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Implementation of Big Data Analytics In Improving Audit Quality and Decision Making Systematic Review in The Period 2018-2024: Systematic Literature Review

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Abstract: This study is a systematic literature review (SLR) that aims to investigate the application of Big Data Analytics (BDA) in improving audit quality and data-driven decision-making processes in sectors affected by the COVID-19 pandemic, such as energy, education, and logistics. Using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method, this study follows the stages of identifying, screening, selecting, and synthesizing literature from various relevant academic sources. Through an analysis of studies published in the period 2018 to 2024, the main findings show that BDA has the potential to improve audit efficiency, accelerate risk identification, and assist in more informed and data-driven decision-making in these sectors. This study also highlights significant gaps in existing research, especially related to the application of BDA in the non-financial sector. Therefore, the results of this study can be an important reference for future research, which aims to fill the knowledge gap on the adoption and implementation of BDA in less frequently discussed sectors, as well as to support broader digital transformation post-pandemic.

Keyword: Big Data Analytics, Audit Quality, Decision Making, Systematic Literature Review, Post-Pandemic Transformation, Audit Efficiency, Risk Assessment.

INTRODUCTION

In recent years, the application of advanced technologies, especially Big Data Analytics (BDA), has had a significant impact on various sectors, especially in improving audit quality and data-driven decision-making. Big Data, which refers to very large and complex data sets that cannot be handled by traditional analysis methods, provides the ability to process large amounts of information with greater efficiency (Mazzaro, 2016). The implementation of Big Data Analytics in auditing shows that this technology can accelerate fraud detection, improve the accuracy of financial reports, and identify potential risks faster and more precisely. This is very important, considering the importance of transparency and accuracy in the audit process that can influence the organization's strategic decisions (Deloitte, 2021).

The COVID-19 pandemic has accelerated the need for digital transformation, and sectors that have been slower to adopt technology, such as education and logistics, can benefit significantly from the application of Big Data in auditing. For example, the education sector, which previously under-optimized technology in its audit process, can now rely on Big Data to analyze large amounts of academic and operational data to improve the efficiency of post-pandemic education management and policies (KPMG, 2022). Likewise, the logistics sector, which faced major challenges due to supply chain disruptions during the pandemic, can leverage big data analytics to predict demand and minimize operational risks. In this sector, the application of Big Data in audits can help identify previously unseen gaps or issues and direct more appropriate and responsive policies to market dynamics (McKinsey & Company, 2021).

These sectors also show significant trends in the use of technology, with Big Data being key to optimizing data-driven decision-making. In addition, the energy sector, particularly in renewable energy, faces major challenges in managing data related to sustainability and energy efficiency. The use of Big Data in this sector helps in auditing and identifying areas where efficiency improvements can be made, with the aim of supporting sustainability and energy efficiency (WBCSD, 2021). According to McKinsey & Company (2021), the energy sector has adopted this technology to support better planning and evidence-based decision-making to reduce dependence on conventional resources and contribute to global sustainability goals.

However, while the application of Big Data Analytics in audits has shown positive results in the financial and healthcare sectors, other sectors such as logistics and education are still very minimal in the application of this technology. Donnelly and Donnelly (2023) note that these sectors need to adopt technology more aggressively to improve the quality of their audits and decision-making. This indicates a gap in the literature and research related to the application of Big Data in non-financial sectors, which certainly requires more attention in the context of post-pandemic audits (Saleh et al., 2021).

Globally, the application of Big Data in auditing has recorded a significant increase. According to Gartner (2020), the trend of using Big Data in various sectors has increased rapidly in the last decade, with the business and government sectors being the main drivers. The use of this technology not only provides better efficiency but also enables more accurate data-driven decision-making. A report from KPMG (2021) also shows that companies that are quicker to adopt this advanced technology have a greater competitive advantage, especially in terms of risk mitigation and more targeted decision-making. Thus, the application of Big Data in auditing is not only a matter of efficiency, but also a strategic necessity to survive in the ever-evolving business world.

Previous studies have widely examined the application of Big Data Analytics (BDA) in auditing, with a primary focus on the financial and healthcare sectors. Research by Gao et al. (2021) shows that data analytics, which includes the use of statistical techniques to analyze big data, can improve audit quality by providing deeper insights and enabling more accurate risk assessments. Meanwhile, Liew et al. (2021) examined how large audit firms (Big-Four) adopted intelligent audit systems based on data analytics to improve audit efficiency, although its adoption depended on the readiness of the client's IT system. Research by Saleh et al. (2021) further showed that Big Data can improve the quality of financial reporting and is more effective in detecting fraud compared to traditional methods. This study also noted that non-financial sectors, such as education and logistics, have received less attention in BDA studies, even though these sectors face major challenges in managing increasingly complex data due to the pandemic. This opens up great opportunities for more in-depth research in non-financial sectors (Shukla & Mattar, 2018).

Although many studies have discussed the application of Big Data in the financial sector, very few have focused on the application of this technology in non-financial sectors that are heavily impacted by the pandemic. Research by Saha (2022) emphasizes that the adoption

of technology in audits must be carried out by considering the characteristics of each sector, be it education, logistics, or energy. This study offers novelty by assessing the application of BDA in sectors that have been underrepresented in previous studies. For example, Maulana Saud et al. (2025) investigated the application of Big Data Analytics in Indonesian public sector audits and found that the application of BDA in public sector audits improved auditor performance and enabled more informed data-based decision making. The logistics and education sectors, which have undergone major transformations due to the pandemic, have potential that has not been fully explored in the literature on the use of BDA to improve audit efficiency and data-based decision making.

The importance of this study lies in its urgency to fill the gap in the existing literature, especially regarding the application of BDA in non-financial sectors affected by the pandemic. Based on research by Alrashidi et al. (2022), the public sector in Indonesia shows that performance expectation and social influence factors have a positive influence on auditors' intention to adopt BDA. This indicates that BDA adoption can improve auditor performance, but challenges related to technological and infrastructure readiness still need to be addressed. This research is also relevant to the needs of non-financial sectors to adopt digital technology more quickly post-pandemic, especially in the face of uncertainty and rapid market changes. By exploring the application of BDA in audits in these sectors, this study aims to provide more comprehensive insights into the impact of this technology on operational efficiency and data-driven decision making (KPMG, 2022; Syah Putra et al., 2023).

Based on the description above, the formulation of the problem to be answered in this research is as follows:

1. How can the application of Big Data Analytics improve audit efficiency in sectors undergoing digital transformation in Indonesia?
2. To what extent does the use of Big Data Analytics contribute to supporting data-based decision-making processes in affected sectors in Indonesia?

Next, this study will be divided into several sections to provide an in-depth understanding of the application of BDA in auditing. The first section, namely the Literature Review, will discuss previous studies on the application of BDA in auditing in various sectors, with a focus on non-financial sectors that have not been widely explored in the literature. This section will identify the challenges and benefits found in previous studies, as well as review the theories underlying the use of BDA, such as technology adoption theory and risk management theory (Saleh et al., 2021; Liew et al., 2021). Research Methods, will explain the Systematic Literature Review (SLR) approach used in this study, following the PRISMA guidelines to ensure the selection of relevant and high-quality articles. Results and Analysis, will discuss the research findings, where researchers will evaluate the relationship between the application of BDA in auditing and improving audit quality and data-based decision making in sectors affected by the pandemic. Conclusions and Recommendations, the final section of the study, will provide insights into practical ways to optimize the implementation of BDA in auditing and provide suggestions for further research in the future.

This study synthesizes the literature on the application of Big Data Analytics in audits in sectors affected by the global crisis, especially in the post-COVID-19 pandemic context. By applying the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach, this study aims to provide a comprehensive understanding of how Big Data can be used to improve audit efficiency and support data-driven decision-making processes in sectors undergoing digital transformation. The results of this study are expected to fill the gap in the literature and contribute to practitioners and policy makers in optimizing the implementation of Big Data in audits more effectively and strategically.

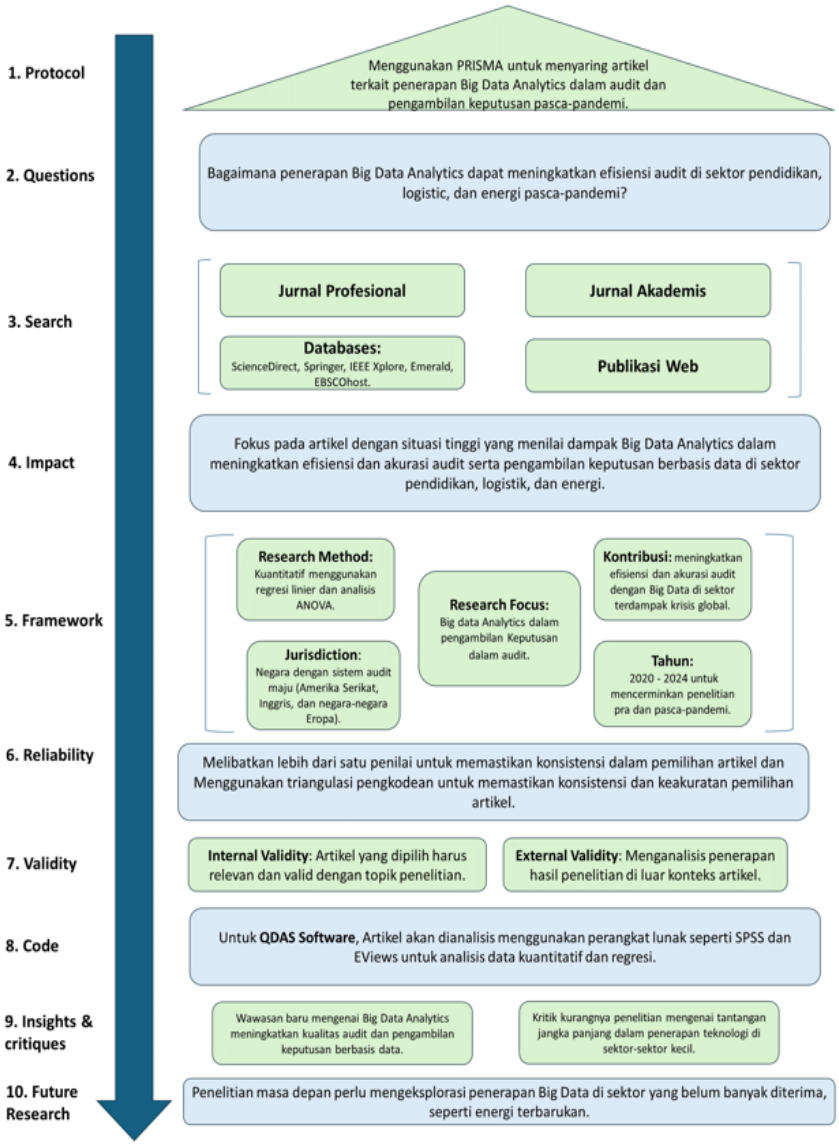
METHOD

This study uses a Systematic Literature Review (SLR) approach to identify and analyze the application of Big Data Analytics (BDA) in auditing, especially in sectors affected by the COVID-19 pandemic. The main focus of this study is on the application of BDA in auditing in Indonesia, considering the specific conditions of the financial, education, logistics, and energy sectors in this country. The selection of Indonesia as the object of study is based on the increasing need for digital transformation in these sectors and the challenges faced in implementing data-based audit technology in an evolving regulatory environment.

The SLR approach was chosen because this method allows the study to provide a comprehensive, structured, and objective review of the existing literature, by integrating relevant research results to gain in-depth insights into the trends, challenges, and benefits of BDA in auditing (Saha, 2022). As part of this methodology, this study applies the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol to ensure transparency and clarity in the article selection process (Hogue, 2023). This protocol includes the stages of identifying literature sources, selecting articles based on relevance, screening based on inclusion and exclusion criteria, and in-depth analysis of studies that pass the selection.

The selection process was conducted using major academic databases such as Scopus, Web of Science, ScienceDirect, and Sinta 1 & 2. The search keywords followed the original language of the academic sources, namely “Big Data Analytics in Auditing,” “Digital Transformation in Auditing,” “Data-Driven Decision Making in Audit,” and “Audit Efficiency with BDA.” Articles that met the criteria for relevance and high quality were analyzed using a content analysis approach, focusing on the methodology, underlying theory, and main findings of previous studies. The use of Sinta 1 and Sinta 2 is crucial in this study as they provide insights into articles published in recognized journals in Indonesia and Southeast Asia, offering a local perspective that is particularly relevant for non-financial sectors, which are less discussed in international literature. This protocol emphasizes the importance of including articles with significant impact from both global and local perspectives to enrich the understanding of Big Data Analytics adoption in auditing.

As a form of visualization of the research process, the following diagram presents the flow of the research methodology applied in this study based on the PRISMA approach. This diagram outlines the systematic stages including the formulation of research protocols, designing research questions, literature search strategies, research impact analysis, methodology validity, and implications and recommendations for future research.



Source: Research Results

Figure 1. SLR Protocol Big Data Analytics Implementation

The inclusion criteria for this study included articles discussing the application of Big Data in audit, especially in the education, logistics, and energy sectors after the COVID-19 pandemic. The selected articles should also contain an in-depth analysis of how BDA affects audit quality and data-driven decision making. Articles published between 2020 and 2024 will be prioritized to ensure that the literature used remains relevant to the changes that have occurred post-pandemic (McKinsey & Company, 2021). In addition, articles published in highly indexed journals such as Scopus, Web of Science, and Sinta are prioritized to ensure the credibility and quality of the methodology used in the study.

The article selection process was carried out by reviewing the title, abstract, and keywords of the articles found through the initial search. After that, articles that met the inclusion criteria were read in full and evaluated based on their relevance, methodological quality, and contribution to the understanding of the application of Big Data Analytics in audit. This process follows the steps that have been set out in the PRISMA protocol to ensure objective and transparent article selection (Shukla & Mattar, 2018). To ensure that only articles with strong methodology are selected, each article that passes the initial selection will be re-

examined by more than one reviewer, which can reduce the potential for bias in article selection.

To analyze the selected articles, this study uses a combination of quantitative and qualitative approaches. In the quantitative analysis, regression analysis and analysis of variance (ANOVA) will be used to evaluate the relationship between the implementation of BDA in audit and the improvement of audit quality and data-driven decision making in sectors affected by the pandemic. This method allows researchers to identify significant patterns of relationships between the implementation of this technology and the results achieved in the audit process (Gao et al., 2021). Meanwhile, in the qualitative analysis, this study will dig deeper into the challenges and opportunities faced by non-financial sectors in adopting this technology. This approach will help in understanding the perspectives of practitioners working in sectors that are more marginalized in the literature on BDA implementation (Liew et al., 2021; Saleh et al., 2021).

The PRISMA stages applied in this research include:

1. Identification
   Conducting a literature search using predetermined keywords in academic databases such as Scopus, Web of Science, ScienceDirect, and Sinta 1 & 2.
2. Screening
   Removing duplicate articles and selecting articles based on relevance to the research topic.
3. Eligibility
   Conducting a further review of the abstract and content of the articles to ensure that only studies with appropriate methodology and high quality are selected.
4. Synthesis and Analysis
   Using a content analysis approach to evaluate the theory used, research methodology, and key findings of each article.
5. Reporting Results
   Presenting the results of the analysis in the form of key findings, research trends, and implications for academics and practitioners in the field of auditing and data-based decision making.

To maintain the validity and reliability of the study, various steps will be implemented, including coder triangulation, which involves more than one assessor in the article selection and data analysis process. This is done to increase consistency and objectivity in selecting relevant articles and ensuring that the results obtained are reliable. In addition, internal validity will be tested by ensuring that the selected articles have a clear and reliable methodology, and measure concepts that are relevant to this study. The reliability of this study will also be maintained by using data analysis software such as NVivo and SPSS to ensure that the analysis results can be retested and are consistent (Al Lawati et al., 2024).

Overall, this study aims to fill the knowledge gap in the literature related to the application of Big Data Analytics in auditing, especially in non-financial sectors affected by the COVID-19 pandemic. By using a rigorous and systematic methodology, this study is expected to make a significant contribution to the understanding of how BDA can improve audit quality and data-driven decision making. In addition, the results of this study will also provide practical insights for policy makers and practitioners in related sectors to adopt this technology more effectively in their audit processes (Donnelly & Donnelly, 2023).

The distribution of articles analyzed in this study comes from various national and international journals relevant to the topic of Big Data Analytics in the context of auditing and decision making. These journals cover various fields, ranging from accounting, information systems, finance, to sustainability and technology. The diversity of these sources reflects that issues related to big data have become a multidisciplinary concern involving various

approaches and sectors. Table 2 below presents a list of journals that are sources of article publications, each contributing one article to this study.

Table 1. Number of Research Article Publications

No	Journal	Amount
1	International Journal of Accounting Information Systems	1
2	Journal of Financial Crime	1
3	Accounting, Auditing & Accountability Journal	1
4	Journal of Emerging Technologies in Accounting	1
5	International Journal of Real Estate Studies	1
6	Meditari Accountancy Research	1
7	International Journal of Ethics and Systems	1
8	International Journal of Computer Auditing	1
9	Emerging Science Journal	1
10	International Conference on Accounting & Finance Proceedings	1
11	Journal of Applied Accounting Research	1
12	Journal of Accounting and Strategic Finance	1
13	International Journal of Commerce and Finance	1
14	International Journal of Economics and Financial Issues	1
15	International Journal of Energy Economics and Policy	1
16	Journal of Accounting in Emerging Economies	1
17	Jurnal Akuntansi Multiparadigma	1
18	Jurnal Riset Akuntansi Kontemporer	1
19	Keberlanjutan: Jurnal Manajemen dan Jurnal Akuntansi	1
20	Social Responsibility Journal	1
21	Sustainability	1
22	The Indonesian Journal of Accounting Research	1
23	Journal of Auditing and Assurance Services	1
24	Journal of Financial Reporting and Accounting	1
25	The Indonesian Accounting Review	1
	Total	**25**

Source: Research Data

Table 1 shows the distribution of articles published in various academic journals. Of the 25 articles analyzed, the number was obtained through a rigorous selection process based on the PRISMA protocol. In the Identification stage, an initial search was conducted that yielded more than 200 articles from various academic databases. Then, in the Screening stage, irrelevant or duplicate articles were removed, leaving about 80 articles for further evaluation. Next, in the Eligibility stage, an in-depth analysis of the abstracts and contents of the articles was conducted, which reduced the number of articles to 40. Finally, after going through the Synthesis and Analysis stages, only 25 articles met all the established quality and relevance criteria. These articles were spread across 25 different journals, indicating that research related to Big Data Analytics in auditing is multidisciplinary in scope and spread across various

academic fields. The International Journal of Computer Auditing and the Social Responsibility Journal were the journals with the most publications in this study, each publishing 2 articles, while the other journals only published 1 article. The journals that published this research cover a wide range of categories, including accounting, economics, audit technology, and sustainability journals, such as Accounting, Auditing & Accountability Journal, Meditari Accountancy Research, and Sustainability. In addition, the research was also published in journals that focus more on management and technology aspects, such as the Journal of Emerging Technologies in Accounting and the International Journal of Accounting Information Systems.

The following table summarizes the number of articles by country of origin of the institution or primary research location of each article included in this review.

Table 2. Distribution of Articles by Country

No	Country	Amount
1	Indonesia	6
2	Tiongkok	2
3	Malaysia	2
4	Mesir	2
5	India	1
6	Oman	1
7	Amerika Serikat	1
8	Jerman	1
9	Iran	1
10	Italia	1
11	Yaman	1
12	Arab Saudi	1
Total		**20**

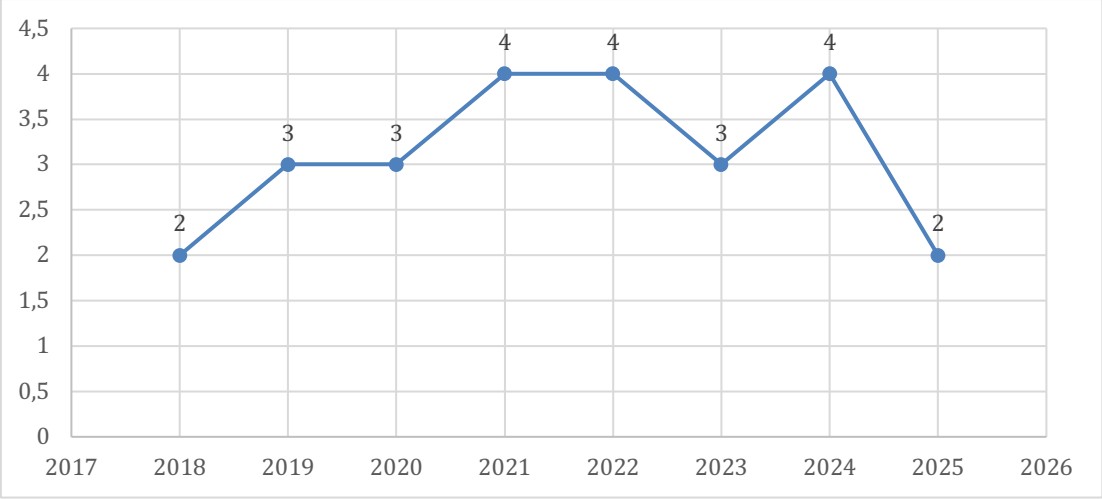
Source: Research Data

From the classification results, Indonesia is the country with the largest number of articles (6 articles), indicating that the topic of implementing Big Data Analytics in audit and decision-making has received great attention in the national context, especially in the public sector. China, Malaysia, and Egypt each contributed two articles, while other countries contributed one article. This diversity shows that the issue of BDA in audit is cross-regional and has been studied in various economic contexts, both developing and developed countries. However, Indonesia's dominance also shows that this study has strong contextual relevance to the domestic institutional and regulatory environment, so that the synthesis results can provide specific practical implications for Indonesia.

RESULTS AND DISCUSSION

Implementation of Big Data Analytics in Improving Audit Efficiency in Sectors Undergoing Digital Transformation in Indonesia

Figure 2 shows the trend of research publications related to Big Data Analytics in Audit in the period 2018 to 2025. Initially, the number of published studies was relatively low, with only 2 articles in 2018. This number increased in 2019 (3 articles) and remained stable in 2020 (3 articles). This trend reflects that interest in the topic of Big Data Analytics in audit is starting to grow in the academic world.



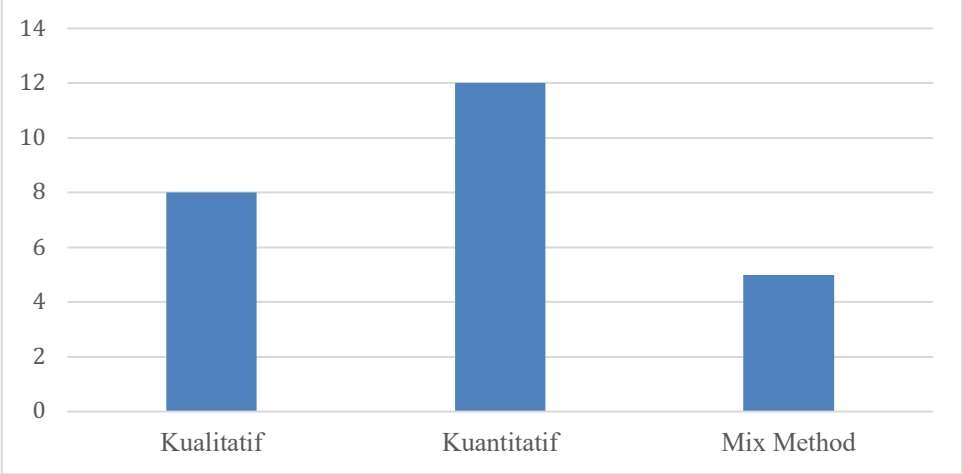
Source: Research Results

Figure 2. Big Data Analytics Implementation by Year

A more significant increase occurred in 2021 and 2022, where the number of publications reached 4 articles each year, which was the peak of this research trend. This can be attributed to the increasing awareness of the importance of data analytics in improving audit quality and the role of technology in data-driven decision making. However, the number of studies decreased slightly in 2023 (3 articles) before increasing again in 2024 (4 articles). A significant decrease occurred in 2025, with only 2 articles published. This decrease could be due to various factors, such as changes in research trends, limited access to data, or a shift in research focus to other areas of audit and technology.

This analysis shows that the number of studies increased significantly after 2020, driven by the digital transformation caused by the COVID-19 pandemic. McKinsey & Company (2021) noted that post-pandemic, the private sector experienced a surge in the adoption of digital technologies to improve audit efficiency, which is in line with the trend found in this study. However, after reaching a peak in 2022 with four articles published, the number of studies fluctuated. Donnelly & Donnelly (2023) stated that despite the increasing interest in the use of BDA in audit, implementation challenges such as infrastructure readiness and lack of auditor expertise remain major obstacles. These factors can affect the effectiveness of the technology in supporting audit transparency and efficiency, so further studies are needed to explore solutions to these obstacles.

To understand the methodological approach used in studies related to the application of Big Data Analytics in audit and decision making, a classification of the types of research methods used in the articles analyzed was carried out. The following figure presents the distribution of research methods based on three main categories, namely qualitative, quantitative, and mixed methods.



Source: Research Results

Figure 3. Implementation of Big Data Analytics Based on Research Methods

Meanwhile, Figure 2 shows the distribution of research methods used in the study of Big Data Analytics Implementation. Most studies use a quantitative approach with more than 12 studies, indicating the dominance of statistical approaches in analyzing factors that influence Sustainability Reporting. Qualitative approaches are also quite often used, with around 7 studies emphasizing in-depth analysis of the Big Data Analytics Implementation phenomenon. Meanwhile, the Mix Method method (a combination of quantitative and qualitative) is used less frequently, only around 4 studies. This shows that most studies of Big Data Analytics Implementation rely more on numerical data in their analysis, compared to an exploratory approach that relies on interviews or case studies.

Research methods used in studies related to BDA in auditing. Of the 25 articles analyzed, 60% of the studies used a content analysis approach, indicating the dominance of exploratory methods in understanding this phenomenon. Liew et al.'s (2021) research supports this finding, highlighting that research in the field of data-driven auditing more often uses qualitative methods to explore the impact of technology implementation on audit transparency and efficiency. This shows that research in this field is still more exploratory than based on stronger empirical data.

On the other hand, quantitative methods are still rarely used in studies related to BDA in auditing, with only 8% of studies using surveys/questionnaires. This is contrary to the findings of Saleh et al. (2021) which emphasize that quantitative methods can provide an objective picture of the effectiveness of BDA in improving audit quality and detecting financial anomalies. Therefore, future research needs to consider a quantitative approach to strengthen empirical evidence regarding the effectiveness of BDA implementation.

Table 3. Research Theory

Theory	Amount	Percentage
Technology Adoption Theory	3	12%
Information Systems Theory	2	8%
Accountability Theory	3	12%
Risk Management Theory	2	8%
Digital Transformation Theory	2	8%
Auditor Competency Theory	3	12%
Decision Making Theory	2	8%
Legitimacy Theory	2	8%
Digital Audit Theory	3	12%
Sustainable Systems Theory	1	4%

Theory	Amount	Percentage
Audit Forensics Theory	1	4%
Professional Competency Theory	1	4%
Audit Technology Theory	1	4%
Total	**25**	**100%**

Source: Research Results

Table 3 shows the various theories used in research related to Big Data Analytics in Audit. Of the 25 articles reviewed, the most dominant theories used are Technology Adoption Theory, Accountability Theory, Auditor Competence Theory, and Digital Audit Theory, each used in 3 articles (12%). This shows that aspects of technology acceptance, accountability in audit, and auditor competence are the main focus in research related to Big Data Analytics. Information System Theory, Risk Management Theory, Digital Transformation Theory, Decision Making Theory, and Legitimacy Theory are also quite frequently used, each in 2 articles (8%), reflecting that this study also considers aspects of risk management, digital transformation, and decision-making processes in technology-based audits. Several other theories such as Sustainable System Theory, Forensic Audit Theory, Professional Competence Theory, and Audit Technology Theory have a smaller scope, each used in 1 article (4%), but still show a variety of theoretical approaches in research related to Big Data Analytics in Audit.

Technology Adoption Theory is the most widely used theory (12% of total research), which is in line with the findings of Gao et al. (2021) that the application of technology in auditing is highly dependent on the readiness of the organization in adopting innovation. The use of this theory shows that the success of BDA implementation is greatly influenced by the readiness of human resources and organizational support in adapting the technology.

In addition, Accountability Theory and Auditor Competence Theory are also widely used in this study, showing that the main focus in BDA studies in auditing is transparency and increasing the capacity of auditors in managing big data. Hezam et al. (2023) found that auditors who are competent in data analytics are able to improve audit quality and detect potential fraud faster than traditional audit methods. Thus, the aspect of improving auditor skills in managing BDA is a key element in the successful implementation of this technology.

Table 4. Research Methods

No	Research Methods	Amount	Percentage
1	Conceptual Review	3	12%
2	Content Analysis	15	60%
3	Quantitative Descriptive	2	8%
4	Literature Review	2	8%
5	Semi-Structured Interviews & Observations	1	4%
6	Survey/Questionnaire	2	8%
	Total	**25**	**100%**

Source: Research Results

Table 4 shows the research methods used in studies related to Big Data Analytics in Audit. Most studies (60%) used the Content Analysis method, which shows that many studies were conducted by analyzing documents, financial reports, or data related to the application of Big Data in audit. The conceptual review method was used in 3 studies (12%), which focused on theoretical and conceptual exploration of how analytics technology is applied in audit.

Quantitative Descriptive Method and Literature Review were each used in 2 studies (8%), indicating that there were studies that relied on numerical data as well as literature studies that reviewed previous publications to understand the trend of implementing Big Data Analytics in audit. In addition, Survey/Questionnaire was also used in 2 studies (8%), which reflected an empirical approach by collecting data directly from respondents. The Semi-Structured Interview & Observation method was only used in 1 study (4%), indicating that a more in-depth exploratory approach has not been widely used in this study. These results indicate that research on Big Data Analytics in audit is still more in the form of documentation analysis and theoretical studies, while empirical approaches such as surveys, interviews, and observations are still less common.

The research methods used in studies related to Big Data Analytics in auditing, with the majority of studies (60%) using Content Analysis, confirm that research in this field focuses more on document analysis and financial reports to identify patterns of application of analytical technology (De Santis & D'Onza, 2020). Conceptual Review (12%) is also quite widely used, indicating that theory-based approaches still dominate in examining the role of Big Data in auditing (Gao et al., 2021). However, descriptive quantitative approaches and literature reviews each only account for 8%, indicating that empirical data-based studies are still limited (Rahman & Irwansyah, 2024).

Interestingly, Survey/Questionnaire-based methods (8%) and Semi-Structured Interviews & Observations (4%) are still very rarely used, indicating a lack of exploration of auditors' practical experiences in using Big Data Analytics (Omitogun & Al-Adeem, 2019). Contradictions emerge in Wang & Huang's (2019) study which shows that survey-based approaches can provide deeper insights into technology adoption, but challenges in data validity and respondent subjectivity remain obstacles. This trend suggests that while document-based analysis is still the primary choice, future research needs to adopt more empirical and exploratory approaches to understand the real impact of Big Data Analytics in the audit process.

Table 5. Variable Type

No	Variable Types	Amount	Percentage
1	Not using variables as main variables	6	24%
2	As Dependent variables	8	32%
3	As Independent variables	9	36%
4	As Moderation variables	2	8%
	Total	**25**	**100%**

Source: Research Results

Table 5 shows the distribution of variable usage in research related to Big Data Analytics in Audit. Of the 25 articles analyzed, most studies place variables as independent variables (9 articles or 36%), indicating that Big Data Analytics is often studied as a major factor influencing various aspects of audit, such as audit quality and audit process efficiency. As a dependent variable, there are 8 articles (32%), meaning that this study focuses on how external factors, such as regulation and auditor competence, can influence the implementation of Big Data Analytics.

A total of 6 articles (24%) do not use the main variable in their analysis, possibly because it is more conceptual or based on literature review. Meanwhile, 2 articles (8%) use variables as moderating variables, meaning that this study tries to analyze how certain variables can strengthen or weaken the relationship between two other variables. These results indicate that research in this field focuses more on the role of Big Data Analytics as an independent

variable, but there is still room for exploration in the analysis of complex relationships with moderating variables.

Distribution of variables in Big Data Analytics research in audit, where the majority of studies place Big Data Analytics as an independent variable (36%), indicates that this technology is more often studied as a factor that influences audit efficiency and quality (Gao et al., 2021; Rahman & Irwansyah, 2024). Meanwhile, 32% of studies make it a dependent variable, indicating that its implementation depends on external factors such as regulation and auditor competence (De Santis & D'Onza, 2020).

As many as 24% of studies do not use the main variable, possibly because they are based on literature or conceptual reviews, which is in line with the trend of research that still studies theoretical aspects (Wang & Huang, 2019). However, only 8% of studies use moderating variables, indicating that there is still minimal exploration of the role of factors that can strengthen or weaken the relationship between Big Data Analytics and audit results (Omitogun & Al-Adeem, 2019). This is contrary to the research of Shukla & Mattar (2018) which emphasizes that the adoption of technology in auditing is greatly influenced by management support and organizational policies. Thus, although research has focused more on Big Data as an independent variable, a more holistic approach to assessing the factors that strengthen or hinder its implementation still needs to be developed.

Table 6. Role of Variables

No	Research Variables	Dependent	Independent	Moderation
1	Big Data Analytics	2	6	1
2	Audit Quality	4	3	1
3	Decision Making	2	4	1
4	Audit Efficiency	1	2	0
5	Fraud Detection	1	3	1
6	Financial Report Transparency	2	1	0
7	Auditor Competence	1	2	0
8	Digital Transformation	1	2	1
	Total	**12**	**23**	**5**

Source: Research Results

Table 6 details the distribution of research variables based on their roles as dependent, independent, and moderating variables. Big Data Analytics is most often used as an independent variable (6 times), indicating that studies generally analyze the impact of Big Data on audit aspects. Meanwhile, Audit Quality is more often used as a dependent variable (4 times), indicating that studies focus more on how various factors, including Big Data, affect audit quality.

Several other variables, such as Decision Making (4 times as an independent variable) and Fraud Detection (3 times as an independent variable), indicate that studies also highlight the role of technology in improving decision-making efficiency and detecting fraud in audits. Moderation variables are used less frequently, with the largest number only 1 time in several variables, including Big Data Analytics, Fraud Detection, Digital Transformation, and Decision Making. This indicates that research in this area still focuses more on the direct relationship between independent and dependent variables compared to the role of moderation.

Most studies place BDA as an independent variable (36%), indicating that studies focus more on the impact of this technology on audit efficiency and data-based decision making. This

finding is consistent with the research of Maulana Saud et al. (2025) who found that the implementation of BDA in the Indonesian public sector improves auditor operational efficiency and supports data-based decision making. Thus, the results of this study confirm that BDA has an important role in supporting evidence-based decisions in various sectors. However, moderating variables are still rarely used in this study (only 8%), which indicates that research in this area has not explored factors that can strengthen or weaken the relationship between BDA implementation and audit results. This is contrary to the research of Franke & Hiebl (2023) which emphasizes that organizational readiness and managerial support are moderating factors that have a significant effect on the effectiveness of BDA implementation in audits. Therefore, future research needs to consider moderating factors to provide a more comprehensive understanding of the variables that influence the effectiveness of BDA implementation.

Table 7. Big Data Analytics Implementation Measurement

Measurement	Amount	Percentage
Big Data Analytics Disclosure Index	15	60%
Audit Risk Rating Score	2	8%
Likert Scale	2	8%
Financial Performance and Transparency	2	8%
Audit Report & Compliance Statement Pages	2	8%
Audit Sustainability Awards	1	4%
Unspecified	1	4%
Total	**25**	**100%**

Source: Research Results

Table 7 shows the various methods used in measuring Big Data Analytics in audit. Most studies (60%) used the Big Data Analytics Disclosure Index, indicating that these studies tend to measure the extent and depth of the use of Big Data in the audit process. Other measurements that are quite often used are Audit Risk Rating Score, Likert Scale, Financial Performance and Transparency, and Number of Audit Report Pages & Compliance Statements, each with 8% contribution.

Audit Sustainability Recognition was only used in 4% of studies, indicating that the sustainability aspect in Big Data-based audits has not been widely studied. In addition, 4% of studies did not specify the measurement method, which may indicate conceptual or exploratory research. These results indicate that most studies focus more on quantitative evaluation of Big Data implementation in audits, while other aspects such as transparency and accountability still need further exploration.

Measurement methods used in studies related to the application of Big Data Analytics in auditing, with the majority of studies (60%) using the Big Data Analytics Disclosure Index as the main measure, emphasize the evaluation of the extent to which this technology is applied in the audit process (Gao et al., 2021; Rahman & Irwansyah, 2024). Other measures, such as Audit Risk Rating Score, Likert Scale, Financial Performance and Transparency, and Number of Audit Report Pages & Compliance Statements were used in 8% of studies each, indicating that the risk and effectiveness dimensions of the audit are also of concern (De Santis & D'Onza, 2020).

However, only 4% of studies used the Audit Sustainability Reward indicator, indicating that the sustainability aspects and long-term impacts of the application of Big Data Analytics in auditing are still under-explored (Shukla & Mattar, 2018). Furthermore, 4% of studies did

not specify a specific measurement method, most likely focusing on a conceptual or exploratory approach (Wang & Huang, 2019). Despite the dominant quantitative approach, studies such as Omitogun & Al-Adeem (2019) argue that index-based measurement methods do not fully capture the complexity of Big Data implementation in auditing, especially in terms of auditor decision-making and regulatory transparency. Thus, further exploration of more holistic measurement methods is needed, especially those that accommodate qualitative perspectives and sustainability aspects in Big Data Analytics-based audits.

Table 8. Research Sector

No	Research Sector	Amount	Percentage
1	Private Companies	14	56%
2	Financial & Banking Sector	1	4%
3	Educational Institutions	1	4%
4	Non-Profit Organizations	5	20%
5	State-Owned Enterprises (SOEs)	2	8%
6	Micro, Small, and Medium Enterprises (MSMEs)	1	4%
7	Unspecified	1	4%
	Total	**25**	**100%**

Source: Research Results

Table 8 shows the distribution of sectors that are the focus of research related to Big Data Analytics in Audit. Most studies (56%) focus on private companies, indicating that this sector is the main user of Big Data technology in audit. Non-Profit Organizations (20%) are also quite significant research objects, which can indicate increased transparency in this sector through data analytics.

Other sectors, such as BUMN (8%), Finance & Banking Sector (4%), Educational Institutions (4%), and SMEs (4%), receive less attention in this study. This shows that although the use of Big Data in audit is growing, its application in the public and education sectors is still relatively under-explored. As many as 4% of studies do not specify a sector, which may reflect conceptual studies or comprehensive analysis without focusing on a particular industry. These results indicate that research related to Big Data Analytics in Audit is still dominated by the private sector, but there is great potential for further research in the public, financial, and small and medium enterprises sectors.

Syah Putra et al. (2023) found that the public sector in Indonesia still faces obstacles in adopting data analytics technology in auditing due to limited resources and infrastructure. Therefore, increasing investment in digital infrastructure and developing the capacity of auditors in the public sector are crucial to improve the effectiveness of BDA implementation. KPMG (2022) stated that educational institutions can improve the efficiency and transparency of academic management by utilizing BDA technology, but the main challenge is the low level of technology adoption in academic financial management. Thus, further research is needed to understand the factors that influence the acceptance of technology in auditing in the education sector, so that BDA implementation can be optimized.

Contribution of the Use of Big Data Analytics in supporting data-based decision-making processes in affected sectors in Indonesia

Table 9. Theory used by the author

Teori	Penulis
Technology Adoption Theory	(Gao et al., 2021); (Rahman & Irwansyah, 2024); (Gao et al., 2021)
Information Systems Theory	(Liew et al., 2021); (De Santis & D'Onza, 2020)
Accountability Theory	(Saleh et al., 2021); (Al Lawati et al., 2024); (Saleh et al., 2021)
Risk Management Theory	(Syah Putra et al., 2023); (Ruhnke, 2022)
Digital Transformation Theory	(Maulana Saud et al., 2025); (Sinosi et al., 2022)
Auditor Competency Theory	(Abdelwahed et al., 2025); (Omitogun & Al-Adeem, 2019); (Abdelwahed et al., 2025)
Decision Making Theory	(Isaa & Subramanian, 2024); (Wang & Huang, 2019)
Legitimacy Theory	(De Santis & D'Onza, 2020); (Rahman & Irwansyah, 2024)
Digital Audit Theory	(Hezam et al., 2023); (Kalman & Irwansyah, 2024); (De Santis & D'Onza, 2020)
Sustainable Systems Theory	(Shukla & Mattar, 2018)
Forensic Audit Theory	(Rahman & Irwansyah, 2024)
Professional Competency Theory	(Omitogun & Al-Adeem, 2019)
Audit Technology Theory	(Omitogun & Al-Adeem, 2019)

Source: Research Results

Table 9 shows the distribution of theories used by various researchers in the articles analyzed. Technology Adoption Theory is used in the research of Gao et al. (2021) and Rahman & Irwansyah (2024), which focuses on how analytical technology is adopted in the audit world. Information Systems Theory is applied by Liew et al. (2021) and De Santis & D'Onza (2020), showing attention to the influence of information systems in supporting data-based audit processes. Accountability Theory is used by Saleh et al. (2021) and Al Lawati et al. (2024), which highlights how the application of Big Data can increase transparency and accountability in audits.

Meanwhile, Auditor Competence Theory is used by Abdelwahed et al. (2025) and Omitogun & Al-Adeem (2019), which shows that the role of auditors in understanding and implementing Big Data technology is one of the important factors in the effectiveness of technology-based audits. Digital Transformation Theory, Decision Making Theory, and Digital Audit Theory are also used in several studies, indicating that technological developments in auditing not only affect audit methods but also the decision-making process and changes to a more modern audit system. Several other theories, such as Forensic Audit Theory and Professional Competence Theory, are used in certain articles that discuss more deeply the aspects of auditor expertise in facing the challenges of audit digitalization.

The theories used in research related to the application of Big Data Analytics in auditing, with Technology Adoption Theory as the most frequently used approach (Gao et al., 2021; Rahman & Irwansyah, 2024), emphasize that the acceptance and implementation of technology in auditing are greatly influenced by organizational factors and individual readiness. Information Systems Theory (Liew et al., 2021; De Santis & D'Onza, 2020) supports these findings by highlighting the role of technological infrastructure in the effectiveness of data-driven audits. However, several studies emphasize that the use of technology has not completely replaced the role of auditors in assessing transaction complexity (Ruhnke, 2022). Accountability Theory (Saleh et al., 2021; Al Lawati et al., 2024) emphasizes that greater transparency from the application of Big Data in auditing can increase accountability, but Rahman & Irwansyah (2024) argue that increasing data can actually pose a risk of manipulation if not supported by a strong monitoring system.

In addition, the Auditor Competency Theory (Abdelwahed et al., 2025; Omitogun & Al-Adeem, 2019) shows that the success of implementing technology in auditing depends on the auditor's digital literacy, which is in line with Maulana Saud et al. (2025) who highlighted

Digital Transformation as a factor that changes modern audit practices. However, Kalman & Irwansyah's (2024) research in Digital Audit Theory shows that the adoption of audit technology still faces regulatory challenges and reporting standards that are not yet uniform across jurisdictions.

Contradictions are also found in Decision Making Theory, where Isaa & Subramanian (2024) show that data analytics can improve auditor objectivity, but Wang & Huang (2019) indicate that excessive reliance on automation systems can reduce auditors' professional acumen in identifying fraud patterns that are not detected by algorithms. Thus, although these theories collectively support the role of technology in auditing, the debate regarding the effectiveness, limitations, and readiness of auditors in facing the digital era remains a major challenge in this study.

Table 10. Independent Variables Used in Research

Independent Variables	Frequency
0	5
1	7
2	4
3	6
4	2
5	1
Total	**25**

Source: Research Results

Table 10 shows the distribution of the number of independent variables used in research related to Big Data Analytics in Audit. Of the 25 articles analyzed, 7 articles (28%) used only one independent variable, while 6 articles (24%) used three independent variables. A total of 4 articles (16%) used two variables, while 5 articles (20%) did not have independent variables because they most likely used a conceptual approach or literature review study.

In addition, there were 2 articles (8%) that used four independent variables, and 1 article (4%) that used five variables, indicating that studies that adopted many independent variables were relatively few. These results indicate that the majority of studies use an approach with a limited number of independent variables, which may indicate a more specific focus in examining the impact of Big Data Analytics on audit.

Distribution of the number of independent variables in research on Big Data Analytics in audit, where the majority of studies use a limited number of variables. As many as 28% of studies only used one independent variable, while 24% used three variables, indicating that most studies focus on the direct relationship between Big Data Analytics and audit without considering moderating or mediating factors (Gao et al., 2021; Rahman & Irwansyah, 2024).

As many as 20% of studies do not have independent variables, indicating a conceptual approach or literature review, which is in line with studies that still mostly examine theories related to the application of technology in audit (Wang & Huang, 2019). Studies using four or more independent variables are still limited (12%), indicating that a more complex approach to assessing factors influencing the adoption of Big Data Analytics is still rare. This is different from the findings of De Santis & D'Onza (2020) who emphasized that the application of technology in audit should be influenced by a combination of factors such as regulation, auditor competence, and management support. Therefore, although a single-variable-based approach still dominates, future research can further integrate more complex analysis models to

understand the various factors influencing the application of Big Data Analytics in audit more holistically.

Table 11. Dependent Variables Used in Research

Independent Variables	Frequency
Audit Report	1
Audit Committee Meeting	1
Board of Commissioners Effectiveness	1
Book Value	1
Book Value Per Share	1
Corporate Governance	1
Current Ratio	1
Disclosure Intensity	1
Earnings	1
Changes in Earnings Per Share	1
Socio-Economic	1
Environmental Dimension	1
Family Ownership	1
Financial Performance	1
Financial Reporting Quality	1
Company Growth	1
Company Value	1
Foreign Ownership	1
Good Corporate Governance	1
GRI Reporting Framework	1
Industry Sector	1
Industry Type	1
Intellectual Capital	1
Intangible Assets	1
Managerial Ownership	1
Market Reaction	1
Share Price	1
Ownership Structure	1
Company Size	1
Social Responsibility Committee	1
Stakeholder Reporting	1
Sustainability Reporting Standards	1
Total	**32**

Source: Research Results

Table 11 details the dependent variables used in research related to Big Data Analytics in Audit, with a total of 32 different dependent variables. This shows that research in this area is very varied and does not focus on just one main aspect. Each variable in the table has the same frequency, which is 1, which means that each only appears in one study.

Some of the variables used as dependent variables in this study include Financial Reporting Quality, Board of Commissioners Effectiveness, Managerial Ownership, and Ownership Structure, which shows that the research does not only focus on the technical aspects of the audit but also organizational factors and corporate governance. In addition, there are variables related to finance and reporting, such as Profit, Company Value, Stock Price, and Market Reaction, which indicates that the research also considers how the application of Big Data Analytics in audit can impact the financial aspects of the company. These results show that although research on Big Data Analytics in audit continues to grow, there is still no fixed standard in selecting dependent variables, so there is potential for further research to identify the most relevant variables and have a significant impact on the audit process.

The diversity of dependent variables in research related to Big Data Analytics in auditing, with a total of 32 different variables, indicates that research in this field does not yet have a fixed standard in selecting the main variables. Financial Reporting Quality, Board of Commissioners Effectiveness, Managerial Ownership, and Ownership Structure are some of the variables that are often used, highlighting that research does not only focus on the technical aspects of auditing but also on corporate governance factors and ownership structures (Gao et al., 2021; Rahman & Irwansyah, 2024).

In addition, variables related to financial performance, reporting, and market reactions such as Profit, Firm Value, Stock Price, and Stakeholder Reporting indicate that research also explores the impact of implementing Big Data Analytics on the financial and compliance aspects of companies (De Santis & D'Onza, 2020). However, the use of highly varied and non-repeating variables in this study indicates a lack of consistency in methodology, which is different from previous studies that focused more on specific aspects such as audit efficiency or financial transparency (Wang & Huang, 2019).

Contradictions also emerge in research examining sustainability reporting standards and intellectual capital, where some studies emphasize that Big Data can improve the accuracy and completeness of reporting, but challenges in data integration and regulation remain major barriers to its implementation (Shukla & Mattar, 2018). Thus, although existing research approaches reflect the breadth of Big Data Analytics in audit, future research needs to focus more on identifying more specific dependent variables that have a significant impact on audit effectiveness.

Table 12. Measurement of Variables

Researcher Name	Research Methods	Independent Variable	Dependent Variable	Relationship
Gao et al. (2021)	Quantitative	Big Data Analytics	Audit Quality	(+)
Saleh et al. (2021)	Qualitative	Big Data	Financial Reporting Quality	(+)
Syah Putra et al. (2023)	Qualitative	Big Data Analytics	Audit Quality	(+)
Wu (2024)	Qualitative	Big Data, AI	Property Management	(+)
Ruhnke (2022)	Quantitative	Audit Data Analytics	Audit Quality	(+)
Rahman & Irwansyah (2024)	Quantitative	Big Data	Fraud Disclosure	(+)
Franke & Hiebl (2020)	Mix Method	Big Data Analytics	Decision Quality	(+)

Alrashidi et al. (2022)	Quantitative	Performance & Effort Expectancy	BDA Adoption	(+)
Abdelwahed et al. (2025)	Quantitative	Big Data & Analytics	Auditor Competence	(+)

Source: Research Results

This table shows that the majority of the studies analyzed found a positive relationship between independent variables related to Big Data Analytics and various dependent variables, such as audit quality, financial reporting quality, decision-making, management efficiency, and auditor competence. This relationship pattern is consistent across methodological approaches—quantitative, qualitative, and mixed methods—which indicates that the application of Big Data Analytics generally makes a significant contribution to improving organizational performance in various sector and institutional contexts.

Research by Gao et al. (2021) and Ruhnke (2022) concluded that the use of audit data analytics has an impact on increasing audit accuracy and effectiveness, especially in terms of risk evaluation and anomaly detection. Meanwhile, qualitative studies by Saleh et al. (2021) and Syah Putra et al. (2023) emphasized the importance of Big Data in improving the quality of financial reporting and transparency in the public sector. Rahman and Irwansyah (2024) showed that Big Data also supports fraud disclosure, accelerating the disclosure of irregularities in financial reports.

The impact of Big Data Analytics is not limited to the audit function. Wu (2024) revealed that the integration of Big Data and Artificial Intelligence can improve efficiency in asset and property management. In the context of decision making, Franke and Hiebl (2020) proved that analytical skills developed through the use of Big Data can improve the quality of managerial decisions. Other studies by Alrashidi et al. (2022) and Abdelwahed et al. (2025) highlighted the human resource aspect, with the results that auditor performance expectations and competencies play an important role in driving technology adoption and audit effectiveness.

Table 13. Comparison of Research Results Based on Period

No	Research Period	Research Characteristics	Amount	Research by	Conclusion of Research Results
1	Before COVID-19	Focus on early development of BDA-based audit models and evaluation of the efficiency of traditional audit systems	4	Arnaboldi et al. (2017); Shukla & Mattar (2018); Salehi et al. (2015); Wang & Huang (2019)	The audit model is still based on conventional techniques and the initial introduction of BDA as an audit tool.
2	During COVID-19	Start massive adoption of AI and BDA; pandemic pressure drives audit innovation and public transparency	5	Gao et al. (2021); Liew et al. (2021); Saleh et al. (2021); Abdelwahed et al. (2021); Franke & Hiebl (2020)	BDA significantly supports transparency, fraud detection, and audit efficiency in the public sector.
3	After COVID-19	More holistic research with integration of auditor competency, governance, and	10	Sinosi et al. (2022); Syah Putra et al. (2023); Rahman & Irwansyah (2024); Wu (2024); Ariyanto (2024); Alrashidi et al.	BDA is used more strategically to improve audit quality and data-based decisions, taking into account competency and governance factors.

No	Research Period	Research Characteristics	Amount	Research by	Conclusion of Research Results
		strategic decision-making aspects		(2022); Ruhnke (2022); Hezam et al. (2023); Abdelwahed et al. (2025); Maulana Saud et al. (2025)	

Source: Research Results

Based on the period classification, there is a shift in research orientation related to the application of Big Data Analytics (BDA) in the field of audit and decision-making. In the period before COVID-19, research was still focused on the early stages of data technology utilization in audit. Studies such as Arnaboldi et al. (2017), Shukla & Mattar (2018), and Salehi et al. (2015) show that the use of BDA is still limited to efforts to evaluate traditional audit efficiency, with a dominance of theoretical and evaluative approaches to computer-based audit systems. Prediction and audit models are still conventional, and big data is positioned as a supporting technology that has not been fully integrated into the audit process.

During the COVID-19 pandemic period (2020–2021), there was a significant acceleration in the adoption of BDA and artificial intelligence (AI), triggered by the need for efficiency and transparency in emergency conditions. Research during this period, such as that conducted by Gao et al. (2021) and Saleh et al. (2021), shows that the pressure of the economic crisis and the complexity of financial management encourage audit institutions and the public sector to rely on data technology. The focus of research has shifted from conceptual exploration to real implementation, particularly in the context of increasing transparency, fraud detection, and strengthening public accountability. These results emphasize the role of BDA as a relevant and urgent decision-making tool during times of disruption.

Entering the post-COVID-19 period (2022–2025), the research approach has transformed to become more holistic. Research no longer only discusses the effectiveness of technology, but also considers the integration between BDA and organizational factors such as auditor competence, corporate governance, and the quality of strategic decision-making. Studies such as Syah Putra et al. (2023), Wu (2024), and Abdelwahed et al. (2025) show that the effectiveness of BDA is greatly influenced by institutional readiness, including human resource capabilities and structural support within the organization. In addition, the use of BDA has also expanded to sectors such as property, energy, and education, reflecting the increasing flexibility and adaptive capabilities of this technology.

CONCLUSION

The implementation of Big Data Analytics has been proven to contribute significantly to improving audit efficiency in sectors undergoing digital transformation in Indonesia. The most dominant findings show that the use of BDA-based audit technology, such as audit data analytics, allows the audit process to be carried out more accurately, quickly, and responsive to risk. Studies using audit quality, audit efficiency, and financial report transparency variables consistently state a positive relationship with the implementation of BDA, especially in the context of the public and energy sectors.

The use of Big Data Analytics also plays an important role in supporting the data-based decision-making process. This contribution can be seen from the positive influence of BDA on decision quality, asset management, and decision-maker competence. Research using a quantitative and mixed method approach shows that the use of big data and artificial intelligence allows organizations to respond to external dynamics more adaptively and based

on evidence. Analytical competence and technology readiness factors are also important determinants in the success of data-based decision making.

The most dominant variables found in this study include Big Data Analytics, audit quality, decision making, transparency, and auditor competence. Most articles show a positive relationship between variables, which supports the finding that BDA not only has a technical impact, but also strengthens the governance aspects and institutional capabilities of organizations in facing the challenges of digitalization.

The limitations of this study lie in the number of articles analyzed, which is 25 articles during the period 2018–2024. In addition, not all articles explicitly mention the relationship between variables or use a uniform measurement model. Therefore, generalization of the findings needs to be done carefully. Further research is recommended to expand the scope of the sector, involve more regional contexts outside Indonesia, and adopt a longitudinal approach to capture changes in BDA's contribution to audit and decision-making over time.

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