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Digital financial literacy and digital financial inclusion: A multigroup analysis based on gender

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ABSTRACT

The objective of this research is to explore the relationship between digital financial literacy (DFL) and digital financial inclusion (DFI) while considering gender differences. The study employed convenience sampling and collected primary data through a questionnaire. The analysis involved a multi-group assessment to examine how DFL influences DFI in distinct gender categories. The results reveal a noteworthy association between DFL and DFI among both females and males. Interestingly, the impact of DFL on DFI appears to be more pronounced within the female group, suggesting that enhancing digital financial literacy can be particularly beneficial for women's financial inclusion. However, it is essential to note that the disparity in the effect of DFL on DFI between the two gender groups does not reach statistical significance. This finding underscores the overall significance of DFL in advancing digital financial inclusion across all genders. These results have substantial implications for policymakers and financial institutions. The study underscores the importance of promoting digital financial literacy to improve digital financial inclusion. While the influence of DFL seems slightly stronger for females, addressing digital financial literacy comprehensively for all genders remains vital in the pursuit of inclusive financial systems. By expanding digital financial literacy initiatives and making them accessible to diverse populations, policymakers and financial institutions can contribute to more equitable financial inclusion. This research highlights the need for gender-inclusive strategies and underscores that bolstering DFL can be a pivotal step towards achieving comprehensive financial inclusion on a broader scale.

Contribution/Originality: This study enhances the knowledge gap by developing an empirical model that explains the nexus of DFL and DFI and explores further the different impacts between males and females.

1. INTRODUCTION

Poverty is a prevalent issue in nearly every developing country, prompting governments to implement policies and programs aimed at improving social welfare and reducing poverty rates. In line with one of the targets outlined in the Sustainable Development Goals (SDGs), the Government of Indonesia (GoI) is actively focusing on financial inclusion as a means to alleviate poverty. According to Demirgüç-Kunt and Singer (2017), financial inclusion plays a crucial role in reducing poverty rates and bridging economic disparities by fostering awareness about the significance of future investments and effective financial risk management.

Previous studies have looked at financial inclusion in a number of ways, including how easy it is to get financial services (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018; Gammage et al., 2017; Widyastuti, Sumiati, Susanti, & Suherman, 2019), how people actually use those services (Gammage et al., 2017; Widyastuti et al., 2019), and what barriers there are (Widyastuti et al., 2019). One of the indicators that indicates accessibility is the ownership of bank accounts. Solo (2008) explained that individuals with lower income and education levels were often referred to as "unbanked" since they did not possess any bank accounts. Unbanked individuals predominantly belonged to the lower socioeconomic strata, including fishermen, farmers, women, informal sector workers, and immigrants.

Essentially, financial inclusion is a strategy aimed at enhancing access to financial services and products, including saving, payments or fund transfers, loans, insurance, and investment, particularly for underserved populations such as women and those at the bottom of the socioeconomic pyramid. In the digital age, traditional financial inclusion has evolved into digital financial inclusion, and its impact on promoting financial inclusivity has been demonstrated in countries like Kenya and India (Karlan et al., 2016). The topic of digital financial inclusion has emerged alongside the technological era and the digitization of businesses. The COVID-19 pandemic has accelerated the need to transition from traditional financial inclusion to the adoption of digital financial inclusion at a faster pace than initially anticipated (Tay, Tai, & Tan, 2022). As per government recommendations, people can make financial transactions while staying at home.

With the advancements in technology, the accessibility of financial services has shifted towards digitalization by leveraging technology. Nowadays, the emergence of digital financial services has encouraged people to adopt various digital platforms to meet their financial needs. This development has prompted financial institutions to enhance their services by offering digital financial inclusion. This enables a more accessible financial system that supports digital transactions, including digital payments, investment platforms, and internet-based money transfer systems, utilizing mobile phones as tools in financial technology. The adoption and utilization of digital financial services have the potential to significantly influence and contribute to a nation's economic growth through daily financial transactions.

Numerous studies on DFI have been conducted in several countries, such as Ukraine (Naumenkova, Mishchenko, & Dorofeiev, 2019), Nigeria (David-West, 2016), China (Lai, Yan, Yi, & Zhang, 2020; Wang & He, 2020; Yang & Zhang, 2020), Bahrain (Sadayan & Rao, 2017), Bangladesh (Aziz & Naima, 2021), African (Kelikume, 2021), and Southeast Asian (Koh, Phoon, & Ha, 2018) by observing several countries including Myanmar, Thailand, Singapore, Malaysia, and Indonesia. Researchers have looked at DFI in a number of different groups, such as adults (Koh et al., 2018), households (Lai et al., 2020), and farmers (Wang & He, 2020). They have also compared the levels of DFI between men and women (Gammage et al., 2017). A systematic literature review has been conducted by Ranabhat, Verma, Kumar, and Siringoringo (2022) based on 93 papers, referring to the Scopus database, which was published in the period 2015 – 2020 and explored the antecedents of digital financial inclusion in developing countries. They found that the variables that were frequently applied to answer the determinant of DFI were perceived ease of use and perceived usefulness. The systematic literature review conducted by Tay et al. (2022) investigates the state of global digital financial inclusion. It reveals that developing countries, especially in Asia, have made progress in using digital financial services to combat poverty. However, this research also highlights the ongoing inequalities in these countries, including disparities in terms of gender, income levels, and urban and rural areas, regarding access to and usage of digital financial services.

Nevertheless, there is a lack of study that develops the model that explains the impact of DFL on DFI and examines further whether there is a differential impact between the groups of females and males. As a component at the bottom of the pyramid, women still become the focus of the government in enhancing their access to financial products and services. This study contributes to filling the research gap by observing households that represent the evidence from Indonesia.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Digital Financial Inclusion

Technological advancements have facilitated the reduction of costs and inconveniences associated with accessing financial services. The integration of digital payment technology with mobile technology is driving a transformation in the financial system, resulting in the elimination of up to 90 percent of transaction fees. Digital financial inclusion is enabling a significant portion of marginalized and previously underserved populations to shift from relying solely on cash-based transactions to embracing formal financial services and avenues like savings, payments, insurance, and credit, all facilitated through mobile money and other digital technologies (Mpofu & Mhlanga, 2022). Given the current government policies promoting the adoption of digital or cashless payments, the digital platform has the potential to handle millions of transactions per day. This development is one facet of Digital Financial Inclusion (DFI). Digital Financial Inclusion (DFI) encompasses initiatives aimed at ensuring that digital financial services are accessible and cost-effective for every person and organization, irrespective of their financial situation, institution size, or geographical location (Lutfi et al., 2021). Chu (2018) defines digital financial inclusion (DFI) as the provision of essential banking services, such as savings, loans, insurance, and other financial services, to all individuals in the population, particularly those living below the poverty line. In contrast, Naumenkova et al. (2019) characterize DFI as the facilitation of access to formal financial services through the utilization of digital technology. This encompasses digital interactions between financial institutions and consumers as well as the availability of infrastructure to support the use of digital financial products. Examples of digital financial services mentioned include digital banks or mobile banks, internet-based digital payments, mobile wallets, and e-wallets. Lai et al. (2020) elaborate on the dimensions used to assess the DFI index, which encompass extensive and intensive utilization, as well as digital service provision. Extensive usage is measured by considering the number of individuals with "Alipay" accounts and the extent to which these accounts are linked to bank cards. Intensive usage gauges the frequency and intensity with which people utilize their Alipay accounts for various purposes, such as making payments, borrowing money, purchasing insurance, spending funds, and investing in money markets. In regards to the relationship between DFI and cellular technology, Chu (2018) highlighted that the expansion of digital financial inclusion is closely intertwined with the advancements in cellular technology. Cellular technology plays a crucial role in enabling accessibility for digital financial products. Chu (2018) emphasized that an accessible cellular network should be available anytime and anywhere to ensure that individuals can utilize digital financial services. This implies that the network infrastructure must adhere to standardized specifications, allowing it to be compatible with multiple mobile network operators and various models of mobile phones.

2.2. Digital Financial Literacy

Digital financial literacy refers to an individual's comprehension of concepts related to online shopping, utilizing diverse payment methods for internet transactions, and navigating the digital banking system (Prasad, Meghwal, & Dayama, 2018; Rahayu, Ali, Aulia, & Hidayah, 2022). Digital financial literacy (DFL) plays a vital role in driving the effectiveness of digital financial inclusion programs, leading several countries worldwide to prioritize these two critical areas in their policies. DFL encompasses two fundamental concepts, namely digital literacy and financial literacy, and also incorporates additional elements such as product characteristics and awareness of potential risks faced by individuals. In their study, Morgan, Huang, and Trinh (2019) emphasized the multidimensional nature of digital financial literacy. Various scholarly works have provided diverse definitions of DFL, tailored to the specific objectives of their respective research endeavors.

Morgan and Long (2020) identified four dimensions that encapsulate the essence of digital financial literacy (DFL). These dimensions encompass knowledge about digital financial products and services, awareness of digital financial risks, comprehension of strategies to mitigate these risks, and an understanding of consumer

rights and compensation procedures. Prasad et al. (2018) established a direct correlation between DFL and knowledge related to online purchases, online payments, and online banking systems. Meanwhile, Setiawan, Effendi, Santoso, Dewi, and Sapulette (2022) conducted a study on DFL, specifically investigating its impact on the savings behavior of millennials in Indonesia. Their study emphasized the measurement of DFL through four components pertaining to digital financial products and services, including knowledge, experience, risk awareness, and the skills required to regulate and manage digital financial activities.

2.3. Hypotheses Development

2.3.1. The impact of DFL on DFI

Asyik, Wahidahwati, Laily, and Wahidahwati (2022) conducted a study about the relationship between financial literacy and financial inclusion and found that there is a significant positive impact of financial literacy on financial inclusion. In line with them, Shen, Hu, and Hueng (2018) also stated that financial literacy is an important factor influencing financial inclusion by mediating with digital financial products. People who lack financial knowledge are less likely to adopt Internet banking. This finding of Grohmann and Menkhoff (2017), which show that a nation's population with a high level of financial literacy contributes significantly to enhancing financial inclusion, support this conclusion. This impact is statistically robust and surpasses the influence of a well-established financial infrastructure. Furthermore, the study indicates that, when considering the utilization of financial products, financial literacy strengthens the impact of a stable financial infrastructure. In countries with less developed financial infrastructures, financial literacy can also enhance access to financial products. Another study found that financial knowledge is a prerequisite for someone using digital financial services (Königsheim, Lukas, & Nöth, 2017).

Drawing from these research findings, the hypothesis is formulated as follows:

H_1: There is a positive impact of DFL on DFI.

2.3.2. The Different Impact of DFL on DFI Based on Gender

Koomson, Villano, and Hadley (2020) investigated how financial literacy training influenced financial inclusion and its depth. They collected data through a randomized controlled trial and found that the impact of financial literacy training was significant in terms of women-headed households owning bank accounts. In contrast, households with male beneficiaries saw an impact on their savings habits and their ability to receive financial assistance. Moreover, those who received financial literacy training were more likely to improve their financial inclusion, and this improvement was more pronounced among households headed by men and younger beneficiaries. These findings highlight that the impact of financial literacy on financial inclusion varies by gender. In a separate study by Hasan, Ashfaq, Parveen, and Gunardi (2023), they explored the influence of Digital Financial Literacy (DFL) on the financial inclusion of women entrepreneurs. Their research revealed that women who had a higher level of DFL tended to actively use or commit to using financial products and services offered by formal financial institutions. While several studies highlighted gender and financial inclusion and found that women dominantly use digital financial inclusion for credit and microfinance activity, or entrepreneurship activity by women entrepreneurs who run their online businesses, especially in Saudi Arabia (Arnold & Gammage, 2019; Gammage et al., 2017). Refering to this literature, the hypothesis is developed as follows:

H_2: There is a different impact of DFL on DFI between males and females.

3. RESEARCH METHOD

To examine whether there was a different impact of DFL on DFI between males and females, this study employed Partial Least Squares – Multi-Group Analysis (PLS-MGA). PLS-MGA is a statistical technique used

in structural equation modeling (SEM) to assess and compare the structural relationships between latent variables in different groups. It's particularly valuable to investigate whether these relationships differ across various subgroups, such as genders, age groups, or other demographic categories. In PLS-MGA, the focus is on examining the moderation effects of group differences on the relationships between latent variables (Chin, Lo, Razak, Pasbakhsh, & Mohamad, 2020; Yaw, Tan, Foo, Leong, & Ooi, 2022). This method was appropriate to compare the impact of DFL on DFI based on gender by considering that the instrument of variables was measured using a different scale (Hair, Risher, Sarstedt, & Ringle, 2019). In our current study, we employ PLS-MGA to extend upon prior research in several ways: (1) Group-Specific Analysis: Unlike prior research that treated all groups uniformly, we use PLS-MGA to examine how the relationships between variables differ across specific groups. (2) Moderation Insights: Our approach helps us uncover if there are moderating effects of certain demographic factors on the relationships, providing deeper insights into the nuances of the studied phenomenon. (3) Precise Comparison: PLS-MGA allows for a more precise comparison of model parameters, helping us identify if the observed differences are statistically significant. (4) Enhanced Validity: By accounting for group-specific dynamics, our model enhances the validity of our conclusions by acknowledging the potential heterogeneity in relationships.

Table 1. Research instruments.

Variable	Indicator
Digital financial literacy	I possess a strong grasp of digital payment solutions, including E-Debit, E-Credit, E-Money, Mobile/Internet banking, and E-wallets. I have a solid understanding of digital asset management products such as Tanamduit, Finansialku, and Bareksa. I am well-versed in digital asset management alternatives like Investeree, Kreditku, etc. I have a comprehensive knowledge of digital insurance offerings, including W+, Cekpremi, and Rajapremi. I am knowledgeable about customer rights, protection, and the procedure for lodging complaints about digital financial service providers. I have practical experience using fintech products and services for digital payments, such as Ovo, Gopay, and LinkAja I have hands-on experience with fintech products and services for financing (loans) and investment, such as CoinWorks, Investree, Modalku, and Amarta. I have firsthand experience using fintech products and services for asset management, such as Bareksa, Tanamduit, and Finansialku. I am conscious of the potential financial risks associated with using digital financial providers or fintech, including considerations like the legality of the fintech provider, interest rates, and transaction fees. I possess strong financial management capabilities through digital platforms, enabling me to effectively manage costs associated with digital financial transactions. I exercise sound control over financial activities using digital platforms by evaluating spending within these platforms.
Digital financial inclusion	Utilized a mobile phone or the internet to access your account. Employed e-debit, e-credit, mobile/internet banking, e-money, e-wallet, or the internet for bill payments or transactions. Utilized e-debit, e-credit, mobile/internet banking, e-money, e-wallet, or the internet for online purchases. Made cash withdrawals using a debit card. Engaged with fintech platforms for investment purposes. Utilized fintech platforms for insurance-related transactions. Used an account to receive income, wages, or government payments. Employed an account for settling utility bills. Utilized a mobile phone or the internet for fund transfers.

By surveying 185 households, the sample was classified into two groups: females and males, which consist of 95 males and 90 females. The instrument that is used to measure DFL has been adapted from Setiawan et al. (2022), which reflects individuals' knowledge, experience, and awareness of digital financial products or services.

This latent variable was operationalized using 4-point Likert scales. On the other hand, digital financial inclusion is defined as individuals' accessibility and usage of digital financial products or services. It was operationalized using yes-or-no questions that are displayed in Table 1. The data of DFI that is used to be analyzed further is the total score of 9 items in the instrument of DFI.

Table 2 represents the results of the validity and reliability tests of the research instrument. Referring to the loading factor, five items of DFI are valid and adhere to the minimum requirement that the loading factor is equal to or more than 0.7 (Hair Jr, Hult, Ringle, & Sarstedt, 2016). If the loading factor is less than 0.7, the items should be deleted and excluded from data analysis. Besides, the average variance extracted also showed that the instruments of DFI fulfilled the convergent validity criterion. The reliability test proved that the instruments of DFI and DFL are reliable based on the values of Cronbach's' alpha and composite reliability.

Table 2. Validity and reliability test.

Item	Loading factor	Average variance extracted	Composite reliability	Cronbach's alpha
DFL1	0.449	0.691***	0.898***	0.850***
DFL 2	0.739			
DFL 3	0.632			
DFL 4	0.661			
DFL 5	0.724			
DFL 6	0.551			
DFL 7	0.569			
DFL 8	0.621			
DFL 9	0.713			
DFL 10	0.830			
DFL 11	0.820			
DFI	1.000	1	1	1

Note: *** $p < 0.01$.

4. RESULTS AND DISCUSSION

According to the data analysis, this research revealed a noteworthy positive correlation between DFL and DFI. When considering the entire sample, the path coefficient was determined to be 0.416, with a p-value of 0.000 (refer to Table 3). This implies that the hypothesis can be accepted at a significance level of 5%. Figure 1 depicts the conceptual framework that develops to answer the research gap, which is to explain the influence of DFL on DFI, both for females and males. The models' goodness of fit was shown by the value of R-square 0.173, which explains that the power of DFL in explaining DFI is 17.3 percent; the rest will be explained by employing other variables in the model. This empirical result was in line with the findings of several scholars, namely (Asyik et al., 2022; Königsheim et al., 2017; Shen et al., 2018). Basically, people tend to use and apply DFI because they have better knowledge about financial concepts or financial products and services.

To explore the impact of DFL on DFI in each gender group, a multigroup analysis was conducted by dividing the sample into two groups. The findings revealed that DFL has an impact on DFI within the male and female groups. The second hypothesis proposed in this study was statistically supported at a significant level of 5%. The path coefficient for the male group was **0.384**, indicating a significant influence of DFL on DFI. Derived from data analysis, this study also found that DFL has a significant impact on DFI for the female group, with a path coefficient of 0.454. Regarding the value of the path coefficient of the two groups, this study interpreted that the effect of DFL and DFI is different between males and females. It could be concluded that the effect of DFL on DFI is greater for females than males' groups.

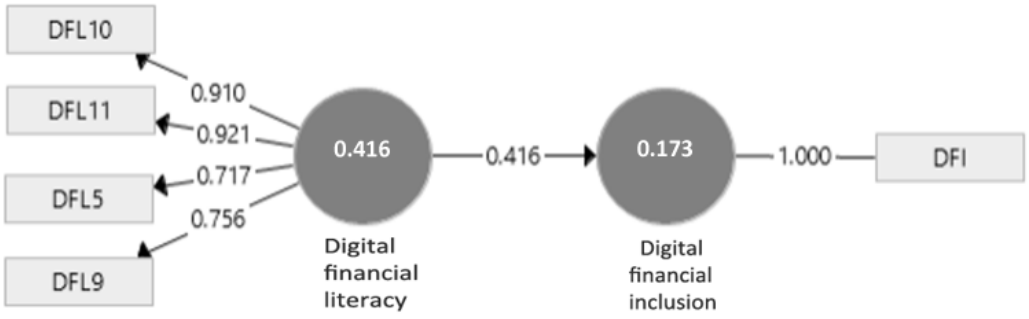

Figure 1. Inner model of DFL on DFI.

Table 3. Research findings.

Direct effect of DFL on DFI	All	Group 1 (Male)	Group 2 (Female)
Path coefficient	0.416***	0.384**	0.454***
t-statistics	7.925	5.265	5.658
p-value	0.000	0.000	0.000
Sample size (n)	185	95	90
R-square	0.173***		

Note: ** $p < 0.05$ and *** $p < 0.01$.

Furthermore, to answer the research question, which asks whether there is a significantly different impact of DFL on DFI in two groups of genders, a parametric test should be performed in this analysis. Table 4 presents the empirical findings that indicate the p-values for each criterion exceeding 0.05 (the significance level), which suggests the acceptance of the null hypothesis. This suggests that there is no significant difference in the path coefficient between gender groups. Consequently, gender does not appear to exert inequality in the association between DFL and DFI. This finding proved that society, both males and females, has better access to financial products and services in the digital era. The empirical result showed that gender is not an issue of inequality in DFI. It was contrary to Demirguc-Kunt et al. (2018), who stated that fifty-six percent of adults categorized as unbanked are women. One of the reasons for not having a bank's account is they did not have regular income (Widyastuti et al., 2019).

Table 4. PLS MGA and parametric test.

Description	PLS_MGA	Parametric test
Coefficientß	-0.070	-0.070
t-statistics	0.733	0.633
p-value	0.534	0.528

5. CONCLUSION

The purpose of this research is to explore whether there are gender-based variations in how digital financial literacy (DFL) influences digital financial inclusion (DFI). To achieve this, the study utilized a convenience sampling method and collected primary data via a questionnaire. Through a multigroup analysis, the research identified a noteworthy connection between DFL and DFI among both male and female participants. Additionally, the results suggested that the impact of DFL on DFI appears to be more pronounced within the female cohort in comparison to the male cohort. However, it's important to note that the observed difference in the influence of DFL on DFI between these two gender groups did not reach statistical significance. The study concludes that there is a relationship between digital financial literacy and inclusiveness that is gender-dependent. In order to encourage financial inclusion among women, efforts to improve digital financial literacy may produce especially significant results.

This study collected data from households in urban areas to represent the sample, where the infrastructure, including banking institutions, could be better reached than in rural areas. This study implies that future

research will focus the sample on rural areas, which represent a society with lower income. Furthermore, this study focused solely on the impact of digital financial literacy on digital financial inclusion, without considering the potential influence of other socio-economic factors or policy interventions. Addressing and acknowledging these limitations can enhance the interpretation and applicability of the research findings for the next studies.

The researchers advise regulators and policymakers to use these findings to develop focused programmes that improve digital financial literacy, with a particular emphasis on women. By creating customized solutions that address the unique challenges and requirements of diverse genders, financial institutions and practitioners may promote more inclusive digital financial ecosystems.

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