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ISR Intervention on Internet of Things and Firm Value: Evidence from Indonesia

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ABSTRACT

This research aims to analyze the role of Islamic Social Responsibility (ISR) as an intervening mechanism linking the Internet of Things (IoT) and risk to firm value in Indonesia. The population of this study consists of all Sharia-compliant companies in Indonesia. The data analysis method used is Structural Equation Modeling (SEM). The findings indicate that both IoT adoption and risk positively influence ISR. In addition, IoT and risk also have direct positive effects on firm value, while ISR likewise contributes positively to firm value. Further analysis confirms that IoT and risk enhance firm value indirectly through ISR. This study offers an important contribution to understanding the relationship between advanced technological adoption and Sharia-based social responsibility, as well as their implications for corporate performance. Technological advancements are also key drivers of capital market development. The findings suggest that Sharia-compliant firms implementing IoT, managing risks effectively, and maintaining strong ISR disclosures tend to have higher firm value. The novelty of this study lies in integrating ISR, IoT, and firm value within the context of the Islamic stock market, an area still rarely explored in the literature.

ملخص

يهدف هذا البحث إلى تحليل دور المسؤولية الاجتماعية الإسلامية (ISR) بوصفها آلية وسيطة تربط بين إنترنت الأشياء (IoT) والمخاطر على قيمة الشركات في إندونيسيا. وتشكل جميع الشركات المتوافقة مع الشريعة الإسلامية في إندونيسيا موضوع هذه الدراسة. طريقة تحليل البيانات المستخدمة هي نمذجة المعادلات الهيكلية (SEM). وتشير النتائج إلى أن اعتماد إنترنت الأشياء

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والمخاطر يؤثران إيجابا على المسؤولية الاجتماعية الإسلامية. وبالإضافة إلى ذلك، لكل من إنترنت الأشياء والمخاطر آثار إيجابية مباشرة على قيمة الشركة، في حين أن المسؤولية الاجتماعية الإسلامية تساهم بدورها بشكل إيجابي في قيمة الشركة. وبمزيد من التحليل تبين أن عنصري إنترنت الأشياء والمخاطر يعززان قيمة الشركات على نحو غير مباشر من خلال المسؤولية الاجتماعية الإسلامية. تجسد هذه الدراسة مساهمة مهمة في فهم العلاقة بين اعتماد التكنولوجيا المتقدمة والمسؤولية الاجتماعية القائمة على الشريعة الإسلامية، فضلا عن آثارها على أداء الشركات. كما أن التقدم التكنولوجي من أبرز المحركات لتطور أسواق رأس المال. تشير النتائج إلى أن الشركات المتوافقة مع الشريعة الإسلامية التي تعتمد إنترنت الأشياء وتدير المخاطر بفعالية وتحرص على توفير إفصاحات قوية عن المسؤولية الاجتماعية الإسلامية عادة ما تكون قيمتها أعلى. تكمن أهمية هذه الدراسة في دمج المسؤولية الاجتماعية الإسلامية وإنترنت الأشياء وقيمة الشركات في سياق سوق الأوراق المالية الإسلامية، وهو مجال لم تتطرق إليه الأدبيات إلا ما ندر.

RÉSUMÉ

Cette étude vise à analyser le rôle de la responsabilité sociale islamique (ISR) en tant que mécanisme intermédiaire reliant l'Internet des objets (IoT) et les risques qui menacent la valeur des entreprises en Indonésie. L'échantillon de cette étude comprend toutes les entreprises conformes à la charia en Indonésie. La méthode d'analyse des données utilisée est le modèle d'équations structurelles (SEM). Les résultats indiquent que l'adoption de l'IoT et le risque ont tous deux un impact positif sur l'ISR. En outre, l'IoT et le risque ont également des effets positifs directs sur la valeur de l'entreprise, tandis que l'ISR contribue également de manière positive à la valeur de l'entreprise. Une analyse plus approfondie confirme que l'IoT et le risque améliorent indirectement la valeur de l'entreprise par le biais de l'ISR. Cette étude apporte une contribution importante à la compréhension de la relation entre l'adoption de technologies de pointe et la responsabilité sociale fondée sur la charia, ainsi que leurs implications pour la performance des entreprises. Les progrès technologiques sont également des moteurs clés du développement des marchés financiers. Les résultats indiquent que les entreprises conformes à la charia qui appliquent l'IoT, gèrent efficacement les risques et maintiennent une forte transparence en matière d'ISR ont tendance à avoir une valeur plus élevée. L'importance de cette étude réside dans l'intégration de l'ISR, de l'IoT et de la valeur de l'entreprise dans le contexte du marché boursier islamique, un domaine encore peu exploré dans la littérature.

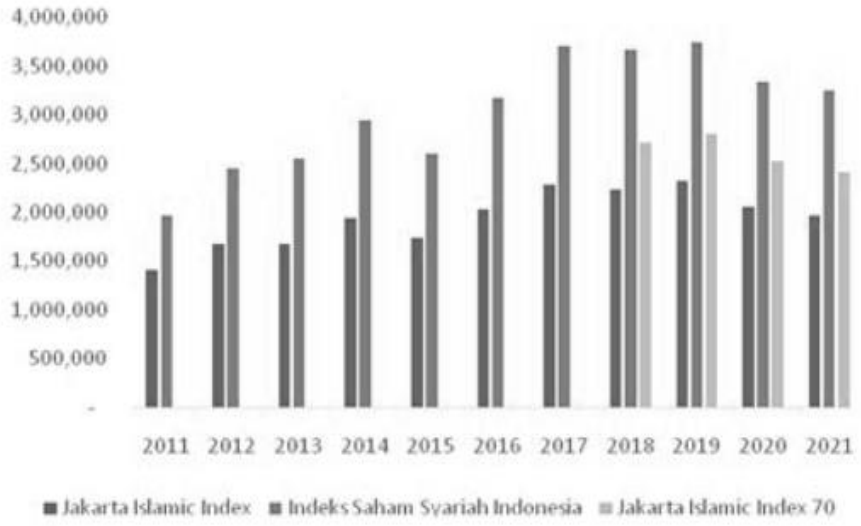
Keywords: IoT, Risk, ISR, Firm value.

JEL Classification: D22, M14, Q55, G32

1. Introduction

The development of sharia shares in Indonesia shows a positive trend, as reflected in the growth of market capitalization and sharia stock indices (Filbery, 2021). The development of the Islamic capital market accompanied by easier access to information will help investors to determine the type of investment they want (Dewaelheyns et al., 2023; Vestrelli et al., 2024). The combination of the development of the Islamic economic system, especially in terms of investment in the Sharia capital market and supported by increasingly easy access to information, is certainly an advantage that can be used to increase investor interest and participation in investing in the Sharia capital market. If this can be realized it will certainly be a revival of the Indonesian economy, especially in the Sharia capital market and other Sharia-based investment instruments (Dewaelheyns et al., 2023; Vestrelli et al., 2024).

Figure 1. Development of Capitalization of Sharia Stock Indices



Source: (Filbery, 2021)

Furthermore, the rapid development of information technology, especially in the field of the Internet of Things (IoT), has had a significant impact on various sectors, including the world of business and finance (Din et al., 2019; Esmaeilpour et al., 2020). IoT provides huge

opportunities for companies to enhance operational efficiency, data-based decision-making, and the development of new business models (Din et al., 2019). On the other hand, this also brings new risks, both in terms of data security and market uncertainty. This change influences firm value in the context of the stock market, especially sharia stocks in Indonesia (Judijanto, Hiswara, et al., 2024). In Islam, which upholds high ethics and social responsibility, lies the concept of Islamic Social Responsibility, which can be the answer to various challenges and risks the companies face. The research is very important because it is still too little research links the role of ISR in the context of IoT to the value of the company in sharia shares in Indonesia. Thus, more detailed research should be done in order to show how ISR reduces risk and enhances firm value from that perspective.

The theoretical basis from which this study was conducted is under the theory of Corporate Social Responsibility, where (Godfrey et al., 2009; Wirawan et al., 2020). suggested that the socially responsible Company will achieve a long-term benefit in reputation, customer loyalty, and the sustainability of the company itself. In the context of this paper, this means that Islamic Social Responsibility represents one form of Corporate Social Responsibility that is amalgamated within Sharia principles. Apart from that, technology and innovation theory is also the basis for understanding the role of IoT in managing resources and increasing company operational efficiency (Birkel & Hartmann, 2020; Carruthers, 2020). Based on these theories, this research will analyze how Sharia-based ISR can mitigate risks arising from the use of IoT and ultimately increase company value in the Sharia stock market.

This research object is based on the rapid growth of the Islamic stock market in Indonesia (figure 1) (Filbery, 2021). Indonesia has great potential as a developing Islamic economic market, where many companies listed on the Indonesia Stock Exchange (BEI) have implemented Sharia principles in their operations. However, when compared with conventional shares, the market share of sharia shares is still far different from the conventional market share (Jayani, 2019; Otoritas Jasa Keuangan, 2023; Pricewater house Coopers, 2018). This shows that people have not fully chosen Sharia products. On the other hand, with the increasing adoption of IoT technology by companies in Indonesia, there is a big challenge regarding how ISR can be implemented effectively to manage the risks that arise from the use of this technology.

Therefore, the Indonesian Sharia stock market is a relevant and important object to be analyzed in this research.

Table 1. Comparison of Market Share and Assets Between Sharia and Conventional Finance in Indonesia (2023)

Indicator	Conventional Financial Industry	Sharia Finance Industry
Banking Asset Market Share	90%	8-9%
Banking Assets (IDR Trillion)	8.000 – 9.000	700-800
Number of Banks	109	14
Number of Bank Branches	7.000+	1.200+
Digital Services	70%+ of digital transactions	30-40%
Innovative Products (Fintech)	More and growing fast	Still limited

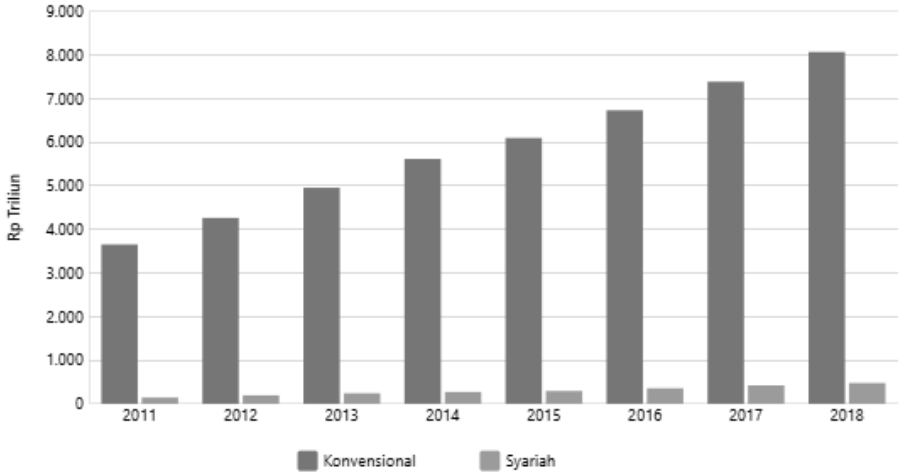
Source: (Otoritas Jasa Keuangan, 2023; Pricewater house Coopers, 2018)

Table 2. Comparison of Conventional Share Transactions and Sharia Shares in Indonesia

Year	Conventional Stock Transaction Volume (IDR trillion)	Sharia Stock Transaction Volume (IDR trillion)	Percentage of Sharia Shares to Total Transactions (%)
2019	400	150	37.5%
2020	450	180	40.0%
2021	600	250	41.7%
2022	650	280	43.1%
2023	700	300	42.9%

Source: (Otoritas Jasa Keuangan, 2023)

Figure 2. Sharia Bank and Conventional Bank Assets



Source: (Jayani, 2019)

Research (Arafat et al., 2012; Platonova & Asutay, M., Dixon, R., & Mohammad, 2016) shows a positive relationship between CSR and company value, especially in the context of Islamic banking. Research (Choi et al., 2010; Harun et al., 2020) shows that CSR can reduce risk and improve financial performance. Although there is research that discusses the effect of ICSR disclosure on company value (Oktaviana et al., 2021). However, there is still a lack of research on how ISR interventions can be integrated with IoT technology to increase company value. This research has the potential to fill several gaps in the literature, with a focus on the integration of ISR, IoT, and risk in the context of Sharia corporate value in Indonesia. This will not only enrich academic understanding but also provide practical guidance for companies in managing their social responsibilities in the digital era.

This study is motivated by the accelerating digital transformation in Islamic financial markets, where the adoption of the Internet of Things (IoT) plays a vital role in improving transparency, efficiency, and accountability within Sharia-compliant firms. Islamic Social Responsibility (ISR) is viewed as a key mechanism that mediates the link between technological innovation and firm value by ensuring that IoT-driven efficiency aligns with Islamic principles of *amanah* (trust), *adl* (fairness), and *maslahah* (public good). The urgency of this topic is

particularly relevant in Indonesia, whose rapid digital growth contrasts with its still-developing ISR disclosure and Sharia governance frameworks compared to Malaysia and GCC countries. Indonesia thus provides a unique context where regulatory efforts by the Financial Services Authority (OJK) to strengthen ISR transparency intersect with high digital readiness recognized by the World Bank.

Accordingly, this study aims to examine how IoT adoption affects firm value through the mediating role of ISR within the framework of Sharia governance. It also investigates whether risk management and governance mechanisms moderate this relationship to ensure ethical and sustainable value creation. The study argues that IoT adoption alone may not enhance firm value unless accompanied by strong ISR integration that transforms technological innovation into ethical legitimacy and stakeholder trust. By situating Indonesia within a comparative regional perspective, this research contributes theoretically and practically to understanding how digital transformation, when guided by Islamic ethical principles, can strengthen firm performance and social accountability in emerging Islamic capital markets.

2. Literature Review

The Islamic Social Responsibility (ISR) theory is used in this research to explain how Sharia companies apply the principles of social responsibility in their operations (Godfrey et al., 2009). Islamic Social Responsibility (ISR) includes aspects such as disclosure of zakat and sadaqah, which are an integral part of Islamic business ethics (Ananda & Nr, 2020). Islamic Social Responsibility (ISR) has two main objectives, namely, as a form of accountability to Allah SWT and society and to increase the transparency of a business by providing relevant information and by the spiritual needs of the Islamic religion. Islam strongly supports CSR because it cannot be denied that the business world causes many problems, both social and environmental. All social responsibility implementation carried out by the company will be socialized, one of which is through the disclosure of the annual report every year. CSR is a moral and religious initiative based on the belief that companies do not only pursue profits (Ismail & Obiedallah, 2023; Sahaf & Fazili, 2024).

Research shows that ISR can improve a company's financial performance, which can then influence company value (Khairiyani & Mubyarto, 2019). In addition, ISR also functions as a tool to increase investor confidence, which is very important in the context of the Islamic stock market (Ullah et al., 2014).

Recent studies reveal a strong trend toward integrating digital technologies—particularly the Internet of Things (IoT) and Artificial Intelligence (AI)—into corporate social responsibility practices, including their Sharia-based form known as Islamic Social Responsibility (ISR). Several studies emphasize that IoT and AI integration enables more accurate, real-time, and verifiable social and environmental reporting, thereby improving ISR quality and reducing information asymmetry between firms and stakeholders (Adhicandra et al., 2024; Shadiq & Hasya, 2025; Shkalenko & Nazarenko, 2024). Moreover, empirical evidence shows that IoT adoption contributes to operational efficiency, waste reduction, and stronger environmental governance—effects that directly align with the sustainability objectives of ISR (Dharmanto et al., 2024; Judijanto, Tahir, et al., 2024; Lanfranchi et al., 2025).

Industry research and market reports also highlight the accelerated adoption of IoT since 2021 and the growing investment of firms in digital transformation, expanding the practical context for ISR–IoT studies (Fernandez, 2024; Judijanto, Triwiyatno, et al., 2024; Walsh, 2021). In the Indonesian digital economy, (Sari et al., 2025) underscore the synergistic role of AI and IoT in driving national economic transformation under the 5.0 paradigm, which aligns with the efforts of Sharia-compliant firms to balance technological innovation and social responsibility. Meanwhile, research in the FinTech–Islamic finance domain (Dosinta & Yunita, 2024; Majid, 2024) stresses the importance of aligning digital financial innovation with ISR principles to ensure that technological advancement truly promotes social justice and Sharia compliance. Synthesizing evidence from 2021–2025, it can be concluded that the collaboration among IoT, AI, and FinTech platforms provides an opportunity to make ISR more measurable and credible; however, its

success fundamentally depends on robust Sharia governance, data validation, and risk management mechanisms.

2.1 Internet of Things towards Islamic Social Responsibility

IoT can play an important role in supporting Islamic Social Responsibility (ISR) by increasing the transparency, efficiency, and accountability of corporate social Responsibility (Khan et al., 2017). It will enable companies to respond more precisely and with data towards their social obligations in accordance with the Sharia principles concerning social responsibility, sustainability, and accountability. By embracing IoT technology, ISR about its contribution to society and the environment would be further enabled on the part of companies, and that acts to maintain the social and economic goals in keeping with Islamic rules too (Palmaccio et al., 2020; Shkalenko & Nazarenko, 2024). Studies like those by (Cantarelli et al., 2018; Inegbedion et al., 2023) reported that, indeed, the impact of IoT touches base with Islamic social Responsibility ; therefore, it is obvious that:

H1: The Internet of Things is a contributor to positive impact on Islamic Social Responsibility.

2.2 Risk towards Islamic Social Responsibility

The companies, which are exposed to various risks, such as reputation risk, environmental risk, financial risk, and Sharia compliance risk, have to take good risk management to produce ISR reports that are accurate, transparent, and according to Sharia principles (Minaryanti et al., 2024). Effective risk management can improve the quality of social Responsibility , improve the company's image, and ensure the company fulfills its social obligations by Islamic teachings (Rashid et al., 2024). Research results (Sariyer & Taşkın, 2022; Tzanidis et al., 2024) show that Risk influences Islamic Social Responsibility , so it can It is concluded that

H2: good risk management has a positive effect on Islamic Social Responsibility.

2.3 Internet of Things towards Firm value

In the ISR principle, the company is supposed to be responsible for environmental sustainability and wise management of natural resources. IoT can be applied to monitor energy use, water consumption, and other environmental impacts in real time. This enables the company to act more efficiently and in an environmentally friendly manner, conforming to the Islamic principle of maslahah. Sustainability maintenance may improve the image of the company, which in turn improves firm value (Mattera & Gava, 2022). The application of IoT technology within the framework of Islamic Social Responsibility not only supports broader social goals but can also increase operational efficiency and company competitiveness. This can lead to an increase in market value or firm value that is more stable and sustainable, creating long-term profits for the Company (Carruthers, 2020). Research results (Rogerson et al., 2024; Wójcik et al., 2022) show that the Internet of Things has an effect on Firm value, so it can be concluded

H3: The Internet of Things has a positive effect on Firm value.

2.4 Risk towards Firm value

In the ISR principle, companies are expected to minimize negative impacts on society and the environment. Reputation risks, legal risks, and environmental risks have been reduced due to the implementation of sustainability and socially oriented policies by companies (Ismail & Obiedallah, 2023; Sahaf & Fazili, 2024). Companies neglecting their social responsibilities stand to face a reputation crisis as it eventually eats into the relationships between customers, investors, and other stakeholders. On the other hand, the company that emphasizes equivalence and fairness or Amanah - honesty will be regarded as better in the public eye. This good reputation can function as a protector against reputation risks which can reduce firm value (Bravo, 2017). Research results (Dewaelheyns et al., 2023; Vestrelli et al., 2024) show that risk affects firm value, so it can be concluded that

H4: good risk management has a positive effect on firm value.

2.5 Islamic Social Responsibility towards Firm value

According to ISR theory, businesses should responsibly manage their natural and social resources to prevent overexploitation and guarantee sustainability (Godfrey et al., 2009). Businesses can lower long-term risks related to environmental harm or social inequity by emphasizing sustainability. This keeps the business stable and makes it more appealing to investors who are becoming more concerned with social and environmental issues. Directly, policies that support sustainability have the potential to increase firm value (Santosa, 2020). Solid ISR practices can improve a company's image in the eyes of the public and consumers. This good reputation can increase customer loyalty and expand the market, which leads to increased revenue and profitability, thereby improving firm value Customers and investors who value ethics and social responsibility will value businesses that care about social justice, people's wellbeing, and environmental management more (Wirawan et al., 2020). Islamic social Responsibility has an impact on firm value, according to research findings (Khalifa et al., 2024; Mousa et al., 2021) Therefore, it can be said that:

H5: Islamic Social Responsibility has a positive effect on Firm Value.

2.6 Internet of Things towards Firm value through Islamic Social Responsibility

The application of the Internet of Things integrated with ISR principles and reported through Islamic Social Responsibility can create synergies that strengthen a company's competitiveness, reduce risk exposure, and improve the company's social image (Nicolescu et al., 2018; Susbiyani et al., 2022). In fact, the better companies report their social and environmental impacts according to Islamic principles, the more likely they are to attract investors concerned with social values and sustainability. Apart from adding to improvement in the reputation of the company, it may boost firm value over the long run as well (Loh et al., 2017). This implies, by the results obtained from (Côrte-Real et al., 2020; Nechaev & Hain, 2023) that the utilization of IoT influences Firm Value through Islamic Social Responsibility.

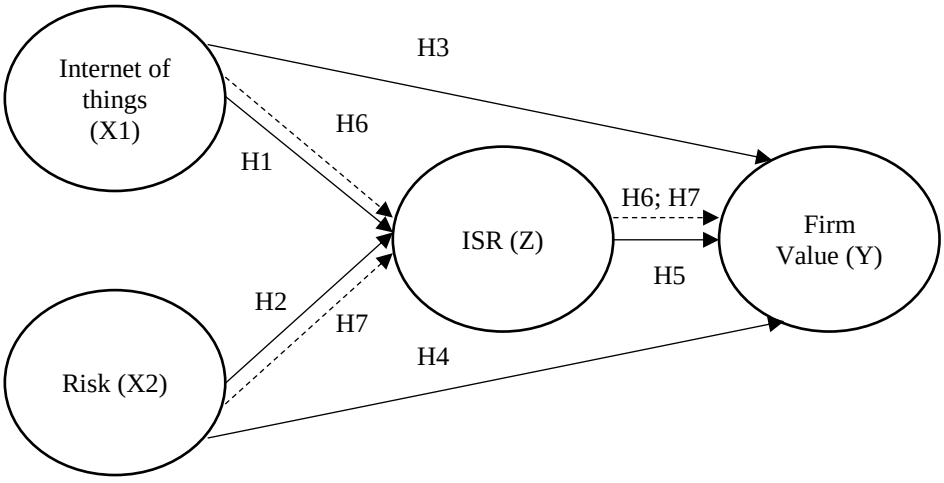
H6: The positive effect of the Internet of Things on Firm value is mediated through Islamic Social Responsibility.

2.7 Risk towards Firm value through Islamic Social Responsibility

Social and environmental risk management are strongly tied to the Islamic Social Responsibility (ISR) framework, which emphasizes social responsibility grounded in Islamic values (Susbiyani et al., 2022). Businesses can openly share the measures they have taken to reduce these risks by using Islamic Social Responsibility (ISR). Businesses can enhance their firm value and, in turn, their marketability by lowering reputational, legal, and social risks and boosting accountability and transparency (Wijayanti & Setiawan, 2022). Results from studies (Côrte-Real et al., 2020; Nechaev & Hain, 2023) depict that risk is influencing firm value through Islamic Social Responsibility; therefore, it can be concluded that

H7: good risk management has a positive effect on Firm value through Islamic Social Responsibility.

Figure 3. Conceptual Framework



The conceptual framework is reconstructed by integrating the *Internet of Things* (IoT), *Islamic Social Responsibility* (ISR), and risk management within the principles of *Sharia governance*. In this framework, IoT functions as a digital governance tool that enhances transparency, efficiency, and accountability through real-time, data-driven reporting.

ISR acts as a mediating mechanism that aligns technological adoption with Islamic values of justice, trust, and social sustainability. Meanwhile, risk management serves as a controlling mechanism that ensures compliance and long-term sustainability, covering financial, social, and environmental risks. Under Sharia governance, these elements are harmoniously integrated—IoT influences firm value both directly and indirectly through ISR, while risk management reinforces this relationship within the ethical boundaries of Islamic principles.

3. Methodology

This study used a descriptive, associative, quantitative, and informal methodological approach. In the quantitative approach, the study examines particular populations or groups by collecting data using research instruments in a methodical manner and analyzing the findings quantitatively or statistically to evaluate preexisting hypotheses (Ghozali, 2021). Using sample data that is collected precisely as it is, descriptive research uses data collection techniques to explain or illustrate the object under study. The goals of causality research are to quantify the strength of the relationship between two or more variables and to show the way the independent and dependent variables are related. In other words, causality research draws attention to issues with the cause-and-effect relationship (Ghozali, 2021).

Several important factors are considered when selecting companies included in the Sharia Stock Index to be used as research subjects. First of all, with a clear commitment to Sharia principles, these businesses make it easier to analyze the relationship between social responsibility and corporate governance in a uniform and standardized atmosphere. Second, the companies included in this index provide more comprehensive and relevant data for this research, because their reports and information regarding their ISR practices are more transparent. By concentrating on this industry, the research can provide more in-depth and targeted insight into how the size of the IoT and Risk affects firm value through ISR implemented by Islamic businesses.

The population in this research comprises all companies listed on the Indonesian Sharia Stock Index (ISSI) in 2024. According to data from the Indonesia Stock Exchange (IDX, 2024), there were 614 companies included in the ISSI. Meanwhile, based on ESG Intelligence (Intelegence, 2024), 507 of these companies have disclosed their Islamic Social Reporting (ISR). Further screening was conducted to ensure data completeness and relevance, particularly focusing on the availability of annual financial reports for the 2024 fiscal year. After excluding companies that had not yet released their financial reports and ensuring consistent ISR disclosure, a final sample of 500 companies was obtained for analysis. This sample represents firms with both complete ISR and financial information, ensuring the validity and comparability of data used in the study. The detailed sampling process is presented in Table 3.

Table 3. Sampling Criteria

No	Information	Total
1	companies listed on the sharia stock index in 2024	614
2	companies that have disclosed their ISR	507
3	Company have not released the financial report	(7)
4	Research period (annualy): 2024	1
5	**Number of samples (with complete data)**	**500**

3.1 Operational Definition of Variables

1. Internet of things (X_1)

   Internet of things (X_1) which can be measured by the value (score) of technology development costs in each company (Ceballos et al., 2024).

IoT = LN (Technology development costs) (1)

2. Risk (X_2)

   Risk (X_2) beta test formula for systematic risk (share beta) in each share of a Sharia company (Bris et al., 2021).

$$F = \frac{R^2/K}{(1 - R^2)(n - k - 1)} \quad (2)$$

3. Islamic Social Responsibility (Z)

   Islamic Social Responsibility (Z) which can be measured by the value (score) of the ISR index in each Sharia company (Othman & Thani, 2010).

$$ISR = \frac{\text{Number of disclosure scores that are met}}{\text{Maximum total diclosure score}} \quad (3)$$

4. Firm value (Y)

   Firm value is calculated using the following formula (Maria et al., 2022):

$$PBV = \frac{\text{Stock Price}}{\text{Book Value per Share}} \quad (4)$$

3.2 Data Analysis Methods

The data analysis technique used in this research is Structural Equation Modeling (SEM) analysis. Data management in this research will use smart PLS software. Structural Equation Modeling (SEM) is a method used to cover the weaknesses found in the regression method (Ghozali, 2021; Hox & Bechger, 1998).

Structural equation modeling is a multivariate data analysis method for analyzing complex relationships among constructs and indicators. To estimate structural equation models, researchers generally draw on two methods: covariance-based SEM (CB-SEM) and partial least squares SEM (PLS-SEM). Whereas CB-SEM is primarily used to confirm theories, PLS represents a causal–predictive approach to SEM that emphasizes prediction in estimating models, whose structures are

designed to provide causal explanations. PLS-SEM is also useful for confirming measurement models (J. F. Hair et al., 2021).

According to (Sudaryono, 2017), there are two reasons underlying the use of SEM, namely, first, SEM can estimate relationships between variables that are multiple relationships. This relationship is formed in a structural model (the relationship between dependent and independent constructs). Second, SEM can describe the pattern of relationships between latent (unobserved) constructs and manifest variables (manifest variables or indicator variables).

Structural Equation Modeling (SEM) is a versatile statistical method used to analyze complex relationships between observed and latent variables (Stein et al., 2017). It can be applied to secondary data, as demonstrated by (Nazim, 2014) using TIMSS data to model factors influencing 8th-grade mathematics achievement in Malaysia. (Kline, 2016) explained that SEM can be used with secondary data, as long as the data is valid and relevant to the model to be tested. Kline also ensures that the basic SEM requirements are met before the analysis. SEM is valuable for testing hypotheses and theories in language learning research (Winke, 2014). However, researchers should be cautious about sample size, model presentation, reliability, and Likert-scale points when using SEM (Winke, 2014). A variant called Partial Least Squares SEM (PLS-SEM) is particularly useful for complex models, prediction-focused research, non-normal data, formative constructs, and higher-order constructs (J. Hair & Alamer, 2022).

In hypothesis testing, it can be seen from the significance value. Ha is accepted and H0 is rejected when $p < 0.05$, otherwise Ha is rejected and H0 is accepted if $p > 0.05$ (Ghozali, 2021)

4. Result

The Indonesian Sharia Stock Index (ISSI) is a composite index of Sharia shares listed on the IDX. ISSI is an indicator of the performance of the Sharia stock market listed on the IDX. ISSI constituents are all Sharia shares included in the Sharia Securities List (DES) published by the OJK and listed on the main board and development board of the IDX. ISSI

constituents are re-selected twice a year, every May and November, following the DES review schedule. Therefore, in every selection period, there are always sharia shares that leave or enter ISSI constituents. The ISSI calculation method follows other IDX stock index calculation methods, namely the weighted average of market capitalization using December 2007 as the base year for ISSI calculations.

4.1 Descriptive Statistics

After analyzing the research data, the next stage is processing descriptive statistical data for the research variables. The results of descriptive statistical data processing for research variables appear in Table 4 below:

Table 4. Descriptive Statistics Result

Variable	N	Min	Max	Mean	Std. dev.
Internet of things (X_1)	500	.01	1.34	.3981	.86159
Risk (X_2)	500	-.97	.86	.2533	.18391
ISR (Z)	500	.02	.96	.2983	.18504
Firm Value (Y)	500	-.3569	.3832	.6444	.49405

Source: Data processed, 2025.

Based on table 4, it shows that there is quite large variation between the variables measured, especially in variable Internet of things (X_1) which has the highest standard deviation, which shows large variations in the data. However, all variables have a positive average value, which indicates a tendency for the variable value to be higher than the minimum observed value.

4.2 Dicriminant Validity

Table 5. Discriminant Validity Assessment (HTMT and RMS Theta)

	Internet of things (X_1)	Risk (X_2)	Firm Value (Y)	ISR (Z)
Internet of things (X_1)				
Risk (X_2)	0.009			
Firm Value (Y)	0.069	0.039		
ISR (Z)	0.033	0.024	0.122	
RMS theta Value:	0.065			

Source: Data processed, 2025

All HTMT values are far below the recommended thresholds of 0.85 and 0.90, with the highest value being only 0.122, indicating that all constructs are clearly distinct and free from discriminant validity issues. In addition, the RMS Theta value of 0.065 is well below the acceptable cutoff of 0.12, confirming that the reflective measurement model demonstrates strong reliability and low indicator error. Overall, these results show that the model meets the required discriminant validity criteria and exhibits a high-quality measurement structure.

4.3 Construct Statistics

Table 6. Construct Statistics: AVE, Composite Reliability, Cronbach's Alpha, and VIF

Variable	AVE	CR	CA	VIF
Internet of things (X_1)	1.000	1.000	1.000	1.000
Risk (X_2)	1.000	1.000	1.000	1.012
ISR (Z)	1.000	1.000	1.000	1.012

Source: Data processed, 2025

The results show that all constructs demonstrate excellent convergent validity and reliability, as indicated by AVE, Composite Reliability, and Cronbach's Alpha values of 1.000 for each variable, reflecting perfectly

consistent and error-free measurement indicators. Additionally, the VIF values, which range from 1.000 to 1.012, fall well below the threshold of 5, confirming the absence of multicollinearity among the constructs. Overall, these findings indicate that the measurement model is highly reliable, valid, and free from collinearity issues.

4.4 Evaluation of Structural Model Predictive Power

Table 7. Evaluation of Structural Model Predictive Power

Endogenous Construct	R^2	f^2	Q^2
ISR (Z)	0.627	X1 → Z = **0.287**	0.864
		X2 → Z = **0.242**	
Firm Value (Y)	0.635	X1 → Y = **0.121**	0.864
		X2 → Y = **0.074**	
		Z → Y = **0.097**	

Source: Data processed, 2025

The results show that both endogenous constructs exhibit substantial explanatory and predictive power. ISR achieves an R^2 of 0.627, indicating that transformational leadership (X1) and compensation (X2) collectively explain 62.7% of its variance, with medium-to-large effect sizes (f^2 = 0.287 and 0.242). Firm Value records an R^2 of 0.635, suggesting that X1, X2, and ISR together account for 63.5% of its variance, supported by small-to-medium effect sizes. The Q^2 value of 0.864 for both constructs demonstrates strong predictive relevance, confirming that the structural model performs well in predicting ISR and Firm Value. Overall, the model shows robust explanatory capacity and high predictive accuracy.

4.5 Goodness of Fit

Table 8. Goodness of Fit

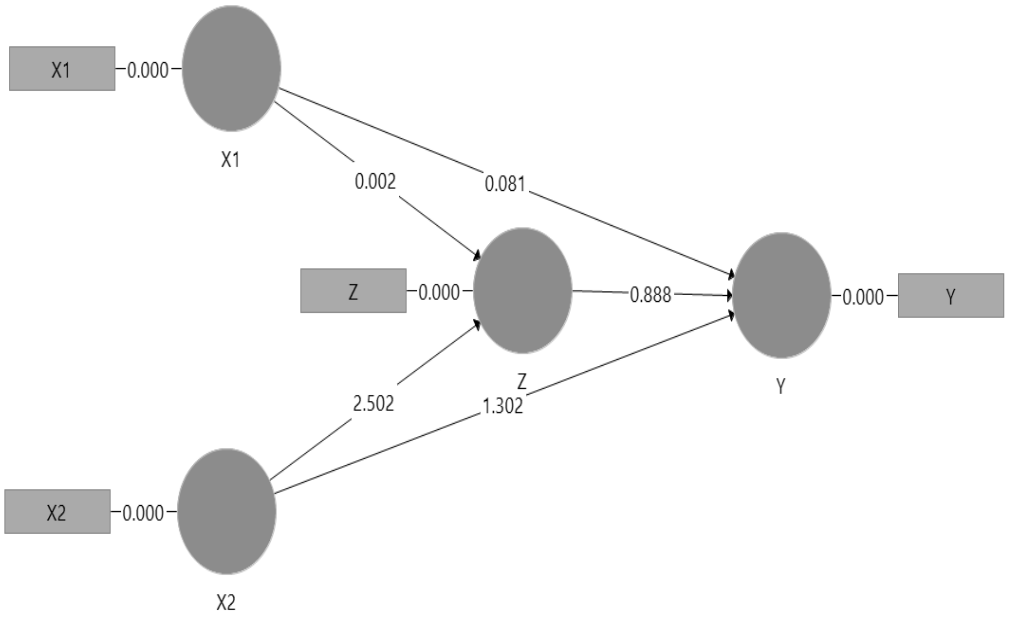
	Saturated Model	**Estimated Model**
SRMR	0.003	0.003
D_ULS	0.002	0.002
D_G	0.006	0.006
Chi_Square	0.002	0.002
NFI	1.000	1.000

Source: Data processed, 2025

All goodness-of-fit indicators show that the model demonstrates an excellent level of fit. The SRMR value of 0.003 is far below the threshold of 0.08, while the extremely small d_ULS, d_G, and Chi-square values indicate no discrepancy between the model and the empirical data. Additionally, the NFI value of 1.000 reflects a perfect fit compared to the baseline model. Overall, these results confirm that both the saturated model and the estimated model exhibit a very strong and acceptable model fit.

4.6 Partial Least Square

Figure 4. Result Test



Source: Data processed, 2025

Tabel 9. Bootstrapping PLS SEM & Hypothesis Testing Results

Variable		Original Sample	Sample Mean	STDEV	T-Statistics	P-value	Result
Direct Effect							
H_1	Internet of things – ISR	0.100	0.011	0.043	2.002	0.038	Supported
H_2	Risk – ISR	0.110	0.107	0.044	2.502	0.013	Supported
H_3	Internet of things – Firm Value	0.001	0.009	0.015	2.081	0.035	Supported
H_4	Risk – Firm Value	0.091	0.092	0.070	2.302	0.014	Supported
H_5	ISR – Firm Value	0.049	0.051	0.055	2.228	0.017	Supported
Indirect Effect							
H_6	Internet of things – Firm Value through ISR	0.100	0.000	0.003	2.002	0.019	Supported
H_7	Risk – Firm Value through ISR	0.049	0.006	0.007	2.759	0.008	Supported

Source: Data processed, 2025

The bootstrapping results indicate that all direct and indirect hypotheses in the model are supported. Each path shows statistically significant effects, with T-statistics exceeding 1.96 and P-values below 0.05, confirming the robustness of the relationships tested. The Internet of Things and Risk both have significant positive effects on ISR and Firm Value, while ISR itself significantly enhances Firm Value. Additionally, ISR successfully mediates the relationships between the Internet of Things and Firm Value as well as between Risk and Firm Value. Overall, these findings demonstrate that both the direct and mediated pathways in the model are empirically validated.

5. Discussion

5.1 Internet of things towards ISR

The findings show that the Internet of Things (IoT) positively influences Islamic Social Responsibility (ISR), demonstrating that digital transformation strengthens transparency, accountability, and ethical governance in Sharia-compliant firms. By enabling real-time monitoring, automated data collection, and accurate disclosure, IoT transforms ISR from a voluntary statement into a verifiable, data-driven practice, consistent with studies by (Cantarelli et al., 2018; Inegbedion et al., 2023; Lanfranchi et al., 2025; Shkalenko & Nazarenko, 2024), who highlight IoT's role in enhancing sustainability reporting and reducing information asymmetry. In Islamic contexts, this integration marks a shift from symbolic to substantive accountability aligned with *amanah* (trust) and *adl* (fairness). While Malaysia's ICGF and GCC regulators have institutionalized digital ISR monitoring, Indonesia—where ISR disclosure is still voluntary—can leverage IoT to standardize reporting, improve data credibility, and align ethical practices with Sharia governance. Ultimately, IoT adoption embeds social responsibility into corporate systems, transforming ISR into a strategic driver of legitimacy and competitiveness in the digital era.

5.2 Risk towards ISR

The results show that effective risk management positively influences Islamic Social Responsibility (ISR), indicating that firms with strong risk governance demonstrate greater ethical accountability and transparency. Consistent with Sharia principles, risk management extends beyond financial concerns to include ethical, social, and environmental risks, serving as a foundation for ISR by identifying and mitigating reputational and compliance risks early. Supported by IoT-based analytics, this integration enhances real-time monitoring and promotes responsible practices. Prior studies (Lanfranchi et al., 2025; OECD, 2023; Sariyer & Taşkın, 2022; Tzanidis et al., 2024) also highlight that linking risk governance to social responsibility strengthens corporate resilience and stakeholder trust. In Malaysia and GCC economies, risk management is embedded within Islamic Corporate Governance systems, while in Indonesia—where such integration remains developing—regulatory initiatives and digital adoption create opportunities to institutionalize

ethical risk-based ISR frameworks. Ultimately, combining risk governance, IoT, and Islamic ethics transforms ISR from voluntary disclosure into a strategic mechanism that enhances legitimacy, sustainability, and firm value.

5.3 Internet of things towards Firm Value

The findings confirm that the Internet of Things (IoT) has a positive and significant impact on firm value, showing that digital transformation enhances both operational efficiency and market perception in Sharia-compliant firms. IoT improves data accuracy, real-time monitoring, and decision-making, which increase investor confidence and strengthen firm competitiveness. Beyond efficiency, IoT serves as a strategic enabler aligning business operations with Islamic principles of *amanah* (trust) and *maslahah* (public good), transforming technological innovation into ethical legitimacy. These results are consistent with studies by (Lanfranchi et al., 2025; OECD, 2023; Rogerson et al., 2024; Wójcik et al., 2022), which show that technology integrated with social responsibility enhances firm reputation and value. In Malaysia and GCC countries, the institutionalization of IoT within the *Islamic Corporate Governance Framework (ICGF)* has improved transparency and market credibility. In Indonesia, despite growing IoT adoption, the absence of standardized ISR-linked systems remains a limitation. However, ongoing initiatives by the Financial Services Authority (OJK) to promote digital governance reflect progress. Overall, IoT contributes to firm value not only by optimizing performance but by embedding ethical accountability and stakeholder trust—the foundation of sustainable advantage in Islamic capital markets.

5.4 Risk towards Firm Value

The findings confirm that effective risk management positively influences firm value, showing that companies with strong risk governance achieve superior market performance by aligning financial stability with ethical responsibility. In Islamic finance, risk management extends beyond financial concerns to include Sharia compliance, reputational, and ethical risks—embodying the principles of *amanah* (trust) and *adl* (justice). By anticipating and mitigating such risks, firms enhance stakeholder confidence and sustain long-term value. Consistent with global evidence (Dewaelheyns et al., 2023; Vestrelli et al., 2024), risk management serves

as a core component of ESG-oriented sustainability and a driver of firm valuation. In Malaysia and GCC countries, risk management has been institutionalized within the *Islamic Corporate Governance (ICG)* framework, linking risk oversight with ethical reporting and stakeholder protection. In Indonesia, the integration of risk management into Sharia governance is still evolving, but digital transformation and IoT-based monitoring offer opportunities to strengthen transparency and prudential control. Overall, ethical and proactive risk governance enhances legitimacy, reduces volatility, and supports sustainable firm value in Islamic capital markets.

5.5 ISR towards Firm Value

The findings confirm that Islamic Social Responsibility (ISR) has a positive and significant impact on firm value, demonstrating that ethical and socially responsible practices enhance market performance and legitimacy in Sharia-compliant firms. ISR bridges corporate ethics and financial outcomes by improving stakeholder trust, transparency, and long-term sustainability, consistent with (Khalifa et al., 2024; Mousa et al., 2021), who found that higher ISR disclosure strengthens investor confidence and firm valuation. Similar to global CSR evidence (Lanfranchi et al., 2025; OECD, 2023), ISR operates through improved reputation, reduced risk perception, and moral accountability grounded in Islamic principles of *amanah* (trust), *adl* (justice), and *maslahah* (social benefit). In Malaysia and GCC countries, ISR has been institutionalized within the *Islamic Corporate Governance Framework (ICGF)* and digital Sharia reporting, while in Indonesia—where disclosure remains voluntary—regulatory efforts by the Financial Services Authority (OJK) are moving toward greater standardization and transparency. Overall, ISR acts not merely as a compliance mechanism but as a strategic driver of firm value by integrating ethical governance, stakeholder legitimacy, and sustainable financial performance.

5.6 Internet of things towards Firm Value through ISR

The findings show that Islamic Social Responsibility (ISR) significantly mediates the relationship between the Internet of Things (IoT) and firm value, indicating that digital transformation generates sustainable value only when technological efficiency is aligned with ethical governance (Côrte-Real et al., 2020; Nechaev & Hain, 2023). While IoT enhances

transparency, accuracy, and real-time monitoring, these benefits increase firm value only through ISR, which converts technological innovation into social legitimacy, stakeholder trust, and adherence to Islamic principles of *amanah*, *adl*, and *maslahah*. This mechanism aligns with global CSR studies (Lanfranchi et al., 2025; OECD, 2023) and evidence from Malaysia and GCC economies showing that integrating digital tools with ethical reporting frameworks strengthens market credibility. In Indonesia—where IoT adoption grows rapidly but ISR disclosure is still voluntary—ISR becomes crucial to ensure that IoT-derived data are interpreted and disclosed within a Sharia-compliant framework, reducing information asymmetry and reinforcing investor confidence. Overall, the results affirm that IoT contributes to firm value not through technology alone, but through ISR's ethical mediation, highlighting the need for Sharia-compliant firms and regulators such as OJK to embed standardized ISR practices into digital transformation strategies.

5.7 Risk towards Firm Value through ISR

The results show that Islamic Social Responsibility (ISR) significantly mediates the relationship between risk management and firm value, demonstrating that ethical and transparent social practices transform risk mitigation into sustainable market trust. In Sharia-compliant firms, risk management extends beyond financial and operational risks to include moral, reputational, and Sharia compliance dimensions, and ISR functions as a communicative bridge that converts ethical risk governance into greater legitimacy and investor confidence (Susbiyani et al., 2022). This finding aligns with global CSR and ESG evidence (Lanfranchi et al., 2025; OECD, 2023), as well as Islamic governance studies by (Côrte-Real et al., 2020; Nechaev & Hain, 2023), which emphasize that integrating IoT-driven monitoring and risk oversight within ISR frameworks strengthens ethical compliance and organizational resilience. Regional practices in Malaysia through the Islamic Corporate Governance Framework (ICGF) and in GCC countries via digital ISR-linked risk reporting systems further illustrate how ISR elevates risk management from an internal control mechanism into a strategic instrument for sustaining investor trust and long-term firm value. In Indonesia, the mediating role of ISR remains emergent due to limited standardization, yet increasing IoT adoption and regulatory encouragement from OJK offer opportunities to reinforce this linkage. Overall, the findings affirm that firm value rises when risk management is conducted not only for

economic stability but also as part of moral and social responsibility communicated transparently through ISR.

6. Conclusion

This study provides evidence that the integration of digital transformation—particularly the Internet of Things (IoT)—and Islamic Social Responsibility (ISR) plays a central role in shaping firm value under Sharia governance principles. Beyond statistical confirmation, the findings reveal an ethical–technological interplay: IoT enhances operational efficiency and transparency, but its capacity to generate sustainable firm value depends critically on ISR as a mediating mechanism. ISR functions as the ethical channel that converts digital innovation into social legitimacy, investor confidence, and public trust. In essence, firm value in Islamic financial markets emerges not merely from technological sophistication but from the moral credibility that technology conveys through responsible, Sharia-compliant governance.

Analytically, this study advances the understanding of how *digital ethics* and *Islamic social governance* intersect. IoT-driven efficiency alone does not guarantee sustainable value creation; it must be filtered through ISR to ensure that innovation serves broader social welfare (*maslahah*), transparency (*amanah*), and fairness (*adl*). ISR mediates the technology–value relationship through three interlinked mechanisms: (1) enhancing investor confidence by increasing disclosure credibility, (2) reducing perceived risks by signaling compliance and ethical stability, and (3) improving legitimacy by aligning technological processes with Islamic governance standards. This synthesis reaffirms that sustainable corporate value in Islamic markets arises when digital transformation is ethically anchored rather than purely operational.

From a practical perspective, Sharia-compliant firms should develop integrated strategies that link IoT implementation with ISR reporting and risk governance. This includes establishing digital platforms for real-time ISR disclosure, automating compliance monitoring, and training managers to interpret IoT data within Sharia ethical frameworks. Regulators, such as Indonesia's Financial Services Authority (OJK), can support this transformation by creating standardized ISR–IoT reporting protocols and incentivizing ethical digitalization. Investors are encouraged to evaluate firms not only on technological readiness but also

on their commitment to transparent ISR practices, as these signal resilience and long-term value.

However, this study is not without limitations. The use of a one-year dataset restricts the ability to capture dynamic causal relationships and long-term effects of digital transformation. The absence of longitudinal validation may limit generalizability across time and market conditions. Future research should extend this framework using panel data models to explore temporal effects, and conduct cross-country comparative analyses (e.g., Indonesia–Malaysia–GCC) to assess how variations in regulatory maturity and digital readiness shape ISR–technology dynamics. Qualitative or mixed-method approaches could also provide deeper insights into managerial interpretations of ISR in digital governance.

In conclusion, this study moves beyond confirmatory evidence to offer analytical insight into how technological progress, when mediated by Islamic Social Responsibility, becomes a source of ethical legitimacy and sustainable value. Strengthening this integration—through institutionalized ISR frameworks, digital governance standards, and cross-country collaboration—can position Islamic capital markets at the forefront of ethically driven innovation in the digital era.

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