Asia Pacific Fraud Journal
E-ISSN: 2502-695X, ISSN: 2502-8731
Volume 9, Issue 1 (January-June) 2024
*Asia Pacific Fraud Journal now has been accredited "**SINTA 3**" by Ministry of Research and Technology of The Republic of Indonesia (No SK. 225/E/KPT/2022).*
Available online at: http://apfjournal.or.id/index.php/apf

Evaluating the Impact of Digital Transformation and Sustainability Strategies on Earnings Management: A Text Mining Approach

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ARTICLE INFORMATION
Article History:
Received July 28, 2023
Revised October 19, 2023
Accepted June 2, 2024

DOI:
10.21532/apfjournal.v9i1.339

ABSTRACT
Digital transformation has the potential to fundamentally change companies and create value. This study examines the impact of digital transformation and sustainability strategies on the earnings quality of Indonesian listed companies on three sectors: infrastructures, transportation and logistics, and consumer non-cyclicals. Using text mining techniques to measure intensity of digital transformation and sustainability strategies, we found that sustainability strategy shown in the company's annual report reflects lower level of earnings management especially in accrual earnings management, while companies with digital transformation strategy, particularly in artificial intelligence technology, are less likely to engage real earnings management. Findings of this study provide insights into the effect of digital transformation and sustainability on the quality of accounting information and corporate governance, and offer implications for corporate digital transformation and government regulation.

Keyword: Digital Transformation, Sustainability, Earnings Management, Text Mining

How to Cite:
Wibowo, A. S., Istianah, I., Sari, N. P., Septiari, D. (2023). Evaluating the Impact of Digital Transformation and Sustainability Strategies on Earnings Management: A Text Mining Approach. *Asia Pacific Fraud Journal, 7*(2), 49-64. http://doi.org/10.21532/apfjournal.v9i1.339.

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1. INTRODUCTION

We evaluated the impact of digital transformation and sustainability strategies on the earnings quality of Indonesian listed companies. The rise of Industrial Revolution 4.0 and the country's commitment to the Sustainable Development Goals (SDGs) have been translated as digital transformation and sustainability strategies. However, even though they have been embraced by business and public sector entities in Indonesia, their impacts on financial reporting quality have yet to be fully understood. Hence, our interest is in explaining the impacts of digital transformation and sustainability strategies along with the key influential factors operating in the country. Our research is part of an ongoing effort by the Indonesian government to accelerate digital transformation and achieve digital sovereignty while committing to SDGs achievement by 2030. With the rapid growth of digital transformation, its consequences on financial reporting quality outcome have become an important topic in academic discussions (Wang, 2021; Jia et al., 2022; Li et al., 2023; Choi et al., 2020; Dissanayake et al., 2023; Grimaldi et al., 2020; Nguyen, 2022; Velte, 2019). Digital transformation and sustainability strategies are relevant to earnings management practice. Digital transformation strategy enabled companies to leverage their earnings to improve their competitive position in the long term and performance on key revenue driver metrics (Tavoletti et al., 2021). Sustainability becomes a cornerstone strategy for companies in building trust with their stakeholders that concern themselves with operational activities and financial reporting practices. Since earnings management practice varies across countries (Wijayana & Gray, 2019), it is therefore imperative to evaluate its driving factors in the context of digital transformation and sustainability strategies adopted by Indonesian companies.

Digital transformation is the rapid and extensive integration and utilization of digital technologies in business environments (Kretschmer & Khashabi, 2020). It has the potential to bring changes in the company's fundamentals and create values. The changes primarily revolved around the growing utilization of information technologies and data, presenting significant challenges across various organizational aspects (Jardak & Ben Hamad, 2022). Companies had been benefited from the transformation, such as by enhanced innovation (Lyytinen et al., 2016; Vey et al., 2017), improved the speed of decision making (Grover & Kohli, 2013), increased competition (Sia et al. 2016; Weill & Woerner 2015). Given the importance of digital transformation for business, the government of Indonesia has created a Digital Roadmap for Indonesia 2021 - 2024 as a strategic guide for realizing the national digital transformation (Hani, 2023). In addition, companies such as PT Telkom Indonesia and PT Microsoft Indonesia have announced cooperation to accelerate digital transformation and achieve digital sovereignty in Indonesia. These efforts aim to strengthen Indonesia's digital economy and accelerate Telkom Group's business transformation across Indonesia (Center, 2021). COVID-19 pandemic brought acceleration on the digital transformation by various organizations to meet the changing needs and expectations of their customers, employees, and stakeholders (Burlea-Schiopoiu et al., 2023).

In the accounting research domain, digital transformation has received a great deal of attention among scholars in these past years. Current research streams have documented both benefits and challenges brought about by the transformation across business activities. Manita et al. (2020) reported that digital transformation improved audit quality, expanding audit offerings, creating new auditor profiles and enabling a culture of innovation within audit firms. In the capital market stream, Wu et al. (2022) argued that digital transformation could greatly lower the danger of stock price crashes by lowering information asymmetry, enhancing information transparency,

bolstering internal control, enhancing information disclosure, and organizational performance. However, in the taxation stream, Chen and Meng (2023) found a negative association between the degree of corporate digital transformation and tax compliance. Using data from companies listed on the Shanghai and Shenzhen stock exchanges, the study found that the greater the degree of digital transformation, the more aggressive corporate tax avoidance behavior was.

Research on digital transformation and sustainability have also developed in the area of financial reporting quality. The topics are especially relevant to earnings management practice in the companies. Since earnings management is about manipulating a company's financial results to meet or exceed expectations, earnings management can be viewed as a fraudulent misstatement defined as a deliberate or reckless misrepresentation of facts or opinions with the intent to mislead a party or to coerce an action or omission as a result of the misrepresentation (IAASB, 2009; Thorps & Harding, 2020). Using data of Chinese listed companies from 2010 to 2020, Jia et al. (2022) found a dual role of digital transformation in financial reporting. On one hand, the study revealed that digital transformation reduced real earnings management by reducing information asymmetry. On the other hand, digital transformation increased accrual earnings management because it reduced the employment of big four accounting firms by increasing the bargaining power of firms and reducing the dependence on external audit, hence increasing pressure to commit real earnings management. In the same vein, accounting scholars also pay their attention to the communication of sustainability practices by companies through the companies' annual reports. An exploratory study by Grimaldi et al. (2020) revealed a negative association between sustainability engagement and earnings management.

Despite the current efforts on achieving digital transformation and SDGs agenda in Indonesia, academic discussions on their consequences on financial reporting quality are still sparse. This leads us to the research questions in this study as follows:

RQ1: What are the impacts of digital transformation strategy on the accrual and real earnings management (AEM) in Indonesian listed companies?

RQ2: What are the impacts of sustainability strategy on the accrual and real earnings management (REM) in Indonesian listed companies?

This study, therefore, extended Jia et al. (2022) and Grimaldi et al. (2020) by exploring the impact of digital transformation and sustainability strategies in a different country setting. We examined the impacts of these two strategies on AEM and REM of Indonesian listed companies from 2020 to 2022, specifically in infrastructures, transportation and logistic, and consumer non-cyclicals industries as they have been greatly implementing digital transformation strategy due to COVID-19 pandemics (Indonesian Statistics Bureau, 2020).

Using text mining techniques to measure intensity of digital transformation and sustainability strategies as suggested by Wu et al. (2022) and He et al. (2023), we found that sustainability strategy shown in the company's annual report reflects lower level of earnings management especially in AEM, while, strategy related to digital transformation did not significantly affect the level of both AEM and REM. Our study contributes to the intersection between financial accounting and information systems literature in three ways. First, this study employs a machine learning text analysis method to measure the level of digitalization and sustainability to explore how digital transformation and sustainability affect the earnings management of Indonesian listed companies from 2020 to 2022. Second, this study provides a new alternative measurement of sustainability, namely the

frequency of related keywords using text mining. Finally, this study provides insight into the effect of digital transformation and sustainability on the quality of accounting information and corporate governance, and offers implications for corporate digital transformation and government regulation.

The rest of this document is organized as follows. The next section outlines the literature review and hypotheses development. Section 3 describes the methodology of the study. Section 4 presents empirical results and is followed by discussion in Section 5. Section 6 concludes and highlights limitations and suggestions for possible future research.

2. LITERATURE REVIEW AND HYPOTHESIS

Earnings Management

Earnings management is the accounting discretion managers employ to affect the reported earnings of their firms (Gisbert & García, 2003). On the other hand, agency theory clarified earnings management behaviour due to a conflict of interest between managers and shareholders, which emerged from public businesses' separation of ownership and control (Jensen & Meckling, 1976). Earning management can be used for various reasons, such as achieving or exceeding earnings targets, controlling the terms of contracts, or dodging governmental attention. Zang (2012) claimed that this technique was employed to enhance the perceived financial standing of the company. Earnings management could be achieved through accounting practices, such as accruals manipulation, asset sales, write-offs, revenue recognition, or tax expense. The consequences of managing earnings encompass the aspects of quality, reliability, and comparability of financial reporting and the valuation and allocation of resources in the capital markets.

Earnings management comes in two forms: real and accrual. Nonetheless, there is a chance that both types will negatively impact a firm's cash flow and future performance (Cohen et al., 2008). REM entails intentionally modifying reported earnings in a particular direction by adjusting the timing or structure of a business operation, investment, or financial transaction (Zang, 2012). Based on this approach, managers would utilize actual business operations to adjust earnings figures (Cohen et al., 2008). REM might include adjusting the quantities produced, varying discretionary spending, or shifting the sales schedule.

Accrual earnings management (AEM) is a technique where managers manipulate the estimates or accounting methods used to present transactions in financial statements, thereby altering the appearance of a company's financial situation (Zang, 2012). This form of earnings management involves adjusting reported earnings using accounting estimates and methods (Cohen et al., 2008). AEM may include changes to revenue recognition policies, depreciation procedures, or bad debt reserves. The techniques of AEM can be seen in managerial adjustments to the fixed asset depreciation method or the provision estimate for questionable accounts. These adjustments can skew reported earnings in a particular direction without altering the underlying transactions, providing managers with a tool to influence the perception of the company's financial performance.

Digital Transformation

The process of utilizing sophisticated and cutting-edge technologies to enhance an organization's corporate reporting procedures and processes is known as digital transformation. On the organization's information management, decision-making, stakeholder involvement, sustainability, and transparency, it might have a variety of effects (Lombardi and Secundo, 2020). Digital transformation is the all-encompassing application of digital technology to integrate product design, production, marketing, and feedback before changing the company model, reorganizing the workforce, and

enhancing consumer interactions. Digital transformations are a conglomeration of information, computer, communication, and connectivity technologies that are frequently called agents of organizational transformation (Hess et al., 2016).

Digital transformation has various impacts on organization and business, such as changing the role of audit as a governance mechanism, improving audit quality, expanding audit offerings, creating new auditor profiles and enabling a culture of innovation within audit firms (Manita et al., 2020). By lowering information asymmetry, enhancing information transparency, bolstering internal control, enhancing information disclosure, and enhancing organizational performance, digital transformation of businesses could greatly lower the danger of stock price crashes (Wu et al., 2022). The economy and society are both impacted by the digital transition in some ways. First, it might reduce waste and supply chain decontamination by a factor of 10-100X1, as well as carbon dioxide emissions by at least 20%, the use of natural resources in products, and 90%. Second, it could improve agility, flexibility, data-driven decision-making, collaboration, open culture, customer centricity, and innovation. The gig economy, disruptive technology, and data analytics are examples of new business models and value propositions that can be produced by it. Fourth, it could increase customer and business productivity, efficiency, convenience, and usability (Lombardi & Secundo, 2020).

Digital Transformation Strategy and Earnings Management

The impact of digital transformation on earnings management varies depending on a company's ownership, technology, and geography. REM, which is based on altering actual business operations, was deterred by digital transformation, while AEM, which is based on altering accounting policies and estimates, was increased (Jia et al., 2022). Li et al., (2023) found that firms in the program's pilot cities tend to reduce accrued revenue management and improve real revenue management. They also noted that information technology could reduce audit delays and financial reconciliations, amplify media coverage of original news, boost investor donations, enhance analyst coverage, and forecast accuracy. These implied that digital transformation can affect the firm's choice of earnings management strategy. Li et al. (2023) suggested that technology information could reduce the information search cost and improve the monitoring efficiency of stakeholders, which could inhibit the firm's AEM but encouraged the firm's REM practices.

Digital transformation increased the pressure on earnings by requiring more investment in R&D, technology, and innovation (Jia et al., 2022). This reduces the short-term profitability of firms and makes them face higher expectations from the capital market and analysts. Then, this situation will increase the manager's motivation to do AEM to smooth earnings and maintain stable performance immediately. Besides, digital transformation would reduce the employment of big four accounting firms by increasing the bargaining power of firms and reducing the dependence on external audit (Jia et al., 2022). The big four accounting firms have higher audit quality and lower tolerance for managers' opportunism (Jia et al., 2022). They are more likely to issue non-standard opinions and constrain AEM. By avoiding the big four accounting firms, firms can increase the space for accrual earnings management.

H_{1a}: Firms with digital transformation strategy are more likely to engage in accrual earnings management (AEM).

Jia et al. (2022) suggested that digital transformation reduced the level of REM. It is because digital transformation will reduce information asymmetry. By using digital technologies and governance mechanisms, organizations can better manage the information they collect and

use it to support their digital transformation efforts (Aben et al., 2021). In addition, the quality of internal control will be enhanced by digital transformation. Wang et al. (2023) suggested the development and efficacy of an organization's internal control systems were significantly impacted by its digital transformation. This transformation led to improvements in areas such as risk assessment, control activities, and information and communication, which are all important components of internal control. Furthermore, digital transformation also raises analysts' following. Analysts play an important role in earnings management as gatekeepers by providing an independent assessment of a company's financial performance and future prospects, which can help to reduce information asymmetry between the company and its investors. Analysts can help to discourage companies from engaging in earnings management by providing accurate and unbiased analysis. Digital transformation will help the analysts work more efficiently and effectively. These factors that we discussed above in the end will limit the managers' ability and motivation to manipulate real earnings management by changing real business activities.

H_{1b}: Firms with digital transformation strategy are less likely to engage in real earnings management (REM).

Sustainability Strategy and Earnings Management

Some previous studies defined sustainability as a form of intergenerational ethics that aims to ensure that present actions should be sustainable and not compromise the opportunities of future generations. This definition is derived from the concept of sustainability in business and ethics, which states that a corporation must take into account not just its financial performance but also its effects on society and the environment in order to succeed over the long run. The studies also referred the Sustainable Development Goals (SDGs) of the United Nations General Assembly as a framework for business sustainability in areas like poverty, inequality, environmental degradation, and climate change (Choi et al., 2020; Dissanayake et al., 2023; Gonçalves et al., 2021; Guevara et al., 2021; Velte, 2019).

Sustainability reflected a long-term perspective and a commitment to ethical and transparent reporting, which reduced the incentives and opportunities for earnings management (Choi et al., 2020; Dissanayake et al., 2023; Grimaldi et al., 2020; Nguyen, 2022; Velte, 2019). Companies that place a high priority on sustainability consider how their decisions will affect society, the environment, and the economy over the long run. They strive to operate in a manner that is ecologically conscious, socially fair, and financially sustainable. By doing so, they can create value for their stakeholders while also contributing to the well-being of future generations. Also, by reporting on their sustainability performance, companies can show that they are taking these commitments to ethical, environmental, and social issues seriously and are working to address them in a responsible manner. This can help in fostering confidence among stakeholders, including investors, clients, and staff members. This argument leads us to conclude that the companies who engage more in sustainability practices are less likely to manipulate their accounting information for personal or organizational benefits.

H_{2a}: Firms with sustainability strategy are less likely to engage in accrual earnings management (AEM).

H_{2b}: Firms with sustainability strategy are less likely to engage in real earnings management (REM).

3. METHODS

Sample Selection and Data Sources

Our samples consisted of companies listed in the Indonesian Stock Exchange on three sectors: infrastructures, transportation and logistics, and consumer non-cyclicals from 2020 to 2022. Initial data consisted of 184 firm-year and after cleaning for incomplete

and outlier data, the final sample was 169 firm-year. To capture and measure the strategy used by companies, we followed the approach by Wu et al. (2022) and He et al. (2023) who employed text mining techniques. We calculated the frequency of occurrence of digital transformation and sustainability-related keywords in annual reports of listed companies as a proxy indicator for the level of digital transformation and sustainability strategy of a company. However, different from Wu et al. (2022) approach that used the natural logarithm of the number of words appeared, we used the percentage of particular words from total unique words in a document. We consider this measure would be superior in the sense that it omitted the likelihood of bias for companies with extremely massive or small number of words used in the document as there are no standards that limit the number of pages and words in Indonesian company annual reports.

Measurement of Variables and Empirical Models

We adopted Jones' model (Jones, 1991) to measure the AEM and REM by Roychowdhury (2006) and Cohen et al. (2008) with the detailed models shown in the Appendix I. To test the research hypotheses, the variables Digitalization and Sustainability were used. The percentage of words related to sustainability in annual reports (Sust_perc) was used as a proxy for sustainability reporting. Meanwhile, the percentage of digitization-related words in the annual report (Digi_perc) was used as a proxy for digitization strategy. Furthermore, we dismantled the technology used in digital transformation strategy into three variables: artificial intelligence (ai_perc), big data (bigdata_ perc), and cloud computing (cloud_ perc). Moreover, this present study used control variables to have an influence on earnings management, as have been shown by previous studies. These control variables were related to company size, profitability, efficiency, and financial pressures. The natural logarithm of total assets (Size_ln) was used as a proxy for company size. Larger companies may have more opportunities and incentives to engage in AEM or REM, but they also face more scrutiny and regulation. Return on assets (ROA) was used as a measure of profitability. Companies that are more profitable may have less need to manipulate profits, but they also face more pressure to maintain or improve their performance. The asset turnover ratio (ATO) was used as an indicator of efficiency. More efficient firms may have higher earnings quality and lower the AEM or REM, but they can also use REM to increase their efficiency ratios. Finally, the FinDist variable represents a proxy for financial stress based on z-score calculations. Companies in financial distress may have more incentive and motivation to manipulate earnings, either to avoid bankruptcy or to attract external financing. After calculating the level of AEM and REM, the regression models to test hypotheses are as followed:

AEM3it= b0 + b1*Sustainability/Digitalization + bi * Control Var it + ε

REM3it= b0 + b1*Sustainability/Digitalization + bi * Control Var it + ε

4. RESULTS AND DISCUSSION

Figue 1 showed the result of descriptive statistics used for hypothesis testing. The mean of AEM and REM were 0.110 and -0.006 respectively. This suggested that REM was relatively less pronounced compared to AEM in the sample we used. FinDist mean was 0.083 indicating there were around 8 percent of the companies observed were under financial distress.

The correlation matrix showed that most of the variables having less than 0.5 correlation coefficient indicated there were no multicollinearity issues, except for ATO with ROA and Digi_perc with bigdata_perc and cloud_perc. This was expected due to the specific technology variables that indeed were the breakdown of the digital transformation, therefore we conducted independent tests for digi_perc

and specific digital technology testings (Figure 2).

Regression Results

Figure 3 showed the result for hypotheses H_{1a} and H_{2a} testings. The regression results for testing AEM showed that Sust_perc was significant at 5 percent level, while digitalization as proxied by Digi_perc was not statistically significant although having positive coefficient as expected.

Figure 4 reported the result in the REM testing, where both Sust_perc and Digi_perc were not statically significant and many control variables also did not show significant relationship. However when we observe specific technology used in digital transformation, we found that artificial intelligence (AI) technology was statistically significant at 1 percent level. Therefore, this study result partly supports H1b. This might be due to the sample limitation being only a fraction of companies engaged in REM that may not reflect the true population. However,

Figure 1. **Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
Size_ln	169	14.362	33.256	26.326	3.638
ATO	169	-6.092	11.172	0.715	2.079
ROA	169	-8.728	9.949	0.203	1.929
FinDist	169	0.000	1.000	0.083	0.276
AEM	169	0.000	0.951	0.110	0.144
REM	169	-0.406	0.416	-0.006	0.135
Words_count	169	14958	571832	152293	90052
Digi_count	169	6	958	118.24	158.15
Sust_count	169	2	657	100.92	113.28
ai_count	169	0	68	6.30	9.81
bigdata_count	169	2	382	54.72	60.41
cloud_count	169	0	100	2.89	10.10
Digi_perc	169	0.002	0.676	0.075	0.099
Sust_perc	169	0.001	0.477	0.068	0.082
ai_perc	169	0.000	0.030	0.004	0.006
bigdata_perc	169	0.001	0.296	0.035	0.035
cloud_perc	169	0.000	0.049	0.002	0.006

Source: Data Processed

Figure 2. **Correlation Matrix**

	Size_ln	ATO	ROA	FinDist	AEM	REM	Digi_perc	Sust_perc	ai_perc	bigdata_perc	doud_perc
Size_ln	1										
ATO	-0.111	1									
ROA	-0.013	0.741	1								
FinDist	0.230	-0.103	-0.038	1							
AEM	-0.224	-0.141	-0.247	0.020	1						
REM	-0.045	-0.393	-0.320	0.157	0.177	1					
Digi_perc	0.272	0.168	0.060	0.214	-0.028	-0.106	1				
Sust_perc	-0.225	0.045	-0.051	-0.119	-0.113	0.000	-0.013	1			
ai_perc	0.145	0.189	0.145	0.052	-0.069	-0.277	0.437	0.037	1		
bigdata_perc	0.228	0.151	0.083	0.233	-0.063	-0.083	0.894	-0.021	0.404	1	
doud_perc	0.212	0.117	0.093	0.276	0.001	-0.040	0.791	-0.015	0.397	0.803	1

Source: Data Processed

the negative relationship as shown by the negative coefficient of Sust_perc and Digi_perc was consistent with the hypothesis proposed.

In addition, we also conducted an additional analysis of an independent t-test to examine whether financial distress affects the preferred strategy used by the

Figure 3. **Regression Results for AEM**

Model	Variables	Parameter Estimate	Standard Error	tValue	Pr > |t|	
Digitalization	Intercept	0.2852	0.0646	4.4145	<.0001	***
	Size_ln	-0.0067	0.0025	-2.7391	0.0066	***
	ATO	0.0037	0.0073	0.5035	0.6151	
	ROA	-0.0221	0.0078	-2.8403	0.0049	***
	FinDist	0.0431	0.0271	1.5911	0.1129	
	Digi_perc	0.0344	0.0928	0.3710	0.7109	
	Digi_perc	0.0507	0.0922	0.5500	0.5827	
Digitalization (Specific technology)	Intercept	0.3690	0.0810	4.5470	<.0001	***
	Size_ln	-0.0090	0.0030	-3.0160	0.0030	***
	ATO	0.0040	0.0080	0.5410	0.5890	
	ROA	-0.0220	0.0080	-2.6700	0.0080	***
	FinDist	0.0280	0.0410	0.6870	0.4930	
	ai_perc	-0.4720	1.9870	-0.2370	0.8130	
	bigdata_perc	-0.5710	0.5190	-1.1000	0.2730	
	cloud_perc	4.3490	3.1300	1.3900	0.1670	
Sustainability	Intercept	0.3178	0.0646	4.9173	<.0001	***
	Size_ln	-0.0073	0.0024	-3.1082	0.0021	***
	ATO	0.0066	0.0071	0.9301	0.3532	
	ROA	-0.0248	0.0077	-3.2155	0.0015	***
	FinDist	0.0440	0.0263	1.6771	0.0948	*
	Sust_perc	-0.2709	0.1170	-2.3149	0.0214	**

Source: Data Processed

Figure 4. **Regression Results for REM**

Model	Variables	Parameter Estimate	Standard Error	tValue	Pr > |t|	
Digitalization	Intercept	0.1101	0.0738	1.4921	0.1376	
	Size_ln	-0.0038	0.0028	-1.3401	0.1820	
	ATO	-0.0227	0.0072	-3.1713	0.0018	***
	ROA	-0.0032	0.0075	-0.4245	0.6718	
	FinDist	0.0592	0.0344	1.7223	0.0869	*
	Digi_perc	-0.0592	0.1057	-0.5600	0.5762	
Digitalization (Specific technology)	Intercept	0.1155	0.0718	1.6080	0.1098	
	Size_ln	-0.0034	0.0027	-1.2541	0.0047	***
	ATO	-0.0200	0.0070	-2.8689	0.5575	
	ROA	-0.0043	0.0073	-0.5879	0.0675	*
	FinDist	0.0667	0.0362	1.8410	0.4930	
	ai_perc	-5.2275	1.7581	-2.9734	0.0034	***
	bigdata_perc	-0.0999	0.4592	-0.2176	0.8280	
	cloud_perc	2.2267	2.7690	0.8041	0.4225	
Sustainability	Intercept	0.1190	0.0759	1.5684	0.1187	
	Size_ln	-0.0043	0.0028	-1.5290	0.1282	
	ATO	-0.0237	0.0070	-3.4073	0.0008	***
	ROA	-0.0026	0.0074	-0.3494	0.7273	
	FinDist	0.0559	0.0340	1.6437	0.1021	
	Sust_perc	-0.0058	0.1216	-0.0474	0.9622	

Source: Data Processed

company when faced with such conditions. The results as documented in Appendix II showed that companies with financial distress were less likely to implement digital transformation strategy and engage in REM.

Analysis and Discussion

The test results of this study support hypothesis H2a, that firms with sustainability strategies are less likely to engage in AEM. Furthermore, we also find evidence that partly supports hypothesis H1b, in which strategy in specific technology of digital transformation (i.e AI) may lower the likelihood of REM. The findings indicate that companies strategy for subsequent years as reflected in their previous annual report might provide valuable insight into the likelihood of a firm committing accrual and real earnings management. The approach to measure the specific strategy from the annual report with text mining in this study also provides an opportunity for researchers to analyze textual data and the relationship with financial data.

Findings about the relationship between corporate strategy in annual reports and the likelihood of earnings management in the previous studies are still limited as measures for such research might not be easily accessible. For example, a sustainable strategy by a company might be difficult to measure as not every company voluntarily provides a sustainability report. Metrics like environmental, social and governance (ESG) scores are also still limited for some companies as from our samples, there were only 13 out of 96 companies that have ESG scores available. This also applies for digital transformation strategy by a company that may not easily capture the available structured report. The data mining approach proposed by this study provides an alternative approach that might not be fully explored by previous study to efficiently capture company strategy from unstructured data.

5. CONCLUSION

The study examines the impact of digital transformation and sustainability strategy as indicated in the company annual report on the likelihood of earnings management by using company data from three sectors namely infrastructures, transportation and logistics, and consumer non-cyclicals listed on the Indonesia Stock Exchange from 2020 to 2022. Results show companies that present more concern on sustainability issues in their annual reports may have higher corporate social responsibility and lower earnings management, but they may also use earnings management to enhance their reputation or legitimacy. Meanwhile, companies that adopt more digitization initiatives may have higher innovation and growth potential and lower AEM or REM but they may also use accrual or real earnings management to signal their competitive advantage or future prospects. Overall, this study shows that sustainability strategies shown in company annual reports reflect lower levels of earnings management especially in AEM, while on the other hand, strategies related to digital transformation did not significantly affect the level of both accrual and real earnings management.

Our study contributes to the inter-section between financial accounting and information systems literature in three ways. First, this study uses machine learning text analysis techniques to measure the level of digitization and sustainability, and how digital transformation and sustainability will affect the revenue management of listed companies in Indonesia from 2019 to 2022. Investigate whether it will have any impact. Second, this study provides a new alternative measure of sustainability. This is the frequency of related keywords using text mining. Third, the study provides insights into the impact of digital transformation and sustainability on accounting information quality and corporate governance, providing implications for corporate

digital transformation and government regulation.

Nevertheless, this study has some limitations. First, the study only used a sample of Indonesian listed companies and one time period, which may limit the generalizability of results to other countries. Future research may expand the sample to include companies from different geographies and industries, or use longer time periods to understand the dynamic impact of digital transformation and sustainability on earnings management. Second, the study only measures digital transformation and sustainability strategies based on the frequency of digital technology and sustainability related keywords in companies' annual reports and may not fully reflect the actual extent and quality of digital transformation and sustainability. Future research may be able to capture the multidimensional aspects of digital transformation using more comprehensive and objective metrics such as digital investments, digital revenues, digital capabilities and digital maturity for digital transformation and ESG score for sustainability. Third, the study only explores the impact of digital transformation on his two types of revenue management: real earnings management and accrual earnings management. Future research may explore other forms or aspects of earnings management, such as classification shifting, tax avoidance, or earnings quality, to provide a more nuanced understanding of how digital transformation and sustainability affects accounting information.

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Appendix 1. Model and Variables

$$TACCit = \Delta Current\ Assets it - \Delta Cashit - \Delta CurrentLiabilitiesit - DAEit \quad (1)$$

$$\frac{TACCit}{TAit-1} = \alpha 1 + \frac{1}{Tait-1} + \alpha 2 \frac{\Delta REVit}{Tait-1} + \alpha 3 \frac{PPEit}{Tait-1} + \varepsilon it \quad (2)$$

$$\frac{PRODit}{TAit-1} = \alpha 1 + \frac{1}{TAit-1} + \alpha 2 \frac{SALESit}{TAit-1} + \alpha 3 \frac{\Delta SALESit}{TAit-1} + \alpha 4 \frac{\Delta SALESit-1}{TAit-1} + \varepsilon it \quad (3)$$

$$\frac{CFOit}{TAit-1} = \alpha 1 + \frac{1}{TAit-1} + \alpha 2 \frac{SALESit}{TAit-1} + \alpha 3 \frac{\Delta SALESit}{TAit-1} + \varepsilon it \quad (4)$$

$$\frac{DISEXPit}{TAit-1} = \alpha 1 + \frac{1}{TAit-1} + \alpha 2 \frac{SALESit}{TAit-1} + \varepsilon it \quad (5)$$

$$REM = ab\_PROD - ab\_CFO - ab\_DISEXP \quad (6)$$

Model (1), (2) adopted from Jones (1991), while Model (3), (4), (5), (6) adopted from Roychowdhury (2006); Cohen et al. (2008) ; Kim et al. (2012); Kuo et al. (2014)

Variables

TACC : Total Accruals

TA : Total Assets

ΔREV : Change in revenue relative to previous year

PPE : Property, plant, and equipment

SALES : Total sales revenue

ΔSALES : Change in sales relative to previous year

PROD : Total cost

CFO : Net operating cash flow

DISEXP : normal value of discretionary expenses

ab_PROD : Abnormal cost

ab_CFO : Abnormal cash from operation

ab_DISEXP : Abnormal discretionary expenses

Size_ln : Log of total assets.

ATO : Assets Turnover calculated from operating income/total asset.

FinDist : Dummy variable for financial distress as measured by z-score, with 1 for the value under the threshold, and zero otherwise.

Appendix 2. Additional Test and Results

Regression Result of Model Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Digitalization	.345[a]	0.1193	0.0923	0.1371
Digitalization (Specific technology)	.359[a]	0.1287	0.0908	0.1372
Sustainability	.389[a]	0.1511	0.1250	0.1346

Real Earnings Management (REM)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Digitalization	.432[a]	0.1862	0.1613	0.1239
Digitalization (Specific technology)	.478[a]	0.2284	0.1949	0.1214
Sustainability	.178[a]	0.0315	0.0018	0.0968

Source : Data Processed

Independent T-test for Financial Distress

	Levene's Test for Equality of Variences		t-test for Equality of Means					95% Confidence Interval	
Variable	F	Sig.	T	df	Sig. (-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AEM	0.022	0.881	-0.255	167	0.799	-0.0103	0.0403	-0.0898	0.0692
REM**	5.959	0.016	-2.059	167	0.041	-0.0770	0.0374	-0.1508	-0.0032
Sust_perc	4.362	0.038	1.554	167	0.122	0.0354	0.0228	-0.0096	0.0803
Digi_perc***	14.174	0.000	-2.832	167	0.005	-0.0766	0.0270	-0.1299	-0.0232
Ai_perc	0.118	0.732	-0.671	167	0.503	-0.0011	0.0017	-0.0044	0.0022
Bigdata_perc***	17.743	0.000	-3.095	167	0.002	-0.0296	0.0095	-0.0484	-0.0107
Cloud_perc***	56.622	0.000	-3.718	167	0.000	-0.0058	0.0016	-0.0089	-0.0027

*,** and *** represent statistical significance at 10%, rate of 5% and 1% level.

Source : Data Processed