

## **Digital Transformation in Banking Sector: The Effect of Covid-19 Pandemic in Indonesia**

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### **Abstract**

The provision of digital services can support the need for integrated financial services, enhance operational cost efficiency, and improve financial performance. This research aims to examine the impact of providing digital services on the financial performance of banks before and during COVID-19, as well as to compare the impact on Islamic banks and conventional banks in Indonesia. This research utilizes secondary data from 15 Islamic banks and 20 conventional banks in Indonesia during the years 2017 - 2022, and estimates by static panel data model such as the fixed effect model (FEM) and random effect model (REM). The findings of this research indicate that the development of digital services significantly influences the financial performance of both Islamic and conventional banks, both before and during COVID-19. Furthermore, there are differences in the impact of providing digital services between Islamic banks and conventional banks before COVID-19. These findings may indicate the effectiveness of banks in developing services and enhancing overall technology adoption.

**Keywords:** *Digitalization; Financial Performance; COVID-19*

## **INTRODUCTION**

Technological advancements have offered various features to simplify daily activities, as evidenced by the use of electronic devices and applications to support community services, particularly due to restrictions on outdoor activities caused by the COVID-19 pandemic. Technological developments in public services are demonstrated through the use of social media, websites, and applications provided by various community institutions to disseminate information and accelerate the completion of public service administrative processes. As a result, people have become increasingly accustomed to digital interactions, making digital financial services highly desirable and compatible with existing public services.

In response to these developments, banks have enhanced their core services by developing digital-based financial products and collaborating with fintech and other stakeholders to maximize their digitalization potential (Lanotte & Trapanese, 2023). The utilization of technology can drive the development of more flexible and efficient services in terms of time and cost (Almulla & Aljughaiman, 2021). This is also supported by a significant competitive advantage, enabling banks to provide services with a better customer experience and acquire more users compared to before digitalization (Balkan, 2021; Lanotte & Trapanese, 2023).

Diversification through the provision of digital services has an impact on banks in terms of operational costs and revenue. On the operational side, efficiency can be achieved through reducing the cost of offline service delivery. Banks have the potential to generate new revenue streams through services tailored to customer characteristics (Ky et al., 2019). Diversifying services through digital platforms can facilitate the community, especially those who have not yet obtained financial access. Increased use of digital services will boost fee-based income or non-interest income (Nguyen et al., 2023)

In reality, the provision of digital services still has a debate regarding its impact on financial performance. This is seen from the effectiveness of information technology (IT) investments made by banks in driving operational cost efficiency (Adewale & Ismal, 2020). Limited budgets for development impact the development of digital services that are limited in accommodating customer needs. In addition, the impact of digitalization as an effort to increase bank non-interest income. This is in line with how much digital services are

used and how big the bank's ability to acquire customers who will use digital services.

The improved performance of Islamic banks has prompted this study to investigate whether the provision of digital services has a significant impact on the improvement of financial performance in the Indonesian banking sector, both before and during the COVID-19 pandemic. Furthermore, a comparison of the results will be conducted to determine the impact between conventional and Islamic banks. Previous studies have investigated the impact of digital services on financial performance and banking stability, with varying findings depending on the scope and context of the research. Digitalization can lead to higher financial performance, as demonstrated in studies by Adalessossi (2023), Akhisar et al. (2015), Banna et al. (2021), Nguyen et al. (2023), Skhaikh & Anwar (2023), Theiri & Hadoussa (2023), and Yunita (2021). However, some research suggests that digital services are not significantly related or even negatively related to bank financial performance, as shown in studies by Almulla & Aljughaiman (2021) and Sutarti et al. (2019). This study complements previous research by using a sample of Islamic and conventional banks in Indonesia from 2017 to 2022 and employing static panel data methods such as the fixed effects model (FEM) and random effects model (REM).

## **LITERATURE REVIEW**

This research aims to examine the impact of digital service provision on the financial performance of Indonesian banks before and during the COVID-19 pandemic. The adoption of technology in developing products and services is one of the ways banks can increase their revenue (Paltrinieri et al., 2021). Banks that invest in technology to develop banking services tend to gain higher market valuations due to the COVID-19 pandemic (Dadoukis et al., 2021). Additionally, technology adoption can reduce costs, including search and information gathering costs, resource usage costs, transportation costs to obtain information, costs of monitoring information developments, and verification and reputation costs (Goldfarb & Tucker, 2019)

The research also compares the differences in digitalization between Islamic and conventional banks. The implementation of diversification in the banking sector may have different impacts on conventional and Islamic banks

(Karim et al., 2022). These differences occur due to different responses to economic changes, different business models, and intensive regulations on diversification in the banking sector (Šeho et al., 2021). Differences in business models allow Islamic banks to have greater advantages from diversification and can improve their financial stability and performance compared to conventional banks (Paltrinieri et al., 2021).

Technological advancements can also reduce agency costs between large and small banks (Berger & DeYoung, 2006). Through of disruptive innovation theory, smaller banks can enhance their competitiveness by offering easily accessible products and services with lower operational costs (Lanotte & Trapanese, 2023). The ability to quickly adapt through product and service innovation allows smaller banks to enter and disrupt the market more rapidly than larger, established institutions (Christensen, 1997).

#### Previous Studies

Numerous studies have explored the impact of digital services development on bank financial performance. Banks have embraced technological advancements, driven by increasing consumer demand for convenient access to banking services. Akhisar et al. (2015) found that technological developments, such as the implementation of ATMs and POS terminals, positively impacted the financial performance of banks in both developed and developing countries from 2005 to 2013. This adoption of technology aligns with the growing customer preference for internet banking services. Similarly, Nguyen et al. (2023) demonstrated that digitalization can enhance financial performance, particularly for banks with relatively smaller assets in Vietnam.

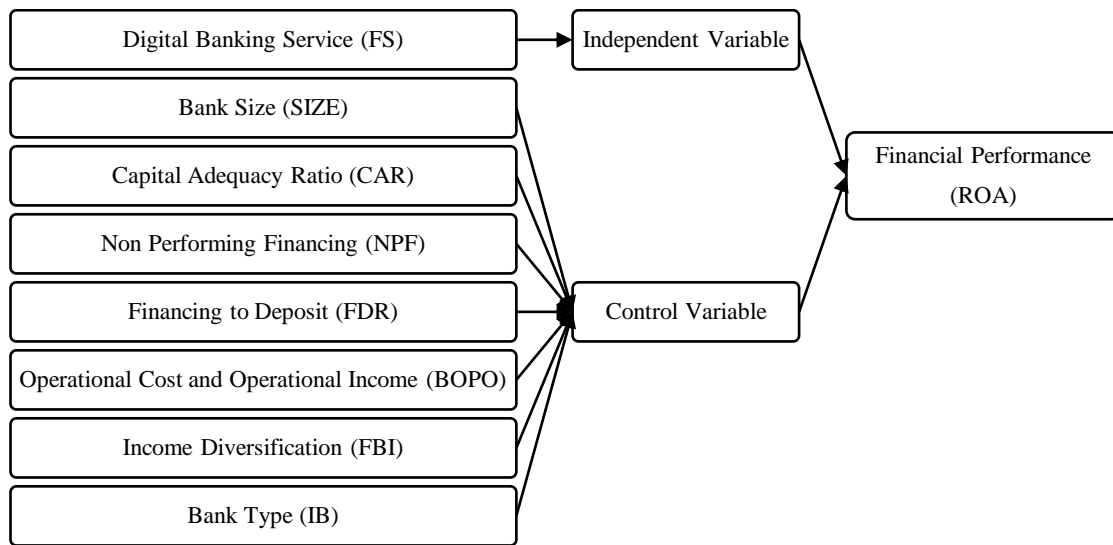
Research on Islamic banks has mirrored findings from studies on conventional banks. Yunita (2021) revealed that the use of digital services, particularly electronic money, positively influences financial performance, although the effect is less pronounced in Islamic banks compared to conventional banks in Indonesia. This is supported by Adalessossi (2023), who found that technological advancements like ATMs and electronic payment and transfer services can improve the financial performance of Islamic banks in the Sub-Saharan Africa region. Banks that actively develop banking services and invest in information technology tend to achieve better financial performance and experience greater growth in financing compared to banks with less technological development (Dadoukis et al., 2021).

However, not all implementations of digital services lead to improved financial performance. Almulla & Aljughaiman (2021) found that digitalization can negatively impact the financial performance of both Islamic and conventional banks in the UAE, Saudi Arabia, and Bahrain. In contrast, they observed that diversifying income from banking service activities can enhance financial performance, with a more significant effect in Islamic banks than in conventional banks. These results align with research conducted by Sutarti et al. (2019) in Indonesia, suggesting that digital services have not yet been able to improve operational efficiency in some contexts. The adoption of digital services faces challenges such as geographical factors affecting internet connectivity, income disparities influencing deposit levels, and low financial literacy (Sullivan & Wang, 2013; Ozili, 2018).

Regarding asset ownership, the adoption of banking technology tends to have a more substantial impact on banks with larger assets (Sullivan & Wang, 2013). Ky et al. (2019) found that digital services can positively influence the financial performance of both small and large banks in the Sub-Saharan Africa region in terms of profitability, efficiency, and stability. However, larger banks, with their greater resources and capabilities in technology management and more stable market positions, are often quicker to adopt technology and tailor digital services to customer needs compared to smaller banks.

Based on the theories and previous studies of digital services, the conceptual framework of digital services illustrated in Figure 1.

**Figure 1. Conceptual Framework**



### Research Hypotheses

Based on the theories and previous studies of digital services, the formed hypotheses are

$H_1$ : Digital services have a significant impact on the financial performance of banks both before and during the COVID-19 pandemic

$H_2$ : There are differences in the impact of providing digital services on financial performance between Islamic banks and conventional banks

### Variabels

The research variables in this study comprise dependent, independent, and control variables. The dependent variable, financial performance, is measured using return on assets (ROA). The independent variable used in the research is digital services provided by banks. Measurement of this variable follows the approach of Sutarti et al. (2019) and Almulla & Aljughaiman (2021), which involves classifying the most common types of digital service transactions and creating a score that reflects the annual development of digital services offered by each bank. This study employs seven dummy variables representing seven types of digital service transactions. Each variable is assigned a value of 1 if the bank offers the specific transaction type each year and 0 if it does not. These values are then summed to generate a digitalization score for each bank. For instance, if Bank A has a digital service score of 5 out of 7 in 2017, it indicates that the bank provided five types of digital service transactions

during that period. Detailed information regarding the operationalization of all variables in this study is presented in Table 1.

**Table 1. Variable Description and Sources**

No	Variable	Description	Sources Type
1	Financial Performance (ROA)	Net profit to total asset	Banks' annual reports
2	Digital Banking Services (FS)	Score of digital baking services	Banks' annual reports
3	Bank Size (SIZE)	The natural log of total asset	Banks' annual reports
4	Capital Adequacy Ratio (CAR)	The minimum capital requirement imposed on banks reflects the bank's ability to absorb losses associated with risky assets.	Banks' annual reports
5	Non Performing Financing (NPF)	Non-performing financing to total financing	Banks' annual reports
6	Financing to Deposit Ratio (FDR)	Total financing to total deposit	Banks' annual reports
7	Operational Expense Ratio (BOPO)	Operational expense to total operational income	Banks' annual reports
8	Income Diversification (FBI)	Total other income (fee based income) to total operational income	Banks' annual reports
9	Type of Bank (IB)	Dummy value of bank type which 1 for Islamic bank and 0 for conventional bank	Banks' annual reports

## METHODOLOGY

In this study, the research model is tested using panel data regression, which is a combination of cross-section and time series using different observations over time. Referring to the research conducted by Ky et al. (2019) and Nguyen et al.(2023), this study will use the fixed effects model (FEM) and random effects model (REM) with the assumption of time-invariant, so that the coefficients owned are different for each individual.

Data processing is carried out on Islamic and conventional banks in two conditions, namely before (2017-2019) and during the COVID-19 pandemic (2020-2022). The separation of the COVID-19 period refers to the first case of COVID-19 in Indonesia.

The model is specified as:

$$ROA_{i,t} = \alpha_{i,t} + \beta_1 FS_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 CAR_{i,t} + \beta_4 NPF_{i,t} + \beta_5 FDR_{i,t} + \beta_6 BOPO_{i,t} + \beta_7 FBI_{i,t} + \beta_8 IB_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where ROA is defined as dependent variables and FS as independent variables. The remaining variables such as CAR, NPF, FDR, BOPO, FBI, and BI defined as control variables

## RESULTS AND DISCUSSION

### Results

Descriptive statistics were used to analyze the characteristics of the data obtained from the research sample. The sample consisted of 35 banks over a 6-year period, resulting in a total of 193 observations, as shown in Table 2.

The financial performance indicator, represented by return on assets (ROA), had an average of 1.4% for the entire sample. Conventional banks had a slightly higher average of 1.6% compared to Islamic banks at 1.2%. The level of digital banking services (FS) in the sample ranged from 0 to 7. Additionally, the size of the bank (SIZE), capital adequacy ratio (CAR), non-performing loan (NPL) ratio, and loan-to-deposit ratio (FDR) had averages of 11.18%, 27%, 3.3%, and 85.3%, respectively. The operating expense to operating income ratio (BOPO) had an average of 90%, while the income diversification ratio (FBI) had an average of 21%

**Table 2. Statistics Descriptive**

Variables	IB+CB			IB		CB	
	Obs	Mean	Std Dev	Obs	Mean	Obs	Mean
ROA	193	0,014	0,03	70	0,012	123	0,016



FS	193	3,95	1,89	70	3,32	123	4,3
SIZE	193	11,18	1,58	70	9,81	123	11,96
CAR	193	0,27	0,32	70	0,32	123	0,24
NPF	193	0,03	0,02	70	0,032	123	0,031
FDR	193	0,85	0,2	70	0,84	123	0,86
BOPO	193	0,90	0,41	70	1,001	123	0,84
FBI	193	0,21	0,13	70	0,18	123	0,23
IB	193	0,36	0,48				

Note: Obs: Number of Samples, Mean: Average , Std Dev: Standard Deviation

**Table 3. Panel Data Estimation Results**

Variables	Before COVID-19		During COVID-19	
	IB	CB	IB	CB
FS	9,04e-06*	-0,0002	0,001***	0,0076**
	(4,19e-06)	(0,0006)	(0,0003)	(0,0029)
SIZE	-0,0002	0,0017*	-0,018***	0,0051
	(0,006)	(0,0009)	(0,001)	(0,0074)
CAR	0,316	0,079***	0,031**	0,036***
	(0,018)	(0,03)	(0,046)	(0,009)
Lagged_C AR	-	-	0,26***	0,038***
	-	-	(0,048)	(0,009)
NPF	-0,017***	-0,035	-0,06	-0,071***
	(0,016)	(0,037)	(0,082)	(0,024)
FDR	-0,007	-0,0006	0,88***	-0,0077
	(0,011)	(0,002)	(0,018)	(0,008)
BOPO	-0,08***	-0,056***	-0,079***	-0,05***
	(0,004)	(0,013)	0,001	(0,006)
FBI	0,009	0,002	0,011	0,041***
	(0,010)	(0,009)	(0,006)	(0,014)
Coeff.	0,094	0,03	0,188***	-0,040
	(0,058)	(0,025)	(0,027)	(0,092)

Obs	35	61	20	41
R <sup>2</sup> overall	0,69	0,9031	0,10	0,52
Prob>F	0,000	0,000	0,000	0,000

Note: \*\*\*: Significant at 1%, \*\*: Significant at 5%, \*: Significant at 10%

## Discussion

### The Impact Before COVID-19 Pandemic

Prior to conducting regression estimation, a model specification test was performed using the entire sample and the Islamic bank sample with a fixed-effect model (FEM) and the conventional bank sample with a random-effect model (REM). Subsequent analysis was conducted to examine the impact of digital services on bank financial performance before the COVID-19 pandemic.

The regression results conducted to test hypothesis 1, namely the impact of digital services on pre-COVID-19 financial performance, are presented in Table 3. Digital services (FS) significantly positively influenced bank financial performance in both the overall sample and the Islamic bank sample. An increase of 1 unit in bank service types can increase ROA by 0.0008% in the overall sample and 0.0009% in Islamic banks. This finding is consistent with research conducted by Akhisar et al. (2015), Adalessossi (2023), Nguyen et al. (2023), and Theiri & Hadoussa (2023), which indicate that the development and use of digital services can enhance bank financial performance.

Control variables consisting of specific bank ratios also have an impact on the dependent variable. Operating cost to operating income ratio (BOPO) significantly negatively impacts ROA. An increase in operating costs incurred can reduce operating income and lead to a decline in ROA (Adalessossi, 2023). Thus, the development of digital services aligns with increased customer satisfaction and efficiency, which can boost bank income (Theiri & Hadoussa, 2023).

Bank size (SIZE) significantly positively impacts ROA by 0.17% in the conventional bank sample. This finding is consistent with research conducted by Wirdiyanti (2018) and Yunita (2021) in Indonesia. A larger bank size indicates that the bank has achieved economies of scale, making

the use of digital services more efficient compared to smaller banks (Sullivan & Wang, 2013).

Capital adequacy ratio (CAR) significantly positively impacts ROA by 4.44% in the overall sample and 7.9% in the Islamic bank sample. This finding is consistent with research conducted in Tunisia by Theiri & Hadoussa (2023) and in countries with a dual banking system by Ahsan & Qureshi (2021). Non-performing finance (NPF), related to credit risk, significantly negatively impacts ROA by 17.2% in the overall sample and 1.7% in the Islamic bank sample. This finding is consistent with research conducted in Indonesia by Wirdiyanti (2018) and Yunita (2021). When borrowers are unable to repay their loans, banks will be more stringent and selective in disbursing credit, which can reduce their income and financial performance (Theiri & Hadoussa, 2023).

Income diversification (FBI) significantly positively impacts ROA by 2.6% in the overall sample. This finding is consistent with research conducted by Ky et al. (2019) on banks in Sub-Saharan Africa, Almulla and Aljughaiman (2021) on Islamic and conventional banks in the GCC region, and Paltrinieri et al. (2021) on Islamic and conventional banks in OIC member countries. Digitalization of services can increase other operating income and encourage diversification in terms of products and services, which will drive improved financial performance (Nguyen et al., 2023).

### The Impact During COVID-19 Pandemic

Before conducting regression estimation, a model specification test was performed using the entire sample, Islamic bank sample, and conventional bank sample with a fixed-effect model (FEM). Subsequently, analysis was conducted to determine the impact of digital services on bank financial performance during the COVID-19 pandemic.

The regression results conducted to test hypothesis 1, namely the impact of digital services on financial performance during COVID-19, are presented in Table 3. Digital services (FS) had a significant negative impact on bank financial performance in the overall sample. An increase of 1 unit in bank service types led to a decrease in ROA by 0.04%. This finding is consistent with research conducted by Sutarti et al. (2019) and Almulla & Aljughaiman (2021). However, the results differed for Islamic and conventional bank samples, which showed a positive significance for

ROA. According to research conducted by Akhisar et al. (2015), the difference in the impact of implementing digital services could be attributed to differences in customer behavior in various countries. These results are also supported by research on banks in Indonesia by Sutarti et al. (2019), which suggests that the decline in financial performance could be due to the high cost of developing digital services that was not offset by an increase in customers understanding and utilizing digital service facilities.

Control variables consisting of specific bank ratios also had an impact on the dependent variable. The operating cost to operating income ratio (BOPO) significantly negatively impacted ROA. An increase in operating costs incurred can reduce operating income and lead to a decline in ROA (Adalessossi, 2023). The variable of bank size (SIZE) had a significant negative impact on ROA in the overall sample and Islamic bank sample. This finding is consistent with research conducted by Sutarti et al. (2019). The negative impact on bank size indicates that banks are not yet fully efficient in their operations.

The capital adequacy ratio (CAR) significantly positively impacted ROA by 3.6% in the conventional bank sample. This finding is consistent with research conducted in Tunisia by Theiri & Hadoussa (2023) and in countries with a dual banking system by Ahsan & Qureshi (2021). However, the results differed for the Islamic bank sample, which showed a negative impact on ROA. Non-performing finance (NPF), related to credit risk, significantly negatively impacted ROA in the overall sample and conventional banks. This finding is consistent with research conducted in Indonesia by Yunita (2021). When borrowers are unable to repay their loans, banks will be more stringent and selective in disbursing credit, which can reduce their income and financial performance (Theiri & Hadoussa, 2023).

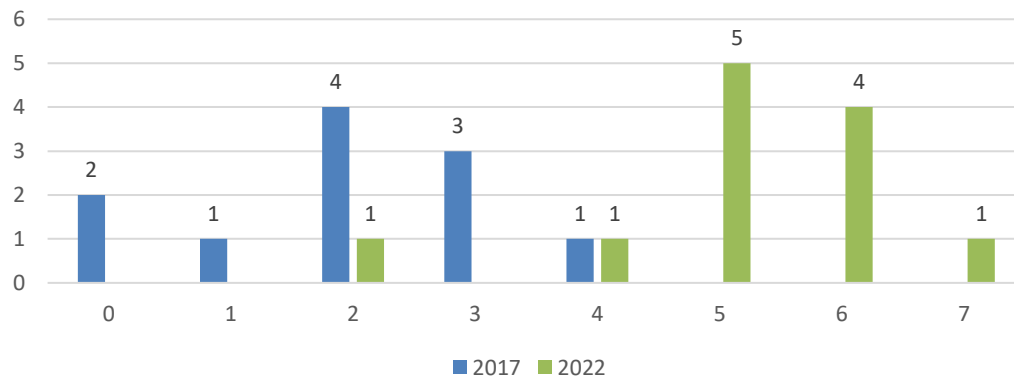
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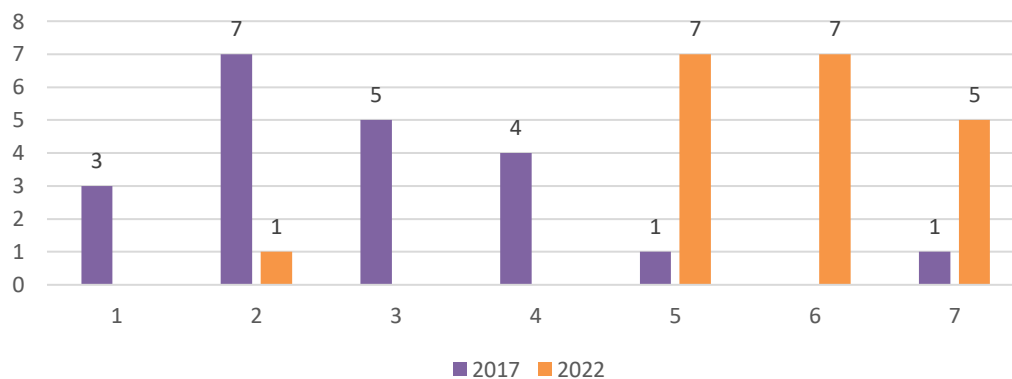
### Overall Discussion

The regression analysis revealed differences in results between the pre- and post-COVID-19 periods. The COVID-19 pandemic accelerated the development of digital services in the banking sector, leading to an increase in features offered by both Islamic and conventional banks, as illustrated in Figure 2 and Figure 3.

**Figure 2. Comparizon of Distribution of Digital Services Provided by Islamic Banks**



**Figure 3. Comparizon of Distribution of Digital Services Provided by Conventional Banks**



Using panel data model, the estimation results showed in Table 2 could indicate significant differences in the impact of digital services on bank financial performance before and during the COVID-19 pandemic. During the COVID-19 pandemic, digital services exhibited a positive and significant relationship with financial performance for both Islamic and

conventional banks. This finding contrasts with the pre-pandemic period, where conventional banks showed no significant correlation between digital services and ROA. These results align with Theiri & Hadoussa (2023), who found that increased IT investments can enhance bank financial performance, especially during crises like COVID-19. The positive significance for Islamic banks is consistent with Christensen's (1997) disruptive innovation theory, suggesting that smaller Islamic banks view digital services as an opportunity to boost revenue and financial performance (Adelessossi, 2023)

Capital adequacy ratio (CAR) demonstrated a positive and significant impact on overall performance and conventional banks before the pandemic. This trend continued for both Islamic and conventional banks during the pandemic. These findings corroborate the studies of Theiri & Hadoussa (2023) in Tunisia and Ahsan & Qureshi (2021) in countries with dual banking systems. Higher CAR levels indicate a bank's ability to withstand risks, including those associated with digital service development and economic shocks like COVID-19.

Income diversification (FBI) showed a positive and significant impact on all samples during the COVID-19 period. This result aligns with the findings of Ky et al. (2019) and Amulla & Aljughaiman (2021). The expansion of digital services, coupled with increased public adoption during the pandemic, led to higher non-interest income, ultimately boosting overall operating income and financial performance for banks.

The regression results for both pre- and post-pandemic periods support Hypothesis 1 ( $H_1$ ), confirming the significant impact of digital services on bank financial performance. Additionally, the differing results before the pandemic—negative for conventional banks and positive for Islamic banks—support Hypothesis 2 ( $H_2$ ), indicating that the impact of digital services on financial performance varies between Islamic and conventional banks.

## CONCLUSION

The estimation results showed that the provision of digital services significantly enhanced the financial performance of Islamic banks but reduced that of conventional banks prior to the COVID-19 pandemic. However, this trend reversed during the pandemic, as digital services positively impacted the financial performance of both Islamic and conventional banks. These findings suggest the increased effectiveness of digital services within the banking sector and their growing adoption among the public.

This study has certain limitations, particularly regarding the sample size and the measurement of digital services. The findings may overestimate the specific impact on Islamic banks due to the inclusion of conventional banks in the sample. The absence of data on the volume and value of digital transactions, as well as IT investment levels for each bank, is another limitation.

For future research, the author suggests a more focused analysis on Islamic commercial banks (BUS) and Islamic business units (UUS). Additionally, the digital services variable could be more precisely measured using data on the number of digital service users or the volume of transactions within a specific period.

#### **Author's Contribution**

Determine the contribution of each of your scriptwriters. A distinction is made between five types of contributions: Creating and designing analyses; Collecting data; Contributing data or analysis tools; perform analysis; Writing paper.

#### **Declaration of Competing Interest**

The author declare to have written this manuscript in full and declare that this manuscript is not submitted to any other journal and only used for International Collaboration Conference on Islamic Economics. The author also have no conflict of interest with any parties for this conference.

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