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The Effect Of Big Data Technology On Financial Performance Ini Banking Companies With Cost Reduction On The Indonesia Stock Exchange

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ABSTRACT
Accroding to data from the financial service authority (OJK) the banking sector demostrated resilience to risk and economic crises by consistently recording profit with positive value in CAR and ROA. Owever, in recent years there has been a signification decline, accompanied by an increase in the operational expenses to operational income ratio (BOPO) wich requires future attention. Since banks play a crucial role as financial intermediaries their quality and soundness must be maintained to meet standards and prevent any negative impac on national economic stability. This research aims to examine the influence of big data technology on financial performance by consider cost reduction. The population of this study is a banking company listed on the Indonesia Stock Exchange in 2018-2023. By using purposive sampling in sample selection obtained 42 research samples over 6 firm-years. This research uses multiple regression analysis to test the hypothesis. The findings of this research reveal that big data technology does not have a significant effect on financial performance. Cost Reduction has a positive and significant influence on financial performance, indicating that cost reduction efforts contribute greatly to improving the company's financial performance. Big data technology simultaneously influences financial performance through cost reduction.

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INTRODUCTION

In the current era of incresing digitalization, data has become an essential and valuable resource for businesses. One of the sector most affected by advancements in information technology and data is the banking sector. Modern bank today face the challenge of effectively utilizing the avaliable data to enchance their business performance and operation efficiency (Nilashi et al., 2023). In this era of the 4.0 industrial revolution, companies are required ti maximize the utilization of the techonogy to support business processes making them easier to manage(Oncioiu et al., 2019). Humans and techonolgy are considered inseparable from one anoher. To stay competitive in an increasingly challenging business environment, business intelligence is essential for making informed decisions based on sure data analysis (Yudha Pratama et al., 2019). Data has become a critical aspect of business

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desicion making, especially in today's advantace era, where data growth is accelerating rapidly. The banking industry has undergone a significant transformation from traditional, physical institution to modern, data- driven financial entities(Raguseo & Vitari, 2017). This shift has been fueled by the advent of big data technology, which enables banks to analyze vast amounts of data for better decision making. Almost all banking companies now leverage large- scale data processing to offer a wider range of high quality product and service (Hasibuan & Oktaviana, 2023). Banks gather data form banking application on offline transaction across various branches, making it easier to used to monitor a company's financial activities, stock trading and business risks including fraud prevention, risk management and anti money laundering efforts. Give the dynamic nature of the stock fluctuations, accurate data analysis is crucial for shareholders. The use of network analytics and NPL can help detec illegal trading activites in financial markets (Putra, 2022).

Big data technologi provides valuable insights for banks to make informed decisions, enchance customer experiance and strimeline operations its processes vast amounts of data generated by digital transaction, enabling banks to detec fraud manage risk and improve cost efficiency. This technology also helps bank personalize their offerings to meet the unique needs of theri customer, resulting in increased efficiency and reduced costs (Nobanee et al., 2021). Big data processing can enchane cost effeciensy by optimizing resource allocation and introducing innovative financial products and services based on data driven insights. By offering customer service that cater to the preferences and needs of diverse audiences, bank stay a head of the competition. If big data technology can influence a company's financial performance, it can also impact cost reduction, as strong performance enchances cost reduction(Suoniemi et al., 2020). Accroding to data from the financial service authority (OJK) the banking sector demostrated resilience to risk and economic crises by consistently recording profit with positive value in CAR and ROA. Owever, in recent years there has been a signification decline, accompanied by an increase in the operational expenses to operational income ratio (BOPO) wich requires future attention. Since banks play a crucial role as financial intermediaries their quality and soundness must be maintained to meet standards and prevent any negative impac on national economic stability (Daljono, 2023).

Literature Review and Hypothesis Development

(Swanta Rahardja & Hariyanto, 2022)This research aims to assess the extent to which Big Data technology influences financial performance and competitive advantage in listed public banks in Indonesia. This research uses quantitative methods using secondary data. The population of this research consists of 43 public banks in Indonesia, with a sample size of 20 banks. (Jessica Naomi Theodora et al., 2023) lizing Resource-Based View (RBV) theory and Dynamic Capabilities theory, this research examines the impact of Big Data technology on company value which is mediated by financial performance. This research uses secondary data from 35 companies listed on the Indonesia Stock Exchange (BEI) and applies strong regression analysis using R Studio. Samppa et al. (2022) This research reveals that large data resources can improve company performance, especially when company capabilities are directed at market demand. (Aziz et al., 2023)According to this research, Big Data has

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changed the way banks operate, although the transformation is still in its infancy. This study emphasizes the significant potential of Big Data to improve banking operations.

Contigency Theory

Contigency theori is a framework for planing and utilizing information technology based on an organization's characteristics and the environmental conditions in wich the system is implemented. This theory emphasizes the need to focus on change, asuming that on single rule on law provides the best solution for every time, place or situation (Lisandra, 2022).

TAM Theory

Davis (1989) discusses several models designed to analyze and undertand the factor affecting the acceptance of computer technology, one of wich is the Technology Acceptance Model (TAM). TAM is a theoretical framework based on the idea that an individual's reactions and perpceptions about something will shape their attitude and behavior towards it. The model posits that users perceptions of technology will influence their attitude towards accepting it. TAM is used to describe how information technology is accepted or influenced by factor such as financial performance (Harsanto et al., 2023).

Big Data Technology

Big data refers to extremly large daasets that can be analyzed computationally to reveal patterns, trends and associations, patriculary those related to human behavior and interaction. It is characterized by high volume, velocity and variety of information that is processed and analyzed (Bajari et al., 2019). This data can include structured data (such as databased), unstructured data (such as social media posts) and semi structured data (such as web logs). The insight gained from big data analysis can lead to better decition- making and more strategic business movementn(Ertz et al., 2021) . In the banking sector, big data technology has significantly transformed banks operate, serve customer and make business decisions. Big data enables banks to optimize their operions by analyzing both internal and external data. For instance banks can use data analysis to forecast service demand, manage human resources more effectively and reduce operational cost (Priyambodo, 2023).

Financial Performance

Financial performance refers to the results or achievements obtained by an organization in executing its funcions to manage assets effectively over a specific period. It can be considered an analytical tool to assess how well an organization adheres to proper financial management practices in carrying out its activities. Performance serves as a benchmark for an organization's ability to manage and allocate its resources effectively. The success in achieving organization's overall accomplishment (Muchlis et al., 2021).

Cost Reduction

Cost reduction is manage activities related to the production process, aiming to reduce production by eliminating unnecessary expenses. Cost reduction focuses on reducing cost by addressing the root cause of waste, particulary in terms of quality. The gial of implementing cost reduction is not only meet established standards but also to gradualy reduce cost below these standars, thereby achieving business efficiency. This allows for minizing expenses while maximizing profits, all without compromising product quality, ensuring that it dose not negatively impac sales (Kusumawardani, 2023).

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METHODS

From the literture review and hypothesis development above, the identified variable relationship in the reserch model are as follows :

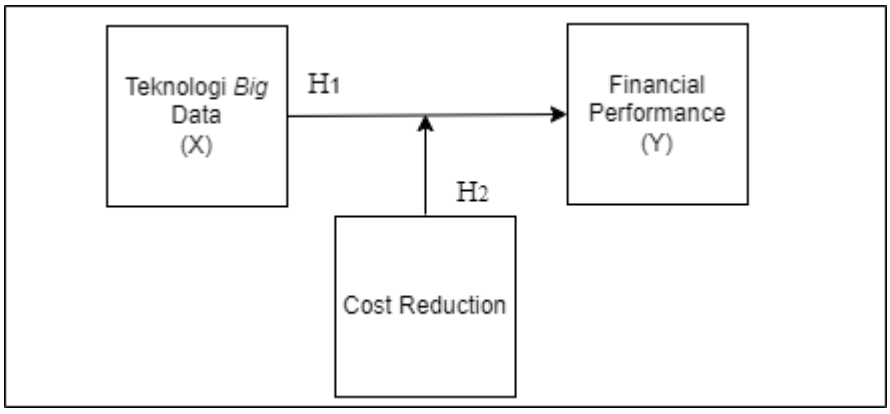

Figure 1. Framework of Thinking

The research method used is quantitative, which describes the relationship between variables using numerical data as research results. The sampling technique used is purposive sampling, where the sample is selected according to the research objectives, typical for quantitative research. Research data uses secondary data in the form of company financial reports with the following criteria: 1) Banking Companies Registered on the IDX 2018-2023; 2) Banking Companies that publish financial reports consecutively from 2018-2023; and 3) Banking Companies that disclose software accounts in their financial reports for 2018-2023 respectively. Based on this sampling method, a total of 6 banks in Indonesia were selected, resulting in a total of 42 samples used for this research. To statistically determine the influence of several independent factors on the dependent variable, quantitative data analysis is used.

Hypothesis formulation is the initial step in hypothesis testing, which involves determining whether there is an effect between variables. The null hypothesis (H0) indicates no effect between the independent and dependent variables, while the alternative hypothesis (Ha) suggests there is an effect on the dependent variable. Descriptive statistics are used to describe the characteristics of the known data. This approach is limited to presenting data in the form of tables, diagrams, charts, and other metrics.

Before conducting hypothesis testing, it's crucial to analyze whether there are deviations from classical assumptions in the regression model used in the research. Normality test is test aims to determine whether the residuals in the regression model are normally distributed. The Kolmogorov-Smirnov test in SPSS is used for this purpose. If the significance value (Sig) > 0.05, the residuals are normally distributed; if Sig < 0.05, they are not.

Multicollinearity test is test checks for correlations among independent variables in a regression model. A good regression model should not exhibit multicollinearity. The Variance Inflation Factor (VIF) is used, where VIF > 0.10 indicates no multicollinearity, and VIF < 0.10 indicates the presence of multicollinearity.

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Heteroscedasticity Test is test assesses whether the variance of residuals is constant across observations. Homoscedasticity (constant variance) is desirable, while heteroscedasticity (varying variance) is not. A good regression model should show homoscedasticity. Autocorrelation test is test checks for correlations between residuals across different time periods. The Durbin-Watson (DW) statistic is used to detect autocorrelation. If the DW value is between the upper bound (du) and (4-du), there is no autocorrelation; if it's lower than the lower bound (dl), there is positive autocorrelation; and if it's greater than (3-dl), there is negative autocorrelation.

Path analysis extends multiple linear regression. The path coefficients are standardized regression weights that compare indirect effects with direct effects. The regression equations in the research are:

$Bopo=\alpha+p1\cdot RPL+e1$

$CAR=\alpha+p3\cdot RPL+p2\cdot Bopo+e2$

Description:

Bopo = Operational Costs and Operational Income
RPL = Software Ratio
CAR = Capital Adequacy Ration
α = Constant
p1 = Path coefficient of RPL with Bopo
p2 = Path coefficient of Bopo with CAR
p3 = Path coefficient of RPL with CAR
e1 = Residual for Cost Reduction
e2 = Residual for Financial Performance

The coefficient of determination (R^2) is crucial in regression as it indicates how well the regression model explains the variation in the dependent variable (Y) based on the independent variables (X). An R^2 value close to 1 indicates that the independent variables explain most of the variation in the dependent variable, whereas an R^2 value close to 0 suggests limited explanatory power.

The F-test assesses the collective effect of the independent variables on the dependent variable. If the significance level is greater than 5% (F > 0.05), the model does not fit well. Conversely, if the significance level is less than 5% (F < 0.05), the model has a good fit.

The T-test evaluates the effect and significance of each independent variable on the dependent variable individually. At a 95% confidence level if the calculated t-value > table t-value (0.05), H0 is accepted, and Ha is rejected. If the calculated t-value < table t-value (0.05), H0 is rejected, and Ha is accepted

RESULTS AND DISCUSSION

In this discussion section, the researcher will reveal the findings that have been calculated according to the methodology used in the research methodology above regarding the influence of big data technology on financial performance through cost reduction using SPSS 25.0 for Windows statistical software. The discussion will be carried out using the classical assumption test, coefficient of determination test, T test, and F test. Due to statistical

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requirements, linear regression analysis using SPSS 25.0 for Windows statistical software must include the classical assumption test. by carrying out normality, multicollinearity, autocorrelation and heteroscedasticity tests. After passing these tests, the coefficient of determination test, path analysis, T test, and F test are then carried out to determine the effect of the independent variable on the dependent variable and intervening variables.

Statistic Descriptif

Big Data technology adoption shows significant variation among companies, with a minimum value of 0.00, indicating no adoption in some cases, and a maximum of 0.98, indicating near-full adoption in others. The standard deviation of 0.34886 reflects this variability. Financial performance varies slightly, with a minimum of 0.18 and a maximum of 0.55, and a small standard deviation of 0.06161 suggests overall stability in financial performance. Cost reduction efforts from 2018-2023 across 7 companies show an average of 0.7143, with some companies achieving minimal reductions (minimum 0.23) and others exceeding expectations (maximum 1.20). The standard deviation of 0.19504 indicates moderate variation in cost reduction success.

Table 1. Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Teknologi Big Data	42	0.00	0.98	0.4279	0.34886
Cost Reduction	42	0.23	1.20	0.7143	0.19504
Kinerja Keuangan	42	0.18	0.55	0.2481	0.06161
Valid N (listwise)	42				

Source: Secondary data processed using IBM SPSS 25, 2024

Normality Test

Based on the Kolmogorov-Smirnov normality test, the Asymp. Sig. (2-tailed) value of 0.200 indicates that the residuals are normally distributed or meet the classical assumption, as the probability value is greater than 0.05.

Table 2. One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		42
Normal Parameters[a,b]	Mean	0.0000000
	Std. Deviation	0.19061705
Most Extreme Differences	Absolute	0.102
	Positive	0.102
	Negative	-0.078
Test Statistic		0.102
Asymp. Sig. (2-tailed)		.200[c,d]

Source: Secondary data processed using IBM SPSS 25, 2024

Multicollinearirty Test

The multicollinearity test results indicate that there is no multicollinearity among the variables. This is evident as the VIF values do not exceed 10, and the tolerance values are not below 0.10.

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Table 3. Multicollinearirty Test

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Teknologi Big Data	0.955	1.047
	Cost Reduction	0.955	1.047

Source: Secondary data processed using IBM SPSS 25, 2024

Autokorelasi Test

This test examines the correlation between residuals in period t and anomalies in period t-1 within the regression model. The Durbin-Watson (D-W) test is used to detect signs of autocorrelation. Positive autocorrelation occurs if D-W < -2, negative autocorrelation if D-W > 2, and if -2 < D-W < 2, the data is free from autocorrelation. The table below shows a D-W value of 0.97, indicating that the study is free from autocorrelation issues since the D-W value falls within the acceptable range of -2.00 to 2.00, making the regression model suitable for use.

Table 4. Autokorelasi Test

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.497[a]	0.247	0.208	0.05482	0.971

Source: Secondary data processed using IBM SPSS 25, 2024

Heterokedasticity Test

The test results indicate that the independent variables overall do not exhibit heteroskedasticity, except for Cost Reduction. The coefficient for Cost Reduction is statistically significant (p = 0.001), with a significance value below 0.05. This suggests that cost reduction has a significant impact on the variability of the residuals, implying that changes in Cost Reduction may be associated with heteroskedasticity. Therefore, the researcher recommends further investigation into the relationship between Cost Reduction and financial performance in future studies.

Table 5. Heterokedasticity Glejser Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.136	0.033		4.169	0.000
	Teknologi Big Data	-0.002	0.025	-0.014	-0.098	0.922
	Cost Reduction	0.158	0.045	0.500	3.514	0.001

Source: Secondary data processed using IBM SPSS 25, 2024

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Coefficient of Determination (R-squared)

Table 6. Coefficient of Determination (R-squared) Model 1

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.233[a]	0.054	0.031	0.12089

Source: Secondary data processed using IBM SPSS 25, 2024

Table 7. Coefficient of Determination (R-squared) Model 2

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.398[a]	0.159	0.116	0.03467

Source: Secondary data processed using IBM SPSS 25, 2024

The two tables above indicate that the adjusted R^2 for Model 1 is 0.031, and for Model 2, it is 0.116. This suggests that the independent variables have an effect on the dependent variable, with the first regression model explaining 3.1% of the variance, while the second model explains 11.6%. The remaining variance is influenced by factors outside the regression model.

Path Analysis

The t-value of 1.264, which is below 2, indicates that the effect of Big Data Technology on Cost Reduction is not significant (p-value > 0.05). This implies that an increase in Big Data Technology usage does not significantly reduce costs in the studied companies. Although the coefficient of 0.169 suggests that a one-unit increase in Big Data Technology would lead to a 0.169 unit increase in Cost Reduction, this effect is not statistically significant given the high p-value. The coefficient for Cost Reduction is 0.158 with a significance value of 0.001, indicating a positive and significant effect on Financial Performance. This means that each one-unit increase in Cost Reduction leads to a 0.158 unit increase in Financial Performance.

Although Big Data Technology does not show a significant direct effect on Financial Performance, the data suggests that Big Data Technology can indirectly improve Financial Performance through Cost Reduction. Model 1 indicates that the relationship between Big Data Technology and Cost Reduction is not significant, but Model 2 demonstrates that Cost Reduction significantly impacts Financial Performance. This means that while Big Data Technology does not directly influence Financial Performance, the cost savings generated from its implementation can enhance Financial Performance. In other words, the cost efficiencies achieved through the use of Big Data Technology can contribute to improving Financial Performance.

Table 8. Path Analysis Model 1

Coefficients						
Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	0.694	0.074		9.432	0.000
	Teknologi Big Data	0.169	0.134	0.196	1.264	0.214

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Table 9. Path Analysis Model 2

Coefficients						
Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	0.136	0.033		4.169	0.000
	Teknologi Big Data	-0.002	0.025	-0.014	-0.098	0.922
	Cost Reduction	0.158	0.045	0.500	3.514	0.001

Source: Secondary data processed using IBM SPSS 25, 2024

T-Test

The test evaluates the combined effect of independent variables on the dependent variable. This relationship is considered significant if the result is less than 0.05. The table below shows a significance value less than 0.05, indicating that the independent variables collectively (simultaneously) have a significant relationship with the dependent variable.

Table 10. T-Test Model 1

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std.Error	Beta		
1	(Constant)	0.109	0.030		3.663	0.001
	Teknologi Big Data	0.082	0.054	0.233	1.518	0.137

Source: Secondary data processed using IBM SPSS 25, 2024

Table 11. T-Test Model 2

T-Test						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.001	0.021		0.038	0.970
	Teknologi Big Data	-0.027	0.016	-0.257	-1.710	0.095
	Cost Reduction	0.069	0.028	0.364	2.420	0.020

Source: Secondary data processed using IBM SPSS 25, 2024

Bopo =0.109+0.082·RPL+e1
CAR =0.001+0.082·RPL+0.069·Bopo+e2

The significance value for the constant is 0.001, indicating that the constant in this model is significant at the 0.05 level. However, the variable "Big Data Technology" is not significant, with a significance value of 0.137, which is greater than 0.05. This suggests that Big Data Technology does not have a significant effect on Bopo in this model. In Model 2, the constant is not significant with a significance value of 0.970, implying that when all independent variables are zero, CAR does not differ significantly from zero. Additionally, "Big Data Technology" is also not significant (significance value of 0.095), indicating that its effect on CAR is not significant at the 0.05 level. However, "Cost Reduction" shows a significant

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coefficient of 0.069 with a significance value of 0.020, meaning that cost reduction has a positive and significant effect on CAR.

F-Test

This test explains the combined effect of the independent variables on the dependent variable. The relationship is considered significant if the results show a value of < 0.05. The table below indicates a significance value of < 0.05, suggesting that the independent variables collectively have a significant relationship with the dependent variable.

Table 12. F-Test Model 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.070	1	0.070	1.877	.178[b]
	Residual	1.490	40	0.037		
	Total	1.560	41			

Source: Secondary data processed using IBM SPSS 25, 2024

Table 13. F-Test Model 2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.038	2	0.019	6.394	.004[b]
	Residual	0.117	39	0.003		
	Total	0.156	41			

Source: Secondary data processed using IBM SPSS 25, 2024

Hypothesis Testing

In the hypothesis testing, we evaluated two hypotheses using the T-Test results: Hypothesis H1 posits that Big Data Technology has a direct effect on Financial Performance. The analysis shows that Big Data Technology has a coefficient of -0.027 with a t-value of -1.710 and a significance level of 0.095. Since this p-value exceeds the 0.05 threshold, it indicates that the effect of Big Data Technology on Financial Performance is not statistically significant. Therefore, Hypothesis H1 is rejected, suggesting that Big Data Technology does not have a meaningful direct impact on Financial Performance.

Hypothesis H2 examines whether Big Data Technology influences Financial Performance through Cost Reduction. The coefficients for this model show that Cost Reduction has a coefficient of 0.069 with a t-value of 2.420 and a significance level of 0.020, which is less than 0.05. This indicates that Cost Reduction significantly affects Financial Performance. Although Big Data Technology itself does not show a significant direct effect on Financial Performance, its impact on Cost Reduction is significant. This implies that Big Data Technology contributes to improved Financial Performance indirectly by enhancing Cost Reduction. Thus, Hypothesis H2 is accepted, confirming that the positive effects of Big Data Technology on Financial Performance are mediated through its influence on Cost Reductionp.

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CONCLUSION

The findings of this research reveal that big data technology does not have a significant effect on financial performance. Cost Reduction has a positive and significant influence on financial performance, indicating that cost reduction efforts contribute greatly to improving the company's financial performance. Big data technology simultaneously influences financial performance through cost reduction.

ACKNOWLEDGEMENT

Data from 42 banks over 2018-2023 limits the study's generalizability. Larger samples or cross-country data could improve results. Variation in Big Data adoption was not fully explored, which could affect understanding of its impact. The study focused on Big Data, cost reduction, and financial performance, missing other factors like management quality or economic conditions. Events like the COVID-19 pandemic were not accounted for, which may have influenced the results. Basic statistical methods were used; more complex analyses could offer deeper insights. Using only one indicator may not fully capture financial perfomance. Multiple indicators could provide a better picture.

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