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Leveraging human capital for performance enhancement in Indonesia Technology Sector

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ABSTRACT
This study analyzes the impact of human capital on the performance of technology companies in Indonesia, focusing on key variables such as education level, work experience, training and development, employee retention, and innovation capacity. This study employed a quantitative approach, utilizing data collected from 150 technology companies in Indonesia through structured questionnaires and company records. Regression analysis was used to evaluate the relationships between the identified human capital variables and company performance, measured by return on assets (ROA). The results reveal that education level, work experience, and innovation capacity significantly and positively affect company performance. Training and development also show a positive, albeit marginally significant, impact, while employee retention has a negative impact on performance. These findings highlight the critical role of human capital in driving technology companies'success in Indonesia. This study suggests that technology companies should prioritize enhancing their employees' educational qualifications, retaining experienced staff, investing in continuous training and development, and fostering a culture of innovation. These strategies can help tech companies sustain their growth and maintain a competitive edge in rapidly evolving markets. This study provides a comprehensive analysis of the specific human capital variables that influence the performance of technology companies in Indonesia. It addresses a gap in the literature and offers valuable insights for business leaders and policymakers on strategic human capital investments to achieve sustainable growth and competitiveness.

KEYWORDS
Human Capital; Technology Companies; Company Performance; Education Level; Work Experience; Training and Development; Employee Retention; Innovation Capacity; Return on Assets (ROA)

1. Introduction

The rapid advancement of technology and increasing importance of innovation have made human capital a critical factor in the success of technology companies (Marchiori et al., 2022). In Indonesia, the technology industry has experienced substantial growth, contributing significantly to the national economy (Maskuroh et al., 2023; Mushtaq et al., 2022). Human capital, defined as employees' knowledge, skills, and abilities, is essential for fostering innovation and maintaining competitive advantage (Abbas et al., 2022).

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Indonesia's startup ecosystem is at a pivotal juncture, with the country boasting a large, Internet-savvy population and a rapidly growing digital economy (Habiburrahman et al., 2022; Suwarni et al., 2020). Despite the global economic slowdown, the Indonesian tech sector continues to thrive driven by robust investments and a dynamic entrepreneurial spirit. Notable companies such as Bukalapak and the GoTo Group exemplify the sector's potential, although they also highlight the challenges faced by tech firms in sustaining growth post-IPO (Initial Public Offering). For example, Bukalapak saw a significant decline in value after its $1.5 billion IPO, and the GoTo Group had to reduce its workforce by 1,300 employees owing to macroeconomic challenges in 2022.

The Indonesian government has also played a vital role in fostering this growth by promoting investments in sectors, such as clean technology, future connectivity (5G and IoT), distributed infrastructure (cloud and edge computing), and next-level process automation (Fahlevi et al., 2022; Yusuf et al., 2024). These initiatives are expected to significantly boost a country's GDP and create a conducive environment for tech companies to flourish (Horváth & Szabó, 2019; Saniuk et al., 2023). An illustrative case is the rise of Akulaku, a digital banking and finance platform that emerged as Indonesia's top startup, with accumulated funding of approximately $310 million over the past two years. Despite the broader challenges in the fintech industry, Akulaku's success underscores the importance of strategic human capital management and innovative business models for driving performance.

However, despite these advancements, there is a gap in the literature regarding the specific role of human capital in enhancing the performance of technology companies in Indonesia (Juhandi et al., 2020; Setyaningrum et al., 2023). While previous studies have extensively covered various aspects of technological growth and economic impact, the influence of human capital variables, such as education level, work experience, training and development, employee retention, and innovation capacity, remains underexplored (Setyaningrum et al., 2024).

The aim of this research is to fill this gap by analyzing the impact of human capital on the performance of technology companies in Indonesia. This study investigates the relationship between education level and company performance, examines how work experience influences the success of tech firms, assesses the role of training and development investments in enhancing company performance, evaluates the impact of employee retention on organizational success, and analyzes the contribution of innovation capacity to company performance. By addressing these aspects, the research aims to provide a comprehensive understanding of how human capital can be leveraged to drive the success of technology companies in Indonesia.

2. Methodology

This study employs a quantitative approach to analyze the impact of human capital on the performance of technology companies in Indonesia. The following sections outline the sample and data collection methods, variables and their measurements, and data analysis techniques used in the study (Fahlevi et al., 2023; Saunders et al., 2009; Sekaran & Bougie, 2016).

2.1. Sample and Data Collection

This study targets a sample of 150 technology companies in Indonesia to ensure diverse representation across different segments of the tech industry. This is achieved through

a well-defined process that includes several key steps (Khan et al., 2024; Maeenuddin et al., 2024). Initially, the population of interest was defined by consulting industry directories, business registries, and relevant databases in order to compile a comprehensive list of technology firms operating in Indonesia. Stratified random sampling was employed to ensure balanced representation. The population was divided into three strata based on the company size: small (1-50 employees), medium (51-200 employees), and large (201-500 employees). This stratification ensured that each segment of the tech industry was adequately represented in the sample. Within each stratum, companies were selected using random sampling techniques, in which a random number generator was used to select the required number of companies from each group. To collect the data, structured questionnaires were designed and distributed to company executives and HR managers. These questionnaires included items related to the key human capital variables under study, such as educational level (Erdal et al., 2018), work experience (Kim et al., 2009), training and development (Anitha & Aruna, 2016), employee retention (Setyaningrum et al., 2024), and innovation capacity (Ahmad et al., 2023; Khalifa Alhitmi et al., 2023). The questionnaires were distributed via email and followed by phone calls to ensure a high response rate. In instances in which electronic responses were not feasible, hard copies were sent and collected.

Relevant company records were collected to complement the questionnaire data. These records include financial statements, employee records, and internal reports, which provide additional data on company performance and human capital variables. To ensure accuracy and comprehensiveness, the collected data were cross-verified with publicly available information such as industry reports and financial databases. Any discrepancies were resolved through follow-up communication with the respective companies. Ethical guidelines were strictly adhered to throughout the data collection process. Informed consent was obtained from all participants, ensuring that they were fully aware of the study's purpose and rights. Confidentiality was maintained, and the data were used solely for academic purposes. By following these detailed steps, the study ensured a robust and representative sample, providing a solid foundation for analyzing the impact of human capital on the performance of technology companies in Indonesia.

2.2. Ethical Considerations

The study adhered to ethical guidelines to ensure the confidentiality and privacy of the participating companies. Informed consent was obtained from all participants, with assurances that the data collected would be used solely for academic purposes, and kept confidential. The research protocol was reviewed and approved by the Institutional Review Board (IRB) to ensure compliance with ethical standards.

2.3. Variables and Measurement

This study examined five key variables to understand their influence on company performance. The measurements for each variable are detailed in Table 1 below.

2.4. Data Analysis

To analyze the relationship between human capital variables and company performance, this study utilizes regression analysis. The dependent variable, company performance, was measured using return on assets (ROA). The independent variables

Table 1. Measurements

Variable	Measurement Item
Education Level	Percentage of employees with tertiary education (bachelor's degree or higher)
Work Experience	Average years of work experience of employees
Training and Development	Annual investment in employee training and development per employee (USD)
Employee Retention	Employee turnover rate (percentage of employees leaving the company per year)
Innovation Capacity	Number of new products or services developed by the company in the past year

include education level, work experience, training and development, employee retention, and innovation capacity. Data analysis was performed using SPSS software, which allows for robust statistical testing and interpretation of results.

The regression analysis provides insights into how each independent variable influences company performance. By examining the coefficients, standard errors, t-values, and p-values, this study identifies the significant predictors of company success. The R-squared value indicates the proportion of the variance in company performance explained by the model, offering a measure of the model's explanatory power.

This section outlines the rigorous quantitative approach employed in this study, including detailed descriptions of sample selection, ethical considerations, variable measurements, and data analysis techniques. This comprehensive approach ensures the reliability and validity of the findings, and provides valuable insights into the role of human capital in the performance of technology companies in Indonesia.

3. Results

This section presents the results of the study, including detailed explanations and interpretations of each table. The analysis focuses on the characteristics of respondents, descriptive statistics, and the regression analysis of the data collected from 150 technology companies in Indonesia.

3.1. Characteristics of Respondents

Table 2. Profile of Respondents

Characteristic	Frequency	Percentage (%)
Company Size (Number of Employees)		
10-50	30	20
51-100	45	30
101-200	50	33.3
201-500	25	16.7
Years in Operation		
1-5	20	13.3
6-10	55	36.7
11-20	50	33.3
21+	25	16.7

3.2. Descriptive Statistics

This Table 3 presents the descriptive statistics for the key variables in the study. The average education level of employees is 70.5%, with a standard deviation of 12.3,

Table 3. Descriptive Statistics

Variable	Mean	Standard Deviation
Education Level (%)	70.5	12.3
Work Experience (Years)	8.4	3.1
Training & Development ($)	1500	450
Employee Retention (%)	15.2	5.7
Innovation Capacity (Count)	3.4	1.2
Company Performance (ROA)	7.8	2.6

indicating a high proportion of highly educated employees. The mean work experience is 8.4 years, suggesting a moderately experienced workforce. On average, companies invest $1500 per employee annually in training and development, highlighting a strong commitment to employee growth. The employee retention rate averages at 15.2%, with a standard deviation of 5.7, reflecting varying degrees of employee turnover across companies. The average innovation capacity, measured by the number of new products or services developed, is 3.4. Finally, the average return on assets (ROA) is 7.8%, indicating the overall profitability of the companies in the sample.

3.3. Regression Analysis

Table 4. Coefficients

Variable	Coefficient	Standard Error	t-value	p-value
Education Level	0.45	0.12	3.75	0.000
Work Experience	0.32	0.10	3.20	0.002
Training & Development	0.28	0.15	1.87	0.063
Employee Retention	-0.40	0.20	-2.00	0.048
Innovation Capacity	0.51	0.14	3.64	0.000
R-squared	0.68			

The regression analysis results (see Table 4) reveal the impact of various human capital variables on company performance, measured by return on assets (ROA). The R-squared value of 0.68 indicates that 68% of the variance in company performance can be explained by the model, suggesting a strong explanatory power. Education level shows a significant positive impact on company performance, with a coefficient of 0.45 and a p-value of 0.000, indicating that higher levels of employee education are associated with better company performance. Work experience also significantly contributes to company performance, evidenced by a coefficient of 0.32 and a p-value of 0.002, suggesting that more experienced employees tend to enhance organizational success.

Training and development have a positive but not strongly significant impact on performance, as indicated by a coefficient of 0.28 and a marginal p-value of 0.063. This implies that investment in employee development generally benefits company performance, although the effect may vary. On the other hand, employee retention has a negative impact on performance. The negative coefficient of -0.40 and a p-value of 0.048 indicate that higher employee turnover negatively affects company performance, highlighting the importance of retaining employees to maintain organizational stability and performance. Innovation capacity has a significant positive impact on company performance, with a coefficient of 0.51 and a p-value of 0.000. This finding underscores that companies developing more new products or services tend to perform better financially. These results collectively underscore the critical role of human capital variables in driving the success of technology companies.

4. Discussion and Conclusion

The results of this study clearly demonstrate that education level, work experience, and innovation capacity significantly and positively impact company performance, measured by ROA. Training and development also show a positive, albeit marginally significant, impact, while employee retention has a negative impact on performance. These findings underscore the critical role of human capital in driving the success of technology companies in Indonesia and provide valuable insights into how companies can enhance their competitive edge through strategic human capital investments (Habiburrahman et al., 2022; Setyaningrum et al., 2024).

The positive impact of education level on company performance aligns with the notion that a highly educated workforce is better equipped to drive innovation and productivity (Abbas et al., 2022; Mushtaq et al., 2022). Higher educational qualifications enable employees to possess advanced skills and knowledge, which can lead to more effective problem-solving and innovative thinking (Suwarni et al., 2020). In the context of Indonesia's rapidly growing tech industry, this finding emphasizes the need for companies to prioritize hiring and developing highly educated employees. As highlighted in the introduction, Indonesia's tech sector is poised for significant growth, driven by robust investments and a dynamic entrepreneurial spirit. Investing in the education of the workforce can further bolster this growth by enhancing the overall quality and capabilities of employees.

Work experience also significantly contributes to company performance, suggesting that experienced employees bring valuable insights and skills that can enhance organizational success (Khalifa Alhitmi et al., 2023). Experienced employees are likely to possess a deeper understanding of industry trends, customer needs, and operational efficiencies, which can translate into better decision-making and strategic planning. In the Indonesian context, where the tech industry is relatively young but rapidly evolving, leveraging the expertise of seasoned professionals can provide companies with a competitive advantage (Yusuf et al., 2024).

Training and development show a positive, albeit marginally significant, impact on company performance (Ahmad et al., 2023). This implies that while investment in employee development generally benefits company performance, the effect may vary depending on how effectively the training programs are implemented and aligned with the company's strategic goals. Continuous training and development are crucial for keeping employees updated with the latest technological advancements and industry best practices. For Indonesian tech companies, which are at the forefront of technological innovation, fostering a culture of continuous learning can help maintain their competitive edge and adaptability in a rapidly changing market (Saniuk et al., 2023).

The negative impact of employee retention on company performance highlights the importance of reducing turnover. High turnover rates can disrupt organizational stability, lead to loss of valuable knowledge and skills, and incur significant costs related to recruitment and training of new employees. This finding underscores the need for Indonesian tech companies to implement effective employee retention strategies, such as offering competitive compensation packages, creating a positive work environment, and providing career development opportunities. Given the challenges highlighted in the introduction, such as sustaining growth post-IPO, retaining skilled employees becomes even more critical for long-term success.

Innovation capacity significantly positively impacts company performance, indicating that companies developing more new products or services tend to perform better financially. This finding is particularly relevant for the Indonesian tech sector, which

thrives on innovation and technological advancements. By fostering a culture of innovation and encouraging employees to develop new ideas and solutions, companies can enhance their market position and drive growth (Fahlevi et al., 2023). As the Indonesian government continues to promote investments in sectors like clean technology, future connectivity, and distributed infrastructure, tech companies that prioritize innovation are likely to benefit from these initiatives and contribute to the country's economic development (Khan et al., 2024).

The novelty of this research lies in its comprehensive analysis of the specific human capital variables that influence the performance of technology companies in Indonesia. While previous studies have broadly covered the impact of human capital on organizational success, this study provides a nuanced understanding of how different aspects of human capital—education, experience, training, retention, and innovation—interact to drive company performance in the Indonesian technological sector. These findings have significant implications for business leaders and policymakers, highlighting the need for strategic investments in human capital to achieve sustainable growth and competitiveness.

4.1. Implications and Business Issues

The implications of this study are clear for business leaders. To enhance company performance, there must be concerted efforts to improve employees' educational qualifications, retain experienced staff, invest in continuous training and development, and foster a culture of innovation. These strategies can help tech companies navigate the challenges of rapid industry growth, sustain their competitive edge, and contribute to Indonesia's broader economic goal. This study underscores the importance of supporting educational initiatives, providing incentives for employee training programs, and creating an environment that encourages innovation and reduces employee turnover for policymakers. By aligning policies with the needs of the technology industry, the government can help ensure that Indonesian tech companies remain competitive on a global scale and continue to drive national economic growth.

5. Limitations

This study has several limitations that should be considered when interpreting the findings. First, the sample size of 150 technology companies, although substantial, may not fully capture the diversity and complexity of the technology industry in Indonesia. Future research could benefit from a larger and more varied sample size to increase the generalizability of the results. Second, the study relied on self-reported data from company executives and HR managers, which may have been subject to response bias. Incorporating additional data sources such as financial reports and independent audits could provide a more comprehensive view of company performance and human capital variables. Third, the cross-sectional nature of the study limits its ability to infer causality between human capital factors and company performance.

6. Suggestions

Based on the findings and limitations of this study, several suggestions can be made for future research and practice. Researchers should consider expanding the scope of this

study to include a broader range of industries beyond technology to compare how human capital impacts performance across different sectors. Additionally, future studies could explore the role of specific educational backgrounds, such as STEM disciplines (science, technology, engineering, and mathematics) versus non-STEM disciplines, in driving company performance. This could provide more nuanced insights into the types of education that are most beneficial to tech companies. From a practical perspective, technology companies in Indonesia should prioritize strategic investments in human capital. This includes not only enhancing educational qualifications and work experience but also implementing robust training and development programs tailored to the industry's specific needs. Companies should also focus on creating an organizational culture that values innovation and supports employee retention through competitive compensation, career development opportunities, and a positive work environment. Policymakers can play a crucial role by supporting educational initiatives that align with industrial needs, offering incentives for companies to invest in employee development, and creating policies that promote a stable and supportive business environment. By addressing these areas, business leaders and policymakers can contribute to the sustainable growth and competitiveness of the Indonesian tech industry.

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