Does digitalization affect shariah supervisory board efficiency? Evidence from Islamic banks

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Abstract
Purpose – This study aims to examine how digitalization affects the work efficiency of the Shariah Supervisory Board (SSB) in Islamic banks.

Design/methodology/approach – This study uses panel data analysis of annual report disclosures over the past 10 years. The authors have selected 79 Islamic banks for the period ranging from 2012 to 2021. The criteria for SSB efficiency used in this research are disclosure of Zakat and disclosure in the SSB report.

Findings – The econometric results show that digitalization has a positive effect on improving the work efficiency of the SSB in Islamic banks. Accordingly, the authors provide evidence that the higher the bank’s digital engagement, the higher the quality of the SSB.

Originality/value – The findings highlight the need to improve the current understanding of SSB structures and governance mechanisms that can better assist Islamic banks in engaging in effective compliance with recent governance and accounting reforms. Moreover, Islamic banks are the most capable and appropriate to implement and activate digitalization because they are based on a vital root calling for development if there are executives believing in it, as well as legislation supporting and serving them.

Keywords Sharia supervisory board, Digitalization, Governance mechanisms

Paper type Research paper

1. Introduction
In the early years of the 21st century, the rapid surge in innovation and technology has brought about significant transformations in strategies, business operations, financial markets and economies. This transformation has been especially evident due to the widespread adoption of digital technologies within organizations. These technological advancements have fundamentally reshaped the way businesses function, impacting not only their internal processes but also the production and marketing of goods and services (Pan et al., 2021).

According to Kriebel and Debener (2020), digitalization provides automated financial services, processes and evaluates data faster. Pan et al. (2021) suggest that banks, similar to corporations, have applied new information technologies such as blockchain, artificial intelligence (AI), big data and the internet of things to improve work efficiency.

It is worth noting that banks are the core of the country’s economy, and without banking activities, economic ones stagnate. Thus, digital technologies enhance bank connectivity with all stakeholders: customers, employees and suppliers (Nugroho and Nugraha, 2020). As information technology (IT) develops, there have been several changes. Today’s business success is influenced by how quickly companies can respond to these changes. Hence, there is an urgent need to transform the banking industry and digitalize its services (Lochy, 2019).
Digitalization, especially banking, is not only about transforming manual transactions into automatic transactions, but also about meeting the needs of the banking business concept. It provides the latest services with a view to reinforcing the transaction behavior of customers (Lochy, 2019). According to Mavlutova et al. (2021) and Ikhwan (2022), digitalization simplifies information transfer, and improves processing speed. It also reduces costs and promotes continuous improvement in transactional loans in the banking sector, especially in the Islamic banking sector. Thus, the emergence of technology-based financial firms has forced the Islamic banking sector to improve.

Siska (2022a) argues that the rapid development of the Islamic banking sector is spurring on the company to gain a competitive advantage capable of gaining market share by implementing the optimal use of digital technology. Saba et al. (2019) clearly state that Islamic banking has to adapt to digitalization with the aim of surviving in this new technological era.

Nevertheless, Islamic banks are characterized by a dual system of corporate governance drawn from both Anglo-Saxon theories and the Koran. They simultaneously apply religious, shareholder and managerial governance rules at the same time. This governance system is based on the principle of disclosure of transparent and complete financial information to all stakeholders to ensure the legitimacy of banks (Hassan et al., 2022; Lassoued, 2018).

In 2018, the World Economic Forum accentuated that the force of dynamic change in the Fourth Industrial Revolution required a new form of governance to address and oversee the complexities and impact of emerging technologies (Mcwattes and Galaski, 2017). Through corporate governance, we discern that the Shariah Supervisory Board (SSB) constitutes one of the main corporate governance mechanisms. As a matter of fact, it plays an essential role in ensuring the development and survival of Islamic banks, and it sustains all business operations and activities in accordance with Islamic principles (Kaaroud et al., 2020).

Bella and Himmawan (2021) indicate that the SSB helps boards of directors oversee the financial reporting process and enhances the credibility of audited financial reports. Meanwhile, the works of several other authors have focused on the most effective SSB competency and on changes in their work. In this sense, Izzatika and Lubis (2016), Dz (2018), Todorof (2018) and Masruki et al. (2018) have conducted studies on the issues and challenges faced by SSB in the digital age.

Thus, Izzatika and Lubis (2016) describe the challenges of SSB in the digital age. Based on this description, the literature review and the results of the interviews conducted with the interviewees have highlighted several challenges related to the competence of the SSB in Indonesia. Among these challenges, there is the strengthening of the work processes of the SSB with digitalization (Rusydiana, 2018). This raises the question of whether digitalization affects the work efficiency of SSB in Islamic banks.

The transition to digitalization is substantial. However, there is a lack of unanimity in the definition of digital transformation and its future role in business models and organizations. Accordingly, this paper aims to provide theoretical and empirical evidence of the significance of assessing and analyzing the impact of digitalization on the work efficiency of the SSB, relying primarily on the legal missions of the disclosure of the SSB report. In many organizations, digital transformation has resulted in significant changes to numerous roles within the SSB. However, the increased transparency of tasks, responsibilities and data processing has also contributed to efficiency improvements.

The first contribution of this study is to gain an in-depth understanding of the use of new technologies to improve the effectiveness of SSB. We notice that the transformation of SSB in the digital age is a topic that has rarely been addressed in empirical research. Hence, we
must develop an appropriate methodology to improve the study of the effectiveness of Sharia governance practices.

We have organized this article in a more conceptual way to enable practitioners and policymakers to better understand how the work efficiency of the SSB is affected by the tools of new technologies. Thus, this study is a direction for a new stream of research addressing the need for change in the work of the SSB in digital governance. Indeed, we believe that this is the first attempt to review and structure the literature on the effectiveness of digitalization in SSB practice.

It should be noted that the emergence of new technologies has led to several changes in the work of traditional companies and banks. However, the Islamic banking sector has lagged behind in adopting deep and transformative digitalization strategies compared to its conventional counterparts. Hence, in this approach, we prove that using technology in Islamic banks is now a necessity, not an option. Indeed, digitalization has brought about changes in the work of the SSB, notably through the use of new digital tools.

The world has experienced many financial crises. However, the case caused by the COVID-19 virus has been different, as it has caused unprecedented and unaddressed problems. In fact, this pandemic has affected all sectors of activity and has hit the banking sector, whether conventional or Islamic. Nonetheless, it is worth noting that these difficulties have quickly transformed into opportunities, creativity and innovation.

In this approach, we seek to analyze the role of digitalization in the management of Zakat and the disclosure of SSB reports in the course of the COVID-19 pandemic. In addition, we also seek to examine the strengths and successes of digital transformation and opportunities, and the threats of digitalization on the efficiency of SSB in different countries. This is because digitalization offers a lot of comfort to its users. It also provides evidence that the new Islamic business and banking opportunities are solutions that can help the players of this new banking industry boost their activities and overcome the consequences generated by COVID-19.

To achieve the objectives of this study, the rest of this article is structured as follows: Section 2 provides the literature review and develops hypotheses. Section 3 discusses the research methodology used in the study. Section 4 presents the primary results and outlines the discussion and interpretation of the findings. Finally, Section 5 concludes the paper, discusses the implications of our results and offers recommendations for future research.

2. Literature review and hypothesis development
2.1 Definition and measures of the digitalization

Digitalization is a generic term that refers to the digital transformation of society and the economy. It describes the transition from an industrial age characterized by analog technologies to a knowledge and creativity age characterized by digital technologies and business innovation (Asri and Rahmat, 2022; Ninglasari and Muhammad, 2021) have defined this as a technical process for converting analog signals into a digital form.

Digitalization, fintech and digital transformation are terms that have been developed with the technological revolution. It is a synonym for digitization or anything done with a digital medium. Indeed, digitalization promotes the use of new technologies to generate new revenue and opportunities. Naimi-Sadigh et al. (2022) indicate that this concept is much more than simply turning physical media into digital media to be viewed on a computer, tablet or smartphone.

According to Rohim (2019), technology based on digitalization is increasingly growing in society. The benefits are immediately felt by the users. In this sense, we can retain the term digital, depicting radical changes triggered by innovative digital business models.
According to Santoso (2020), this digitalization is one of the outcomes of the industrial revolution that has brought significant changes to human life and has resulted in the emergence of an innovative digital transformation strategy commonly known as digitalization.

Due to digitalization and its new wave of technology, known as FinTech, financial innovation has become a key concept for changing, shifting, expanding and transforming ideas and systems. FinTech is commonly used to define innovation in financial services (Gomber et al., 2017; Arvanitis and Loukis, 2020) substantiates that the momentum of new technologies is expected to have a massive global impact. A set of actions known as digital transformation is henceforth being applied by organizations to take up new innovative models, such as big data, AI and blockchain (Naimi-Sadigh et al., 2022).

Business models must be reconfigured to encompass AI technologies, 3D printing, remote sensing, satellite imagery and vertical struts (Arvanitis and Loukis, 2020). Thus, digitalization is emerging as an opportunity for companies and organizations to improve their business operations. Along with business innovation, digitalization is one of the most prominent business trends in the future of the economy. Banks need to develop digital strategies and focus on the key success factors of digital transformation (Asri and Rahmat, 2022). Indeed, we use digital technologies to create value for corporations or banks. Biancone et al. (2019) note that digitalization strictly refers to the technological process of transforming analog data into a digital form.

In general, digitalization is the transformation of a bank through technology to better serve customers. It offers banks the opportunity to move to more comprehensive and efficient internal systems. Based on this evolutionary analysis, a complete typology of the digital industry can be developed (Asri and Rahmat, 2022). Moreover, banks must adapt to the demands of consumers for whom technology has become standard in recent years. They infer that having a website or Twitter account is no longer sufficient. Thus, they adapt their offers.

The digitalization of Islamic banks brings greater accessibility, better customer experience, process automation and operational cost reduction. However, it is important to carry out digitalization in accordance with Sharia principles. Indeed, it must avoid noncompliant products and services, whereas ensuring transaction security and customer data protection (Siska, 2022a).

Digitalization is the link between raw data and intelligence. It is introduced into business strategy to create a better customer relationship. The features of digitalization can help banks grow. It is a brand-new industry becoming more nascent when combined with the Islamic finance industry (Biancone et al., 2019; Lacasse et al., 2017; Laldin and Djafri, 2019; Todorof, 2018). Nonetheless, when examining the link between digital technologies and SSB work efficiency, a major problem arises. It consists of the unavailability of structured data on digitalization investments and digital capabilities.

Digitalization makes it easier to automate financial control processes, thus reducing manual tasks and error risks. In fact, Islamic banks can use computerized systems to collect and analyze financial data, perform Shariah compliance checks and generate audit reports. In addition, digitalization facilitates the establishment of stronger internal control mechanisms. Indeed, Islamic banks can implement real-time transactions monitoring tools and software. This allows them to quickly detect suspicious or non-Sharia-compliant activities. These automated control mechanisms strengthen compliance and they enable faster response to noncompliance (Sutikno et al., 2022; Manita et al., 2020).

Digitalization also provides opportunities to strengthen external control mechanisms. Islamic bank regulators and supervisors can use digital technologies to access banking
data and information. Hence, they can streamline auditing and monitoring processes (Manita et al., 2020).

Digitalization allows collecting, processing and analyzing large amounts of data in real time. This enables the control mechanisms in Islamic banks to have a clearer view. Accordingly, this will help them make informed decisions faster and respond effectively to potential compliance issues. As a result, digital technologies are radically changing how banks operate (Henfridsson and Bygstad, 2013; Holtzman et al., 2018).

Several previous studies, such as those by Bharadwaj (2000), Santhanam and Hartono (2003), Aral and Weill (2007), Beccalli (2007) and Chae et al. (2014), have relied primarily on self-reported survey data. Nevertheless, in recent research, Fei et al. (2021), Bellstam et al. (2021) and Kriebel and Debener (2020) have developed new digitization measures based on text-mining methods in their papers. As a matter of fact, in their research, Bellstam et al. (2021) have used large text databases, “Rapidminer”, as data mining software, and a filter list of keywords related to digitalization. They have developed a digitalization metric to identify the newest technologies in the mining industry.

Text mining is the same as data mining, except that it focuses on text rather than on more structured forms of data. However, one of the first steps in the text mining process is organizing and structuring the data to be subjected to both qualitative and quantitative analyses. This typically involves using natural language processing algorithms that apply the principles of computational linguistics to analyze and interpret data sets.

To the best of our knowledge, we suggest a practical solution using text-mining methods. Indeed, our paper presents methodological, conceptual and contextual development priorities that will contribute to setting higher methodological standards in text mining and improving methodological depth.

2.2 Shariah supervisory board
According to Alhammadi et al. (2022), ethical issues involve religious aspects. Religious facts raise controversy not only in Islamic countries but also in secular countries. The regulatory trends on which Islamic finance is based are commonly accepted worldwide, not only by Muslims, but also by non-Muslims who prefer operating with Islamic banks in the same market (Tameme and Asutay, 2012).

Islamic finance is a system with ethical concerns justified by the theory of finance through customer satisfaction (Haddad et al., 2022; Ariff and Rosly, 2011; Wajdi Dusuki and Irwani Abdullah, 2007; Wilson, 1997). In addition, Islamic banks use Shariah as their operational system. The principles of Shariah used in Islamic banks are based on the Fatwa of the National Shariah Council. Consequently, Islamic banks must establish a SSB (Rohim, 2019).

Moreover, Islamic bank governance is based on the epistemological aspects of Tawhid, Shariah and ethics (Hasan, 2011; Hendra, 2016) point out that the uniqueness of the good corporate governance structure in Islamic banks is summed up by the existence of the SSB whose role in Islamic banking is worthy. It pays particular attention to ensuring that the business activities of Islamic banks are in line with Islamic rules and halal products, and provides benefits to all stakeholders, thus avoiding any violation of Islamic values.

This body assists the board of directors in controlling managers’ business activities. The SSB is part of the Islamic banking governance component that plays a role in monitoring the policies and decisions of the board of directors or managers to implement banking services (Ariff and Rosly, 2011). They need to broaden their focus to obtain predictive information through analytics (Kana, 2020). In a relatively new and fast-growing market such as Islamic banks, this information is invaluable, as it allows for a better assessment of customer preferences for Shariah-compliant services.
In addition, Islamic banks should have written policies regarding the dissemination of information and the improvement of the disclosure level. This is especially in terms of financial and nonfinancial aspects, such as the remuneration of the Shariah board and material issues related to employees. It is also recommended that Islamic banks disclose the details of Shariah board information, statements, reports and organizational charts through their websites (Hasan, 2011).

Furthermore, the role of the SSB is to clarify the unique attributes of Islamic banks and reduce conflicts between investors and bank management to improve their financial performance and governance transparency (Grais and Pellegrini, 2006). Moreover, SSBs reply to all questions raised by depositors, clients and investors. They also clarify any ambiguity in any transaction. What is more, they continuously direct and train senior management to apply Islamic rules in daily transactions, and to avoid religious or ethical conflicts before entering into agreements with investors.

Traditionally, the SSB role focuses on financial compliance and monitoring because of the implementation of good internal controls (Aljifri and Kumar Khandelwal, 2013). SSB professionals have the ability to align the structure of Sharia internal audit with the dynamics of Islamic bank operations and should have a close relationship between management skills and SSB (Sahdan et al., 2019). Thus, effectiveness can be defined as the degree to which established objectivity is achieved. Badara and Saidin (2013) highlight some definitions of the term effectiveness. The effectiveness of an SSB can be defined as the degree to which the objectives established are met.

Klinsukhon (2016) argue that a program can be considered effective only if its outcomes are in line with its objectives. On the other hand, Bank Negara Malaysia (Central Bank of Malaysia) (2010) defines effectiveness as an objective aiming at guaranteeing a strong and effective internal control system for Shariah compliance. Accordingly, based on the definitions above, Islamic banks need to make certain that their SSB is effective in creating value and efficiency.

Indeed, the SSB establishes a comprehensive framework for Shariah compliance, and oversees all Sharia issues within Islamic banks (Khan et al., 2023). This aims to improve the performance of these banks, and to build confidence among stakeholders. Thus, these stakeholders will contribute to improving the bank performance (Nomran and Haron, 2020).

In addition, SSB supervision of these institutions faces significant challenges related to stakeholder needs and satisfaction (Alam et al., 2019; Alam et al., 2022). Indeed, Shariah board plays a central role in providing legal advice, and in overseeing the activities of Islamic banks to ensure their compliance with Shariah principles (Ajili and Bouri, 2018a, 2018b). However, the extent of information disclosure can affect its effectiveness within Islamic banks.

In summary, the effectiveness of Shariah board in Islamic banks is closely linked to information disclosure. This is because clear and complete information disclosure builds stakeholder confidence and promotes robust governance in the activities of Islamic banks (Khan et al., 2023).

Appropriate information disclosure is also paramount for the Sharia board to accurately assess banking products, transactions and operations. Adequate transparency also enables Sharia board members to scrutinize bank activities in detail and formulate informed opinions on their compliance with Islamic principles (Nurkhin and Rohman, 2020). Consequently, it is important that Islamic banks provide the Sharia board with all the information it needs to effectively perform its supervisory and advisory role (Fakhruddin et al., 2020).

However, we note that the effectiveness of the SSB plays a key role in supervising the activities of Islamic banks, and in ensuring their compliance with Shariah principles. It
provides legal advice and guidance to verify that financial operations and products comply with Sharia requirements. In addition, it enhances the credibility of the Sharia board and its ability to effectively oversee the activities of Islamic banks (Khalid, 2020; Lynall et al., 2003).

2.3 Theoretical framework

Although there is a huge number of studies on Islamic finance, the majority of studies have adopted two main theories: organizational theory and institutional theory. Various researchers, including Obid and Naysary (2014), Alam et al. (2021a, 2021b, 2021c), Karbhari et al. (2020), Greenwood et al. (2011), DiMaggio and Powell (1983) and Scott (2013), have supported this approach.

Scott (1987) argues that the institutional theory is a statement about the deeper and more flexible characteristics of societal structure. It deals with the process through structures containing application and cognitive regulation (normative and cultural), which are recognized as leadership strategies for societal behavior. According to Scott (2005), the institutional theory has become popular because of the general and dominant description of guidelines for individual and corporate actions. Hence, Alam et al. (2021a, 2021b, 2021c) state that the tactic of institutional theory depicts the similarities and modification of the organizational structure rather than concentrating on finding its changes.

Meyer and Rowan (2006) substantiate that organizational guidelines function as mythologies through institutions incorporating the legitimacy of acquisition, constancy and improvement of prospects for survival.

Institutions must follow dominant guidelines and belief structures (Meyer and Rowan, 2006; DiMaggio and Powell, 1983) because the organizational isomorphism, both structural and procedural, allows the organizational legitimacy (Dacin, 2022; Suchman, 2023; Deephouse, 1996). They have outlined three isomorphic processes: “coercive” to access legitimacy, “mimetic” to eliminate uncertainty and “normative” mainly from professionalization (DiMaggio and Powell, 1983). Thus, organizational isomorphism is the leading component of institutional theory, in which institutions implement similar processes through coercive, mimetic and normative isomorphisms, as indicated in previous work (DiMaggio and Powell, 1983).

However, the institutional theory refers to the capability of countries and institutions to perform similar structures and exercises (Sharia governance) as isomorphism (DiMaggio and Powell, 1983).

Carpenter and Feroz (2001) refer to this process as organizational marking, and assert that this process does not necessarily make institutions more effective. Furthermore, Carruthers (1995) argues that the institutional process is a social and political issue denoting legitimacy and authority, rather than just effectiveness. Thus, countries and institutions may carry out particular Sharia governance exercises not only to improve performance or advance financial development but also to achieve legitimacy in the culture (Alam et al., 2021a, 2021b, 2021c).

On the other hand, the institutional theory provides a beneficial structure for achieving social, financial and legal effects on countries and institutions, and brings about tactical responses to these effects (Covaleski and Dirsmith, 1988; Carruthers, 1995; Brignall and Modell, 2000). The Sharia governance framework also provides guidelines, strategies and procedures for Islamic banks to conduct, monitor and control their activities.

The institutional theory involves an analysis of the social systems of institutions, including contours, rules, norms and procedures, which are recognized as dominant strategies for institutional behavior (Scott, 2005). Islamic banks adopt Sharia principles to control their business activities. From an economic point of view, the information system technology can be considered as a factor of production that could substitute for traditional capital and labor.
According to the theory of organizational behavior, the IT lowers management costs and increases organizational management efficiency. In fact, IT lowers decision-making rights in an organization because lower-level employees receive the information they need to make decisions. Managers can now receive much more information that is accurate in a timely manner, so they can make decisions much quicker. This lowers management costs as a percentage of revenue and makes organizations more efficient (Meyer and Rowan, 1977).

With IT, decision-making becomes more decentralized as knowledge and information spread throughout the organization (Drucker, 1988). Thus, it creates a networked organization in which groups of professionals come together electronically to accomplish a specific task. In this case, firms function as virtual organizations in which work is no longer tied to geographic locations, thus reducing the cost of maintaining them (Scott, 1987).

In this study, we mainly use the institutional theory as it provides a better understanding of the orientations and operational procedures of Islamic financial institutions. Moreover, this method enables us to better understand the development of Islamic banking structures, and the impact of current practices and standards on the regulatory implementation (Yoshikawa et al., 2007; Chakrabarty and Bass, 2014; Morrison, 2014). This theory also allows us to better understand how Sharia committees consider and adapt to digitalization, which may affect their effectiveness in using new technologies (Karbhari et al., 2018; Parsons, 1956; Weber and Roth, 1978).

2.4 Hypotheses development

2.4.1 Impact of digitalization on the disclosure of shariah supervisory board reports in Islamic banks. The SSB is a key corporate governance mechanism. It plays a critical role in ensuring the development and survival of Islamic banks (Ajili and Bouri, 2018a, 2018b; Haridan et al., 2018; Ulussever, 2018). In addition, it plays a prominent role as an internal control mechanism in supervising the activities of Islamic banks (Ajili and Bouri, 2018a, 2018b).

The theoretical approaches outlined in the literature on the Islamic finance have formed a divergent and inconsistent system that has not really appreciated the effectiveness importance of the SSB practices. According to Greenwood and Hinings (1996), the tactics of the institutional theory describe similarities and changes in the organizational structure. Consequently, the latter is in charge of changing the way they conduct business through the rapid evolution of financial technologies available in banks (Tadic et al., 2018).

According to Kitsios et al. (2021), the digital transformation involves a path serving to identify, mobilize and organize resources to start from one point and go to another. According to Lochy (2019), the adoption of readily available technology skills transforms an organization’s responsiveness to market changes.

The era of digitalization resulting from the Fourth Industrial Revolution has also changed the business intelligence industry. Indeed, digitalization aims to put information at the disposal of its users and contributes to creating new practices to make faster and more accurate decisions. These new practices lead to an increase in the volume of achievement, reducing the intensity of routine and increasing the volume of information exchanged in the SSB report (Al-Mohammedi, 2020; Naimi-Sadigh et al., 2022). In this case, by aligning their digitization actions and strategies with institutional expectations and norms, SSBs can manage this legitimacy, using the institutional theory. This includes transparent communication of the benefits of digitization, adherence to relevant regulations and ethical practices (Scott, 2013).

In summary, digitalization is a process of examining how best to apply digitized information to simplify specific SSB operations (Sahabuddin et al., 2019). Kriebel and Debener (2020)
measure the degree of digitalization by the presence of IT expenditures related to hardware and software assets reported on the balance sheets of banks. Process applications increase productivity and facilitate regulatory compliance, whereas direct imaging and processing lead to a streamlined workflow.

Several previous studies, such as Baydoun et al. (1999), Haniffa and Hudaib (2007), Maali et al. (2008) and Tahri et al. (2023), have used the concept of speed and transparency to explain how Islamic banks conduct their reporting disclosure. Today, technological innovations driven by financial products and service start-ups offer more speed of work and evaluate and share data in real time (Leung and Snell, 2021). In this case, the institutional theory addresses the norms, values and beliefs shared within an organization. At the same time, it focuses on analyzing how digitalization is changing the culture of SSBs, particularly in terms of new work, communication and collaboration standards. This affects the effectiveness of SSBs in adopting and using digital technologies (Greenwood et al., 2011).

Digitalization not only has the potential of start-ups to reshape the financial sector but it also changes the mode and technique of SSB work efficiency in Islamic banks (Mohamed and Ali, 2018). Digitization also improves the dissemination and accessibility of SSB reports. Reports can be published online on Islamic bank websites, financial news portals and digital platforms. Therefore, this makes the information accessible to a wider audience, including customers, investors and interested stakeholders (Yunita, 2021; Schinagl and Shahim, 2020; Bergsteiner and Avery, 2010).

Islamic finance and its digitalization process create the opportunity to restore trust in the Islamic financial system, which should promote the quality of information disclosure. Thus, the innovative role and creative use of digital technology constitute a powerful vision for the effectiveness of SSB (Razak et al., 2020). As a result, digitization provides more transparent ways of communication to disclose SSB reports. This enhances transparency and facilitates the communication of SSB decisions and opinions to stakeholders (So et al., 2021). In this regard, the institutional theory is adopted by the operational guidelines and procedures of the organization. It describes the roles and powers of various stakeholders, regulators, institutions, SSB, board of directors, management and Sharia officials. This theory plays an important role in improving the organizational structure (Belal et al., 2015; Carpenter and Ferod, 2001).

Owing to digitalization, banks are shifting customer transactions from physical branch channels to digital channels, such as the internet, mobile, automated teller machines and video teller machines. Consequently, banks seek to reduce the workload of branches, and improve customer satisfaction by performing banking transactions quickly and without errors (Salman et al., 2020; Ray and Thomas, 2019). In addition, the institutional theory enables SSBs to recognize how existing organizational practices and structures can influence the implementation of digitalization (Karbhara et al., 2020).

Wei et al. (2015) prove that with technology, information could help the lender achieve true creditworthiness. Social network information can potentially contribute to reducing information asymmetry. In summary, digitization facilitates the disclosure of SSB reports in Islamic banks by improving accessibility, transparency, real-time updating, interactivity and archiving (So et al., 2021). This strengthens communication and stakeholder engagement, promoting trust and mutual understanding in the Islamic banking sector. Therefore, we propose our first hypothesis as follows:

\[ H1. \] Digitalization positively affects the disclosure of SSB reports.

2.4.2 Impact of digitalization on zakat disclosure in the shariah supervisory board reports of Islamic banks. Scott (2005) and Maali et al. (2008) investigate the annual reports of 29 Islamic banks in the Middle East. They find out that their Zakat disclosures do not meet
expectations. Using the bank Zakat disclosure index developed by Maali et al. (2008), Farook and Lanis (2007) and Farook et al. (2011), we also find limited disclosure in Islamic banks. In this case, the institutional theory involves an analysis of systems, rules, norms and procedures that are recognized as dominant strategies for institutional behavior (Scott, 2005).

Haniffa and Hudaib (2007) examine the gap between the “communicated” (based on information reported in annual reports) and the “ideal” (what should be disclosed in annual reports) in seven Islamic banks operating in the Persian Gulf region. They aim to achieve the same results as those of Maali et al. (2008) showing that the level of Zakat disclosure is not in line with stakeholders’ expectations of Islamic banks as ethical organizations with socioeconomic objectives.

However, Zakat disclosure has been chosen as a measure of the effectiveness of SSB for several reasons. First, Zakat is one of the five pillars of Islam and represents a religious duty for Muslims who have the financial capacity. It is an annual levy on the assets of individuals, to be redistributed to those in need. Therefore, Zakat disclosure is essential to ensure that Islamic banks comply with this religious duty, and to assess their commitment to Shariah principles (Adachi, 2018).

Transparency and accountability in Islamic banking activities can also be achieved through Zakat disclosure. Most importantly, in the activities of Islamic banks, Zakat disclosure strengthens the confidence of stakeholders, including customers, investors and regulators. Indeed, Zubaidah and Afifah (2020) show that collecting clear and accurate information on the use of Zakat by Islamic banks allows them to engage with society.

Touching the policymakers, the authority should strive to encourage Shariah in implementing and using remote banking and technology service quality, especially with regard to the characteristics of the service to provide information and characteristics of financing services (Fikri et al., 2021; Suriyankietkaew and Avery, 2014). Digitization plays an important role in improving the accessibility of Zakat information to a wider audience. Thus, Zakat disclosure reports can be made available online, allowing individuals, investors and stakeholders to easily use them at any time (Pati et al., 2021).

Several previous studies (Laurence, 2019; Salleh and Chowdhury, 2020a, 2020b) have studied Zakat and redesigned its collection and distribution. They infer that the development of the E-Zakat system should be fulfilled by accountability, transparency and efficiency. Most importantly, it should not violate Shariah rules. Digitalization provides detailed and transparent information on the collection and use of Zakat funds. Thus, digital reports can include details of amounts collected and beneficiary eligibility criteria (Beik et al., 2021; Davis and Searcy, 2010). This enables stakeholders to understand how Zakat funds are managed and used.

It can be used as an impetus to optimize the role of Zakat disclosure, especially digital Zakat (Ninglasari and Muhammad, 2021), particularly throughout the COVID-19 pandemic.

Santoso (2020) argues that information management based on digitalization technology can help with Zakat disclosure and support modernization and innovation. Because of dynamic technological development, especially the emergence of blockchain technology, Zakat disclosure would be more systematic. It could also be further improved as blockchain offers an immutable, secure and transparent system, thus addressing the stabilization of the nonbank Islamic financial system (Mohamed and Ali, 2018).

Using a digital portfolio for Zakat disclosure is a potential method for the Shariah committee (Mahomed, 2018). In any case, research on Zakat and technology has spurred on researchers to examine the possibility of maximizing technological advancement in Zakat disclosure management (Salleh and Chowdhury, 2020a, 2020b).
function, also known as a crypto-currency portfolio, facilitates financial transactions and information storage such as loyalty card information, payment information, passwords and identification information (Laurence, 2019; Mahomed, 2018).

Therefore, the institutional theory emphasizes the importance of formal and informal rules in financial institutions. It examines how these rules are created, maintained and modified in response to internal and external pressures. In the context of digitalization, this theory can help us understand how financial institutions establish new rules, standards and procedures to integrate digital technologies into their operations (DiMaggio and Powell, 1983; Karbhari et al., 2020).

For SSB activities in Islamic banks, the potential use of blockchain technology and that of the digital portfolio solves the problem of reducing errors or lack of attention to these activities, and enhances the speed of processing and evaluating data (Fei et al., 2021). Owing to the digital technology used in collection and distribution, Zakat management has significantly developed (Ninglasari and Muhammad, 2021).

Banks increase their branches’ operational efficiency by automating their repetitive and simple banking transactions via information systems, or through integration with partner institutions. Consequently, business processes are simplified, and the branch workload is reduced (Ortaköy and Ozsturunç, 2019). In addition, Rachman and Salam (2018) analyze the enhancement of Zakat disclosure through a financial technology system. In this regard, the institutional theory best serves the development of operational strategies and structures of Islamic banks, including the role, function and authority of various stakeholders. They are, for example, regulators and those involved in the Shariah governance process of Islamic banks (Dacin, 2023; Scott, 1987).

Digitalization also makes it possible to track Zakat contributions, fund movements and supported projects in real time. Digital platforms allow information to be updated instantly, providing real-time visibility into the impact of Zakat. They also enable stakeholders to verify compliance with Shariah principles and ensure that Zakat funds are used appropriately (Dan, 2021; Khairi et al., 2023; Salleh and Chowdhury, 2020a, 2020b).

Ben and Bahloul (2021) and Dan (2021) note that Zakat disclosure is a measure of SSB effectiveness. Hence, we take into account the importance of Zakat in Islamic finance, the need for transparency and accountability and the social impact. This measure assesses the performance of SSbs in terms of adherence to religious principles, transparent management of Zakat funds and contribution to social welfare and economic development. Moreover, because of the global reach of the internet and mobile applications, SSbs can reach potential donors in different regions and communities. This can increase the amount of Zakat funds collected. This can also reinforce the visibility and status of SSbs as efficient and committed Islamic financial institutions.

The development of digitalization has been rapid, and its growth has contributed to efficient and effective practices in the financial sector. It has also benefited the management of other industries, including Zakat management organizations in the reports of Islamic banks (Hudaefi and Noordin, 2019). Currently, technology has a significant impact on many industries, including the institution of Zakat. The digital portfolio blockchain solution is a tool to improve the image and partial efficiency of the Zakat system (Salleh and Chowdhury, 2020a, 2020b). This allows Islamic banks to remain competitive and to achieve sustainable growth. This suggests that digitalization increases the effectiveness of Zakat disclosure, leading to the following hypothesis:

\[ H2. \] Digitalization positively affects Zakat disclosure by SSB.
3. Research methodology

3.1 Sample and data
We conducted our study by selecting 79 Islamic banks from various countries worldwide and used data sourced from the Bankscope database. Furthermore, to gather the maximum amount of data useful for our research, we obtained the annual reports of these Islamic banks, specifically from both the English and Arabic versions of the official bank reports [1]. More specifically, our sample consists of Islamic banks operating in 20 countries, in accordance with previous studies (Tashkandi, 2022; Nomran et al., 2018; Alam et al., 2021a, 2021b, 2021c; Davis and Searcy, 2010; Milad and Bicer, 2020; Meslier et al., 2020; Ben and Bahloul, 2021; Khalil and Chihi, 2020). Eight banks are in UAE, 13 banks in Bahrain, three banks in Jordan, five banks in Qatar, one bank in Egypt, one bank in Palestine, four banks in Pakistan, three banks in Bangladesh, two banks in Sudan, five banks in Kuwait and two banks in Tunisia. In addition, two banks are in Algeria, two banks in Lebanon, one bank in Syria, three banks in Oman, seven banks in Saudi Arabia, three banks in Turkey, nine banks in Indonesia, four banks in Malaysia and one bank in UK. The research period spans a decade, from 2012 to 2021, driven by three key factors. First, the choice of 2012 as the starting point was made to mitigate the impact of the subprime crisis. The stability and effectiveness of SSBs in Islamic banks within the financial landscape have been inconsistent and faced governance challenges. Consequently, there has been a significant surge in the establishment of these boards within banks, particularly following the subprime crisis (Haddad et al., 2022). Second, the study period coincides with a period of notable technological advancements, with a particular emphasis on digitalization and fintech, including technologies like blockchain, AI and big data (Chaidar et al., 2022; Thakor, 2020). Finally, this timeframe offers a more current and up-to-date data set compared to prior research. As a result, the final sample includes 790 bank-year observations from 2012 to 2021. Table 1 summarizes the construction of our sample.

3.2 Definition of variables
3.2.1 Dependent variable. SSB effectiveness: This variable gauges the efficiency of SSB. In this study, we use two measures: the SSB report disclosure score (Diclo report) and the “Zakat” disclosure score (Diclo zakat) as proposed by Ulussever (2018), Neifar et al. (2020), Amalina Wan Abdullah et al. (2013) and Darmadi (2013). We have extracted the relevant items necessary for calculating the scores of Diclo_report and Diclo_zaket. Table 2 provides information about items connected to the disclosure of the SSB’s effectiveness.

Both scores are calculated based on a binary coding scheme where the disclosure of an item receives a score of “1”, and the nondisclosure receives a score of “0”. The score is computed as the ratio of the actual score (X) assigned to an Islamic bank to the total maximum disclosure score (TS). The formula is as follows:

\[
\text{Score\_disc} = \frac{X}{TS}
\]  

3.2.2 Independent variable. Digitalization aims to make information available to users and it contributes to creating new practices to make faster and more accurate decisions. According to Al-Mohammedi (2020) and Razak et al. (2020), these new practices lead to an increase in the volume of achievement, thus reducing the intensity of the routine, and increasing the volume of information exchanged in the SSB report.

Indeed, we use the methods of Kriebel and Debener (2020) and Chhaidar et al. (2022) to compute the DIG score of digitalization engagement. We use the text mining method to calculate this digitalization score. The authors develop a digitalization measure to identify emerging technological trends in the mining industry. They reveal that automation, robotics
the internet of things, big data and AI are the most widely used technologies in the mining industry. They also note that the adoption of these technologies is not only limited to spending on hardware and software but also encompasses using them to develop new services. This enables individuals and businesses to benefit from digital financial services and to maintain a competitive environment.

Recently, Barnewold and Lottermoser (2020) and Kriebel and Debener (2020) have developed new analysis measures based on text mining methods. However, because of the diversity of aspects and the large volume of information, the use of the text mining method is considered the best solution to extract this information (Fan et al., 2006):

$$\text{DIG}(\text{annual report}_{i,t}) = \ln \left( \frac{\sum_{x=1}^{N} tf}{Nt} \right)$$

Thus, $tf$ is the frequency term of $x$. $Nt$ is the total number of words in the survey report and $n$ is the total number of keywords tested in the survey report ($n = 77$).

Consequently, to calculate the digitization measure, we use 77 keywords collected from digitization dictionaries. To calculate the digitization measure, we use 50 specific keywords collected from the digitization dictionaries of Barnewold and Lottermoser (2020) and 27 collected from the digitization dictionaries developed by Chhaidar et al. (2022).


<table>
<thead>
<tr>
<th>Countries</th>
<th>No. of banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAE</td>
<td>8</td>
</tr>
<tr>
<td>Bahrain</td>
<td>13</td>
</tr>
<tr>
<td>Jordan</td>
<td>3</td>
</tr>
<tr>
<td>Qatar</td>
<td>5</td>
</tr>
<tr>
<td>Egypt</td>
<td>1</td>
</tr>
<tr>
<td>Palestine</td>
<td>1</td>
</tr>
<tr>
<td>Pakistan</td>
<td>4</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>3</td>
</tr>
<tr>
<td>Sudan</td>
<td>2</td>
</tr>
<tr>
<td>Kuwait</td>
<td>5</td>
</tr>
<tr>
<td>Tunisia</td>
<td>2</td>
</tr>
<tr>
<td>Algeria</td>
<td>2</td>
</tr>
<tr>
<td>Lebanon</td>
<td>2</td>
</tr>
<tr>
<td>Syria</td>
<td>1</td>
</tr>
<tr>
<td>Oman</td>
<td>3</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>7</td>
</tr>
<tr>
<td>Turkey</td>
<td>3</td>
</tr>
<tr>
<td>Indonesia</td>
<td>9</td>
</tr>
<tr>
<td>Malaysia</td>
<td>4</td>
</tr>
<tr>
<td>UK</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
</tr>
</tbody>
</table>

Source: Authors’ own elaboration

Table 1. Sample distribution

Shariah supervisory board efficiency

3.2.3 Control variables. The control variables are simply variables added by the econometrician to a regression to avoid bias in the estimation of the parameter. The role of a control variable is to exploit auxiliary information to allow correcting the estimator.

Bank size (SIZE_BANK): This variable is introduced in our study as a control variable. We calculate bank size, using the natural logarithm of total assets (Ajili and Bouri, 2018a, 2018b).

Debt ratio (LEVERAGE): This variable is calculated as the ratio of total debt to total assets (Salem et al., 2021).

The bank age (AGE_BANK): This variable is computed by counting the number of years since its foundation (Milad and Bicer, 2020).
Profitability (PROFIT): This variable is measured by the profitability of assets and it is calculated as the ratio of net income to total assets (Al-Homaidi et al., 2020).

3.2.4 Model. In this study, we use the generalized method of moments (GMM) estimation method in the system, which is the most recommended technique when the individual dimension (N) largely exceeds the temporal dimension (T). Moreover, this technique overcomes the endogeneity problem of lagged dependent variables and explanatory variables (Chowdhury and Rasid, 2016).

To assess the impact of digitalization on the effectiveness of Shariah supervision in Islamic banks, we have chosen a methodological approach based on a GMM dynamic panel. This method allows us to estimate heterogeneous regression coefficients in a convergent, consistent and unbiased way (Khan and Zahid, 2020; Chowdhury and Rasid, 2016). The GMM dynamic panel is a widely used econometric technique for estimating panel models, taking into account lags in explanatory variables and autocorrelated errors. The pioneering work by Arellano and Bover (1995) and by Blundell and Bond (1998) has introduced this method. In addition, we rely on several previous studies (Luo, 2016; Dong et al., 2020; Mamatzakis et al., 2017) that have successfully used this method to examine similar issues.

Based on the empirical considerations discussed above, we estimate the following dynamic panel data model:

\[ E_{SHARIA\_SB\_i,t} = \alpha_0 + \alpha_1 SHARIA\_SB_{i,t-1} + \alpha_2 DIG_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 LEV_{i,t} + \alpha_5 PROFIT_{i,t} + \alpha_6 AGE_{i,t} + \epsilon_{i,t} \]  

with:
- \( E_{SHARIA\_SB\_i,t} \) = Effectiveness of the Sharia Supervisory Board of bank \( i \) at time \( t \);
- \( DIG_{i,t} \) = represents the digitalization of bank \( i \) at time \( t \);
- \( SIZE_{i,t} \) = represents the bank size;
- \( LEV_{i,t} \) = represents the debt ratio;
- \( PROFIT_{i,t} \) = represents the bank profitability; and
- \( AGE_{i,t} \) = represents the bank age where \( \epsilon_{i,t} \) is the error term.

4. Estimation and discussion of results
4.1 Descriptive statistics
The descriptive statistics of the variables are provided in Table 3. For the period from 2012 to 2021, Table 3 shows the mean, minimum and maximum values, and the standard deviation of all the variables introduced into our empirical models.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>St. dev</th>
<th>Min</th>
<th>Max</th>
<th>No. of obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disclosure of Zakat in the SSB report</td>
<td>0.348</td>
<td>0.3334</td>
<td>0.3237</td>
<td>0.0000</td>
<td>5.0000</td>
<td>790</td>
</tr>
<tr>
<td>Disclosure of the SSB Report</td>
<td>0.566</td>
<td>0.6667</td>
<td>0.2974</td>
<td>0.0000</td>
<td>1.0000</td>
<td>790</td>
</tr>
<tr>
<td>DIGITAL</td>
<td>0.008</td>
<td>0.0014</td>
<td>0.0177</td>
<td>0.0000</td>
<td>0.0989</td>
<td>790</td>
</tr>
<tr>
<td>SIZE_BANK</td>
<td>22.831</td>
<td>22.8999</td>
<td>2.5600</td>
<td>15.3539</td>
<td>34.1713</td>
<td>790</td>
</tr>
<tr>
<td>PROFITABILITY</td>
<td>0.334</td>
<td>0.1974</td>
<td>1.8073</td>
<td>0.0000</td>
<td>36.5483</td>
<td>790</td>
</tr>
<tr>
<td>LEV</td>
<td>0.712</td>
<td>0.8412</td>
<td>0.5963</td>
<td>0.0045</td>
<td>9.1149</td>
<td>790</td>
</tr>
<tr>
<td>AGE_BANK</td>
<td>34.676</td>
<td>32.0000</td>
<td>25.1934</td>
<td>0.0000</td>
<td>158.0000</td>
<td>790</td>
</tr>
</tbody>
</table>

Source: Authors’ own elaboration

Table 3. Descriptive statistics
The average of Zakat disclosure score by SSB during the course of the study period is 0.347. This represents the Zakat disclosure level of the SSB in Islamic banks, ranging from a minimum score of 0 to a maximum score of 5, with a standard deviation of 0.323. The mean of SSB report disclosure score is 0.56. This represents the SSB’s reporting disclosure level in Islamic banks, ranging from a minimum score of 0 to a maximum score of 1, with a standard deviation of 0.297.

The DIGITAL variable displays a median of 0.001479, with deviations of [0.000000 and 0.098990]. The value “0.000” has occurred mostly in the early years of the study since the commitment of the sampling bank is relatively low.

4.2 Correlation matrix

There is a thorough absence of multicollinearity in the two empirical regressions. Indeed, as Table 4 shows, all Pearson correlation coefficients are below 0.75, which is the limit drawn by Kennedy (2008). Furthermore, with reference to the results in Table 5, all VIFs have a value below 10, representing the limit suggested by Meyer and Rowan (2006).

We can infer from the examination of the correlation matrix that the results indicate that there is no autocorrelation problem, as all the correlation coefficients between the independent variables are less than 0.5. A positive and statistically significant correlation is observed between the Zakat disclosure score and bank size, as well as with the SSB report disclosure score. However, the Zakat disclosure score still exhibits a negative and statistically significant impact on bank age. The second dependent variable related to the SSB report disclosure score appears to have a negative and statistically significant correlation with variables related to bank size, debt ratio and bank age.

We conclude that it is not necessary to exclude certain variables in the absence of the multicollinearity problem between the explanatory variables. To further ensure the absence of multicollinearity between the variables, we have used the variation inflation factor (VIF) test. The VIF measures the degree to which each explanatory variable can be explained by the other explanatory variables. Thus, when the VIF is less than 10, collinearity is not

**Figure 1.**

Total frequency of all technological words used

**Source:** Authors’ own creation
considered a problem (Chavent et al., 2006). For this test, all the variables have values lower than 10. Hence, the multicollinearity problem is not critical, and all the variables of our study can be retained.

5. Results and discussion
As shown in Table 6, the variable of the “Disclosure of Zakat in the SSB report” is influenced by its previous values. In fact, the coefficient associated with the variable of the Disclosure of Zakat in the SSB report (−1) is positive and statistically significant at a threshold of 1%. Moreover, the coefficient associated with the Disclosure of the SSB Report variable (−1) is positive and statistically significant at a threshold of 1%. Therefore, we conclude that Zakat disclosure of the previous year has an influence on Zakat disclosure of the current year, similar to the disclosure of the SSB report.

Digitalization positively and significantly affects the disclosure of Zakat in the SSB report and the disclosure of the SSB report at a threshold of 1%. These outcomes provide evidence that digitalization promotes the effectiveness of SSBs. That being so, it is important for digitalization and other Islamic banking players to work together to manage Shariah noncompliance issues and risks in light of new emerging technologies and financial products. Consequently, maintaining increased transparency in the digital world seems to be an easy thing to do, particularly for banks with several clerks working for bank growth. Therefore, digitalization in the context of effective SSBs is increasingly becoming a must

Table 4.
Correlation matrix

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIGITAL</td>
<td>1.05</td>
</tr>
<tr>
<td>SIZE_BANK</td>
<td>1.07</td>
</tr>
<tr>
<td>PROFITABILITY</td>
<td>1.00</td>
</tr>
<tr>
<td>LEV</td>
<td>1.03</td>
</tr>
<tr>
<td>AGE_BANK</td>
<td>1.11</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Source: Authors’ own elaboration

Table 5.
Multicollinearity test

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disclosure of Zakat in the SSB report</td>
<td>1.0000</td>
</tr>
<tr>
<td>Disclosure of the SSB Report</td>
<td>0.3551*</td>
</tr>
<tr>
<td>DIGITAL</td>
<td>−0.0971*</td>
</tr>
<tr>
<td>SIZE_BANK</td>
<td>0.1439*</td>
</tr>
<tr>
<td>PROFITABILITY</td>
<td>−0.0517</td>
</tr>
<tr>
<td>LEV</td>
<td>−0.0596*</td>
</tr>
<tr>
<td>AGE_BANK</td>
<td>−0.1573*</td>
</tr>
</tbody>
</table>

Source: Own elaboration
rather than an option. Thus, we conclude that digitalization has a significant impact on improving bank performance and on implementing an effective transparency strategy in banking activities.

Our findings are consistent with the principles of the institutional theory, which posits that organizations’ behavior and practices are shaped by social norms, rules and values (Alam et al., 2021a, 2021b, 2021c). Islamic banks, in line with this theory, adhere to Shariah principles to govern their business activities. Looking at it from an economic perspective, information system technology can be considered a production factor capable of substituting traditional capital and labor. Our results align with the research findings of Mohd Haridan et al. (2023), Manita et al. (2020) and Adnan and Uyuni (2023).

In the same vein, Manita et al. (2020) examine the relationship between digitalization and audits as a governance mechanism. They find a positive relationship, meaning that digitizing the audit function increases the effectiveness of corporate governance reporting. Hence, this finding is consistent with the organizational behavior theory. This theory states that IT creates a networked organization in which groups of professionals meet electronically and perform specific tasks (Drucker, 1988). Indeed, we conclude that the digitization of the audit function improves the service rendered, and makes the work easier and faster, allowing rapid decision-making.

Moreover, bank size has a positive and statistically significant influence on the Zakat disclosure score at the 1% threshold. However, it has a negative and significant impact at the 1% threshold in the SSB report. This result confirms the idea that larger banks are most encouraged to provide information. This positive relationship indicates that Islamic banks with a large SSB tend to perform better. The stakeholder theory supports our finding and asserts that large corporations are called upon to attract more attention from investors through more information disclosure. These results indicate that the bank size plays an important role in bank development and affects management decisions.

Regarding profitability, the relative coefficient of the variable is negative, and statistically significant at the 5% threshold on the disclosure of Zakat by the SSB. This result validates the idea that the most successful companies are the least committed to disclosing information about SSB Zakat disclosure to investors. This outcome is not in agreement with previous studies on the disclosure of Zakat by the SSB. Subsequently,

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Disclosure of Zakat in the SSB report</th>
<th>(2) Disclosure of the SSB report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disclosure of the SSB report</td>
<td>0.522373*** (0.006)</td>
<td>0.889379*** (0.010)</td>
</tr>
<tr>
<td>Disclosure of Zakat in the SSB report</td>
<td>0.607499*** (0.106)</td>
<td>0.232971*** (0.043)</td>
</tr>
<tr>
<td>DIGITAL</td>
<td>0.010261*** (0.001)</td>
<td>0.000112 (0.001)</td>
</tr>
<tr>
<td>SIZE_BANK</td>
<td>-0.006426** (0.003)</td>
<td>0.004472*** (0.001)</td>
</tr>
<tr>
<td>PROFITABILITY</td>
<td>0.006915 (0.005)</td>
<td>-0.00615** (0.002)</td>
</tr>
<tr>
<td>LEV</td>
<td>-0.001258*** (0.000)</td>
<td>-0.000270*** (0.001)</td>
</tr>
<tr>
<td>AGE_BANK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>711</td>
<td>711</td>
</tr>
<tr>
<td>Number of panel</td>
<td>79</td>
<td>79</td>
</tr>
<tr>
<td>AR(2) test (p-value)</td>
<td>0.99 (0.324)</td>
<td>0.29 (0.775)</td>
</tr>
<tr>
<td>Sargan test statistics</td>
<td>35.02 (0.919)</td>
<td>47.14 (0.508)</td>
</tr>
</tbody>
</table>

Notes: **Significance at 5% level; ***significance at 1% level  
Source: Authors’ own elaboration  

Table 6. Results of the estimations by the GMM method in system
Ninglasari and Muhammad (2021) and Rachman and Salam (2018) analyze the enhancement of Zakat disclosure through the fintech system to improve Islamic banking performance. Hence, it is positive and statistically significant at the 1% threshold for SSB report disclosure. This result indicates that the most performing firms are the ones most committed to disclosing SSB reporting information to investors. Therefore, several authors (Mohamed and Ali, 2018; Ortaköy and Özsürünç, 2019) have validated that the efficiency of IT and bank reporting disclosure can achieve productivity gains that strengthen competitiveness, and thus contribute to sustainable economic growth.

The debt ratio has a positive and nonsignificant influence on the Zakat disclosure score. However, our results show that the debt ratio has a negative and significant impact at the 5% threshold in the SSB report. Consequently, the more the debt ratio increases, the more the disclosed SSB ratio becomes increasingly weak. Indeed, the debt ratio is not relevant information for Islamic banks to disclose because their fundamental principles prohibit lending.

Furthermore, bank age has a negative and statistically significant effect at the 1% threshold on the two variables of disclosure of Zakat by SSB and disclosure of the SSB report. This result supports the idea that the efficiency of the SSB is better for younger banks. It should be noted that firm age reflects the maturity level (Amalina Wan Abdullah et al., 2013). Neifar et al. (2020) indicate that the most mature companies are the most attentive to their reputation, so they are spurred on disclosing more voluntary information. This finding indicates that older banks are not motivated to encourage information disclosure. This finding indicates that the bank senior managers show no interest in integrating new information and communication technologies because they tend to protect their interests. However, these technologies simplify tasks and improve banking transparency.

According to these findings, the Sargan overidentification test does not reject the hypothesis of the validity of lagged variables as instruments (p-value 0.919 for the first model and 0.508 for the second model). Therefore, the instruments used in this study are valid.

In accordance with these results, the second-order autocorrelation test of Arellano and Bond did not make it possible to reject the hypothesis of the absence of second-order autocorrelation (p = 0.324 for the first model and 0.775 for the second model). That being the case, we prove that there is no second-order autocorrelation of the errors in the difference equation (AR2).

6. Conclusion
This study addresses the impact of digitalization on the work efficiency of Islamic banks, focusing on digital transformation as a function of the SSB in Islamic banks. We use dynamic panel data as our econometric method, relying on the GMM in the system. Our estimation covers 79 Islamic banks located in different countries around the world for fiscal years spanning from 2012 to 2021.

In addition, two models have been developed. The first one considers the dependent variable (SSB work efficiency is measured by the SSB report disclosure index) and the independent variable (DIG is measured by the digital score). It also considers other control variables such as bank size, debt ratio, bank age and profitability. Using this model, we have tested the effect of digital technologies on the disclosure of SSB reports. The second one uses exactly the same dependent and independent variables as the first model, except that it changes the disclosure index of the SSB report to the disclosure index of Zakat.
Our results prove that digitization positively and significantly affects the SSB’s work efficiency in Islamic banking. Therefore, $H_1$ and $H_2$ are confirmed. Thus, digitization improves the work quality of SSB in Islamic banks. Moreover, we have provided evidence that digital technologies and the efficiency of SSB work help banks ensure the disclosure of information, improve the quality of SSB business performance and solve the problem of reducing errors in these activities. In general, they enhance the speed of the data processing and evaluation.

Due to digitization, banking services have become closer to customers. With respect to access to financial data, it provides an instant view of transactions, account statements, payments, fund transfers, end-to-end loan lifecycle management, etc. In fact, digitalization not only helps banks satisfy their customers and increase their loyalty but also helps reduce costs, thus pushing growth further. This new way of doing business implies proximity to customers, based on technology. Banks around the world are responding by strengthening their internet and mobile platform offerings, providing digital-only banking services to meet the different needs of their customers.

It should also be noted that the presence of digital or electronic banking services would reduce operational costs and increase bank profitability, while remaining oriented toward the efficiency of employees’ work because of the ease and speed of transactions. Therefore, technology plays a substantial role in improving financial inclusion. It makes banking services cheap, simple, compliant, fast, secure and available anywhere and anytime, and able to reach the majority of people regardless of their geographic locations.

The purpose of digitalization is to increase the bank market share by reaching an additional customer segment. It is a prominent tool for remaining customer-centric. Therefore, adopting new technologies is no longer a choice but an absolute imperative for Islamic banks to gain market share and customer satisfaction.

In this article, we have attempted to summarize the state-of-the-art in this research area and identify an agenda for future research. Our literature review indicates that the SSB’s work efficiency requires a digitally-oriented approach. In this sense, Soomro et al. (2016) and Schinagl and Shahim (2020) argue that this board must adapt to changing boundaries – that is technology-driven organizations leaving no room for distance between work efficiency and business.

Our article contributes to the literature in several ways. First, our study builds upon previous research by providing a more comprehensive view of the relationship between digitization and the effectiveness of Shariah-compliant banking services. Second, we demonstrate the crucial role of digitization in the banking sector, as it enhances work flexibility, performance monitoring and professional development. Digitalization offers new opportunities for Islamic banks to innovate and develop products and services tailored to meet the specific needs of their customers. In addition, our study aids customers in selecting the best technology to facilitate their transactions, thereby enabling Islamic banks to foster customer loyalty and attract new clients, ultimately positively impacting the bottom line of SSB.

Indeed, our study holds practical and managerial implications. It empowers decision-makers within banks to make informed choices and implement digitization as a means to enhance risk management and improve overall performance. Consequently, Islamic banks can increase transparency and employ digitization and Shariah disclosure as a brand image to build public trust, even in countries where Islamic banking regulations may be insufficient. In summary, digitalization facilitates human-resource management, communication, collaboration and access to information and resources, thereby improving
work flexibility, performance monitoring and professional development in the Islamic banking sector.

It is worth noting that we have begun the empirical study by using a questionnaire, but with no response. The response rate has almost been zero. We have then used a measurement based on articles available in indexed journals and paid particular attention to searching for significant keywords related to digital transformation. The major limitation is the scarcity of articles and information related to our research topic. This narrows the field of action.

However, this approach opens new avenues for future research. Indeed, previous analyses will need to be conducted at a deeper content level so that the keyword analysis is not only limited to the framework but also includes interpretations of the content of the related reports. Thus, additional research is needed to examine and analyze new approaches to further develop the existing reporting standards that mandate and enforce the full reporting of important topics.

We strongly suggest that future research should empirically test these propositions to shed more light on the results. The most successful banks are those investing the most in their knowledge assets, representing a fundamental value to their digital transformation.

Note

1. www.annualreports.com/Company/firstenergy-corp
   www.maybank.com/en/investor-relations/financial-overview/annual-reports.page
   www.islamibankbd.com/annual-report

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Further reading

Carruthers, B.G. (2024), “Accounting, ambiguity, and the new institutionalism”.


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