

The Impact of mobile banking adoption on financial inclusion: A case study of Indonesian college students

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ABSTRACT

This study aims to examine the effect of mobile banking adoption on financial inclusion among university students in Indonesia. This research employs a quantitative approach. The sampling method used in this study is purposive sampling, with a total sample size of 400 respondents determined using Cochran's formula. The data utilized in this research are primary data obtained through a digital questionnaire distributed via Google Forms, using a Likert scale. The data analysis method employed is simple linear regression analysis. The findings indicate that mobile banking adoption has a significant positive effect on financial inclusion among university students in Indonesia.

KEYWORDS

Mudharabah savings; profit sharing;
Islamic banking; sharia principles;
Bank Syariah Indonesia

ARTICLE HISTORY

Received 2 November 2024

Accepted 7 December 2024,

Published online: 31 December 2024

1. Introduction

The financial inclusion programs in Asia have intensified, focusing on increasing access for communities that have not yet benefited from the services of formal financial institutions due to existing barriers. These barriers arise from a lack of public knowledge about the functions of financial institutions and the mismatch between the products offered by financial institutions and the needs of low-income communities (Nugroho & Purwanti, 2018).

Globally, financial inclusion has garnered attention from international organizations, particularly within the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) agendas. Some MDG targets that have expired remind UN member states of the urgent issues surrounding financial inclusion and its complexities. Specifically, goals such as eradicating extreme poverty (MDG1), achieving gender equality to provide equal opportunities for women in employment, social protection, and training (MDG3), and fostering global partnerships for development (MDG8) directly address financial inclusion challenges. Similarly, SDG targets with

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direct impacts on financial inclusion include no poverty (SDG1), zero hunger (SDG2), good health and well-being (SDG3), quality education (SDG4), decent work and economic growth (SDG8), industry, innovation, and infrastructure (SDG9), reduced inequalities (SDG10), peace, justice, and strong institutions (SDG16), and partnerships for the goals (SDG17) (Siano et al., 2020).

Financial inclusion can be interpreted as the difficulty individuals face in accessing or utilizing financial services. To address this, Indonesia's Minister of Finance, Sri Mulyani Indrawati, noted in a Working Committee on Financial Inclusion (WF-FINC) meeting that ASEAN aims to reduce financial inclusion levels from 44% to 30%. The Financial Services Authority (OJK) announced in 2022 that the National Survey on Financial Literacy and Inclusion (SNLIK) showed an increase in financial literacy and inclusion indices. The 2022 survey indicated financial literacy at 49.68% and financial inclusion at 85.10%, an improvement from 2019 results of 38.03% and 76.19%, respectively. OJK Chairman Mahendra Siregar emphasized that financial literacy and inclusion play a critical and strategic role in accelerating national economic recovery post-COVID-19.

Recognizing the importance of financial inclusion, especially during the COVID-19 pandemic, the National Financial Inclusion Council Coordination Meeting decided to accelerate financial inclusion implementation to expedite economic recovery. Vice President Ma'aruf Amin highlighted the need to expand the accessibility and affordability of digital financial services nationwide to enhance financial inclusion, promoting a robust, sustainable, and equitable economic recovery. Domestically, digital financial development efforts include building digital infrastructure, enacting supportive regulations like the Indonesia Digital Roadmap 2021-2024, and intensifying digital education and literacy initiatives. Furthermore, collaboration within ASEAN aims to develop digital talent in each member country (Bank Indonesia, 2023).

Despite progress, ASEAN countries still exhibit significant disparities in financial inclusion levels, with the lowest index at 33% and the highest around 90%, averaging 41% (World Bank, 2021). In Indonesia, the Global Financial Inclusion Index reported a financial inclusion rate of 51.76%. Nevertheless, OJK's latest data (2022) showed that financial literacy in Indonesia reached 82.5%. The unbanked population remains a critical factor affecting the ASEAN region's economy.

Financial inclusion is crucial for improving public welfare. Dicky Kartikoyono, Assistant Governor and Head of Payment System Policy Department at BI, highlighted the potential of leveraging digital technology to address the significant unbanked population in Indonesia, estimated at 97.7 million people (48%). BI's three-pillar strategy for payment system policies focuses on growth, inclusion, and stability to enhance the digital financial ecosystem. Collaboration between the government and BI

has successfully reduced financial transaction costs, increased access to financial services, and promoted digital technology adoption across sectors. This initiative has raised financial inclusion from 83.6% in 2021 to 85.1% in 2022, with targets set at 88% and 90% for 2023 and 2024, respectively.

In recent decades, advancements in information and communication technology, particularly mobile devices, have significantly impacted various life aspects, including finance. Mobile banking, introduced in the early 2000s, has played a pivotal role in advancing financial inclusion by providing virtual access for individuals and businesses to conduct financial transactions such as savings, fund transfers, and stock market deals at convenient times and locations (Siano et al., 2020). Digital banking services have gained popularity, with 88% of Indonesians preferring digital banking in 2022, up from 86% in 2021 and 75% in 2020 (VISA, 2022).

Bank Indonesia reported that digital banking transactions in April 2023 reached IDR 4,264.8 trillion. Although monthly and annual fluctuations occur, the five-year trend shows significant growth in digital banking transactions, reflecting increased adoption. Mobile banking offers a viable solution to financial inclusion challenges, making banking services more accessible to the public, fostering closer ties between banks and their customers, and indicating national progress (Chiu et al., 2017; Merhi et al., 2020 in Mardika, 2022).

In Indonesia, where technology and smartphone penetration are growing rapidly, mobile banking has emerged as a promising tool for enhancing financial inclusion. Students, as digitally active individuals, are key participants in this shift, yet many still prefer traditional banking methods. Understanding the adoption of mobile banking among students and its implications for financial inclusion requires further investigation to address these challenges effectively.

2. Literature review

2.1. Financial inclusion

Financial inclusion refers to the calculation of the number of participants or customers using financial services in Indonesia, including savings, deposits, loans, investments, transfers, and insurance. The growing potential for innovation through fintech has been able to enhance financial inclusion as it introduces more people to effective payment transaction methods utilizing digital innovation (Yahya & Rahayu, 2020). Financial inclusion is a process aimed at ensuring easy access, availability, and usage of formal financial systems by all economic players. It provides financial services like savings, credit, insurance, and payment at affordable costs, particularly targeting low-income economic actors (Okaro, 2016, cited in Anwar et al., 2017).

According to the World Bank and European Commission, financial inclusion is a comprehensive activity aimed at eliminating all forms of barriers—both price-related and non-price-related—to public access in utilizing financial services (Nugroho & Purwanti, 2018). Indicators for measuring financial inclusion in a country include access (measuring the availability and affordability of formal financial services), usage (measuring the actual usage of financial products and services, including regularity, frequency, and duration), quality (evaluating whether the attributes of financial products and services meet customer needs), and welfare (assessing the impact of financial services on users' living standards) (Ummah et al., 2015).

As defined by Kalunda (2012, cited in Domeher et al., 2022), financial inclusion involves making various financial services accessible to all members of society without discrimination. These services are provided at reasonable costs and in an easily understandable manner. From the World Bank's perspective, financial inclusion occurs when individuals who are underbanked or financially excluded gain access to a broad range of financial services without prejudice. It encompasses three main dimensions: access to financial services, usage of financial services, and banking penetration.

2.2. Technology adoption

Kotler and Keller (2016, cited in Mauludiyah & Diana, 2018) define adoption as an individual's decision to become a regular user of a product. It involves a mental process through which an individual progresses from initial awareness to final adoption. This process includes five stages: awareness, interest, evaluation, trial, and adoption. Technology adoption is seen as the acceptance of new technology into human daily routines, driven by a desire to transition to a more modern and practical era. In the context of e-banking, adoption reflects the customers' willingness to continually use e-banking services.

There are three common approaches to assessing e-banking adoption intentions: the Technology Acceptance Model (TAM), the Theory of Reasoned Action (TRA), and the Theory of Planned Behavior (TPB). TAM, introduced by Fred D. Davis in 1986, aims to explore the influence of external factors on users' beliefs, attitudes, and intentions to adopt a technology (Davis, 1989, cited in Caroline, 2021). TAM predicts users' attitudes and behavior based on perceived usefulness (PU) and perceived ease of use (PEOU) of a system. PEOU refers to the extent to which an individual believes that using a specific system will require minimal effort.

Theory of Planned Behavior posits that behavior is guided by beliefs based on available information. It suggests that individuals who possess the necessary opportunities and resources are likely to succeed in performing a behavior, with behavior achievement influenced by motivation (intention) and capability (behavioral

control). This theory also highlights the role of subjective attitudes, ease/difficulty, and various reasons affecting an individual's behavior (Ayudya & Wibowo, 2018).

2.3. Mobile banking

Mobile banking (m-banking) is a banking service accessed through mobile devices such as smartphones, offering functions similar to ATMs. It enables customers to conduct transactions anytime and anywhere without visiting a bank. In Indonesia, most banks provide m-banking services via data service menus or SMS (known as SMS banking) (Septyan, 2020). OJK (2021), in its "Bijak Ber-electronic Banking" publication, describes mobile banking as a service enabling bank customers to perform banking transactions via mobile phones. Compared to SMS banking, mobile banking offers the convenience of eliminating the need to remember SMS formats and target numbers (Mastuti & Indriyani, 2021).

Mobile banking is a facility that allows financial transactions through a smartphone application, saving time and costs. It supports non-cash banking transactions such as fund transfers and bill payments, enabling account holders to interact with their banks without physical presence (Akturan & Tezcan, 2012). Mobile banking enhances connectivity, interactivity, time optimization, and convenience (Malaquias & Hwang, 2016).

2.4. Relationship between mobile banking and financial inclusion

According to Mardika (2022), mobile banking is an alternative solution to enhance financial inclusion, addressing the persistent challenges faced by many communities in accessing financial services. Mobile banking facilitates easier banking transactions, fostering a closer connection between the public and banks. This proximity is advantageous for both banks and the government, as increased public engagement with banking products reflects progress within a nation. Consequently, mobile banking has become a crucial innovation for advancing economic development.

Laut & Hutajulu (2019) state that financial technology plays a significant role in promoting financial inclusion. With the advent of financial technology, individuals previously excluded from formal banking systems now have access to various technology-based financial services. This is due to the faster, simpler, and more convenient processes offered by financial technology. Additionally, many Indonesians utilize fintech lending to access microcredit more easily, with lighter terms and without requiring collateral.

Rohmah & Gunarsih (2021) highlight that fintech, or financial technology, serves as a tool that simplifies access to digital financial services. Through fintech, a growing number of individuals now have accounts with technology-based financial services. This increasing utilization of fintech directly correlates with improved financial inclusion. The development of fintech innovations facilitates financial transactions and enhances financial inclusion, particularly through fintech lending, which supports credit growth among the unbanked population.

According to Marini et al. (2020), greater utilization of technology-based financial assistance contributes to achieving the government's financial inclusion goals. The growing use of fintech boosts the financial inclusion index and underscores the need for increased support for financial technology companies. Technology-based financial services are expected to play a pivotal role in enhancing financial inclusion.

3. Methods

3.1. Type and sources of data

This research focuses on Indonesia, with the study subjects being Indonesian university students who utilize mobile banking services for financial purposes. The object of the study is mobile banking adoption and financial inclusion among Indonesian university students. The study aims to analyze the relationship between mobile banking adoption and financial inclusion in this demographic.

Primary data was used to gather information on mobile banking adoption and financial inclusion. According to Umar (2013), primary data is defined as data obtained directly from the first source, either from individuals (e.g., through interviews) or from questionnaires filled out by respondents.

To collect primary data, this study employed an online questionnaire distributed to university students. Sugiyono (2017) defines a questionnaire as a data collection technique involving a set of written questions or statements given to respondents for them to answer.

3.2. Population and sample

Sugiyono (2017) describes the population as the generalization area encompassing objects or subjects with specific quantities and characteristics defined by the researcher for study and conclusion drawing. The target population for this research is Indonesian university students who use mobile banking for financial transactions.

A sample is a subset of the population with similar characteristics, and it must be representative (Sugiyono, 2017). This study employed non-probability sampling, where not all members of the population have an equal chance of being selected (Sugiyono,

2017). Specifically, purposive sampling was used, which involves selecting samples based on predetermined criteria (Sugiyono, 2017).

The sample criteria are Indonesian university students using online financial services (mobile banking) and aged 17–24 years, classified as Generation Z. Since the exact population size is unknown, the sample size was determined using Cochran's formula (Sugiyono, 2017):

$$n = \frac{z^2 pq}{e^2} \quad (1)$$

where n is required sample size, z is value in the normal curve for a 5% deviation, 1.96, p is probability of success, 0.5, q is probability of failure, 0.5, and e is sampling error, typically 5%.

Applying the formula Equation (1):

$$n = \frac{(1.96)^2 (0.5)(0.5)}{(0.05)^2}$$

$$n = 385 \text{ respondent.}$$

The sample size was rounded to 400 to minimize measurement errors, resulting in a total of 400 respondents for this study.

3.4 Data collection

The primary data was collected using a questionnaire as the main instrument. According to Sugiyono (2017), questionnaires are an efficient method when researchers know the variables to be measured and can predict respondents' responses. This method is also suitable for large and dispersed respondent groups.

Data collection was conducted online using Google Forms distributed through social media platforms. The target respondents were Indonesian university students using mobile banking for financial transactions. The questionnaire included questions designed to measure variables such as mobile banking adoption and financial inclusion. Respondents provided their answers using a Likert scale ranging from 1 to 5, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

The quality of data for hypothesis testing depends on the quality of the instruments used for data collection. The study employed validity and reliability tests (Sugiyono, 2017): (a) *Validity Test*. This measures the accuracy of an instrument in measuring what it is intended to measure (Puspasari & Puspita, 2022). Items are valid if the calculated *R-value* exceeds the *R-table value* and is significant at a level below 0.05 (Sahir, 2022); and (b) *Reliability Test*. This measures whether a questionnaire consistently produces

reliable data. The Cronbach's Alpha test was used; a variable is reliable if the Cronbach's Alpha value exceeds 0.60 (Dewi & Sudaryanto, 2020).

3.5 Data analysis

Hypothesis testing is a decision-making method based on data analysis, whether from controlled experiments or observations. Results are statistically significant if they are unlikely to have occurred by chance, based on a predefined probability threshold.

Simple linear regression analysis was used to determine the effect of one variable on another. When only one independent variable and one dependent variable are present, the relationship is described as a simple regression equation in Equation (2) (Sugiyono, 2017)

$$Y = a + bX + e \quad (2)$$

where Y is financial inclusion, a is constant, b is regression coefficient, X is mobile banking adoption, and e is standard error.

4. Results and discussion

4.1. Results

4.1.1. Descriptive statistics

Descriptive statistics are statistical analyses that provide a general description of the characteristics of each research variable, as seen from the mean, maximum, and minimum values. In this study, the discussion of descriptive statistical analysis was carried out on normalized data. The descriptive statistical analysis results from 400 respondents who met the sample criteria are presented in Table 1.

Table 1. Descriptive Statistics

		X	Y
N	Valid	400	400
	Missing	0	0
Mean		4.1550	4.0000
Std. Deviation		0.44325	0.40671
Variance		0.196	0.165
Range		2.00	2.00
Minimum		3.00	3.00
Maximum		5.00	5.00

Source: Data processed by the researcher, 2024

Based on Table 1, the descriptive statistical results from 400 respondents show that the variable Mobile Banking Adoption (X) has a minimum value of 3.00 and a maximum value of 5.00. The mean value of the Mobile Banking Adoption variable (X) is 4.15, with a standard deviation of 0.44. The Financial Inclusion variable (Y) has a

minimum value of 3.00 and a maximum value of 5.00, with a mean value of 4.00 and a standard deviation of 0.41.

4.1.2. *Validity and reliability test*

The validity test is used to determine the extent to which an instrument can measure what it is intended to measure. Validity ensures the precision of a measurement tool in obtaining data. The validity test system involves correlating the scores obtained on each question or statement item with the total individual score. A questionnaire statement is declared valid if the R-calculated value > R-table. In this study, the R-table value is 0.098, with $df = N - 2 = 400 - 2 = 398$, $\alpha = 5\%$ (0.05). To determine the validity level, statistical calculations were carried out first. The validity test output results can be seen in the following table.

Table 2. Validity test results for the mobile banking adoption

Item	R-calculated	R-table	Remarks
X.1	0.312	0.098	Valid
X.2	0.528	0.098	Valid
X.3	0.452	0.098	Valid
X.4	0.491	0.098	Valid
X.5	0.414	0.098	Valid
X.6	0.447	0.098	Valid
X.7	0.440	0.098	Valid
X.8	0.373	0.098	Valid
X.9	0.546	0.098	Valid
X.10	0.488	0.098	Valid
X.11	0.529	0.098	Valid
X.12	0.540	0.098	Valid
X.13	0.400	0.098	Valid
X.14	0.453	0.098	Valid
X.15	0.373	0.098	Valid

Notes: X.1 to X.15 represent statement items for the mobile banking adoption variable

Source: Results of data processing by researchers, 2024

Table 3 shows that the Mobile Banking Adoption variable (X) meets the validity criteria for all statement items, as the R-calculated value is greater than the R-table value of 0.098 in this study. This indicates that each statement on the Mobile Banking Adoption variable is reliable and suitable for the study. Table 3 also shows that the Financial Inclusion variable (Y) meets the validity criteria for all statement items, as the R-calculated value is greater than the R-table value of 0.098 in this study. This indicates

that each statement on the Financial Inclusion variable (Y) is reliable and suitable for the study.

Table 3. Validity test results for the financial inclusion

Item	R-calculated	R-table	Remarks
Y.1	0.381	0.098	Valid
Y.2	0.296	0.098	Valid
Y.3	0.339	0.098	Valid
Y.4	0.449	0.098	Valid
Y.5	0.398	0.098	Valid
Y.6	0.407	0.098	Valid
Y.7	0.253	0.098	Valid
Y.8	0.175	0.098	Valid
Y.9	0.461	0.098	Valid
Y.10	0.438	0.098	Valid
Y.11	0.465	0.098	Valid
Y.12	0.454	0.098	Valid
Y.13	0.367	0.098	Valid
Y.14	0.307	0.098	Valid

Notes: Y.1 to Y.14 represent statement items for the financial inclusion variable

Source: Results of data processing by researchers, 2024

Puspasari & Puspita (2022) state that the reliability test of a research instrument is a test used to determine whether a questionnaire used for data collection can be considered reliable. In the reliability test, Cronbach's Alpha analysis is used, and if the Cronbach's Alpha value is > 0.60 , it can be concluded that the variable is reliable or consistent in measurement. The reliability test output results can be seen in Table 4.

Table 4. Reliability test results for mobile banking adoption and financial inclusion

Variables	Cronbach Alpha	r-calculated	Remarks
Adopsi <i>mobile banking</i> (X)	0.847	0.60	Reliable
Inklusi keuangan (Y)	0.737	0.60	Reliable

Based on Table 4, the Cronbach's Alpha value for the Mobile Banking Adoption variable is 0.847. Thus, it can be concluded that the statements in this questionnaire are reliable because they have a Cronbach's Alpha value greater than 0.60. Based on Table 4, the Cronbach's Alpha value for the Financial Inclusion variable (Y) is 0.737. Thus, it can be concluded that the statements in this questionnaire are reliable because they have a Cronbach's Alpha value greater than 0.60.

4.1.3. Regression estimation

Simple linear regression analysis aims to determine the influence of one variable on another. If the regression equation only has one independent variable and one dependent variable, it is referred to as a simple regression equation (Sugiyono, 2017). The regression equation obtained in Table 5.

Table 5. Regression estimation results

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	2.463	0.176		14.004	0.000
Mobile Banking Adoption	0.370	0.042	0.403	8.789	0.000
R	0.403				
R-square	0.163				
R-square adjusted	0.160				

Note: Dependent variable is Financial Inclusion (Y)

Source:: Results research

The constant value of 2.463 indicates that if the Mobile Banking Adoption variable (X) is constant (0), then the value of Financial Inclusion (Y) is 2.463. The regression coefficient of the Mobile Banking Adoption variable (X) is 0.370, indicating that if the Mobile Banking Adoption variable increases by 1 percent, the Financial Inclusion variable (Y) will increase by 0.370. The positive coefficient means there is a positive relationship between Mobile Banking Adoption and Financial Inclusion; the higher the Mobile Banking Adoption, the greater the Financial Inclusion.

Partial testing or t-test is used to test the regression coefficient partially, to determine the partial significance of each independent variable on the dependent variable. Testing uses a significant value $\alpha=0.05$ or 5% (Sahir, 2022). If the significant value is smaller than 0.05, the independent variable significantly influences the dependent variable. The t-test results are the analysis results show that the t-calculated value for the Mobile Banking Adoption variable (X) is 8.789, with a significance level of 0.000 (less than the significance level of 0.05). Thus, it can be concluded that the Mobile Banking Adoption variable (X) partially has a positive and significant influence on the Financial Inclusion variable (Y).

The coefficient of determination, often symbolized as R^2 , essentially shows the magnitude of the influence of independent variables on the dependent variable. If the coefficient of determination value in the regression model gets smaller or closer to zero, it means that the influence of all independent variables on the dependent

variable is minimal. Conversely, if the value gets closer to 100%, it means that the influence of all independent variables on the dependent variable is significant (Sahir, 2022). The results of the coefficient of determination test are as follows:

Based on Table 4, the analysis results show an R^2 value of 0.16 or 16%. This indicates that the Financial Inclusion variable (Y) can be influenced by the Mobile Banking Adoption variable (X) by 16%. The remaining 84% (100% - 16%) is influenced by other variables such as financial literacy, financial knowledge, financial skills, financial confidence, and others not examined in this study.

4.2. Discussion

Based on the results of the research conducted, data analysis revealed that the t-test yielded a t-value of 8.789 with a significance level of 0.000 (less than the significance threshold of 0.05). This indicates that mobile banking adoption has a positive and significant effect on financial inclusion among Indonesian students, thereby supporting the acceptance of hypothesis H1.

This finding suggests that the more frequently students adopt and utilize innovations in the financial services industry that leverage technology to facilitate specific financial transactions, the more this contributes to increasing access to and utilization of various financial service products. Mobile banking simplifies the process of seeking and understanding information about financial services, subsequently encouraging individuals to access these services more effectively and efficiently, thereby promoting financial inclusion.

This study aligns with the findings of Mulasiwi & Julialevi (2020), which demonstrated that fintech-based financial services positively influence financial literacy and inclusion, emphasizing the need for such services to expand public understanding of financial literacy and inclusion. It is also consistent with the research by Yuliyanti & Pramesti (2021), which underscored the importance of improving financial literacy and leveraging available financial technology to achieve financial inclusion.

Furthermore, the results are in agreement with studies by Domeher et al. (2022) and Siano et al. (2020) conducted in Sub-Saharan Africa. These studies concluded that investments in banking sector innovation drive financial inclusion and that financial inclusion fully mediates the relationship between innovation and economic growth. Hence, it is recommended that governments in these regions invest in appropriate technological infrastructure to support banking services as a critical strategy for promoting financial inclusion and economic growth.

5. Conclusion

Mobile banking adoption positively affects financial inclusion among Indonesian students. Increased frequency of mobile banking usage by students to access financial products and services results in improved levels of financial inclusion. Mobile banking simplifies the process of accessing and understanding financial service information, enabling individuals to utilize financial services more effectively and efficiently, thereby achieving financial inclusion.

The findings of this study are expected to serve as a reference for Indonesian students, particularly Generation Z, in addressing their financial concerns about future financial security. It encourages confidence in their ability to manage financial activities effectively. The results also offer insights for decision-making and strategy development among relevant stakeholders. For example, the Financial Services Authority (OJK) is encouraged to implement educational programs on financial products, benefits, and risks, as well as training initiatives to enhance financial inclusion. Programs such as student savings accounts and digital banking initiatives should continue to be developed, aiming to sustain and improve the current achievements, especially for Generation Z, who play a significant role in driving financial inclusion due to their population dominance.

Future researchers are encouraged to incorporate additional independent variables and develop new research models, as the current model explains only 16% of the variance in financial inclusion, leaving the remainder to be explained by variables outside the proposed model. Expanding the target respondents to include the general public would also align with the Indonesian government's broader financial inclusion objectives.

Disclosure statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

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