

The Impact of CEO Education and Board Diversity on Innovation: Focus on Fintech Companies in Indonesia

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Abstract

Research Background: As fintech opportunities continue to grow in Indonesia, CEOs face substantial challenges in establishing public trust and implementing strategic innovations. In this context, the CEO plays a central role in driving technological innovation to improve service quality and user accessibility. **Introduction / Main Objectives:** This study examines the influence of CEO educational background and board diversity on corporate innovation in Indonesian fintech companies. **Method:** Using secondary data collected from company websites and the Indonesia Stock Exchange (IDX) between 2015 and 2019, this study investigates how educational qualifications and board composition relate to innovation outcomes. **Results / Findings:** The results indicate that CEOs with educational backgrounds in science, technology, engineering, and mathematics (STEM) fields have a significantly positive effect on fintech innovation. Conversely, CEOs with non-STEM educational backgrounds tend to have a negative impact. Furthermore, board diversity is found to positively influence corporate innovation, suggesting that diverse boards enhance strategic decision-making by providing varied perspectives and support to the CEO, particularly in investment-related decisions. **Conclusion:** These findings contribute to the growing literature on corporate governance and innovation in emerging markets, highlighting the importance of executive qualifications and inclusive leadership structures in fostering innovation in the fintech sector.

Keywords: Board Diversity; CEO Education; Fintech Innovation; Upper Echelon Theory.

JEL Classification: M40; M48

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INTRODUCTION

The development of financial technology (fintech) in emerging markets continues to present substantial opportunities, particularly in areas such as online payments, insurance services, digital banking, and peer-to-peer lending (Omodero, 2021). Technological advancement enables faster service delivery and facilitates globalization, thereby encouraging entrepreneurship. Fintech firms aim to provide better customer service through financial innovation, such as transforming traditional loan services into more accessible and inclusive platforms (Ashta, 2018). However, challenges remain, including the high operational costs

and limited competitiveness compared to traditional banks offering lower interest rates, which hinder the scalability and sustainability of fintech solutions.

Despite these barriers, fintech offers the advantage of rapid and accessible financing, often surpassing the limitations of traditional banking in terms of flexibility and reach. This flexibility positions fintech companies to serve not only individuals but also enterprises, offering services such as corporate financing, digital transactions, and seamless information access. Consequently, fintech has emerged as a competitive threat to both traditional banks and smaller fintech providers (Zavolokina et al., 2016). Innovations such as open banking APIs, blockchain, and artificial intelligence enable fintech firms to share financial data more effectively and deliver services that are typically beyond the scope of conventional banks.

However, the open innovation environment also increases vulnerability to fraud and misuse, especially in regions where regulatory frameworks are underdeveloped (Ng & Kwok, 2017). Investment in information technology (IT) infrastructure entails high risks, yet it is essential for digital transformation and revenue diversification (Stewart & Jürjens, 2018). Thus, the CEO's role in innovation-related investment decisions becomes pivotal to long-term financial performance. Although fintech services tend to have higher operational costs, their profitability remains comparable to traditional banks.

Prior research emphasizes the strategic influence of CEOs on corporate innovation. CEOs with strong backgrounds in science, technology, engineering, and mathematics (STEM) are more likely to invest in research and development (Harymawan et al., 2020; Lin et al., 2011; Ren et al., 2020). STEM graduates are highly valued in the labor market due to their creative and technological competencies (Ray, 2015), which are critical for exploring new technologies, promoting financial inclusion, and delivering sustainable innovations (Ferrata, 2019). For instance, e-wallet innovations offering convenience and unique features have enhanced user trust and credibility (Ranjan et al., 2019). Such strategies demonstrate how CEOs can drive financial performance through innovation-driven marketing (Tjahjadi et al., 2019).

Nonetheless, previous studies have shown inconsistent results regarding the impact of educational background on innovation. Some scholars suggest that CEOs with IT-related education can drive IT innovation (Choi et al., 2018), while others highlight that educational attainment in general supports strategic decision-making and business success (King et al., 2016; Jalbert et al., 2011). Gounopoulos et al., 2020 argue that CEOs with domestic educational backgrounds better understand local business environments and financial structures, enhancing long-term performance. However, (Altuwaijri & Kalyanaraman, 2020) found no significant effect of managerial degrees on firm performance.

Moreover, educational backgrounds in STEM disciplines are associated with enhanced creativity, innovation capacity, and awareness of scientific advancements, making such individuals more capable of appreciating long-term value creation through innovation (Hsieh et al., 2022). Similarly, board diversity plays a crucial role in supporting innovation strategies by offering broader perspectives and monitoring executive decisions more effectively (Miller & Del Carmen Triana (2009)). Diverse boards bring together human and social capital that can help identify innovation opportunities and allocate resources efficiently.



According to the Upper Echelon Theory (Hambrick & Mason, 1984), organizational outcomes reflect the characteristics of top executives. CEOs with higher education and STEM backgrounds are more inclined to invest in R&D and lead innovation initiatives (Harymawan et al., 2020; Loukil et al., 2020). However, the interplay between CEO characteristics and board diversity in driving innovation remains underexplored, particularly in the fintech context.

In Indonesia, fintech growth is supported by favorable regulatory mechanisms established by the Financial Services Authority (OJK) (Iman, 2018). Platforms such as peer-to-peer lending aim to improve credit access for small businesses, especially in urban areas like Bandung—dubbed the "creative city"—as well as Semarang and Surabaya. These platforms play a significant role in enhancing operational productivity for micro, small, and medium enterprises (MSMEs) and simultaneously contribute to the fintech sector's growth through improved service competitiveness.

RESEARCH METHOD

This study employs firm-level data from Indonesian financial technology (fintech) companies registered under the supervision of the Financial Services Authority (Otoritas Jasa Keuangan OJK) and Bank Indonesia. The sample includes firms operating across various fintech segments, including e-wallets, e-money, payment gateways, digital banking, insurtech, capital market financial services, and telecommunications-based financial solutions.

A total of 368 firm-year observations were collected over the 2015–2019 period, based on available annual reports and disclosures. The data were obtained from multiple sources, including company websites, OJK statistics, the Indonesia Stock Exchange (IDX), and other publicly accessible platforms. Additional CEO background data were complemented using social media platforms such as LinkedIn and Facebook.

The study adopts an input-based approach to measure fintech innovation (INNO), using research and development (R&D) expenditure scaled by total sales, following methodologies used by (Lin et al., 2011; Sarto & Saggese, 2022). This innovation input ratio reflects the firm's investment intensity in developing new financial products and technologies.

The key independent variable, CEO education in STEM, is a binary dummy variable that equals 1 if the CEO holds an educational background in science, technology, engineering, or mathematics (Hsieh et al., 2022), and 0 otherwise.

To test the second hypothesis concerning board diversity, three dummy variables are defined:

DIV1 (Gender Diversity): Equals 1 if at least one female member is present on the board, and 0 otherwise.

DIV2 (Professional Background Diversity): Equals 1 if board members have prior experience in fintech or traditional banking, and 0 otherwise.

DIV3 (Local Representation): Equals 1 if there is local (Indonesian) representation on the board, and 0 otherwise (Iqbal et al., 2019).

Each of these board diversity indicators captures a distinct aspect of cognitive, experiential, and demographic heterogeneity within the board of directors, potentially influencing corporate innovation decisions. A comprehensive definition of variables and measurement criteria is presented in Table 1 below.

Table 1. Variable Definition

Variable	Description
INNO	The ratio of R&D expenditure to total sales
CEO Education	
STEM	The dummy variable has a value of 1 if the CEO has an educational background in science, technology, engineering, and mathematics
NON_EKSATA	The dummy variable has a value of 1 if the CEO has an educational background in accounting, finance, management, economics, administration, arts and law
SIZE_BOARD	Board size is measured as the number of directors on the board
Board Diversity	
DIV1	The dummy variable takes the value 1 if there are female members on the board and 0 otherwise
DIV2	The dummy variable has a value of 1 if there are members with experience and knowledge in fintech and banking companies on the board and 0 otherwise
DIV3	The dummy variable has a value of 1 if there is a local presence on the board and 0 otherwise
AGE	Number of years since the fintech company was founded
TOTASET	Natural logarithm of total assets

Based on the measurement approach above, this research tests the hypothesis empirically using the following econometric model :

$$INNO = \beta_0 + \beta_1 * STEM + \beta_2 * SIZE_{BOARD} + \beta_3 * DIV1 + \beta_4 * DIV2 + \beta_5 * DIV3 + \beta_5 * DU + \beta_6 * AGE + \beta_7 * TOTASET + \varepsilon$$

RESULTS AND DISCUSSION

The initial sample consisted of 368 fintech companies operating in Indonesia during the period 2015–2019. However, due to incomplete or unavailable data from annual reports and disclosures, 151 companies were excluded from the final sample. As a result, the study includes 217 fintech firms, yielding a total of 1,085 firm-year observations over the five-year observation period.

The fintech firms included in this study span various financial service sectors under the supervision of OJK and Bank Indonesia. The largest representation in the sample comes from securities firms, which play a significant role in the Indonesian capital market. For instance, PT Kliring Penjamin Efek Indonesia (KPIE), one of the major players, facilitated stock purchase transactions valued at IDR 14.7 trillion in 2022. The remaining sample is distributed across several fintech categories, as follows:

1. Payment systems, including QRIS services, payment gateways, and e-money providers: 43 companies
2. Life insurance companies: 41 companies
3. General insurance companies: 59 companies
4. Reinsurance companies: 5 companies

These categories reflect the diversity of fintech business models operating in the Indonesian financial ecosystem, offering insights into how innovation practices vary across sectors. A detailed breakdown of the sample composition by company type is presented in Table 2 below.

Table 2. Research Sample

The type of company	Number of Companies
Payment Systems, QRIS, Payment Gateways, and Electronic Money	43
Securities Company	69
Life Insurance	41
General Insurance	59
Reinsurance	5
Amount	217

Source: data processed

The results of descriptive statistical tests on this research data can be shown in Table 3 below. Research and Development data has an average value of -3.359 with a total of 368 observations, this shows that very few fintech companies publish research and development expenses in their financial reports or annual reports.

Table 3. Descriptive Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Board_Size	1,085	1,014568	0,5187723	3	2,397895
Penj	1,085	24,84672	2,319799	12,25627	31,63435
Aset	1,085	28,3616	2,319357	12,29633	34,81508
RDP	368	-3,359745	2,141832	-9,472322	4,143809

Source: data processed

Table 4 presents the correlation matrix among key variables used in the study. The correlation between CEO educational background in STEM and innovation input (INNO) is positive, with a coefficient of 0.114, indicating a modest but favorable association. The correlation between innovation and board size is also positive at 0.093, while the correlation between innovation and gender diversity on the board (presence of female directors) is 0.087, suggesting a weak but consistent positive relationship.

Interestingly, a negative correlation is observed between gender diversity and CEO STEM background ($r = -0.035$), suggesting that fintech firms with female board members may be slightly less likely to have STEM-educated CEOs, although the relationship is weak and not economically significant.

Stronger correlations are observed among the board diversity dimensions, with coefficients ranging from 0.354 to 0.554, indicating moderate associations and potential overlap in how board diversity is operationalized. Additionally, a notably strong positive correlation is found between firm assets and board size, with a coefficient of 0.585, implying

that larger firms in terms of total assets tend to have larger boards, consistent with firm governance expectations.

Overall, none of the variables exhibit correlations strong enough to indicate multicollinearity concerns, allowing for reliable interpretation in subsequent regression analyses.

Table 4. Correlation between Variables

	INNO	STEM	Board	DIV1	DIV2	DIV3	DU	AGE	Aset
INNO	1								
STEM	0,114	1							
Board	0,093	0,034	1						
DIV1	0,087	-0,035	0,220	1					
DIV2	-0,001	-0,061	0,254	0,354	1				
DIV3	-0,011	0,090	0,113	0,368	0,554	1			
DU	-0,030	0,068	0,005	0,108	0,219	0,259	1		
AGE	-0,013	-0,074	0,312	0,044	0,077	-0,072	-0,045	1	
Aset	0,224	-0,034	0,585	0,275	0,237	0,149	-0,005	0,124	1

Source: data processed

The first hypothesis (H1) posits that CEOs with educational backgrounds in science, technology, engineering, and mathematics (STEM) positively influence innovation in fintech firms. The regression results support this hypothesis. As presented in Model 1, Table 4, the coefficient for the STEM education variable is positive and statistically significant at the 1% level ($\beta = 0.7307$, $t = [\text{value}]$, $p < 0.01$). This indicates that fintech firms led by CEOs with a STEM background tend to invest more in innovation activities, suggesting that technical knowledge and analytical capabilities associated with STEM education enhance the firm's innovation capacity.

The second hypothesis (H2), which examines the effect of board diversity on fintech innovation, yields mixed results. Gender diversity (DIV1) is found to have a positive and statistically significant effect on innovation, with a coefficient of 0.5704 and a t-value of 3.10, significant at the 5% level ($p < 0.05$). This finding supports the argument that the presence of women on the board contributes positively to the firm's innovation efforts, potentially due to increased diversity in perspectives and decision-making styles. Professional experience diversity (DIV2) and local representation (DIV3), however, do not show statistically significant relationships with innovation. Their p-values exceed the 10% threshold, indicating that these dimensions of board diversity do not have a robust impact on innovation outcomes in the sample of fintech firms studied.

Overall, the results partially support the second hypothesis, highlighting that gender diversity but not all forms of board diversity plays a significant role in driving innovation within Indonesian fintech companies. A summary of the regression coefficients, t-statistics, and significance levels is provided in Table 4: Model 1 below.

Table. 4 Regression Analysis Results

	Model 1	Model 2
STEM	0,7307*** (3,99)	
NON_EKSATA		-0,7221*** (-3,97)
Board	0,0942** (2,39)	0,8946*** (2,48)
Div1	0,5704** (3,10)	0,5688*** (3,89)
Div2	-0,0631 (-0,35)	-0,0599 (-0,33)
Div3	-0,2351 (-1,39)	-0,2359 (-1,39)
DU	-0,2490 (-1,06)	-0,2489 (-1,06)
Number of obs	1,084	1,084
F(6, 1077)	5,88	5,84
Prob > F	0,0000	0,0000

Note: The table above shows the results of ordinary least squares (OLS) regressions with the dependent variable INNO. The t-statistics are reported in brackets, and ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed)

Further analysis was conducted to examine the impact of non-STEM educational backgrounds including accounting, management, finance, economics, law, administration, and arts on fintech innovation. The results indicate a statistically significant negative relationship, with a t-statistic of -3.97 and significance at the 1% level. The corresponding coefficient of -0.7221 suggests that CEOs with non-STEM educational backgrounds are associated with lower innovation input in fintech firms. This finding reveals a distinct contrast compared to the positive impact observed from CEOs with STEM backgrounds.

This result implies that non-STEM educated CEOs, particularly those with backgrounds in finance, accounting, economics, and related disciplines, may adopt a more conservative approach to long-term investment decisions. Their professional training may lead them to prioritize financial prudence and risk mitigation over aggressive R&D-driven innovation strategies. In contrast, STEM-trained CEOs may be more inclined to embrace emerging technologies, make data-driven decisions, and invest in long-term innovation despite associated risks.

This finding supports the Upper Echelon Theory (Hambrick & Mason, 1984), which posits that organizational outcomes are partially predicted by the characteristics of top executives. In the context of Indonesian fintech firms, the CEO's educational profile serves as a critical determinant in steering innovation strategies aligned with technological advancements.

The findings also align with prior research (Harymawan et al., 2020; Lin et al., 2011; Hsieh et al., 2022) indicating that CEOs with strong technical or scientific knowledge are more likely to support research-based initiatives. Given the rapid transformation of the fintech landscape in Indonesia, this suggests an urgent need for leadership with the cognitive and analytical skills to adapt and drive innovation in an increasingly competitive market.

Interestingly, while finance-related backgrounds are generally associated with better financial management, in the fintech context, they may result in risk-averse behavior that limits innovation opportunities. This highlights the importance of not only technical expertise but also a mindset oriented toward digital transformation and disruptive innovation.

CONCLUSION

Fintech firms in Indonesia hold significant potential to expand their role in improving financial services and accessibility. In an increasingly competitive digital landscape, continuous innovation is crucial to maintain market relevance and gain customer trust. Innovation in fintech can be effectively fostered through greater investment in research and development, and the diversification of products and services to better meet evolving consumer needs.

This study highlights the important role of the CEO's educational background, particularly in STEM fields, in enhancing innovation performance. It also underscores the function of the board of directors, especially gender diversity, in providing strategic recommendations and supporting innovation-oriented decision-making. As such, the governance structure comprising both executive and board-level human capital plays a pivotal role in shaping fintech innovation outcomes.

However, this research is subject to several limitations. First, the availability of complete and reliable data is constrained, particularly for non-public fintech companies in Indonesia. Many private firms lack public disclosures on their financial and innovation-related activities, which restricts sample size and representativeness. Second, while this study focuses on educational background and diversity, other potentially influential CEO characteristics such as career history, tenure, age, and experience with innovation failures—were not fully explored.

Future research should aim to examine a broader set of CEO attributes, including prior leadership experiences and decision-making behavior, to assess how these factors influence innovation strategies. Longitudinal case studies or qualitative interviews could also provide richer insights into how CEOs shape innovation culture within fintech firms. As the industry continues to evolve, having a strategically capable, analytically minded, and innovation-driven leadership team will be critical to sustaining growth and delivering transformative financial solutions.

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AUTHORSHIP CONTRIBUTION STATEMENT

Kurniawan conceived the study, conducted the data collection, performed the data analysis, and drafted the manuscript. **Noorlailie Soewarno** contributed to the conceptual framework, provided supervision throughout the research process, and critically reviewed and revised the manuscript. Both authors have read and approved the final version of the manuscript.

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