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Implementation of Big Data and Technology in Improving The Quality of Auditor's Audit Results (Case Study at BPK The Riau Province)

Implementasi Big Data dan Teknologi dalam Meningkatkan Kualitas Hasil Pemeriksaan Auditor (Studi Kasus di BPK Provinsi Riau)

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Abstract - This study aimed to determine the effects of data science implementation and examiner performance technology at the government auditor's office. The variables were data science and technology, and the performance of financial examiners as a dependent variable during the pandemic. A descriptive method in the form of correlation studies with a quantitative approach was used to determine the effect. It is expected that more accurate measurement results about the responses given by respondents would be obtained so that data in the form of numbers could be processed using statistics, namely normality tests, tests of validity, reliability, and hypothesis testing. This study's population was confined to the financial examiners of the government auditor office, with the sample consisting of 43 auditors. A google form questionnaire with a likert scale was used for sampling. The data were analyzed at a 95% significance level. Regression analysis was employed as an analytical tool in this study. The novelty of this research is how the use of big data and technology has a vital role in auditing, especially remote audits because it does not allow for field inspections during the pandemic. Result of this study, the big data and technology variables had a beneficial impact on the quality of government auditors during the pandemic period.

Keywords: Audit, Big Data, Technology.

Abstrak *- Tujuan dari penelitian ini adalah untuk mengetahui pengaruh implementasi ilmu data dan teknologi kinerja pemeriksa pada kantor auditor pemerintah. Variabel penelitiannya meliputi variabel independen seperti data science dan teknologi, serta variabel dependen yaitu kinerja pemeriksa keuangan pada masa pandemi. Untuk mengetahui pengaruhnya digunakan metode deskriptif berupa studi korelasional dengan pendekatan kuantitatif. Diharapkan diperoleh hasil pengukuran yang lebih akurat terhadap tanggapan yang diberikan responden, sehingga data yang berupa angka-angka dapat diolah dengan menggunakan statistik yaitu uji normalitas, uji validitas, reliabilitas, dan uji hipotesis. Populasi penelitian ini dibatasi pada pemeriksa keuangan pada kantor auditor pemerintah. Sampel penelitian penelitian ini terdiri dari 43 auditor. Kuesioner formulir google dengan skala likert digunakan untuk pengambilan sampel. Data dianalisis pada tingkat signifikansi 95%. Analisis regresi digunakan sebagai alat analisis dalam penelitian ini. Kebaruan dari penelitian ini adalah bagaimana penggunaan big data dan teknologi memiliki peran yang sangat vital dalam audit, terutama penggunaan audit jarak jauh karena tidak memungkinkan dilakukannya inspeksi lapangan di masa pandemi. Hasil penelitian variabel data dan teknologi memberikan dampak positif terhadap kualitas auditor pemerintah pada masa pandemic.*

Kata kunci *: Audit, Big Data, Teknologi.*

INTRODUCTION

The Supreme Audit Agency of the Republic of Indonesia (BPK) is a state entity entrusted with investigating the administration and accountability of state finances by central and regional government entities. This is specified under article 23E paragraph (1) of the 1945 constitution and law number 15 of 2006. With the BPK's investigation, it is hoped that state financial management will be free of fraudulent or corrupt acts that are harmful to the state. However, the existence of covid-19 has caused the BPK's method of reviewing state financial management to be less than optimal. This is due to the government's various large-scale social restrictions (PSBB) adopted in breaking the chain of transmission and dissemination of covid-19 to the population. This is due to the ease with which covid-19 can be transmitted, beginning with the air and progressing to contacting objects and people

who are positive for covid-19. The considerable budget supplied for health facilities and the government's economic stimulus increases the strain on the government examiner to carry out their jobs appropriately with all of their limitations. This study aimed to determine the effects of data science implementation and examiner performance technology at the government auditor's office. The research gap in this research is how auditors use big data and technology during covid-19. Several options for overcoming these issues include using big data processing and audit technology in the examination. The novelty of this research is how the use of big data and technology has a vital role in auditing, especially remote audits because it does not allow for field inspections during the pandemic. According to the August 2021 issue of CPAB exchange technology, auditing has altered. Operations are becoming more automated, and software and technology are now available to analyze risk and audit procedures. Among the most often utilized technologies are (1) application for preparing and compiling documentation, (2) application for the examiner, (3) applications as tools and automation techniques to perform audit procedures.

Tests by Euleric and Pickerd (2020) suggest that technology-based auditing can improve audit effectiveness and efficiency while also increasing trust from audit report users. According to Rus Research (2015), information technology-based auditing employs theory and practice in areas such as database utilization, finding and analyzing problems, and producing reports that are understandable to all stakeholders. According to Hamdam and Jusoh (2020), the cognitive process of integrating data visualization and data processing modes is intuitive because the amount and complexity of business data will be taken into account and used as the basis for auditor decision-making when preparing audit reports. According to Appelbaum and Kogan (2017), modern auditing frequently employs big data analytics for competitive and relevant data that is integrated with the cloud, the internet of things, and external data sources such as social media. New auditing standards for audit evidence based on data analysis are required for the measurement and reporting of working papers based on the usage of big data by auditors.

The contribution of this research is that by utilizing big data and technology, auditors can improve the overall quality of their audit results, provide significant added value for organizations and other stakeholders and can become a reference for auditors, both government auditors and public accounting firms, in carrying out work if there is a pandemic in the future.

LITERATURE REVIEW

Agency theory

Agency theory Jensen & Meckling, (1976) states "agency relationship as a contract under which one or more persons (the principals) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent". One's own interests take precedence over the interests of shareholders is the meaning of agency theory. Reschiwati and Muthia (2022). To reduce or minimize fraud carried out by management and create financial reports making management more trustworthy (reliable) is necessary monitoring that can only be carried out by third parties, namely independent auditor to be able to carry out auditing activities. So with this theory of nostalgia, it can help auditors in understand the conflict of interest that occurs between the agent and principal which leads to acts of fraud.

Big Data

According to Mauro and Greco (2016), big data is information data that has the characteristics of very big volume, rapid data change, and diversity of data types, requiring technology and analytical methodologies to be valuable and usable for commercial goals. According to Geppa and Linnenluecke (2017), big data audit methods can be coupled with traditional audit procedures for real-time information, collaborative platforms, and peer-to-peer marketplaces. Yadaf (2020) discovered that auditors rely on big data to sample the quality of audit evidence to provide reasonable assurance that financial statements are materially based on generally accepted accounting principles. Big data can help to reduce sampling risk and provide a decent level of assurance. Meanwhile, according to Joshi and Marthandan's (2020) research, auditors can do big data analysis, which involves the

complexity of data extraction and data mapping, by efficiently and cost-effectively processing their customers' data.

In the meantime, Krieger and Drews (2021) presented a process theory that describes how public accounting firms employ analytical data in the audit practice. In practice, the process consists of six activities: data analysis ideas, preparation review, solution creation with data analysts, auditor commitment, data dissemination, and operational use of big data analysis tools. According to Li et al (2022), a model is needed to audit cloud data as a source of big data with a verifier designed to keep the audit running with integrity that is acceptable to the public to get a random sample of audit batches for prediction and add to the data security model.

Technology

According to Shun (2017), technology is anything smart and good enough to do something according to its function, and purpose and has benefits in an activity. The research of Manitaa et al. (2019) shows that technology will digitize all activities that can increase the role of the auditor organization in: relevance in organizational governance mechanisms, quality audit, analyze all customer data, strengthen the culture of innovation. Meanwhile, research by Mustapha and Lai (2017) shows that information technology is widely used in the audit process such as audit work papers, selecting samples, and accelerating the process of completing work to produce financial report opinions efficiently.

According to Rujia, Ziaya, and Zenkai (2018) to improve the efficiency of the audit system for big data, it is proposed to pay attention to the following: use of cloud for high-efficiency data storage based on precise algebraic computing methods and reduce server costs, designing databases for large-scale data with search algorithms and data security, remote audit method at the time of audit. Additionally, as part of the audit, the information system must be audited. Information auditing is limited to information system components. As a result, information audits cannot be combined with other types of audits. Information auditing has unique aims, special techniques, and tools (Rus, 2015). For this audit, information must have the following seven essentials: availability of information must be available at all times during the decision-making process. The integrity of the data accuracy must follow the rules and expectations of the organization, compliance with the information logic structure information reliability information efficiency effectiveness of information must be relevant, accurate, and timely confidentiality of information is given to those who are entitled.

Audit technology for small and medium-sized firms, according to Rikhardssona and Dull (2016), can be used by the internal audit department and compared to the size of the organization where the pattern is unstructured, sudden, and opportunity-based. According to research conducted by Naim et al (2022), the information technology policy applied in governance in the auditor's work environment, particularly in decision making, promotes effectiveness, efficiency, and performance while minimizing risk.

Auditing

According to Yadav (2020), auditing is a systematic and planned method aimed to determine if an organization's financial statements conform to generally accepted accounting standards (Ruppert). As explained by Zucca (2015), the auditor must collect and document evidence to support the auditor's opinion report on the organization's financial statements in compliance with applicable auditing standards.

According to Harris and Williams (2020), audit experience, corporate internal control, timely reporting, and auditing standards all have an impact on audit opinion report quality. Defined by Xiong et al. (2020), auditor traits, audit office size, and audit office specialization all have an impact on audit quality. Leadership problems and the expertise of supervisors and audit teams affect audit quality based on research from the internal auditor board (2018).

Research by Comprix and Huang (2015) states that the size of audit firms, both large and small, does not affect audit quality. This is in line with research DeAngelo (1981) argues that larger audit firms have "more losses" if they do not find financial standard violations, but other researchers have found that large public accounting firms have better audit quality (eg, Becker et al., 1998; Francis & Krishnan, 1999; Francis et al., 1999; Lennox & Pittman, 2010; Teoh & Wong, 1993; Weber &

Willenborg, 2003 Lawrence et al. (2011) show that there is audit quality between large and small public accounting firms which is more likely due to client characteristics. Boone et al. (2010) show that there is a slight difference in audit quality between large public accounting firms compared to small ones.

Hypothesis

Based on research by Rakipi et.al (2020) found a positive relationship between the use of big data analytical data on audit activities the use of automation, big data, and machine learning will facilitate time analysis and detection reporting tools in the audit field according to Chu et al (2021). Rafael Research claims (2020) that the use of big data and artificial intelligence in the audit process attempts to detect and prevent accounting fraud. Both big data and artificial intelligence can be used to detect fraud. Big data represents more credible and relevant audit evidence than traditional evidence gathered by auditors during the audit process. Other studies on the use of big data for auditors include big data as credible and relevant audit evidence for determining if financial statements conform with principles during the audit process, as well as Vasarhelyi et al. 2015. The use of big data to make data population analyses that obtain financial and non-financial information (Brown-Liburd et al. 2015). The authors (CAO et al. 2015) identify several big data applications in the audit process that are linked to various audit phases, such as identifying and assessing the risks associated with accepting or continuing an engagement audit or performing substantive analytical procedures in response to an assessment of material misstatement risks.

According to Guanfang Qiao (2020), the use of big data technology has become a trend in China's current creative auditing procedure. Based on the findings presented above, the following hypotheses can be promoted:

H1: The use of big data in the audit process can improve the quality of audit reports.

The results of research by Baatwaha and Ansi (2022) showed that the use of technology can provide high audit performance and quality during the pandemic by using remote auditing. According to Castka et.al (2020) during the pandemic crisis the potential for remote auditing and other technologies such as artificial intelligence and the use of satellites to carry out audits that meet standards. According to research undertaken by Miklos A. Vasarhelyi and Silvia Romero (2014), the usage of integrated information technology facilities can assist auditors in completing complex jobs. According to the findings of Adeyemi et al. (2014) research, the majority of internal auditors use audit software technologies to conduct audits.

According to Ali Mustafa Magablih (2019), the use of technology in the audit process has an impact on reducing audit fees, speeding the audit process, taking more samples, and eventually improving trust in auditors in Jordan. Based on the research above, the following hypotheses can be made:

H2: The use of technology in the audit process can improve the quality of the auditor's report.

RESEARCH METHOD

This study used quantitative method. The research sample used purposive sampling. The data were collected by using a questionnaire with independent variables namely understanding accounting standards, experience, technology and the dependent variable, performance. The questionnaire was made using google form and using a linker scale with the answers to the questionnaire in the form of: (1) strongly disagree, (2) disagree, (3) doubt, (4) agree, (5) strongly agree. variable definition big data: large and complex data sets that are difficult to process with traditional tools, including structured and unstructured data from various sources. Indicators: volume, speed, variety, accuracy, and value of data. Technologist: advanced tools and methods for collecting, storing, processing, and analyzing data in audits, including audit software, data analytics, quality of audi results the level of reliability, accuracy and relevance of audit findings, including the ability to detect errors and fraud and provide relevant recommendations. Indicators: accuracy of findings, error/fraud detection, quality of recommendations, and level of compliance. From the quosiner, the data were obtained in the form of numbers. Then the data were processed by using statistical methods with smart-PLS. Quantitative research methods have the aim of showing the correlation between variables, testing theories, looking for generalizations that have predictive values. Theory is a framework in quantitative research that

underlies the formulation of problems or questions, developing hypotheses, testing data, and making conclusions. The position and role of theory in quantitative research is reflected in the results of research in the form of support or rejection of the theory. The data collection method was carried out in accordance with BPK's standard procedures, namely the questionnaire was handed over to the public relations section of BPK Riau Representative and the public relations section distributed it to the auditor and the auditor filled out and returned the questionnaire to 43 respondents. The reason for selecting the sample was because the author lives in Riau, making it easier to obtain data.
Statistical test used was validity test, reliability test and hypothesis test. with the Independent variable is the understanding of government accounting standards, experience and accountability while the dependent variable is report quality.

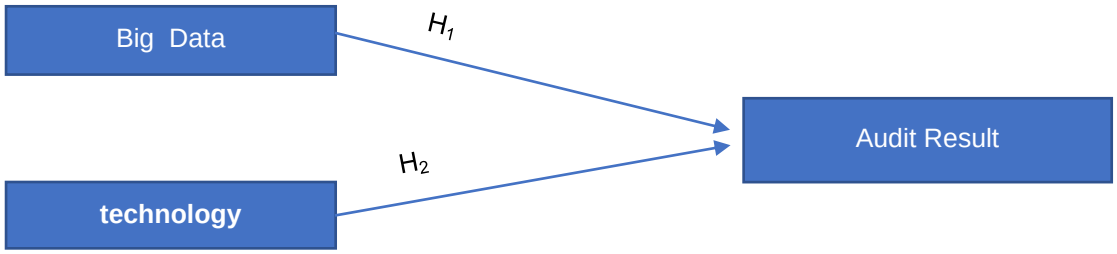


Figure 1. Research Framework

FINDINGS AND DISCUSSION

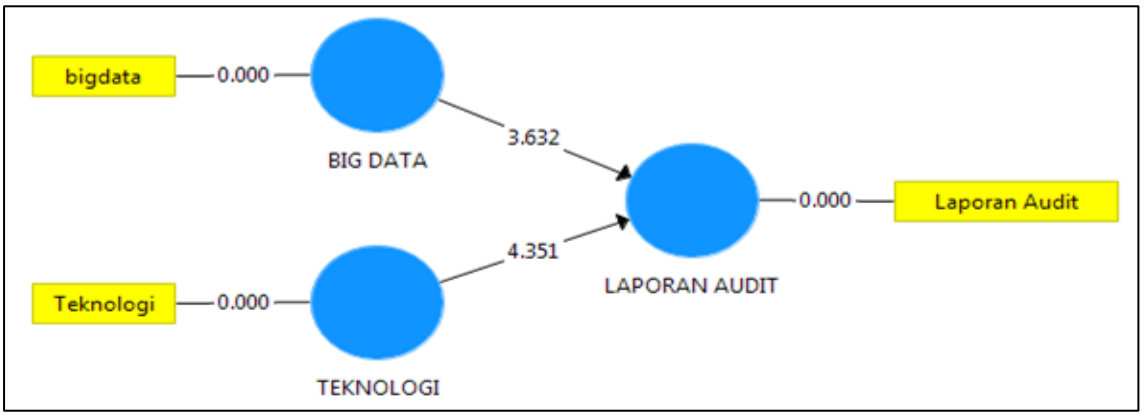


Figure 2. Model PLS

Description: Data is processed using smart-PLS.
PLS (partial least square) is a component or variant-based SEM structural equation model. PLS is an alternative approach that shifts from the covariance-based to variance-based SEM approach. Based on table 1, big data has a positive and significant influence on audit reports with an influence of 3,632. So when the use of big data will increase, the quality of audit reports will increase. Likewise, technology has a positive and significant influence on audit reports with an influence of 4,351. So that when using technology it will improve the quality of AUD reports.

Table 1. Validity and Reliability Test

Description	Cronsbach Alpha	Composite Reliability	Average Variance Extrated (AVE)
Big Data	1.000	1.000	1.000
Laporan Audit	1.000	1.000	1.000
Teknologi	1.000	1.000	1.000

Description: Data is processed using smart-PLS.
Validity and reliability are measuring tools in research. Validity assesses how accurate the measuring instrument used is, while reliability assesses how consistent the measuring instrument is. Accuracy as measured by validity includes results that correspond to real characteristics, properties, and variations. Qualitative and quantitative methods often use validity measurement tools. Both refer to

the number of conditions to be measured or the amount of unrelated information that is involved in the research results.

Meanwhile, reliability assesses the consistency of measuring methods, meaning that if there are similar results, it can be said to be consistent if similar methods or methods are used in the same conditions. Only then can it be said to be reliable. Simply put, reliability is being able to repeat similar test results. Reliability can be said to be efficient if it can measure how well the test being measured is able to achieve what is desired. There are several methods that can be used to test reliability, namely repeating test results to produce similar results. In this case there is something called a reliability coefficient, namely cohen's alpha, cronbach's alpha, spearman brown formula, pearson correlation.

Based on table 2 from the output above, the AVE value for all variables is greater than 0.5, so it can be said that all valid indicators converge in forming their respective variables. Apart from that, cronbach's alpha and cr values were also obtained which were greater than 0.6 for all variables. It can be concluded that all variables and items used in this research meet validity and reliability in measuring variables.

Table 2. Path Coefficients

Description	Original Sample	Sample Mean	Standar Deviasi	T.Statistic	P Values
Big Data	0.451	0.440	0.124	3.622	0.000
Teknologi	0.514	0.526	0.118	4.351	0.000

Description: Data is processed using smart-PLS.

Path coefficients are a value that is useful in showing the direction of the relationship between variables, whether a hypothesis has a positive or negative direction. Path coefficients have values in the range -1 to 1. If the value is in the range 0 to 1 then it can be stated as positive, whereas if the value is in the range -1 to 0 then it can be stated as negative. And if it has a p value < 0.05 has a significant effect. It can be seen in table 3 that all direct effects of the big data variables have a p-value of 0.000, less than the significance level of 0.05, so that big data has a significant and positive influence on the audit report. And the technology variable has a p-value of 0.000 which is less than the 0.05 significance level so that technology has a significant and positive influence on audit reports.

Table 3. R Square

Description	R Square	R Square Adjusted
Audit Result	0.893	0.888

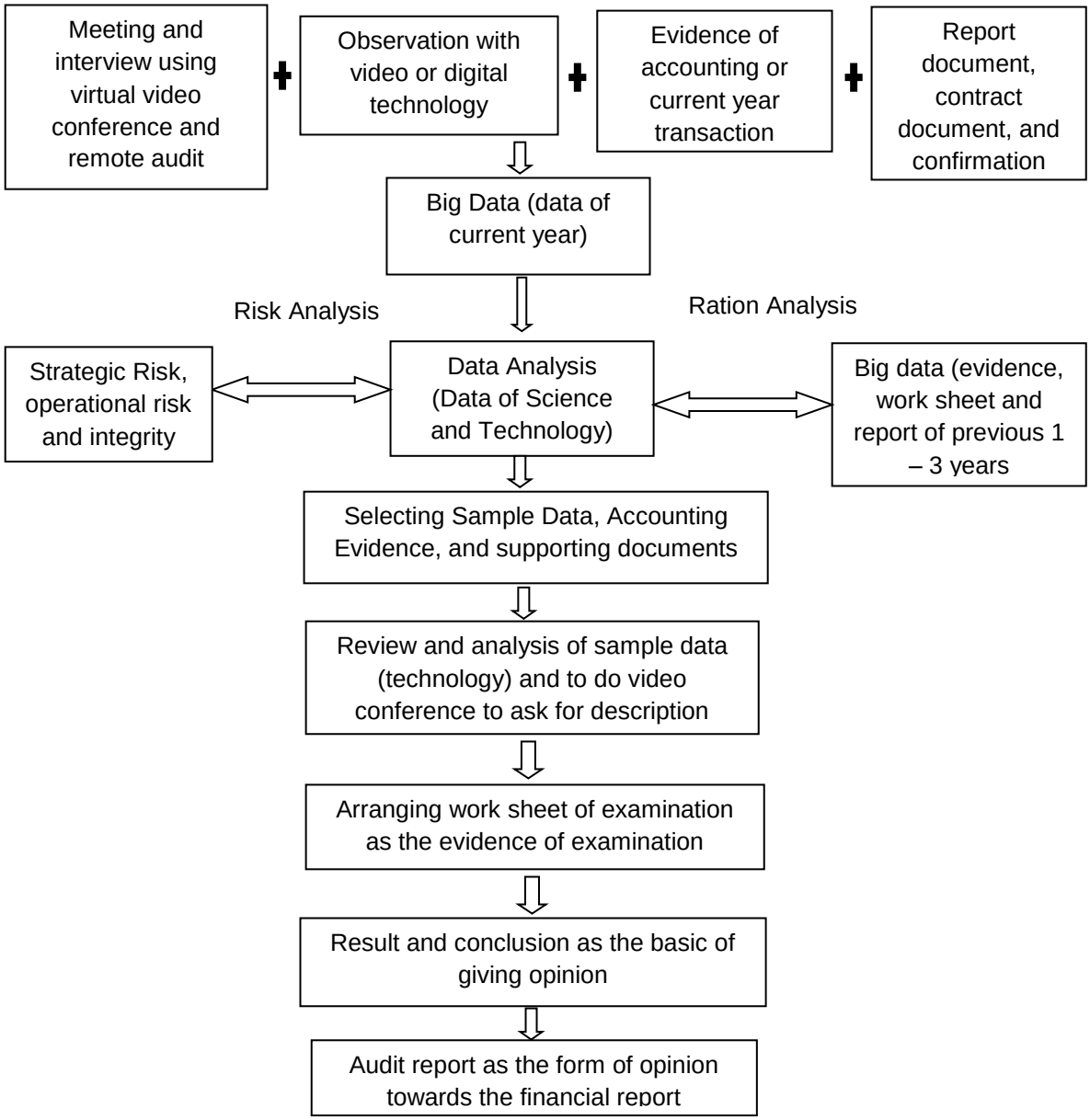
Description: Data is processed using smart-PLS.

R square is a value that shows how much the independent (exogenous) variable influences the dependent (endogenous) variable. R squared is a number that ranges from 0 to 1 which indicates the magnitude of the combination of independent variables that together influence the value of the dependent variable. The r-squared value (r2) is used to assess how much influence a particular independent latent variable has on the dependent latent variable. There are three grouping categories in the r square value, namely the strong category, moderate category and weak category (Hair et al., 2011). Hair et al stated that an r square value of 0.75 is included in the strong category, an r square value of 0.50 is included in the moderate category and an r square value of 0.25 is included in the weak category (Hair et al., 2011). Based on table 4, the value is 0.893 which means that the big data and technology variables have a strong influence on the audit report with a figure of 89.3%.

Discussion

The Indonesian government passes a law on state financial policy and financial system stability for handling pandemics in the face of threats to the national economy and/or financial system stability. This policy grants the government and the financial sector stability committee very broad powers to take extraordinary steps (extraordinary) in the realm of state financial management in dealing with the pandemic. To ensure the fulfillment of good governance, the speed of government movement must be tempered with a check and balance procedures and oversight. To ensure that government policies dealing with covid-19 are transparent, responsible, and effective, there must be a collaboration between the executive, legislative, and auditing institutions, as well as the public. In international practice, the role of state auditors is summarized into oversight, insight, and foresight functions.

The progress audit scheme implemented can be seen in the flow below:



Auditors use an examination procedure that allows them to gather sufficient and suitable evidence without jeopardizing human health considerations during the pandemic period. The use of information and communication technologies is optimized to boost the efficiency and effectiveness of examinations while reducing personal interaction. If an examination technique necessitates a physical meeting, it is assumed that the examiners follow the necessary health procedures. The steps are as follows:

The first is to collect the required data in the form of:

1. Request for accounting evidence or transactions for the current year is the auditor's main step, the data is in the form of electronic data and physical data. Physical data is returned after the inspection process is complete.
2. Report documents, namely financial reports, work progress reports if the project is multi-year, work contracts that have been completed, are still in process and have not been started both digital and physical documents, and confirmation letters from external parties.
3. Observations with video or digital technology are carried out to see the results of work in the field, both completed and progressing, if you are not satisfied, then it will be carried out in the field with strict health procedures.

4. Meetings and interviews using virtual video conferencing and remote auditing to ask questions and also fill out questionnaires that can be sent via electronic mail.

Second, compile all data for the current year into a single big data database or big data.
Third, use tools and technology (artificial intelligence and machine learning) to process data and perform ratio analysis between the current year's data and the prior year's data or the previous two years utilizing data saved in databases kept on servers.
Fourth, conduct risk testing by submitting internal control questionnaires and standard operating financial procedures and determining whether they were carried out following applicable legal provisions, as well as conducting analysis using tools and technology (artificial intelligence and machine learning) based on an audit platform.
Fifth, selecting a sample of accounting evidence and supporting documents based on ratio analysis and risk analysis performed on an audit platform utilizing tools and technology (artificial intelligence and machine learning).
Sixth, examine and analyze sample data utilizing tools and technologies based on an audit platform (artificial intelligence and machine learning).
Seventh, employing a data processing tool to compile working papers and process existing numbers
Eighth, based on the examination work paper, draw judgments.
Ninth, write an auditor's report explaining if the financial statements were calculated correctly and in compliance with applicable accounting principles.

CONCLUSIONS

Big data has a positive and significant effect on the quality of audit reports. This is the same as research by Putra et.al (2023) that the use of big data analytics has a positive and significant effect on audit quality. Technology has a positive and significant effect on the quality of audit reports. This is the same as research by Setyabudi et.al (2021) that the use of information technology can improve audit quality. The use of big data and technology has significantly transformed auditing by enhancing accuracy, efficiency, and scope. Big data analytics enables auditors to perform more precise risk assessments by identifying patterns and anomalies in large datasets. This targeted approach improves the audit process's effectiveness. Automation tools streamline routine tasks like data extraction and analysis, reducing human error and saving time. This allows auditors to focus on complex and judgment-based tasks. Continuous auditing, facilitated by technology, enables real-time monitoring of financial transactions, ensuring early detection of irregularities and compliance with regulations. Predictive and prescriptive analytics provide insights beyond historical data, forecasting future trends and recommending actions to mitigate risks. Data visualization tools help auditors communicate findings effectively through intuitive visual representations like charts and dashboards. Big data also enhances fraud detection by analyzing large volumes of data to identify unusual patterns. Machine learning algorithms improve the speed and accuracy of identifying fraudulent activities. Cloud computing offers secure and scalable storage solutions, promoting flexibility and collaboration among auditors. Overall, integrating big data and technology in auditing leads to more comprehensive, efficient, and effective audit processes, providing deeper insights and greater value to clients. Recommendations need to hold ongoing training for auditors on the use of big data and the latest audit technologies, invest in technology, adopt advanced audit software and technologies such as blockchain to increase efficiency and security, integrate various data sources into big data and analytics and machine learning to detect errors and fraud more accurately. Implementation The use of big data and data analysis using data processing technology, namely artificial intelligence, and machine learning, as well as other supporting technologies, will provide auditors with convenience and confidence in carrying out financial statement audit work both under normal conditions, especially in an emergency, and the data stored can be very large, minimizing the possibility of analysis errors and data loss in the future. Limitations This research only covers the Riau Representative BPK and the number of respondents is not that many and future research can expand the BPK's work area more widely.

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