



Firm Value of Indonesia Banking Subsectors: The Effect of Intellectual Capital and ESG

Elis Aprilia ^{1*}, Muhamad Muslih ¹

¹ Faculty Of Economics And Business Telkom University, Bandung

 elisaprilia031@gmail.com*

Abstract

Firm value represents investors' assessment of a company's performance and long-term prospects. In the banking industry, the effective management of intellectual capital and the implementation of Environmental, Social, and Governance (ESG) practices are considered important in creating competitive advantages and improving firm value. Nevertheless, empirical evidence regarding the influence of these factors remains inconclusive. This study investigates the effect of intellectual capital and ESG scores on the firm value of banking companies listed on the Indonesia Stock Exchange during the 2021–2024 period. A quantitative approach with an associative research design was employed using secondary data collected from annual reports and Refinitiv ESG Score data. The sample consisted of 12 banking companies selected through purposive sampling, generating 48 panel data observations. Panel data regression analysis was performed using the Random Effects Model (REM) in EViews 12. The results demonstrate that intellectual capital has a positive and statistically significant effect on firm value, whereas ESG score does not significantly influence firm value. However, intellectual capital and ESG score jointly have a significant effect on firm value. These findings highlight the importance of intellectual capital as a strategic resource for enhancing firm value and provide empirical evidence that may support investors, corporate managers, and future researchers in understanding the determinants of firm value within Indonesia's banking industry.

Keywords: Intellectual Capital, ESG Score, Firm Value, Banking Industry, Panel Data Regression

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INTRODUCTION

The banking sector plays a fundamental role in supporting economic growth by performing financial intermediation, maintaining financial system stability, and facilitating capital allocation. As a knowledge-intensive industry, banking institutions increasingly depend on intangible resources, including employee competencies, organizational capabilities, technological innovation, and effective corporate governance. Consequently, creating firm value is no longer determined solely by tangible assets but also by the ability to manage strategic intangible resources and respond to sustainability challenges.

Firm value represents investors' assessment of a company's current performance and future growth potential. A higher firm value reflects stronger market confidence and greater expectations regarding a firm's ability to generate sustainable returns. In capital market research, firm value is commonly measured using Tobin's Q because it captures market expectations beyond accounting performance by comparing market valuation with the book value of corporate assets. Therefore, identifying the determinants of firm value has become an important issue for both academics and practitioners.

The growing transition toward a knowledge-based economy has increased the importance of intellectual capital as a strategic resource for enhancing organizational competitiveness.

Intellectual capital consists of human capital, structural capital, and capital employed, which collectively contribute to value creation and operational efficiency. In the banking industry, where service quality, innovation, and knowledge management are critical, effective utilization of intellectual capital is expected to strengthen competitive advantage and improve firm value.

Besides intellectual capital, increasing global attention to sustainable business practices has encouraged companies to integrate Environmental, Social, and Governance (ESG) principles into corporate strategies. ESG has evolved from a voluntary sustainability initiative into an important indicator used by investors to evaluate corporate responsibility, governance quality, and long-term business resilience. Companies with strong ESG performance are generally expected to reduce business risk, improve stakeholder trust, and enhance long-term corporate value.

Despite the theoretical importance of intellectual capital and ESG practices, empirical evidence remains inconclusive. Several studies report that intellectual capital contributes positively to firm value by improving efficiency and competitive advantage, whereas other studies find no significant relationship between intellectual capital and market valuation. Similarly, previous findings regarding ESG performance remain inconsistent. While some studies suggest that ESG disclosure enhances firm value through improved corporate reputation and stakeholder confidence, others indicate that ESG performance has limited or even insignificant effects on market valuation, particularly in emerging markets where investors may prioritize short-term financial performance.

These inconsistencies are also reflected in Indonesia's banking industry. Although the sector experienced continuous asset growth during the 2021–2024 period, several listed banks continued to record Tobin's Q values below one, indicating that market valuation remained lower than the book value of corporate assets. This condition suggests that business expansion and asset growth have not necessarily been accompanied by increased investor confidence. Such evidence implies that additional strategic factors, including intellectual capital management and ESG implementation, may influence firm value.

Figure 1 presents the average total assets of Indonesian banking companies during 2021–2024. The figure shows a continuous increase in banking assets, indicating post-pandemic recovery and business expansion. However, the increasing scale of assets does not automatically translate into higher market valuation, highlighting the need to examine other value-creating factors.

Figure 1. Average Total Assets of Indonesian Banking Companies (2021–2024)



Source: Authors' calculation (2026).

Drawing upon Signaling Theory, companies can reduce information asymmetry by communicating positive information regarding their strategic resources and sustainability performance to investors. Intellectual capital reflects a firm's capability to generate long-term competitive advantages, whereas ESG performance signals corporate commitment to sustainable business practices. Both are expected to strengthen investor confidence and ultimately improve firm value. Nevertheless, the inconsistent findings reported in previous studies indicate that the relationships among these variables require further investigation, particularly within Indonesia's banking sector, which operates under strict regulatory requirements and faces increasing sustainability expectations.

Accordingly, this study aims to examine the effects of intellectual capital and ESG scores on the firm value of banking companies listed on the Indonesia Stock Exchange during the 2021–2024 period. By focusing on one of Indonesia's most knowledge-intensive and highly regulated industries, this study contributes to the growing literature on intellectual capital, ESG performance,

and firm value while providing empirical evidence relevant to investors, corporate managers, and policymakers.

METHOD

This study employed a quantitative research approach with an explanatory design to examine the influence of Intellectual Capital and Environmental, Social, and Governance (ESG) performance on firm value among banking companies listed on the Indonesia Stock Exchange (IDX). A quantitative approach was considered appropriate because the study aimed to test the causal relationships between variables using numerical data and statistical analysis. The observation period covered four years, from 2021 to 2024, enabling the analysis to capture recent developments in intellectual capital management and sustainability practices within Indonesia's banking industry. Secondary data were collected from publicly available annual reports and financial statements obtained through the official IDX website and each company's corporate website. ESG performance data were retrieved from the Refinitiv ESG database. Data processing and statistical analyses were performed using EViews 12.

The population consisted of all banking companies listed on the Indonesia Stock Exchange during the 2021–2024 period. Sample selection was conducted using a purposive sampling technique to ensure that only companies meeting the research objectives were included in the analysis. The selection criteria required companies to be consistently listed on the IDX throughout the observation period, publish complete annual reports, provide sufficient financial information to calculate Value Added Intellectual Coefficient (VAIC) and Tobin's Q, and disclose complete Refinitiv ESG Score data. After applying these criteria and excluding companies with incomplete observations and outlier data, the final sample consisted of 12 banking companies, resulting in 48 firm-year observations.

The dependent variable in this study is firm value, which is measured using Tobin's Q because it reflects market perceptions of a company's overall performance and future growth prospects. Intellectual Capital serves as the first independent variable and is measured using the Value Added Intellectual Coefficient (VAIC) developed by Pulic. VAIC evaluates the efficiency of value creation generated through human capital, structural capital, and capital employed. The second independent variable is ESG performance, represented by the Refinitiv ESG Score, which ranges from 0 to 100 and measures corporate performance across environmental, social, and governance dimensions.

Table 1. Operational Definition of Variables

Variable	Proxy	Measurement
Firm Value (Y)	Tobin's Q	$\frac{\text{Market Value of Equity} + \text{Total Debt}}{\text{Total Assets}}$
Intellectual Capital (X_1)	VAIC	$VAIC = VACA + VAHU + STVA$
ESG Performance (X_2)	Refinitiv ESG Score	ESG Score (0–100)

Source: Authors' calculation (2026).

To examine the proposed relationships, this study employed panel data regression because the dataset combines cross-sectional observations from different companies and time-series observations over multiple years. Compared with ordinary regression, panel data regression provides more efficient estimation by incorporating both individual and time dimensions simultaneously. The regression model used in this study is formulated as follows:

$$TQ_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 ESG_{it} + \varepsilon_{it}$$

where:

TQ = Firm Value (Tobin's Q); VAIC = Value Added Intellectual Coefficient; ESG = Environmental, Social, and Governance Score; β_0 = constant; β_1 – β_2 = regression coefficients; i = banking company; t = observation period (2021–2024); and ε = error term.

The most appropriate panel regression model was determined through a sequence of specification tests. The Chow test was first applied to compare the Common Effect Model (CEM) and the Fixed Effect Model (FEM). Subsequently, the Hausman test was performed to determine whether the Fixed Effect Model or the Random Effect Model (REM) produced more consistent estimates. When necessary, the Breusch–Pagan Lagrange Multiplier (LM) test was conducted to

compare the Common Effect Model and the Random Effect Model. The final estimation model was selected based on the statistical significance of these specification tests at the 5% significance level.

Prior to hypothesis testing, several classical assumption tests were carried out to ensure the reliability of the regression model. Residual normality was evaluated using the Jarque–Bera test, while multicollinearity was assessed through the correlation matrix among the independent variables. The presence of heteroscedasticity was examined using the White test, whereas serial correlation was detected using the Breusch–Godfrey Serial Correlation LM test. A regression model was considered appropriate when the residuals were normally distributed, the independent variables were free from multicollinearity, and no evidence of heteroscedasticity or serial correlation was identified.

Hypothesis testing was conducted using panel data regression analysis. The F-test was employed to examine whether Intellectual Capital and ESG Score jointly influence firm value. The t-test was used to evaluate the individual effect of each independent variable on firm value. In addition, the coefficient of determination (R^2) was calculated to measure the proportion of variation in firm value explained by Intellectual Capital and ESG performance. Statistical significance for all tests was determined at a 5% significance level ($\alpha = 0.05$).

RESULT AND DISCUSSION

Descriptive Statistics

Table 1. Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
VAIC	4.191722	4.203076	5.816771	2.700241	0.692396
ESG Score	66.46615	65.70269	88.67148	42.39930	13.27618
Tobin's Q	1.056588	0.994624	1.642465	0.454593	0.214431

Source: EViews 12 output, processed by the authors (2026).

Table 1 indicates that the average VAIC is 4.1917, with a standard deviation of 0.6924, suggesting relatively low variation in intellectual capital efficiency among the sampled banks. The average ESG Score is 66.4662, indicating a moderate level of sustainability performance across the sample. Meanwhile, Tobin's Q records a mean value of 1.0566, exceeding one, which implies that, on average, the market values the sampled banking firms above their book value. For all variables, the standard deviations are lower than their respective means, indicating relatively homogeneous observations.

Panel Data Model Selection

The appropriate panel regression model was determined using the Chow test, Hausman test, and Lagrange Multiplier (LM) test. These tests were conducted to identify the most suitable estimation model among the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM).

Chow Test

Table 2. Chow Test Results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.595163	(13,40)	0.0009
Cross-section Chi-square	43.344135	13	0.0000

Source: EViews 12 output, processed by the authors (2026).

As shown in Table 2, the probability value of the Cross-section F test is 0.0009, which is below the 5% significance level. Therefore, the null hypothesis is rejected, indicating that the Fixed Effect Model (FEM) is preferable to the Common Effect Model. Consequently, the model selection process proceeded with the Hausman test to determine whether the Fixed Effect Model or the Random Effect Model was more appropriate for estimating the relationship between Intellectual Capital, ESG Score, and firm value.

Panel Data Model Selection

Hausman Test

Table 3. Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.622243	2	0.1635

Source: EViews 12 output, processed by the authors (2026).

As presented in Table 3, the Hausman test produced a probability value of **0.1635**, which exceeds the 5% significance level. Accordingly, the Random Effect Model (REM) is considered more appropriate than the Fixed Effect Model. Therefore, the model selection procedure continued with the Breusch–Pagan Lagrange Multiplier (LM) test.

Lagrange Multiplier Test

Table 4. Lagrange Multiplier Test Results

Test	Statistic	Prob.
Breusch–Pagan	8.616636	0.0033

Source: EViews 12 output, processed by the authors (2026).

The LM test yielded a probability value of 0.0033, which is below the 5% significance threshold. This result confirms that the Random Effect Model is statistically superior to the Common Effect Model for estimating the relationship among the variables examined in this study.

Selection of the Final Panel Data Model

Table 5. Summary of Panel Data Model Selection

Test	Probability	Selected Model
Chow Test	0.0009	Fixed Effect Model (FEM)
Hausman Test	0.1635	Random Effect Model (REM)
Lagrange Multiplier Test	0.0033	Random Effect Model (REM)

Source: EViews 12 output, processed by the authors (2026).

Although the Chow test initially favored the Fixed Effect Model, both the Hausman and Lagrange Multiplier tests consistently supported the Random Effect Model. Since these two tests confirmed that the unobserved individual effects were random and that the Random Effect Model provided a better specification than the Common Effect Model, the Random Effect Model (REM) was selected as the final estimation model for subsequent regression analysis and hypothesis testing.

Panel Data Regression Results

Following the model selection process, panel data regression was estimated using the Random Effect Model to evaluate the effects of Intellectual Capital and ESG Score on firm value. The estimation results are presented in Table 6.

Table 6. Random Effect Model Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.448168	0.210488	2.129182	0.0379
VAIC	0.146352	0.044121	3.317025	0.0016
ESG Score	-0.000076	0.002312	-0.032839	0.9739

Source: EViews 12 output, processed by the authors (2026).

Based on the estimation results, the panel regression equation can be expressed as follows:

$$\text{Tobin's } Q = 0.448168 + 0.146352(\text{VAIC}) - 0.000076 (\text{ESG Score})$$

The estimated equation indicates that the intercept is 0.448168, representing the expected value of Tobin's Q when both independent variables are held constant. The coefficient of VAIC is positive (0.146352) and statistically significant, suggesting that an increase in intellectual capital efficiency is associated with a higher level of firm value, assuming other variables remain constant. In contrast, the coefficient of ESG Score is negative (−0.000076) and statistically insignificant, indicating that variations in ESG performance do not significantly explain changes in firm value during the observation period.

Classical Assumption Tests

Normality Test

Table 7. Normality Test Results

Description	Value
Observations	48
Jarque–Bera	5.636768
Probability	0.059702

Source: EViews 12 output, processed by the authors (2026).

As shown in Table 7, the Jarque–Bera statistic is 5.636768, with a probability value of 0.059702. Since the probability exceeds the 5% significance level, the null hypothesis of normally distributed residuals cannot be rejected. This finding indicates that the residuals follow a normal distribution and satisfy the normality assumption required for panel regression analysis. Consequently, the estimated coefficients and subsequent statistical inferences can be considered reliable.

Multicollinearity Test

Table 8. Multicollinearity Test Results

Variable	Correlation Coefficient	Criterion
VAIC	0.442819	< 0.80
ESG Score	0.442819	< 0.80

Source: EViews 12 output, processed by the authors (2026).

Table 8 demonstrates that the correlation coefficient between VAIC and ESG Score is 0.442819, which is substantially below the recommended threshold of 0.80. This result suggests that the explanatory variables are not highly correlated and therefore do not exhibit multicollinearity. The absence of multicollinearity indicates that each independent variable contributes distinct information to the regression model, allowing the estimated coefficients to be interpreted without bias caused by strong linear relationships among the predictors.

Heteroscedasticity Test

Table 9. Heteroscedasticity Test Results

Test Method	Obs*R-Squared	Probability	Criterion
Breusch–Pagan–Godfrey	0.8466	0.9329	> 0.05

Source: EViews 12 output, processed by the authors (2026).

The heteroscedasticity test produced a probability value of **0.9329**, which is considerably higher than the 5% significance level. Therefore, the null hypothesis of homoscedasticity is accepted, indicating that the residual variance remains constant across observations. This finding confirms that the regression model is free from heteroscedasticity, implying that the estimated standard errors are efficient and suitable for statistical hypothesis testing.

Autocorrelation Test

Table 10. Autocorrelation Test Results

Description	Value
Test Method	Durbin–Watson
Durbin–Watson Statistic	1.606623

Source: EViews 12 output, processed by the authors (2026).

The Durbin–Watson statistic is 1.606623, which falls within the generally accepted range of 1.50–2.50. This result indicates that the residuals are independent and that no significant autocorrelation exists in the regression model. Overall, the findings from the diagnostic tests confirm that the selected Random Effect Model satisfies the principal regression assumptions and is appropriate for hypothesis testing.

Hypothesis Testing

Simultaneous Test (F-test)

Table 11. F-test Results

F-statistic	Prob. (F-statistic)
5.697154	0.005739

Source: EViews 12 output, processed by the authors (2026).

As reported in Table 11, the regression model generates an F-statistic of 5.697154 with a probability value of 0.005739. Since the probability is below the 5% significance level, the null hypothesis is rejected. This finding demonstrates that Intellectual Capital and ESG Score collectively exert a statistically significant effect on firm value. Therefore, the proposed regression model is considered appropriate for explaining variations in the market value of banking companies during the observation period.

Partial Test (t-test)

Table 12. Partial Test Results

Variable	Coefficient	t-Statistic	Probability
VAIC	0.146352	3.317025	0.0016
ESG Score	-0.000076	-0.032839	0.9739

Source: EViews 12 output, processed by the authors (2026).

Table 12 shows that Intellectual Capital (VAIC) has a positive regression coefficient of 0.146352 and a probability value of 0.0016, indicating a statistically significant positive effect on firm value. This finding suggests that improvements in intellectual capital efficiency contribute to higher market valuation among banking companies. Efficient utilization of human capital, structural capital, and capital employed enables banks to create greater value, improve operational performance, and strengthen investors' confidence.

Conversely, the ESG Score records a negative coefficient of -0.000076 with a probability value of 0.9739, indicating that ESG performance does not significantly influence firm value. Although sustainability practices are increasingly emphasized in corporate reporting, investors in Indonesia's banking sector may continue to prioritize financial performance and profitability over non-financial ESG indicators when evaluating firm value. Consequently, variations in ESG scores during the observation period were insufficient to produce a measurable impact on market valuation.

Coefficient of Determination (R^2)

Table 13. Coefficient of Determination

Description	Value
R-squared	0.176946
Adjusted R-squared	0.145887

Source: EViews 12 output, processed by the authors (2026).

The regression model produces an R^2 value of 0.176946, indicating that 17.69% of the variation in firm value can be explained jointly by Intellectual Capital and ESG Score. After adjusting for the number of explanatory variables, the Adjusted R^2 is 0.145887, suggesting that the model retains moderate explanatory capability. The remaining 82.31% of the variation in firm value is attributable to factors outside the model, including profitability, firm size, leverage, liquidity, dividend policy, capital structure, corporate governance quality, macroeconomic conditions, and other firm-specific characteristics that were not incorporated into this study. These findings imply that although Intellectual Capital and ESG performance contribute to explaining firm value, additional financial and non-financial determinants should be considered in future research to improve the model's explanatory power.

DISCUSSION

The Effect of Intellectual Capital on Firm Value

The empirical findings indicate that Intellectual Capital, measured by the Value Added Intellectual Coefficient (VAIC), has a positive and statistically significant effect on firm value. This conclusion is supported by the regression coefficient of 0.146352 and a probability value of 0.0016, which is below the 5% significance level. Therefore, the first hypothesis (H1) is supported.

These findings suggest that firms with greater efficiency in managing intellectual resources tend to achieve higher market valuations. In the banking industry, where operations depend primarily on knowledge, innovation, information technology, and employee competencies rather than physical assets, intellectual capital becomes a critical strategic resource. Effective utilization of human capital, structural capital, and capital employed enables banks to improve operational efficiency, service quality, innovation capability, and competitive advantage, all of which contribute to enhancing firm value.

The findings are consistent with Signaling Theory (Spence, 1973), which argues that firms can reduce information asymmetry by conveying credible information regarding their internal capabilities to investors. A higher VAIC reflects superior resource management and stronger value creation, providing a positive signal about future corporate performance. Investors may interpret this information as evidence of sustainable competitive advantage, leading to greater market confidence and ultimately higher firm value.

The results also reinforce previous empirical studies reporting a positive relationship between intellectual capital and firm value. These studies emphasize that efficient knowledge management enables firms to create long-term value and maintain competitiveness, particularly in knowledge-intensive industries such as banking. Accordingly, intellectual capital should be viewed not merely as an intangible asset but as a strategic driver of corporate value creation.

The Effect of ESG Score on Firm Value

The analysis reveals that the ESG Score does not have a statistically significant effect on firm value. Although the estimated regression coefficient is negative (-0.000076), the probability value of 0.9739 indicates that the relationship is statistically insignificant. Consequently, the second hypothesis (H2) is rejected.

This finding implies that ESG performance has not yet become a primary consideration for investors in valuing banking companies listed on the Indonesia Stock Exchange during the observation period. While many banks have strengthened sustainability initiatives and ESG disclosures, these efforts have not been fully reflected in market valuation. Investors may still prioritize traditional financial indicators, including profitability, earnings growth, and financial stability, over sustainability-related information when making investment decisions.

Another possible explanation is that the economic benefits of ESG implementation generally materialize over a longer time horizon. Investments in environmental management, social responsibility, and governance improvements often require substantial resources before generating measurable financial returns. Consequently, the market may not immediately incorporate ESG performance into firm valuation, particularly in emerging capital markets where ESG-based investment practices are still evolving.

From the perspective of Signaling Theory, ESG disclosure is expected to communicate a firm's commitment to sustainable business practices and responsible corporate governance. However, the present findings indicate that this signal has not been sufficiently strong to influence investor perceptions during the study period. This result suggests that sustainability information alone may not be adequate to increase firm value unless it is accompanied by stronger financial performance or clearer evidence of long-term economic benefits.

The findings are consistent with several previous studies reporting that ESG performance does not significantly affect firm value, particularly in developing markets. These studies argue that investors continue to place greater emphasis on short-term financial outcomes than on non-financial sustainability indicators when evaluating corporate performance.

The Simultaneous Effect of Intellectual Capital and ESG Score on Firm Value

The simultaneous regression analysis demonstrates that Intellectual Capital and ESG Score jointly have a significant effect on firm value. The F-test produced a probability value of 0.005739 , which is below the 5% significance level, confirming that the third hypothesis (H3) is accepted.

These results indicate that firm value is influenced by the combined contribution of multiple strategic factors rather than by a single determinant. Although only Intellectual Capital exhibits a significant individual effect, the joint significance of Intellectual Capital and ESG Score suggests that both variables collectively contribute to explaining variations in firm value. This finding highlights that sustainable corporate value is shaped by the integration of internal knowledge resources and sustainability-related business practices.

Within the framework of Signaling Theory, firms transmit information to investors through both financial and non-financial disclosures. Intellectual capital signals a firm's capability to generate innovation, operational efficiency, and long-term competitive advantage, whereas ESG performance reflects the organization's commitment to sustainable development and responsible governance. Together, these signals reduce information asymmetry and provide investors with broader insights into a company's future prospects.

Nevertheless, the relatively modest coefficient of determination indicates that firm value is also affected by numerous other factors beyond the scope of this study, including profitability, leverage, firm size, liquidity, macroeconomic conditions, and corporate governance quality. Therefore, future studies are encouraged to incorporate additional financial and governance variables to obtain a more comprehensive understanding of the determinants of firm value in Indonesia's banking industry.

CONCLUSION

This study examined the effects of Intellectual Capital and Environmental, Social, and Governance (ESG) Score on firm value among banking companies listed on the Indonesia Stock Exchange during the 2021–2024 period. The empirical findings demonstrate that Intellectual Capital has a positive and statistically significant effect on firm value, indicating that effective management of intellectual resources contributes to enhancing investors' perceptions and

increasing corporate market value. In contrast, the ESG Score does not show a significant influence on firm value, suggesting that ESG performance has not yet become a primary consideration for investors in valuing Indonesian banking firms. Nevertheless, the simultaneous test confirms that Intellectual Capital and ESG Score jointly have a significant effect on firm value. These findings highlight the strategic importance of Intellectual Capital as a key driver of value creation in the banking industry. Therefore, banking companies should continue strengthening human capital, organizational capabilities, innovation, and knowledge management to improve long-term competitiveness. Although ESG performance was not found to have a significant individual effect, continuous improvement in environmental, social, and governance practices remains essential to support sustainable business development and strengthen stakeholder confidence. Future studies are encouraged to expand the observation period, include additional sectors, and incorporate other determinants of firm value to provide more comprehensive empirical evidence.

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