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A Review of Board Level IT Governance: A Taxonomy to Inform the Quality of Financial Reports

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Abstract
Financial reports are important documents that stakeholders never ignore, and Information Technology (IT) is utilized throughout firms to increase operation efficiency. However, prior researches studies Information Technology Governance (ITG) that relates to cybersecurity risks, thus, this paper takes step further to reviews board level ITG literature that is relevant to Corporate Governance (CG) and discuss how it impacts on the quality of financial reports. This paper systematically presents a taxonomy of research encompassing the focus areas: performance, cybersecurity losses, more accurate earnings forecasts, lower audit fees based upon prior studies in ITG over the period 2010-2020. The main finding is that results reveal a lack of board level ITG under CG research and a lack of the relation between board level ITG and financial results. Therefore, this paper discusses research perspectives and identify avenues for future research in last part, research perspectives and future research could focus on how to improve CG based on IT and the financial consequences of CG with IT.
Keywords: Board Level IT Governance, Financial Results, Corporate Governance, IT Governance.

Introdution

How to maximize the potential of information technology is a long-term problem in information technology research and practice. Inspired by corporate governance, IT Governance (ITG) aims to ensure effective utilization of IT by focusing on board level ITG according to ITG definitions. This focus area makes it clear that ITG shares many issues considered in corporate governance research. The aim of this paper is to review board level ITG, and provide a taxonomy that informs board level ITG research and practice, thus, offer new ideas to board level ITG research by putting board level ITG under CG.

There is a growing awareness of the role of IT in managing knowledge through ubiquitous information systems (IS) that capture, store, manipulate, and present data to facilitate a company's business processes and value-added activities. Accounting information systems (AIS) assist in external and internal reporting, tax and assurance services, while Management information systems (MIS) provide technical evaluation of issues related to the quality of

systems, information and services to support decision making. Therefore, IS, AIS and MIS ultimately focus on producing information in a timely, accurate, relevant, cost effective, and reproducible manner to facilitate business processes that enable businesses to be economically and socially effective in a competitive environment. Those systems all require board of directors have knowledge of IT, thus, board level ITG is becoming more and more important.

The increasing centrality of IT to growing demand for corporate governance, means many board-related factors have played a significant role in strengthening the impetus for ITG. The ultimate demand for IT requires careful consideration of strategy, risk, resources, value delivered, and performance. Thus ITG, being stream of CG research and practice, goes beyond technological solutions to comprehensive governance of all IT functions.

Our paper begins by reviewing earlier literature and summarizing understanding provided by ITG. We then survey literature published for the period from the foundation of ITG in 2010 until 2022 as the basis for developing a research taxonomy that provides organized appreciation of the literature and evidence of further concerns. Our review shows progress in understanding the consequences of higher board level ITG but in an atomistic manner with little integration of CG. We discuss board level ITG to frame out taxonomy within which we investigate inherent themes in existing research and offer suggestions for future research. Accordingly, in Section 2 we define our understanding of the term ITG, board level ITG and summarize early relevant literature. Section 3 details our taxonomy of research during the surveyed period. Section 4 provides perspectives on our findings and Section 5 presents concluding comments.

An Overview of Board Involved it Governance

IT Governance Definitions

The term “IT governance” first appeared in academia was in 1990s. Loh and Venkatraman (1992) define IT outsourcing as “an innovative IT governance model and studied the driving factors of its development”. Later, Weill and Ross (2004) define ITG as “specifying the decision rights and accountability framework to encourage desirable behavior in using IT”, and discuss ITG arrangements that consist of specific components as well, suggesting that ITG can be conducted by a set of structure of decision-making such as the roles that take responsibility for IT decisions; communication approaches that related to IT policies and the results of IT decisions; and alignment processes such as formalization of how the IT decisions are made. Consistent with these prior research, Peterson (2004) argues that ‘‘IT governance describes the distribution of IT decision-making rights and responsibilities among different stakeholders in the enterprise, and defines the procedures and mechanisms for making and monitoring strategic IT decisions,” and emphasizes ITG needs to address the issue of IT authority allocation and enhance the ability of IT coordination.

Moreover, on the basis of researches from Peterson (2004); Weill and Ross (2004), a further in-depth study on how to implement ITG was conducted by De Haes and Van Grembergen (2009), and they consider that ITG arrangements should be composed of relationship mechanism, structure, and process. Since the mid-2000s, scholars were paying more and more attention to the actual mechanism of ITG implementation. For instance, Schlosser et al. (2015) consider that ITG mechanism play an important role on achieving social ties between

IT and business. Wu et al (2015) studied the moderating effect of strategic alignment between IT and business on the association between ITG mechanism and organizational performance. Overall, academic research on ITG seems to have become better aligned with practice in the 2000s, as scholars shifted their attention to the practical mechanisms for ITG.

Board Level IT Governance

Van Grembergen (2002) defines ITG as "an organizational capacity exercised by the board, executive management, and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT". Academic scholars pay increasingly attention on the more specific and relevant issues of ITG related in board. In addition, ITG is an integral part of corporate governance, implying the involvement of the board of directors (DeHaes and Van Grembergen, 2015). Based on De Haes et al (2020) research, the board's involvement in ITG can be achieved by implementing a mix of structures, processes and relational mechanisms. In conclusion, the key point of implementing ITG is rely on board, thus, this paper focuses on board-level ITG research.

A Taxonomy of Research Related to Board Level Itg

Based on ITG definitions, this paper classifies research related corporate governance consideration, research journals include leading journals related to ITG published during the period 2010-2022.

As the foundation for ITG, board level ITG requires that IT expertise and IT related committee are aligned with board so that IT provides capability to deliver information and help business operation. Being governance, it should be driven by the board and indicate all components of the IT function (business processes together with the supporting applications and technology, staffing, and funding) are attuned to an organization's risk tolerance and strategic directions. As such, board level ITG should address the direction for other ITG focus areas with business value delivered through effective investment and planning including tactical plans for risk management. In our reviews, this focus area received the most attention (31 percent of papers) with 31 papers related to delivering business value from IT investment. This attention suggests a view that value may be achieved with the use of governance structures and processes. Researches with a governance focus address business IT capability. Much of the identified literature considers CG without embedding discussion in a broader understanding of aligning IT with business operations. Few of prior research considered to put ITG under CG, thus, no much researches considered the relationship between board level ITG and financial accounting results. Therefore, key considerations of this paper are:

1. What is different between CG and ITG?
2. What are the qualities of board level ITG?
3. What is the role of the board level ITG in the quality of financial accounting reports?
4. What are the consequences of board level ITG?

1. What is different between CG and ITG?

As the rapid development of IT, IT integrates into enterprise on all sides. The complexity, rapidly changing, and pervasiveness nature of IT have changed the experience and knowledge needed to govern an enterprise (Weill and Ross, 2004). IT plays a more and more functional and strategic role on tactics and decision rights, which leads to a wider comprehending of ITG (Wilkin and Chenhall, 2010). An enterprise that utilizes IT for operations may require

managers and employees with domain-specific knowledge and experience to understand the significance of IT on the strategic objectives and business operations (Jewer and McKay, 2012). Therefore, De Haes et al (2020) define ITG as "an integral part of corporate governance for which, as such, the board is accountable. It involves the definition and implementation of processes, structures, and relational mechanisms that enable both business and IT stakeholders to execute their responsibilities in support of business/IT alignment, and the creation and protection of IT business value".

The linkages between CG and ITG are reflected by the governance modes, the ITG modes tended to reflect CG modes (Sambamurthy and Zmud, 1999) and IT contributes greatly to reporting accuracy (Holder et al., 2016; Li et al., 2007). For example, the concept of CG provides guidance for IT governance and management (Wilkin and Chenhall, 2010; Debreceny and Gray, 2013; ISO/IEC 38500:2015, 2015; ISACA, 2018). ITG provides a pathway forward requited strategic oversight (Zukis, 2016; Liu et al., 2016), particularly when ITG is integrated as part of CG's oversight of strategic risk management and internal audit outcomes. Prior research found that the board was interested in IT risk rather than IT strategic planning and efficiency by investigating the impact of ITG oversight on corporate efficiency (Huff et al., 2006); the role of IT in enhancing CG (Thomas et al., 2009); the links between ITG and the internal audit function (Heroux and Fortin, 2013).

In addition, there are clear synergies between the goals of ITG and CG in managing risk exposure and delivering business value (Wilkin and Chenhall, 2020). Firstly, IT is both key to risk management within internal control (EY, 2016) and to organizational risk management (Comptia, 2018). Risk management is an important concern of CG and a focus area for ITG (Paquette, 2010; Prasad et al., 2010). CG addresses risk through internal controls (COSO, 2004), and performance and monitoring control are increasingly dependent on IT capabilities. Similarly, IT affects CG through new audit approaches, including audit data standards and audit tools that facilitate the decisions of auditors (Vasarhelyi et al., 2014). Secondly, extant research shows that business performance can be improved through the link between ITG and CG (Jewer and McKay, 2012; Kappelman et al., 2014).

Furthermore, existing research has studied the role of directors in ITG (Benaroch and Chernobai, 2017; Turel and Bart, 2014), the importance of board members' IT expertise (Turel and Bart, 2014; Higgs et al., 2016; Li et al., 2007), and offers advises to the board on the implementation of ITG on compliance and risk issues (Higgs et al., 2016; Li et al., 2007).

Overall, given the breadth of current research into the role of ITG in organizational performance and risk management, ITG evolves as a key component of CG's strategic oversight. ITG is not just used for decision making or contingency analysis any more, it is an essential integral part of CG to help board and top managers handle business/IT alignment and achieve IT business value. In addition, board plays an important role on ITG, the board of directors, executive management, shareholders, and other stakeholders take the responsibility for ITG, which is same as they take responsibility for CG. Thus, the inherent IT requirements suggest the board need to better understand IT.

What are the qualities of board level ITG?

Extant research also provides insights on the issue of implementing or effectuating board level ITG. The qualities of board involvement in ITG can be effectuated through implementing a mix of structures, processes, and relational mechanisms. A summary of these mechanisms as proposed in extant literature is provided in Table 1.

Table 1
Selected Papers Related to the Qualities of Board Level IT Governance (ITG) Focus Area

Board-level IT governance mechanisms	
Structures	***Reference(s)***
Board-level IT committee	Higgs et al (2016); Coertze and von Solms (2014); Turel and Bart (2014); Posthumus et al (2010); Oliver and Walker (2006); Nolan and McFarlan (2005)
Board member with IT expertise	Mohamad et al (2014); Valentine and Stewart (2013a, 2015)
CIO reporting to the CEO	Valentine and Stewart (2013b)
CIO on board	Benaroch and Chernobai (2017); Coertze and von Solms (2014); Posthumus et al (2010)
Processes	***Reference(s)***
Asking IT-related questions	Turel and Bart (2014); Bart and Turel (2010); Nolan and McFarlan (2005)
Relational mechanisms	***Reference(s)***
Effective IT-related communication from and to the board	Coertze and Von Solms (2014); Yayla and Hu (2014); Kuruzovich et al (2012); Andriole (2009); Oliver and Walker (2006)
CIO regularly meeting with the board	Kuruzovich et al (2012); Butler and Butler (2010)

Adopted from De Haes, Grembergen, Joshi and Huygh, 2020, "Enterprise Governance of Information Technology," Springer Nature Switzerland AG 2020, pp. 62

The structures of board level ITG have been studied in the prior literature, which could provide this study with influence factors of board-level ITG. Firstly, a board-level structure that is mentioned commonly is an IT oversight or similar board level committee (Oliver and Walker, 2006; Premuroso and Bhattacharya, 2007; Posthumus et al., 2010; Coertze and von Solms, 2014; Turel and Bart, 2014; Higgs et al., 2016). An IT committee has a variety of responsibilities, which includes to help the board monitor how competitors and other organizations are dealing with IT (Nolan and McFarlan, 2005); and to identify, mitigate, and report IT-related risks (Higgs et al., 2016). In addition, another structural mechanism is board members who have the expertise of IT (Valentine and Stewart, 2013a, 2015). Independent directors and internal directors have a slightly different impact on companies' ITG when they have IT expertise. Independent directors who have IT expertise enable the board to advise management, facilitate access to outside IT personnel, attract qualified IT managers and advocate for an increase in IT budgets, while internal directors who have IT expertise are important to ensure the board understands the business costs of IT risks and can quickly allocate resources and set priorities to address IT breaches (Benaroch and Chernobai, 2017).

To gain a better understanding of IT professional knowledge, to fully perform board's oversight role, Valentine and Stewart (2015) suggested that the directors should have three main IT-related competencies, which includes directing and managing technical to support strategies and plans to maximize technical advantages and improving performance at all levels of the organization, leading and managing business technology investments and risks, directing and managing technical support for innovation and value creation. Moreover, there are two other common IT governance structures at the board level related to CIOs' position in the enterprises. Valentine and Stewart (2013b) consider that the CIO should report directly to the CEO, and other approaches such as the CIO reporting to the COO or CFO firstly may result in a cost increase and affect the effectiveness of communication between IT executives and the board. Other scholars have even argued that if IT is considered as a strategic commercial asset, or IT becomes the business itself, then CIO can sit on the board (Posthumus et al., 2010; Benaroch and Chernobai, 2017).

There is a lack of studies into board-level ITG processes (De Haes et al., 2020). Some studies consider that boards should manage IT related questions in order to achieve their control and duties (Nolan and McFarlan, 2005; Bart and Turel, 2010; Turel and Bart, 2014). Existing literature also provides practical guidance to boards in the form of problem sets (Nolan and McFarlan, 2005).

The first relational mechanism mentioned in the prior literature is that effective communication among the board members about IT needs the board's participation in IT-related decision-making. Coertze and von Solms (2014) suggest that CIO is responsible for translating the strategy into IT objectives when board with limited IT expertise. It is the CIO's responsibility to communicate effectively with the board on IT related matters (Andriole, 2009; Yayla and Hu, 2014). A board of directors with substantial IT expertise can translate business strategy into IT terms, which results in IT-oriented board directives directly. This is an important point to be noted because delivering high quality of the IT related information to the board helps board to make better decisions (Kuruzovich et al., 2012). Another relational mechanism mentioned is that the CIO should have access to visit the board of directors and communicate with them frequently (Butler and Butler, 2010).

In summary, board level structures conclude that board level IT committee, board of directors with IT expertise, the role of CIO are crucial for the quality of board level ITG structures. Board level processes consider that board take responsibility for ITG implementing. Lastly, board level relational mechanisms conclude that effective communication about IT to the board, CIO meeting with the board regularly are important for the quality of board level ITG. Therefore, board level IT committee, board of directors with IT expertise and the role of CIO are considered as the most important influence factors for the levels of board level ITG.

What is the role of the board level ITG in the quality of financial reports?

Board level ITG paid attention on the cost of IT related and its financial consequences. Firstly, Benaroch and Chernobai (2017) argue that internal directors who have the expertise of IT such as CFOs are very important to ensure that the board comprehends the IT risks' costs and enables rapid resources allocation and prioritization of IT weaknesses. In addition, board members with IT expertise typically set the long-term IT firm strategies in order to detect situations when other managers/employees circumvent firm policies and controls, and if

board members with IT and financial expertise will more be set on the 'front line' with regard to preventing security breaches and take responsibility for the losses (Bailey et al., 2014). Thirdly, the establishment of board-level IT committees has been considered as the tone of the board attitude of IT risk (Price and Lankton, 2018). Board members have higher IT risk perceived or acknowledged, the firms have higher perceived need for applicable control and investment in IT (Higgs et al., 2016). According to the research of Heninger et al (2018), the board's significant risk attitudes associated with weak internal controls motivate managers to make earnings management decisions to mitigate negative financial impacts and maintain the legitimacy of the company. Therefore, board level ITG do care about financial results.

Furthermore, higher quality of board level ITG may improve internal control environments. For example, board members with IT expertise are more effective than other board members without IT expertise in improving the internal control environment after IT related material weaknesses (Haislip et al., 2016a). The tone of IT acceptance set by an executive who have the expertise of IT can help to improve the internal information environment of enterprises and reduces the company's information security vulnerabilities (Haislip et al., 2017). Hence, board members with IT expertise can improve internal controls and effectively limit IT related material weaknesses, which relates to income-increasing abnormal accruals positively (Heninger et al., 2018). In addition, according to the research of Haislip et al (2016b), the presence of a technical committee can help to monitor and support management's strategic choices regarding the utilization of enterprise IT, thus improving the information environment. Sambamurthy and Zmud (2012) also advocated the establishment of an independent board-level technical committee to serve as the basis for supervising key IT risk decisions. Kickenweiz et al (2016) argue that having IT experts on a technology committee is a great advantage because they can introduce the knowledge of cybersecurity risks to the rest of the board as well. Thus, a better board level ITG can improve the information environment to lower the possible of financial losses by reducing information asymmetry and IT related risk.

Besides, higher quality of board level ITG can enhance information transparency and transfer information in time. For instance, Haislip and Richardson (2016) demonstrate that executives that have the expertise of IT can improve the environment of information of their companies and more accurate earnings forecasts. Haislip et al (2016b) consider that CEOs and CFOs with IT expertise disclose key documents more timely than other companies. Therefore, board members with IT expertise can reduce information asymmetry and information security breach that may lead to huge losses, which both motivates accrual-based earnings manipulations and real earnings management activities (Xu et al., 2019). In addition, information transparency relates to audit fees negatively (Hackenbrack et al., 2014) and more information asymmetry need specialist auditors as well (Hakim and Omri, 2010). Therefore, higher level of board-level ITG could enhance audit quality.

Although board of directors with IT expertise can improve information transparency and internal control environment in order to decrease earnings manipulations (Haislip et al., 2017; Heninger et al., 2018; Xu et al., 2019), the simple presence of IT specialists on the team does not ensure IT part have been valued when making firm's strategic decisions. Only board members who have the expertise of IT and adequate political influence can affect the setting of priorities strongly (ITGI, 2005; Luftman and Kempaiah, 2008). The prior literature shows

that executives that have higher levels of political influence have more compensation (Hall and Liedtka, 2005; Yayla and Hu, 2008). Therefore, the remuneration of board members with IT expertise can be considered as an important indicator of the ITG at the board level as well.

Based on signaling theory, board involvement in IT signal to outside that firms are willing and able to handle IT related risks and thus this can be used to send a positive signal to the market including auditors (Higgs et al, 2016). In addition, higher quality board-level ITG signal to outside that firms have great information system environment that can help auditor planning judgements (Brazel and Agoglia, 2007), and information technology can help auditor to detect misstatements (Messier et al., 2004), in order to decrease audit risk and the possibility of falsifying financial statements and improve audit quality, based on an equation

$$audit\ risk\ =\ material\ misstatement\ risk * detection\ risk$$

CG address risk through internal controls (COSO, 2004), while internal monitoring control increasingly relies on IT functions. IT impacts CG through new auditing approaches that involve audit data standards and audit tools where IT facilitates auditors' determinations (Vasarhelyi et al., 2014). Besides, board-level ITG as part of internal CG, higher levels of Board-level ITG enhance the circulation of information and improve internal information environment (Haislip and Richardson, 2018), is willing to introduce new systems (Paredes and Wheatley, 2018) and is as control mechanisms to monitor agents' behaviors and protect stakeholders (EI Diri, 2018), which could decrease material misstatement risk and detection risk. In addition, Smith et al. (2019) investigate different characteristics of board-level ITG and put forward that higher quality ITG at the board level can reduce the additional fees of auditing, especially the risk committees are active. In addition, IT improves the accuracy and timeliness of important information and reduces opportunities to circumvent controls, both of them can increase audit quality (Messier et al., 2004). As a result, the US Centre for Audit Quality (CAQ) has outlined the role of external auditors in respect to IT risks (CAQ, 2014). Overall, higher levels of board-level ITG may increase the quality of external auditing because IT helps to monitor internal control and risks and IT applying to auditing can help auditor to make decision effectively and efficiently.

What are the consequences of board level ITG?

Based on the discussion in the role of the board level ITG in the quality of financial reports, this paper concludes higher quality of board level ITG pays more attention on firms' financial results, improve internal control environments, enhance information transparency and transfer information in time, signal a positive signal to the market participants including auditors. Therefore, this section discusses how board level ITG impact on financial consequences according to the role of board level ITG, which has been studied by prior researches.

Table 2
Selected Papers Related to the Quality of Financial Reports Focus Area

Consequences	***Reference(s)***
Improve firms' performance	Turel and Bart (2014); Turel et al (2017); Jewer and McKay (2012); Yayla and Hu (2014); Khalil and Belitski (2019)
Decreasing security breaches losses	Bailey et al (2014); Haislip et al (2017); Xu et al., (2019); Higgs et al (2016); Kwon et al (2013); Benaroch and Chernobai (2017);
More accurate earnings forecasts	Haislip and Richardson (2016); Haislip et al (2016b)
Lower audit fees	Hackenbrack et al (2014); Brazel and Agoglia (2007); Messier et al (2004)
More IT security investment	Gartner (2015)

Several prior studies have proven that more board involved in ITG can improve performance of enterprises (Turel and Bart, 2014; Turel et al., 2017). For example, Jewer and McKay (2012) balance strategic choice theory and institutional theory to research board-level ITG, they considered a board's involvement in ITG relates to the contribution of IT to organizational performance positively. Turel and Bart (2014) studied empirically the effects of organizational IT usage patterns on the organizational performance and board-level ITG. Their key finding is that the board's involvement in ITG depends on the organization's IT usage pattern (regardless of the organization's mode of IT use), and board's participation in ITG improves the performance of the enterprise. A more specific viewpoint is considered by Yayla and Hu (2014), who put forward that board IT awareness affects organizational performance positively, and define board-level ITG as "the extent to which the board is conscious of IT as a business function and able to formulate appropriate conceptions of what IT entails to their firm and industry". Khalil and Belitski (2019) find that the functions of various board ITG mechanisms are dynamic capabilities that are directly related to corporate performance.

In addition, board involved in ITG could improve IT-related material weakness (ITMV) firm's performance. Haislip et al (2016) considered that ITMW firms hire CEOs, CFOs, and directors who have higher levels of IT expertise, which makes significant IT system upgrade; ITMW firms remediate deficiencies in time by appointing a new CFO with IT expertise or upgrading their financial reporting system. Besides, board involved in ITG may improve IT systems in firms and increase the accuracy rate of earnings forecasts. For example, Haislip and Richardson (2018) put forward that a CEO with IT expertise tends to encourage to utilize IT across the company, thereby improving the information environment that is revealed through the company earnings. They put forward that CEOs who have IT expertise do make more accurate earnings forecasts, and enterprise that have IT expertise CEOs announce earnings on a timelier compared with firms that have non IT expertise CEOs (Haislip and Richardson, 2018).

Furthermore, board involved in ITG also decrease corporate losses and improve IT risk management. For example, Higgs et al (2016) find that organizations that have a board level technology committee tend to disclose cybersecurity breaches than those without such committees by analyzing the connection between board-level technical committees and the possible of reporting security breaches. These committees are more mature, the less likely they are to be breached. In addition, Vincent et al (2019) find that the maturity of IT risk

management practices is positively influenced by the board's involvement and the board that have IT expertise. Furthermore, Kwon et al. (2013) show that top management team that involves in IT executives can reduce the possibility of cybersecurity breaches and the greater the difference between the compensation of IT and non-IT executives makes the lower the possible of cybersecurity breaches.

Overall, the board is a crucial and important role in ITG. It is widely recognized that ITG need the involvement of board (Nolan and McFarlan, 2005; ISACA, 2018; Turel and Bart, 2014; Valentine and Stewart, 2015). However, board participation in ITG seems to be the exception rather than the convention in practice for now (Bart and Turel, 2010; Valentine and Stewart, 2015). Limited academic research is available about the results of board level ITG, almost research focus on firms' performance and the likelihood of cybersecurity breach.

Directions for Future Research

Board level ITG is a motivator for ITG, ensuring linkage of firms' business and operations, accounting information systems and other IT related systems through establishing, evaluating and ensuring ITG. Hence, board level ITG research should go beyond the issues raised in 1-4 and include holistic research into CG research like board structure, board responsibilities and oversight of controls, which highlights the value of research exploring board level ITG. Achieving good ITG requires IT involved in board, good communication between board of directors with IT expertise and management. Research that highlights board value in ITG related to CG would be fruitful, as would research into the importance of ITG under CG aspect. Thus, further research should base on the value of CG that guides research directions.

Cybersecurity has long been regarded as a practical and theoretical topic that explores the wider application of ITG. Cybersecurity and related accountability have strengthened the importance of board level ITG with this being reflected in a practitioner survey (PWC 2006). However, must of cybersecurity studies just focus on IT risk itself, this paper argues that future research can put board level ITG under CG to discuss. In addition, interdependencies between cybersecurity, ITG and performance are evident in research by (Turel and Bart, 2014; Haislip et al., 2017). Further investigation of the potential interplay between IT risk, cybersecurity, privacy and legal issues, and alternative management strategies under CG is warranted. Here, future research can explore normal CG topics that relates to IT, such as board-level ITG and earnings management, corporate social responsibility, firm's risk management, management strategies, internal audit, innovation, investment.

Must of the researches have argued the more efficient and effective CG have been achieved by adding IT. Future research could focus on how IT is managed and used in CG practices. Here, it would be relevant to investigate maximizing existing IT capability, particularly its capacity to manage knowledge and to co-create business value in intra/ inter-organizational environments. Some results show that the usage of IT systems and applications improve firm's performance and decrease cybersecurity losses (Turel and Bart, 2014; Bailey et al., 2014). However, some results show that the complex nature of IT systems and applications has held back organizational performance, hindering coordination across business functions. Consequently, there is scope to investigate maximizing existing IT capability rather than new investment, particularly for knowledge management and regulatory compliance, which is all under CG area. Other future research topics could include tailoring frameworks and standards

for application to particular industry sectors and outsourcing environments and the IT influence of power and politics under CG.

Discussion and Conclusion

ITG has evolved from requirements for effective CG of IT infrastructure including regulatory compliance, the significance of IT investment, the poor track record of IT investment, and globalization (Wilken and Chenhall, 2010). Having used taxonomy of this paper to review relevant literature related to board level ITG, this paper now draws the components together and indicate opportunities to progress this field. An obvious concern is the identified lack of literature that deals with ITG holistically under CG and the possible impacts this may have on financial accounting results. An important direction for future research is for less atomistic research, more work that demonstrates the inter-relational nature of the ITG under CG, and an emphasis on the contribution of IT to the whole.

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