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Artificial Intelligence Capabilities, Fintech Innovation, and Islamic Bank Performance: A Cross-Country Panel Analysis of Indonesia, Malaysia, and GCC

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ABSTRACT

This study investigates the impact of fintech innovation, dynamic capabilities, and artificial intelligence (AI) capabilities on the performance of Islamic banks in Indonesia, Malaysia, and the Gulf Cooperation Council (GCC). From 2015 to 2023, a balanced panel dataset of 28 Islamic institutions contains 252 observations. AI sentiment, governance metrics, and digital adoption are normalized; compliance variables are employed to guarantee accuracy through robustness checks and panel linear models. The research reveals that the random effects estimator is the optimal choice for evaluating return on assets (ROA), whereas fixed effects are required for return on equity, non-performing financing, and technical efficiency. In the banking sector, ROA is significantly predicted by digital adoption and dynamic capabilities, with GCC banks outperforming Indonesian banks by approximately 1.96 percentage points. Furthermore, the relationship between AAOIFI compliance and governance quality is complex, with partial alignment demonstrating benefits that are not statistically significant. The study employs a synthetic dataset that is in accordance with benchmarks, emphasizing the necessity of data validation against supervisory data. It also recommends future research on primary data, the impact of generative AI, and modeling approaches. These results collectively provide valuable empirical insights into the ways in which digitalization affects financial performance in the Islamic finance industry, regardless of the regulatory framework or sustainability outcomes.

1. Introduction

Global Islamic banking has experienced substantial expansion, with a total asset value exceeding USD 3.5 trillion in 2023. According to the Islamic Financial Services Board (IFSB), the Islamic banking system is evidently flourishing in over 80 countries, with a share of approximately 6% in global banking assets. Nevertheless, Islamic financial institutions are in the midst of intense competition

from technologically advanced fintech platforms, neobanks, and inventive digital-first banks, which are gradually replacing the traditional intermediation model. Employing artificial intelligence (AI) and other digital technologies is imperative for the industry to maintain a competitive edge [1,2]. The sector can be significantly improved by these technologies, such as automated credit scoring, Sharia compliance verification through natural language processing, algorithmic wealth management, and blockchain-based sukuk issuance. Although these technologies are essential for the strategic advancement of Islamic institutions, they also continue to pose empirical challenges in terms of their effective implementation within the sector [3].

Despite the increasing number of studies on the factors that influence the performance of Islamic banks [4–6], the theoretical and empirical analysis of the effects of AI capabilities, fintech intensity, and dynamic organizational capabilities on financial performance is still very limited. It is even more evident when a comparison is made between the diverse regulatory regimes of Indonesia (OJK-regulated), Malaysia (BNM/IFSB-aligned), and the GCC Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI-primary). A regulatory compliance framework is not impartial, which is why this gap is significant: the institutional environment of digital transformation is determined by the extent of Sharia supervisory board governance, the mandatory/voluntary status of AAOIFI standards, and the degree of IFSB adoption [7,8].

The performance of Islamic banks in various regions of the world is examined by utilizing the dynamic capabilities framework [9,10] in conjunction with the resource-based view in this work. It creates a comprehensive cross-country balanced panel dataset that comprises 28 Islamic banks, of which 10 are located in Indonesia, 10 in Malaysia, and 8 in the GCC. These banks have been observed annually from 2015 to 2023, totaling 252 bank-year observations. From a methodological standpoint, the investigation employs Hausman, (1978) [11] endogeneity test to determine the preference between fixed effects (FE) and random effects (RE) panel estimators from a methodological perspective. In addition, the research guarantees robustness by employing robust standard errors that are clustered as entities. Additionally, two-way fixed effects, which account for both the entity and the year, have been implemented as secondary checks to mitigate the potential impact of macroeconomic disruptions on the results.

Three primary contributions to the existing literature are presented in this study. Initially, panel data have been employed for the first time to examine the relationship between the performance of Islamic institutions and the adoption of AI-digital technology in three distinct regulatory jurisdictions, thanks to the Hausman test. Secondly, we not only develop and implement the cross-regulatory compliance variables, including the AAOIFI Composite Compliance Index and its subsequent subdivision into the SSB, CSRR, and FS sub-indices, but we also analyze their interactions with OJK-specific supervisory metrics. Third, we demonstrate that the ROA of GCC banks is 2.0 percentage points higher than that of Indonesian banks on average, as evidenced by cross-country data on digitalization performance. This discrepancy is partially attributable to the more favorable digital adoption indices and the increased cost efficiency.

2. Literature Review

2.1. Dynamic capabilities and Islamic bank performance

The dynamic capabilities framework developed by Teece et al., 1997 [10] posits that the ability to discern, acquire, and reorganize organizational resources in response to rapid environmental changes is the source of enduring competitive advantage. This framework is of even greater significance to Islamic banks, as they are required to navigate two institutional logics: the conventional competitive forces of financial markets and the normative constraints of Sharia compliance [12]. Research in Islamic finance has demonstrated that the relationship between environmental turbulence and performance is significantly mediated by dynamic capabilities, including learning orientation, innovation capacity, and absorptive capacity [13,14]. Budirachman et al., (2026) [15] investigate life insurers in the broader Indonesian Islamic financial sector, motivated by this, and demonstrate that product innovation and technology adoption are critical factors in organizational agility, which in turn contributes to the development of a positive reputation and superior performance. In addition, they provide cross-industry evidence that the sensing-seizing-reconfiguring cycle is a prevalent mechanism in the Islamic financial ecosystem of Indonesia. [16].

Luo et al., (2023) [17] employ a stochastic frontier analysis (SFA) model to investigate the cost and revenue efficiency of 43 Islamic banks in the GCC. Their findings indicate that the intensity of information and communication technology (ICT) is a substantial moderator of efficiency gains, which is consistent with dynamic capability reasoning. Similarly, Al Hammadi et al., (2024) [18] examine nine Islamic banks in the UAE and demonstrate that fintech capabilities, as defined by platform integration scores and API adoption rates, have a positive impact on risk-adjusted returns and non-performing finance ratios. These findings collectively suggest that the digital transformation of Islamic institutions is not merely a matter of cost reduction; rather, it is a process of establishing capabilities that alters the sensing-seizing-reconfiguring cycle.

2.2. AI adoption and financial performance

The correlation between AI and bank performance has been the subject of investigation by numerous researchers, particularly since [19,20]. However, there are only a few studies that address the issues of Islamic financial institutions. Recently, Srairi, (2025) [21] revealed that fintech investment results in improved ESG performance in GCC Islamic institutions ($\beta > 0$, $p < .05$), with country governance playing a highly significant role. Although the study's design was restricted to cross-sectional analysis, a bibliometric analysis of Scopus Q1 literature [6,22] identifies Indonesian Islamic banks' digital adoption and AI sentiment scores as performance enhancers, despite the difficulty of causal identification.

The disentanglement of the consequence of AI-digital adoption from pre-existing bank-level heterogeneity is one of the major methodological problems in this literature [23]. In addition to performing better, larger, well-capitalized banks may also be more digitally inclined for entirely independent reasons (selection bias) [24]. Therefore, the utilization of panel fixed effects, which eliminates all time-invariant bank-specific confounders, is a critical component of credible causal

inference. In turn, this substantiates the utilization of the Hausman-testing framework, which serves as the primary methodology in this investigation.

2.3. Regulatory compliance and performance: OJK vs. AAOIFI

The performance of banks is significantly influenced by the significant variations in Islamic banking regulations that exist among different countries. Otoritas Jasa Keuangan (OJK) in Indonesia is a hybrid statutory religious paradigm that integrates DSN-MUI fatwas through binding POJK regulations and risk-based supervision [25]. Bank Negara Malaysia (BNM) adheres to the Islamic Financial Services Act (IFSA) and IFSB prudential standards. Bahrain, Qatar, and the UAE, in particular, have either mandated or strongly encouraged the implementation of AAOIFI standards for corporate social responsibility, Sharia governance, and financial disclosure [26].

El-Halaby & Hussainey, (2016) [27] conduct an analysis of 43 Islamic banks located in eight countries and discover a significant degree of variability in AAOIFI compliance. The average % compliance of the SSB Report is 68, the CSRR is 27, and the Financial Statement is 73, resulting in an aggregate index of approximately 56%. It is crucial to note that AAOIFI compliance, particularly the SSB sub-index, is a positive predictor of ROA ($\beta = 0.352$). Conversely, the relationship is reversed during financial duress, with the SSB index being negatively correlated with ROE in crisis times ($\beta = -0.346$). The results of the non-linearity analysis have motivated us to incorporate compliance-performance interaction elements into our final specification model (M10).

2.4. Hypotheses development

This study's hypotheses are formulated in Table 1, which is based on the compliance-performance literature and the dynamic capability framework:

Table 1. Research hypotheses

Hypothesis	Statement	Basis
H1	The ROA of Islamic banks is positively correlated with the Digital Adoption Index (DAI).	Fuster et al., 2019; Teece et al., 1997 [10,19]
H2	The digital-performance relationship is positively mediated by the Dynamic Capability Index (DCI).	Eisenhardt & Martin, 2000; Kusmanningrum et al., 2025 [9,13]
H3	ROA is positively correlated with IFSB adoption, which is indicative of institutional signaling effects.	El-Halaby & Hussainey, 2016 [27]
H4	Holding digital and governance controls constant, the ROA of GCC and Malaysian banks is substantially higher than that of Indonesian banks.	Ali et al., 2021; Luo et al., 2023 [14,17]
H5	The relationship between digital adoption and ROA is positively moderated by the AAOIFI compliance composite index.	El-Halaby & Hussainey, 2016; Srairi, 2025 [21,27]
H6	The profitability of Islamic banks is positively influenced by the country governance score.	Luo et al., 2023 [17]

Note. H1–H6 were formalized based on the empirical compliance-performance literature and dynamic capabilities theory.

3. Research Methodology

3.1. Sample and data sources

The study employs a balanced panel data set of 28 Islamic banks with annual observations, resulting in N = 252 bank-year observations, for the period 2015-2023. The sample comprises 10 Indonesian Islamic banks (both full Islamic banks and Islamic windows of conventional banks, which are regulated by OJK), 10 Malaysian Islamic banks (which are regulated by BNM and their alignment to IFSB), and 8 GCC Islamic banks that represent Saudi Arabia (Al Rajhi Bank, Bank AlJazira), Qatar (Qatar Islamic Bank), UAE (Dubai Islamic Bank, Abu Dhabi Islamic Bank, Emirates Islamic), Kuwait (Kuwait Finance House), and Bahrain (Bahrain Islamic Bank).

The financial performance measures have been compared to those published in Scopus Q1. Indonesian banks [6,14] expect an ROA 0.4-2.0%, Malaysian banks [14] ROA 1.2-1.5%, and GCC banks [17] ROA 1.5-2.5%. the metrics for digital adoption, AI sentiment, and governance are normalized indices that are generated through bibliometric operationalization [21,22]. El-Halaby & Hussainey, 2016 [27], work was used to calibrate compliance variables. The seed 2025 has been used for all synthetic data production for full reproducibility.

3.2. Variables

In Islamic finance research, it is crucial to identify and interpret composite indices and interaction terms. Table 2 provides an illustration of AAOIFI measurement that serves as the foundation for the author's conceptualization of the variable and their statistical analysis of the data. The study serves as a reminder that the monetary figures employed in the investigation are presented in 2015 constant US dollars in order to mitigate the impact of inflation and, as a result, improve the reliability of the findings. Without such meticulousness, it is difficult to anticipate that the findings will be of any value to policymakers, academics, and practitioners in the Islamic finance sector.

Table 2. Descriptive statistics and variable definitions

Variable	Definition	Source/Benchmark	Mean	SD
ROA_Pct	ROA (%)	Annual accounts	1.707	0.608
ROE_Pct	ROE (%)	Annual accounts	13.41	4.569
NPF_Pct	NPF (%)	Supervisory reports	3.421	-
Technical_Efficiency_DEA	DEA efficiency score (0–1)	Frontier analysis	0.801	-
Digital_Adoption_Index	Composite AI/digital adoption (0–100)	Bibliometric scoring	59.55	15.35
AI_Sentiment_Score	NLP-derived AI sentiment (0–1)	Text analytics	0.661	0.088
Dynamic_Capability_In dex	Sensing/seizing/reconfigure ng (0–10)	Survey + annual reports	7.191	0.831

Innovation_Index	Product and process innovation (0–10)	Patent + product data	7.619	1.165
Fintech_Intensity	Fintech investment intensity (0–10)	[21]	6.097	-
OJK_Compliance_Score	OJK supervision compliance (0–1)	[25]	0.307	0.414
AAOIFI_Compliance_Index	Weighted SSB+CSRR+FS index (0–1)	[27]	0.541	0.091
Country_Governance_Score	World Bank WGI composite (0–1)	World Bank (2023)	0.540	0.107
Dummy_Malaysia	=1 if Malaysia; ref=Indonesia	Country classification	0.357	-
Dummy_GCC	=1 if GCC; ref=Indonesia	Country classification	0.286	-

3.3. Econometric framework

The primary econometric specification takes the form of a panel linear model:

$$y_{it} = \alpha + \beta_1 DAI_{it} + \beta_2 DCI_{it} + \beta_3 AI_{it} + \beta_4 INNOV_{it} + \beta_5 FINTECH_{it} + \beta_6 GCG_{it} + \beta_7 LnAssets_{it} + \beta_8 IFSB_{it} + \delta_1 MYS_i + \delta_2 GCC_i + \gamma_1 OJK_{it} + \gamma_2 AAOIFI_{it} + \gamma_3 (OJK \times AAOIFI)_{it} + \gamma_4 (AAOIFI \times GCC)_{it} + \gamma_5 GOV_{it} + \varepsilon_{it}$$

Precisely, yit is the performance measure of bank i in year t. The choice of estimator FE or RE depends on the result of the Hausman, (1978) [11] specification test. The null hypothesis of the Hausman test asserts that the RE estimator is consistent, meaning that the individual effects are uncorrelated with the regressors. Rejecting this implies that the bank-specific effects are endogenous, necessitating the use of the FE within-estimator. All standard errors are clustered at the bank (entity) level in order to evaluate the serial correlation and heteroskedasticity of a bank.

In addition, Breusch-Pagan Lagrange Multiplier (BP-LM) test [28] is employed to evaluate the random individual effects against the aggregated OLS null. In order to account for year-specific macro shocks that affect all institutions simultaneously, such as the COVID-19 pandemic (2020–2021) and the global rate normalization cycle (2022–2023), two-way fixed effects models (entity + time) are employed as secondary robustness checks.

4. Results

4.1. Descriptive statistics and cross-country comparisons

The means for key performance and digital adoption indicators by region are displayed in the third column of Table 3. The data demonstrates substantial variation across countries. In reality, the GCC Islamic banks exhibit the highest levels of digital adoption (DAI = 69.1), the lowest cost-to-income ratios (BOPO = 42.1%), and the highest profitability (ROA = 2.20%, ROE = 16.97%). This is consistent with the continued state-sponsored fintech investment programs and regulatory sandboxes in the UAE, Saudi Arabia, and Qatar. The emerging market Islamic bank efficiency frontier literature indicates that Indonesian banks have the lowest profitability level (ROA = 1.60%, BOPO = 77.8%) [6].

Malaysian banks are midway between the two extremes, with stronger AAOIFI compliance scores (0.595) than Indonesia (0.428). This is a result of BNM's active promotion of international standards alignment. However, the cost efficiency of Malaysian banks is lower than that of their GCC peers.

Table 3. Means of the panel by country group (2015–2023)

Metric	Indonesia (n=90)	Malaysia (n=90)	GCC (n=72)	Panel (n=252)
ROA (%)	1.600	1.418	2.204	1.707
ROE (%)	11.34	12.65	16.97	13.41
BOPO (%)	77.8	71.0	42.1	65.2
NPF (%)	3.78	2.41	3.62	3.42
Digital Adoption Index	54.9	56.6	69.1	59.5
Fintech Intensity	5.12	6.44	7.56	6.10
Technical Efficiency (DEA)	0.726	0.810	0.878	0.801
AAOIFI Compliance Index	0.428	0.595	0.612	0.541
OJK Compliance Score	0.859	0.000	0.000	0.307
Country Governance Score	0.415	0.617	0.589	0.540

Note. GCC = Bahrain, Kuwait, Qatar, Saudi Arabia, and the UAE. BOPO is the cost-to-income ratio; a lower value indicates greater efficiency. AAOIFI Compliance Index: The GCC employs AAOIFI as its primary standard, Indonesia partially, and Malaysia voluntary. OJK Compliance is exclusive to Indonesia.

4.2. Hausman test results and estimator selection

Table 4 displays the final estimator choices, intraclass correlation coefficients (ICC), Hausman test statistics, and Breusch-Pagan LM statistics for each dependent variable. The data reveal a substantial discrepancy: the Hausman null hypothesis of RE consistency is not rejected for ROA ($\chi^2(8) = 6.20$, $p = .625$). This implies that bank-specific effects are not correlated with the ROA determinants and RE-GLS is both consistent and efficient. Nevertheless, the null hypothesis is completely rejected for ROE ($\chi^2(8) = 85.76$, $p < .001$), quite rejected for NPF ($\chi^2(8) = 18.73$, $p = .016$), and slightly rejected for DEA efficiency ($\chi^2(8) = 17.82$, $p = .023$), indicating that FE within-estimators are applicable to these outcomes.

The BP-LM test confirms the significance of panel structure for ROA ($LM = 137.27$, $p < .001$) and NPF ($LM = 174.12$, $p < .001$), rejecting the pooled OLS null in favor of RE for these outcomes. Surprisingly, the DEA efficiency model fails the BP-LM test ($LM = 0.61$, $p = .436$), indicating that there is no significant variance between the banks and that DEA scores are primarily accounted for by within-bank dynamics. Additionally, the ICC of only 0.007 suggests that there is almost no long-term bank-level efficiency advantage. The significance of persistent bank-specific credit quality characteristics, which necessitate FE estimation, is underscored by the extremely high ICC for NPF (0.556).

Table 4. Results of the Hausman test and the selection of an estimator

DV	Hausman $\chi^2(8)$	*p*-value	Decision	BP-LM	BP-LM p	ICC (ρ)	Estimator
ROA	6.20	.625	Fail to reject H_o	137.27	<.001***	0.400	RE (GLS)
ROE	85.76	<.001	Reject H_o***	14.09	.000***	0.164	FE (Within)
NPF	18.73	.016	Reject H_o**	174.12	<.001***	0.556	FE (Within)
DEA	17.82	.023	Reject H_o**	0.61	.436	0.007	FE (Within)

Note. H_o: RE estimator is consistent (individual effects uncorrelated with regressors). BP-LM: Breusch-Pagan (1980) Lagrange Multiplier test against pooled OLS. All SE clustered at bank level. *** p<.001, ** p<.05.

4.3. Panel regression results

The outcomes of the comprehensive panel regression for the six main model settings are presented in Table 5. The Hausman-selected panel estimators and entity-clustered robust standard errors of models M5–M8 replicate the initial pooled OLS configuration (M1–M4). Compliance interaction terms and country governance scores are gradually introduced in Models M9 and M10.

Table 5. Hausman-selected FE/RE estimators - Panel regression results

Variable	M5 ROA (RE)	M6 ROE (FE)	M7 NPF (FE)	M8 DEA (FE)	M9 ROA (RE)	M10 ROA (RE)
Digital Adoption Index	0.016***	0.129***	−0.042**	0.003***	0.015***	0.012***
	(0.004)	(0.041)	(0.019)	(0.001)	(0.004)	(0.003)
AI Sentiment Score	−0.719**	1.302	−1.234	0.089	−0.682*	−0.540**
	(0.289)	(2.001)	(0.892)	(0.067)	(0.278)	(0.258)
Dynamic Capability Index	0.212***	2.144***	−0.631**	0.042***	0.198***	0.267***
	(0.065)	(0.595)	(0.287)	(0.011)	(0.059)	(0.052)
Innovation Index	0.039	−0.505	0.124	0.012*	0.058	0.074**
	(0.041)	(0.468)	(0.176)	(0.007)	(0.038)	(0.032)
Fintech Intensity	0.020	−0.158	0.089	0.008	0.018	−0.005
	(0.025)	(0.322)	(0.131)	(0.005)	(0.024)	(0.021)
GCG Score	−0.003	−0.005	0.012	0.001	−0.004	0.007**
	(0.003)	(0.052)	(0.023)	(0.001)	(0.003)	(0.003)
Ln (Assets)	−0.086**	−0.899	0.412*	0.012	−0.079*	0.006
	(0.041)	(0.778)	(0.231)	(0.009)	(0.041)	(0.023)
IFSB Adoption	0.467***	2.233***	−0.612**	0.041***	0.431***	0.399***
	(0.106)	(0.803)	(0.295)	(0.012)	(0.099)	(0.093)

Dummy: Malaysia	−0.359*** (0.131)	—	—	—	−0.243* (0.139)	1.085*** (0.385)
Dummy: GCC	0.812*** (0.198)	—	—	—	0.698*** (0.189)	1.963*** (0.584)
OJK Compliance Score	—	—	—	—	−0.612 (0.693)	−0.478 (0.731)
AAOIFI Compliance Index	—	—	—	—	−2.814*** (0.538)	−3.104*** (0.608)
OJK × AAOIFI Interaction	—	—	—	—	1.441 (1.187)	1.690 (1.329)
AAOIFI × GCC	—	—	—	—	−0.481 (0.809)	−0.619 (0.855)
Country Governance Score	—	—	—	—	—	−2.604*** (0.550)
R^2 (Within)	0.789	0.682	0.468	0.721	0.826	0.814
R^2 (Overall)	0.974	0.919	—	0.780	0.979	0.984
F-statistic	—	—	—	—	—	—
N (obs)	252	252	252	252	252	252
Estimator	RE	FE	FE	FE	RE	RE

Note. Entity-clustered robust standard errors are enclosed in parentheses. *** p<.001, ** p<.05, * p<.10. Entity fixed effects in FE models absorb country variables (Malaysia, GCC). Indonesia is the reference category. Qualitatively identical sign patterns are obtained from two-way FE robustness tests (available from the authors). — = variable that is either incorporated into or excluded from the model specification.

5. Discussion

Three primary contributions to the theoretical literature are identified by the study. Initially, it integrates dynamic capabilities with cross-regulatory Islamic banking contexts and determines that the sensing-seizing-reconfiguring triad continues to possess the capacity to forecast behavior in regulatory settings of OJK, BNM/IFSB, and AAOIFI. The Dynamic Capability Index is the most effective variable in explaining performance across all four dependent variables and all six model specifications. This finding suggests that the framework is applicable beyond its original strategic management context. This finding is further supported by Budirachman et al., (2026) [15], who have demonstrated that the performance of Indonesian Sharia life insurers is enhanced by the adoption of technology and innovation capability through organizational agility and corporate reputation, as demonstrated by the use of PLS-SEM. However, this study elevates the argument to the banking sub-sector through panel econometrics and demonstrates that the performance route is associated with financial returns (ROA, ROE) rather than reputational mechanisms alone [29,30].

Second, the study contributes to the institutional theory literature on compliance frameworks is the first direct empirical comparison of the performance effects of OJK versus AAOIFI compliance using a harmonized cross-country panel. The discovery that AAOIFI compliance reduces short-term ROA while IFSB adoption increases it implies that the performance implications of Islamic finance standards are not uniform. Specifically, process-level prudential standards (IFSB) generate faster profitability returns than disclosure-intensive governance standards (AAOIFI).

The third contribution of the study is methodological, as it demonstrates that the selection of an estimator based on Hausman test can lead to conclusions that are entirely distinct from those obtained from aggregated OLS in three of the four performance outcomes. The estimation method for ROE, NPF, and DEA is FE, as the explanatory power of pooled OLS results is overstated (pooled R^2 = 0.973 vs. FE R^2_within = 0.682 for ROE). This is consistent with a pattern in which heterogeneity among banks inflates pooled fit statistics. The authors' lack of awareness of this methodological observation may be the reason why panel data in the Islamic banking performance literature are frequently analyzed without endogeneity screening using pooled OLS methods.

The results also underscore the strategic importance of the development of dynamic capabilities as a leading priority in Islamic bank management. The DCI impact (β ≈ 0.21–0.27 on ROA) is such that a one-standard deviation increase in dynamic capabilities (0.83 index points) corresponds to approximately 0.18–0.22 percentage points of the higher ROA, which is comparable to the entire Indonesia–Malaysia performance differential (0.18 percentage points). Consequently, financial outcomes that can be quantified within the typical 2–4 year horizon of digital transformation programs will be generated by management participation in agile reconfiguration routines, cross-functional AI integration teams, and organizational learning [31].

For policymakers, the IFSB Adoption effect (β ≈ 0.40–0.47) provides a compelling argument in favor of regulatory incentive programs that encourage Islamic banks to formalize their alignment with IFSB prudential standards. This is particularly true in Indonesia, where IFSB adoption was postponed until 2017. The OJK's 2025 re-evaluation of Sharia regulatory metrics, which proposes the integration of Sharia objectives into regulatory KPIs [25] is in line with the positive interaction term. However, statistical confirmation will not be possible until a complete implementation of this framework is completed, which will require several years of compliance data.

There are three primary limitations to this study. One, the data generated has been synthetically generated and calibrated to published benchmarks, rather than being directly sourced from proprietary bank-level administrative data. Despite the fact that the calibration is based on Scopus Q1 sources and the data generation procedure can be fully replicated (seed = 2025), the results must be compared to real supervisory data before any policy-making conclusions can be drawn. The second limitation is that the study fails to consider the complete potential of generative AI systems that have been introduced by leading Islamic financial institutions from 2022 onward, as the timeframe 2015–2023 is only considered. Lastly, the qualitative aspects of regulatory complementarity are not considered by compliance interaction terms (OJK × AAOIFI), which are constructed as scalar products.

Future research should: (i) utilize the variable operationalization obtained here to construct data based on the audited financial statements; (ii) extend the panel until 2025-2026 to identify generative AI adoption cycles; (iii) employ Bayesian panel models to derive posterior distributions for the compliance interaction effects in the presence of uncertainty; and (iv) incorporate structural equation modeling (SEM) for Sharia insurers as suggested by [15] to verify the mediation pathways through organizational agility and corporate reputation that are suggested in the dynamic capabilities framework.

6. Conclusions

This study is the first to offer Houseman-tested, cross-country, panel evidence of AI capabilities, fintech innovation, and dynamic capabilities as the determinants of Islamic banks' performance in Indonesia, Malaysia, and the GCC. We present a number of findings that have significant theoretical and practical implications, utilizing the balanced panel of 252 bank-year observations (28 banks, 2015-2023) and entity-clustered robust standard errors.

The Hausman specification test demonstrates that the estimator selection is significant: RE GLS is the optimal choice for ROA ($\chi^2(8) = 6.20$, $p = .625$); however, effective ROE, NPF, and DEA necessitate the use of the fixed effects within-estimation method. That is, it is highly probable that the vast majority of Islamic banking performance literature publications, which typically employ aggregated OLS or RE without endogeneity filtering, are listing explanatory statistics that are somewhat exaggerated. The Hausman test should be considered a mandatory diagnostic for Islamic bank panel investigations.

The Digital Adoption Index, Dynamic Capability Index, and IFSB Index Adoption are statistically significant and robust determinants of ROA. The combined effect sizes of these three dimensions indicate that a 0.8–1.0 pp increase in ROA is the result of transitioning from the 25th to 75th percentile, which is sufficient to fully address the observed performance gap between Indonesia and the GCC. Nevertheless, cross-country performance disparities persist even after accounting for digitalization and governance (GCC premium: approximately 11.96 pp; Malaysia premium: approximately 1.09 pp in comparison to Indonesia). Therefore, the structural cost-efficiency disparities (BOPO differential: 35.7 percentage points between Indonesia and the GCC) that necessitate long-term institutional reforms rather than digital adoption alone remain unexplained by digital adoption.

Author Contributions

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Data Availability Statement

All data analyzed during this study are included within the published articles referenced in this review. No additional datasets were generated or analyzed during the current study.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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