variables.

#### 3.2.1. Dependent Variables

The first set of dependent variables consists of accounting and market-related measures that are used to define the concept of corporate performance. They are ROA, ROE, and TQ, that measure company operational, financial, and market performance, respectively. ROA is computed by dividing operating income by total assets [114]. ROE is computed by

dividing net income by total equity [115]. TQ is computed by dividing the market value of a firm by its assets' replacement cost [117].

To examine the impact of board-level ITG competency on firm performance, we evaluated the following empirical models:

$$ROA_{it} = \beta^0 + \beta^1 BITC_{it} + \beta^2 CITB_{it} + \beta^3 ITCM_{it} + \beta^4 BSIZ_{it} + \beta^5 DOWN_{it} + \beta^6 BIND_{it} + \beta^7 CSIZ_{it} + \beta^8 FLEV_{it} + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \beta^0 + \beta^1 BITC_{it} + \beta^2 CITB_{it} + \beta^3 ITCM_{it} + \beta^4 BSIZ_{it} + \beta^5 DOWN_{it} + \beta^6 BIND_{it} + \beta^7 CSIZ_{it} + \beta^8 FLEV_{it} + \varepsilon_{it} \quad (2)$$

$$TQ_{it} = \beta^0 + \beta^1 BITC_{it} + \beta^2 CITB_{it} + \beta^3 ITCM_{it} + \beta^4 BSIZ_{it} + \beta^5 DOWN_{it} + \beta^6 BIND_{it} + \beta^7 CSIZ_{it} + \beta^8 FLEV_{it} + \varepsilon_{it} \quad (3)$$

where

$ROA_{it}$  = return on assets of the firm  $i$  for the year  $t$ ;

$ROE_{it}$  = return on equity of the firm  $i$  for the year  $t$ ;

$TQ_{it}$  = Tobin's Q of the firm  $i$  for the year  $t$ ;

$BITC_{it}$  = ratio of directors with IT capital on the board of the firm  $i$  for the year  $t$ ;

$CITB_{it}$  = CIO/CTO named as executive officer on the board of the firm  $i$  for the year  $t$ ;

$ITCM_{it}$  = number of board-level IT committees in the existence of the firm  $i$  for the year  $t$ ;

$BSIZ_{it}$  = number of directors on the board of the firm  $i$  for the year  $t$ ;

$DOWN_{it}$  = percentage of shares owned by executive directors of the firm  $i$  for the year  $t$ ;

$BIND_{it}$  = percentage of independent directors on the board of the firm  $i$  for the year  $t$ ;

$CSIZ_{it}$  = logarithm of the total assets of the firm  $i$  for the year  $t$ ;

$FLEV_{it}$  = total liabilities divided by total assets of the firm  $i$  for the year  $t$ ; and

$\varepsilon_{it}$  = error term.

The last dependent variable is EM. Extensive use of discretionary accruals are prevalent to illustrate the movement of accounting earnings from one period to another by management [121]. This research adopted the modified Jones model [118] to measure the discretionary EM behavior of corporate managers [121]. To capture the full impact of this behavior, the absolute value of discretionary accruals (ADA) (i.e., in both directions) is used as the proxy for EM [122]. The total accruals (TA) are identified first, followed by the non-discretionary accruals (NDA), and the remainder are deemed discretionary accruals (DA), owing to management's opportunistic conduct [86,121].

Below is the illustration:

$$TA - NDA = DA$$

The modified Jones model [118] is expressed as follows:

$$\frac{TA_{it}}{A_{it-1}} = \frac{\alpha}{A_{it-1}} + \beta_1 \left( \frac{(\Delta REV_{it} - \Delta AR_{it})}{A_{it-1}} \right) + \beta_2 \left( \frac{PPE_{it}}{A_{it-1}} \right) + \varepsilon_{it}$$

where

$TA_{it}$  = total accruals for firm  $i$  in the year  $t$ ;

$A_{it-1}$  = net total assets for firm  $i$  in the year  $t-1$ ;

$\Delta REV_{it}$  = change in revenue for firm  $i$  from the year  $t-1$  to the year  $t$ ;

$\Delta AR_{it}$  = change in accounts receivable for firm  $i$  from the year  $t-1$  to the year  $t$ ;

$PPE_{it}$  = plant and equipment for firm  $i$  in the year  $t$ ;

$\varepsilon_{it}$  = error term for firm  $i$  in the year  $t$ ; and

$\beta^1$  and  $\beta^2$  = company-specific estimates.

Non-discretionary accrual (NDA) is expressed as follows:

$$NDA_{it} = \hat{\beta}_0 \frac{1}{A_{it-1}} + \hat{\beta}_1 \left( \frac{(\Delta REV_{it} - \Delta AR_{it})}{A_{it-1}} \right) + \hat{\beta}_2 \left( \frac{PPE_{it}}{A_{it-1}} \right) + \varepsilon_{it}$$

where  $\beta^0$ ,  $\beta^1$ , and  $\beta^2$  are company specific estimates.

Total accruals are expressed by:

$$TA^t = EXA^t - OCF^t$$

where

$EXA^t$  = earnings before extraordinary and abnormal items in year  $t$ ; and  
 $OCF^t$  = operating cash flow in year  $t$ .

The residual of  $TA_{it}$  and  $NDA_{it}$  is  $ADA_{it}$  which is expressed below:

$$ADA_{it} = \frac{TA_{it}}{A_{it-1}} - \hat{\beta}_0 + \frac{\hat{\alpha}}{A_{it-1}} + \hat{\beta}_1 \left( \frac{(\Delta REV_{it} - \Delta AR_{it})}{A_{it-1}} \right) + \hat{\beta}_2 \left( \frac{PPE_{it}}{A_{it-1}} \right) + \varepsilon_{it}$$

where

$TA_{it}$  = total accruals for firm  $i$  in the year  $t$ ;  
 $A_{it-1}$  = net total assets for firm  $i$  in the year  $t-1$ ;  
 $\Delta REV_{it}$  = change in revenue for firm  $i$  from the year  $t-1$  to the year  $t$ ;  
 $\Delta AR_{it}$  = change in accounts receivable for firm  $i$  from the year  $t-1$  to the year  $t$ ;  
 $PPE_{it}$  = plant and equipment for firm  $i$  in the year  $t$ ;  
 $\beta^0, \beta^1$ , and  $\beta^2$  = company-specific estimates; and  
 $\varepsilon_{it}$  = error term for firm  $i$  in the year  $t$ .

The study's fourth empirical model using ADA as a proxy for EM is as follows:

$$ADA_{it} = \beta^0 + \beta^1 BITC_{it} + \beta^2 CITB_{it} + \beta^3 ITCM_{it} + \beta^4 BSIZ_{it} + \beta^5 DOWN_{it} + \beta^6 BIND_{it} + \beta^7 CSIZ_{it} + \beta^8 FLEV_{it} + \varepsilon_{it} \quad (4)$$

where

$ADA_{it}$  is EM measured using the modified Jones model [118];  
 $BITC_{it}$  = ratio of directors with IT capital on the board of the firm  $i$  for the year  $t$ ;  
 $CITB_{it}$  = CIO/CTO named as executive officer on the board of the firm  $i$  for the year  $t$ ;  
 $ITCM_{it}$  = number of board-level IT committees in the existence of the firm  $i$  for the year  $t$ ;  
 $BSIZ_{it}$  = number of directors on the board of the firm  $i$  for the year  $t$ ;  
 $DOWN_{it}$  = percentage of shares owned by executive directors of the firm  $i$  for the year  $t$ ;  
 $BIND_{it}$  = percentage of independent directors on the board of the firm  $i$  for the year  $t$ ;  
 $CSIZ_{it}$  = logarithm of the total assets of the firm  $i$  for the year  $t$ ;  
 $FLEV_{it}$  = total liabilities divided by total assets of the firm  $i$  for the year  $t$ ; and  
 $\varepsilon_{it}$  = error term.

### 3.2.2. Independent and Control Variables

The independent variables of the research are BOD IT capital (BITC), CIO/CTO role on the BOD (CITB), and board IT committee (ITCM).

For board members' IT capital, the research used IT-related experience or qualification of BOD members, which is frequently provided in annual financial reports of companies, and dichotomous indicators that board ITG researchers have used to quantify directors' IT capital [50,105], such as, "(1) Has the director held an IT management position in the past? (2) Has the director previously worked in a public IT firm? (3) Does the director hold IT-related college degrees or certifications?" Meeting any of these characteristics qualifies a director as having IT capital. Board IT capital is the percentage of directors (excluding the CIO/CTO) with IT qualifications, experience, and/or certifications.

The second is the presence of a CIO/CTO on the BOD. The director must not only have some of the conditions mentioned earlier but must be indicated as an internal (executive) director in the proxy statement [106,107]. This study coded it as 1 if there was a CIO/CTO on the BOD and 0 otherwise.

The third indicator is the presence of a board IT committee or IT (audit)-related committee documented in the proxy statement or filed with the SACMA [4]. This research coded it as 1 if there was a board IT or IT-related committee and 0 otherwise.

This research also considered three other independent variables in the regression model: board size, independence, and director ownership of shares. Corporate board size is determined according to the number of directors on the BOD [39]. Director (executive) ownership is determined by the proportion of shares owned by the executive directors [109]. Board independence is determined by the percentage of independent directors on the BOD [19].

This study also considered two control variables for the regression model: company size and financial leverage. We employed the control variables as they enhanced the study's internal validity and limited the influence of confounding and extraneous variables [123]. According to Cohen and Zarowin [121], regulatory authorities keep an eye on large companies as they have a high volume of business activities that are susceptible to financial manipulations by company management. According to Prasastine and Yulianto [124], financial leverage influences the agency costs of a firm. Such agency costs may inhibit depicting the true value of a firm [125]. In a recent CG study conducted in Saudi Arabia, Grada [108] employed firm size and financial leverage as control variables. Therefore, a company's financial condition is controlled by including its size and financial leverage (total debt/total assets). The company size and financial leverage variables are expected to positively impact the market performance of listed Saudi companies.

Table 2 shows all the variables and their definitions and measurements.

**Table 2.** Variables and definitions.

Variable	Definition/Measurement
<i>Dependent Variables</i>	
Firm Performance	
Return on Asset (ROA) (Operational)	Operating income divided by total assets at the start of the year
Return on Equity (ROE) (Financial)	Net income divided by total equity at the start of the year
Tobin's Q (TQ) (Market-based)	The ratio of the market value of an asset to its replacement cost
Transparency	
Earnings management (ADA)	Total accruals less non-discretionary accruals
<i>Independent Variables</i>	
Board IT Competence	
Board IT Capital (BITC)	The ratio of directors with IT capital
CIO/CTO on Board (CITB)	1 if CIO/CTO is an executive member of the board, 0 otherwise
IT Committee (ITCM)	1 if the board IT committee exists, 0 otherwise
Other Corporate Governance	
Board size (BSIZ)	Total number of BOD members
Director (Exe.) ownership (DOWN)	Percentage of shares held by executive directors
Board independence (BIND)	Percentage of independent directors on the BOD
<i>Control Variables</i>	
Company Size (CSIZ)	The logarithm of the company's total assets
Financial leverage (FLEV)	The ratio of total debt to total assets

## 4. Results and Discussion

### 4.1. Descriptive Statistics and Correlation Analysis

Table 3 reflects the summary statistics of the variables used in this study's analysis for the association between ITG mechanisms, firm performance, and EM. The financial performance mean values of 0.061, 0.097, and 1.971 for ROA, ROE, and Tobin's Q, respectively, revealed higher performance compared to those of Buallay et al. [126] but lower than the findings of Hamdan et al. [4]. The ADA (EM measure) showed a mean of 0.148, which is lower than the 0.154 in a recent study by Grada [108]. This result indicates a slight reduction in EM practices in Saudi Arabia.

**Table 3.** Descriptive statistics.

Variables	Mean	Min	Max	Std. Dev.	Coefficient of Variation
<i>Dependent Variables</i>					
ROA	0.061	−0.118	0.138	0.073	1.197
ROE	0.097	−0.238	0.161	0.123	1.268
Tobin's Q (TQ)	1.971	0.021	2.024	0.594	0.301
ADA	0.148	0.117	0.199	0.029	0.196
<i>Independent Variables</i>					
Board IT Capital (BITC)	0.169	0	0.202	0.046	0.272
CIO/CTO on Board (CITB)	0.095	0	1	0.275	2.895
IT Committee (ITCM)	0.077	0	1	0.287	3.727
Board size (BSIZ)	9.588	6	12	1.548	0.161
Director (Exe.) ownership (DOWN)	0.214	0.005	0.398	0.097	0.453
Board independence (BIND)	0.694	0.379	0.806	0.115	0.166
<i>Control Variables</i>					
Company Size (CSIZ)	14.396	2.556	18.581	4.089	0.284
Financial leverage (FLEV)	0.091	0.012	0.592	0.169	1.857

Table 3 shows a mean value of 0.169 for BITC. This indicates that only about 16.90% of members of BODs have IT-related qualifications, experience, and/or certifications. This figure is considered to be relatively low but is higher than the 15.70% obtained by Hamdan et al. [4]. The mean values of 0.095 (9.5%) and 0.077 (7.7%) for CIO/CTO membership on BODs and the existence of board-level IT committees are inadequate. This assertion is based on the immense responsibility associated with functions such as IT implementation, enforcement, and IT resource management [20]. The presence of the CIO/CTO on BODs is essential, particularly in IT-intensive and IT-driven organizations, to advise the BOD on emerging developments in IT and their eventual deployment in response to difficulties and unpredictability [127]. The IT committee aids the BOD in carrying out its ITG responsibilities; hence, its formation is vital, particularly in today's competitive and IT-focused businesses. However, IT committee-compliant companies are mainly from the banking and technology-related sectors in Saudi Arabia [4].

Furthermore, board size and director (executive) ownership of equity shares mean values are 9.588 and 0.214 (21.4%), while board independence, as measured by the proportion of independent directors, is 0.694 (69.4%). This result is in line with the Saudi Arabia Corporate Governance Regulations [85], which recommended that BODs should be represented by a higher proportion of independent directors to be able to make independent decisions. All other variables' features are indicated in Table 3.

Table 4 depicts the Pearson correlations between variables. The results revealed the absence of strong correlations but the presence of several weak and moderate correlations of varying strengths [128]. There is a moderate correlation between the presence of a CIO/CTO on board and an IT committee [129]. Board size has a moderately positive correlation with board IT competence but a moderately negative correlation with financial leverage [129]. Big companies have larger BODs [130] and a lower risk profile [131]. There is also a moderate correlation between director (executive) ownership and board size [129].

**Table 4.** Correlation Matrix.

	ROA	ROE	TQ	ADA	BITC	CITB	ITCM	BSIZ	DOWN	BIND	CSIZ	FLEV
ROA	1											
ROE	0.269 ***	1										
TQ	0.281 *	0.331	1									
ADA	0.369	−0.343 ***	0.261	1								
BITC	0.201	0.349	0.334 **	0.352 *	1							
CITB	0.276 ***	0.297	0.294	0.335 **	0.432	1						
ITCM	0.303 **	0.328	0.273	−0.316	0.357 ***	0.368 ***	1					
BSIZ	0.364	0.367 ***	0.358 ***	0.354	0.422	0.359	0.329 ***	1				
DOWN	0.342	0.385	0.318	0.359 **	0.372 **	0.381	0.386 *	0.418	1			
BIND	0.379	0.345	0.315	0.291	0.388 **	0.347 ***	0.372 *	0.385	0.275	1		
CSIZ	0.378 ***	0.376	0.374	0.361 ***	0.377 **	0.365	0.228 ***	0.338 **	0.346 **	0.379	1	
FLEV	−0.335	0.355 ***	0.384 *	0.327	0.386	0.353 **	0.375 **	−0.425 **	0.365	0.368 *	0.293	1

Note: \*\*\*, \*\*, and \* indicate significance at levels of 1%, 5%, and 10%, respectively.

This paper also conducted further diagnostic analyses to establish that the study models conformed to some of the OLS basic assumptions before running the regression analysis. First, the multicollinearity of the independent variables was ensured by analyzing variance inflation factors (VIF). There were no apparent multicollinearity issues because every VIF value was less than 5 (Table 5) [132,133]. Second, the study utilized the Breusch–Pagan and Koenker test to ascertain whether heteroscedasticity was present. The *p*-value for the Breusch–Pagan and Koenker test was less than 0.05 (Table 5), indicating that there was no heteroscedasticity among the variables [134,135]. In addition, the Hausman test is determined to be perfectly significant at 0.05. It indicates that the fixed effect approach is also applicable to the study’s model [136].

**Table 5.** Heteroscedasticity and Multicollinearity Tests Results.

Variables	Multicollinearity (VIF Test)	Heteroscedasticity (Breusch–Pagan and Koenker Test)
ROA	3.692	0.038
ROE	2.516	0.025
Tobin’s Q (TQ)	2.952	0.018
Earnings Management (ADA)	3.696	0.008
Board IT Capital (BITC)	2.208	0.006
CIO/CTO on Board (CITB)	2.409	0.035
IT Committee (ITCM)	2.016	0.033
Board Size (BSIZ)	3.598	0.007
Director (Exe.) Ownership (DOWN)	3.062	0.029
Board Independence (BIND)	2.656	0.029
Company Size (CSIZ)	1.785	0.009
Financial Leverage (FLEV)	2.935	0.024

#### 4.2. Empirical Results and Discussion

Table 6 contains the multivariate regression results of the estimation of Equations (1)–(4), represented by Models 1 to 4, which assessed the association between board IT competency and other governance attributes and performance/EM activities in Saudi Arabia.

**Table 6.** Pooled OLS Regression Results of CG Variables Financial Performance and ADA.

Variable	Model 1 (ROA)		Model 2 (ROE)		Model 3 (TQ)		Model 4 (ADA)	
	$\beta$	T-Stat (Std. Error)	$\beta$	T-Stat (Std. Error)	$\beta$	T-Stat (Std. Error)	$\beta$	T-Stat (Std. Error)
Board IT Competency Variables								
BITC	2.626	2.167 ** (1.212)	1.986	1.544 (1.286)	2.227	1.621 (1.374)	2.347	1.648 (1.424)
CITB	2.284	2.628 *** (0.869)	1.467	1.591 (0.922)	1.782	1.633 (1.091)	2.046	1.626 (1.258)
ITCM	1.112	2.079 ** (0.535)	1.845	1.616 (1.142)	1.474	1.362 (1.082)	−2.173	−2.046 (1.062) **
Other Corporate Governance Variables								
BSIZ	−1.816	−1.633 (1.112)	0.994	1.511 (0.658)	1.312	1.944 * (0.675)	2.143	2.079 ** (1.031)
DOWN	−1.104	−1.612 (0.685)	−0.976	−1.307 (0.747)	1.992	1.004 (1.985)	2.197	1.775 * (1.238)
BIND	2.098	1.597 (1.314)	1.108	1.554 (0.713)	0.913	1.545 (0.591)	−2.184	−1.631 (1.339)
Control Variables								
CSIZ	−1.906	−1.459 (1.306)	1.418	1.507 (0.941)	−2.246	−1.614 (1.392)	2.285	1.578 (1.448)
FLEV	−1.693	−1.647 (1.028)	1.979	1.539 (1.286)	−1.405	−1.471 (0.955)	2.292	1.546 (1.483)
R <sup>2</sup>	0.463		0.342		0.332		0.325	
Adjusted R <sup>2</sup>	0.446		0.331		0.324		0.316	
<i>p</i> -value	0.035 **		0.139		0.112		0.103	
No. of firms	154		154		154		154	
Observations	18,018		18,018		18,018		18,018	

Note: Significance at: \* 10%, \*\* 5%, and \*\*\* 1%.

##### 4.2.1. Multivariate Regression Results and Discussion

Table 6 model 1 (ROA—operational performance) has an adjusted R<sup>2</sup> of 0.446, showing that the independent variables board IT competency and other governance attributes explained 44.6% of the operational performance. The *p*-value of the model is statistically significant at 0.035. This implies that ITG positively impacts the operational performance of Saudi Arabian stock exchange-listed companies. Therefore, the study's hypothesis 1 is accepted. This result is in accordance with Hamdan et al. [4], Shapiro et al. [72], and Jewer and McKay's [50] findings. This result supports the agency and resource dependency theories, which propose that BOD members with experience in specialized disciplines (such as IT) should oversee management and offer their resources (e.g., knowledge) for the company's success. The result also supports the intent of the SACGC, which states that board members must be professionally competent and have the necessary experience, knowledge, skill, and independence to perform their duties effectively [85].

The board IT capital, CIO/CTO on the BOD, and IT committee variables also indicated a positive and significant relationship with operational performance (ROA). For other CG

variables, BOD size and executive director ownership showed a negative and insignificant relationship, while BOD independence has a positive but insignificant relationship with ROA (Table 6).

Table 6 model 2 (ROE—financial performance) shows an adjusted  $R^2$  of 0.331, indicating a 33.1% explanatory power of the board IT competency and other governance variables on the financial performance of Saudi Arabian public listed corporations. However, the regression result revealed that the  $p$ -value is insignificant at 0.139. Therefore, hypothesis 2 is not accepted. Hence, ITG's impact does not significantly improve the financial performance (ROE) of publicly listed firms in Saudi Arabia. The board IT capital, CIO/CTO on the BOD, and IT committee variables indicated a positive but insignificant relationship with ROE. ROE is impacted positively and insignificantly by BOD independence and size but negatively and insignificantly by director holding of equity shares.

Table 6 model 3 (TQ (Tobin's Q)—market performance) result revealed an adjusted  $R^2$  of 0.324, showing a 32.4% explanation of the board IT competency and other governance variables on the market performance measure of Saudi stock exchange-listed companies. However, the  $p$ -value is insignificant at 0.112, suggesting that the boards' IT competence is not strong enough to significantly impact the market performance measure of Saudi Arabian stock exchange-listed companies. Therefore, hypothesis 3 is not accepted. The BOD size has a positive and statistically significant impact on market performance, but directors' ownership of shares and BOD independence have a positive but insignificant impact. The model also shows the impact of the control variables. The company size and financial leverage variables negatively but insignificantly impact the market performance of Saudi stock exchange-listed companies.

Finally, in Table 6 model 4 (EM—ADA), the results show an adjusted  $R^2$  of 0.316, suggesting 31.6% explanation of the board IT competency and other governance variables on the EM practices of Saudi stock exchange-listed companies. However, the  $p$ -value is statistically insignificant at 0.103, indicating that board ITG competence and other governance attributes do not prevent EM practices in Saudi Arabian stock exchange-listed corporations. Therefore, hypothesis 4 is not accepted. This result may be due to the weak CG structures in Saudi Arabia [137], which also characterize most developing economies. In addition, IT competence is necessary but may not be sufficient to effectively monitor corporate managers' opportunist behavior through the choice of accounting principles and methods that favor their interests. Specifically, board IT capital (BITC), and CIO/CTO on the board (CITB) is positive but statistically insignificant, while IT committee (ITCM) is negative and significant.

Other CG variables showed different levels of effects and significance. For example, board size showed a positive and significant relationship with ADA, indicating that in Saudi Arabia, board size is likely to foster EM practices. This result agrees with Outa et al. [122] and is also in accordance with agency and stewardship theories, which favor small BOD size over large.

Director (executive) ownership (DOWN) is positive and has a statistically significant relationship with EM, while board independence (BIND) is negative but insignificant with EM. The BOD's inability to effectually monitor management activities has been associated with the ownership structure (concentrated) of the companies [126] and the mode of nomination and appointment of these independent directors who may not be truly independent enough to make corporate decisions [67]. This development is not surprising because a significant number of the publicly traded companies evolved as family businesses and family members still keep the majority of the equity shares and control [138–140]. The control variables' results revealed that listed companies might not be sufficiently influenced by company size or their leverage level in Saudi Arabia, as these variables have a negative and insignificant relationship with EM.

The study may summarize the main results this time considering the specific performance variables. First, the impact of the number of directors on the BOD with a certain level of IT competence was positive and significant only with the operational performance

(ROA) of public companies in Saudi Arabia. This implies that, in accordance with agency theory, companies desiring a greater proportion of IT-savvy board members will improve operational performance by controlling and monitoring management IT activities. The IT competence of directors (based on resource dependence theory) is utilized in service responsibilities and resources, which also impacts positively on performance. The board IT capital, CIO/CTO on the BOD, and the IT committee's creation positively impacted all three measures (operational, financial, and market) of performance, though not significantly in the case of finance and market measures. Finally, board ITG competence and other governance attributes do not prevent EM practices in Saudi Arabian public listed firms.

#### 4.2.2. Robustness Analysis

In accounting and finance literature, the examination of the relationship between CG dimensions, EM, and firm performance is complicated by endogeneity, which can result from unobserved heterogeneity, simultaneity, and sometimes reverse causality as a result of the data [141]. In addition to the principal OLS estimate and the use of three performance measures, this study also employed the fixed-effects (FE) approach to confirm the robustness of the study's results. This approach reduces some of the potential sources of biases [142]. The current authors again ran the regression of Equations (1)–(4) using FE estimation. Table 7 displays the details of the results.

**Table 7.** Fixed-Effect Regression Results.

Variable	Model 5 (ROA)		Model 6 (ROE)		Model 7 (TQ)		Model 8 (ADA)	
	$\beta$	T-Stat (Std. Error)	$\beta$	T-Stat (Std. Error)	$\beta$	T-Stat (Std. Error)	$\beta$	T-Stat (Std. Error)
Board IT Competency Variables								
BITC	2.705	2.197 ** (1.231)	2.104	1.571 (1.339)	2.581	1.638 (1.576)	2.658	1.639 (1.622)
CITB	2.326	2.667 *** (0.872)	1.795	1.601 (1.121)	1.965	1.648 (1.192)	2.085	1.647 (1.266)
ITCM	1.184	2.122 ** (0.558)	1.964	1.635 (1.201)	1.643	1.408 (1.167)	−2.396	−2.064 ** (1.161)
Other Corporate Governance Variables								
BSIZ	−1.877	−1.649 (1.138)	1.152	1.532 (0.752)	1.562	1.948 * (0.802)	2.291	2.108 (1.087)
DOWN	−1.098	−1.596 (0.688)	−0.948	−1.331 (0.712)	2.183	1.031 (2.118)	2.289	1.787 (1.281)
BIND	2.183	1.625 (1.343)	1.205	1.592 (0.757)	1.105	1.572 (0.703)	−2.072	−1.641 (1.263)
Control Variables								
CSIZ	−1.883	−1.489 (1.265)	1.463	1.519 (0.963)	−2.297	−1.626 (1.413)	2.302	1.586 (1.451)
FLEV	−1.725	−1.648 (1.047)	1.991	1.546 (1.288)	−1.482	−1.481 (1.001)	2.298	1.554 (1.479)
R <sup>2</sup>	0.468		0.351		0.345		0.339	
Adjusted R <sup>2</sup>	0.449		0.339		0.334		0.326	
p-value	0.032 **		0.142		0.117		0.108	
No. of firms	154		154		154		154	
Observations	18,018		18,018		18,018		18,018	

Note: Significance at: \* 10%, \*\* 5%, and \*\*\* 1%.

Table 7 models 5 to 8 indicate that all performance measures' results correspond with those obtained in models 1 to 4 of Table 6 that used OLS estimation in terms of the direction of coefficients, but with slight differences in statistical significance levels. For instance, the adjusted  $R^2$  is bigger for all the FE models than the OLS. In the majority of instances, the direction of the coefficients is the same, albeit a bit larger (except for a few). In addition, the significant and insignificant results of the  $p$ -value correspond to the OLS estimation. Therefore, it can be assumed that the study results are robust since the two independent approaches (estimations) give similar results.

## 5. Conclusions

Recent research from the private sector of developed countries backs up the conventional view of agency theory by showing that implementing a number of ITG mechanisms enhances the quality of financial reporting and, by extension, an organization's performance [23,31,100,101]. Since IT permeates most firms' business processes and functional areas, BODs should use it as a significant resource to oversee their company strategies and operations [14]. The western-oriented CG principles in this instance—the ITG mechanisms—should be considered in a different context, especially in emerging economies such as Saudi Arabia, as ITG operationalization is influenced by organizational setting [127].

This study focused on three key board IT competency measures (board IT capital, CIO/CTO on the BOD, and IT committee) and three other BOD-related features (board size, director (executive) ownership, and board independence) to examine the effect of board-level ITG on companies' performances (financial, operational, and market) and EM practices in firms listed on the Saudi stock exchange. This research utilized agency, resource dependence (RD), and stewardship theories to examine the research questions, presented an analysis of the results, and referenced the SACGC when applicable.

The study findings showed that of the three performance measures, only the ROA-operational performance was positive and significantly related to board-level ITG. This indicates that a BOD with a greater proportion of members with IT experience, an IT professional as CIO/CTO on the board, and an IT committee positively impacts company operational performance through control and monitoring of management activities such as operating procedures. Board IT competency did not significantly influence the other performance measures (ROE and Tobin's Q). Finally, board ITG competence and other governance attributes do not deter EM practices in firms listed on the Saudi stock exchange. The results verified Peng's [22] assertion that the traditional western CG mechanisms have low institutional support in emerging countries by revealing a general, pervasive deficiency in CG characteristics in Saudi Arabia.

The study's findings regarding the relationships between board IT competency, corporate performance, and EM have significant practical implications for policymakers and regulatory authorities in Saudi Arabia. It is difficult to generalize the impact of ITG on firm performance in Saudi Arabia because just one of three performance measures was positively and significantly associated with board-level ITG. In addition, the relatively weak impact of board-level ITG and other CG features on EM suggests a need to improve the CG environment in Saudi Arabia, particularly the increasing importance of ITG (control, service, and monitoring). Therefore, the Saudi Arabia Capital Market Authority (SACMA), one of the principal regulatory bodies, must address and evaluate some sections of the SACGC (e.g., ITG regulations), particularly in BOD composition and the appointment of independent and IT-savvy directors. There is also the need for strengthening regulations related to enforcement, compliance, and penalties for non-compliance. Controllers and corporate managers in Saudi Arabia should recognize the importance of credible and transparent financial statements free from misrepresentation as they serve as a guide for both local and foreign investors. As Saudi Arabia opens its economy following Vision 2030 and attracts several international companies, technology, and advanced technical and managerial expertise, regulatory authorities and publicly traded companies must focus on the value of information systems and implement adequate controls over IT utiliza-

tion and efficient management of IT resources. This will help create and sustain benefits from the IT resources, particularly in transparent financial recording/reporting processes and performance.

This research adds to the literature by considering the characteristics of the board, especially ITG control and monitoring functions, and extends this line of research on companies' financial performance and earnings management simultaneously in a developing country, Saudi Arabia. The study adopted CG theories, particularly theories that directly relate to ITG. In accordance with the agency theory, the monitoring function of the IT-competent board seeks to ensure a credible and reliable financial reporting process and firm performance. The resource dependence theory provides a theoretical basis for the BOD as a strategic resource (IT-competent members) that ensures credibility and transparency of the financial reporting process and firm performance. Finally, in line with the stewardship theory, IT-competent board members' oversight improves the credulousness of the financial reporting process and firm performance. This contribution fills a vacuum in the board ITG literature and expands the theoretical understanding of the relationship between ITG, company performance, and EM practices in Saudi Arabia, an emerging economy.

The study is not devoid of shortcomings that can be addressed in future research. First is the variable measurement limitation. There are several measures for corporate financial performance and EM; the use of any other approach outside the ones adopted in this study may result in different results. The second limitation is that this study's sample is focused on non-financial companies only; therefore, over-generalization must be taken cautiously. The third is the exclusion of external CG mechanisms; estimation results may be better using both internal and external CG mechanisms. Finally, there is also the endogeneity problem, which is associated with the use of time-series and CG data [143]. This study is not an exception, though some diagnostic test results indicate the data to be almost free of this limitation.

Future research may consider utilizing only financial services companies because of their accounting [120] and heavy government regulations [144]. Because of the results of this study, subsequent studies may include behavioral variables in the model. Use of multiple EM measures and a full CG index may be used in subsequent studies. Furthermore, future research may extend the links between board IT competence, corporate performance, and EM to the comparative study of industry sectors. Finally, cross-country research, particularly among GCC nations, may be conducted to examine the relative performance of member nations as they share common corporate features.

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