

# Big Data in Auditing for the Future of Data Driven Fraud Detection



**Bambang Leo Handoko, Archie Nathanael Mulyawan, Jonathan Tanuwijaya, Fransiska Tanciady**

**Abstract:** *Industry revolution 4.0 makes people face change, the auditor profession is no exception. Auditors no longer conduct audits using the manual method but use computerized systems such as big data analytics. Our research aims to find out how auditors must change, when facing new technology approach audit. Very complicated and various data kinds that was too large to be audited manually. The research method in this research is descriptive qualitative, the method of data collection uses interviews with informants. The informant is the auditor partner of the public accounting firm. Big data has advantage and disadvantage to audit and fraud detection profession. The results of this study state that audit firm must be aware of the obstacles that come from internal and external for the implementation of big data analytics audit. Obstacles will hinder the adoption of technology for the auditor, while the auditor must change rapidly following the demands of technological development*

**Keywords :** *big data, auditing, future, data, analytics, technology*

## I. INTRODUCTION

Entering the Industrial Revolution 4.0 era where humans lived in very fast changing technology environment, encouraging humans updating their lifestyles by using technology. The 4.0 Industrial Revolution produced technology in the form of Artificial Intelligence (AI), ERP, Cloud-based Accounting, Internet of Things (IOT), and others. In this case, various things can be obtained quickly, including in obtaining data. Data is an important thing needed by humans to become information in taking future steps [1].

As we know, data has played an important role in human life. Whether we realize it or not, each of us must produce and use the data itself. The sixth annual info graphic released by [2], titled "Data Never Sleeps 6.0", states that more than 2.5 quintillion bytes are produced every day.

**Revised Manuscript Received on January 30, 2020.**

\* Correspondence Author

**Bambang Leo Handoko\***, Accounting Department, Faculty of Economics and Communication, Bina Nusantara University, Jakarta, Indonesia, 11480.

**Archie Nathanael Mulyawan**, Accounting Department, Faculty of Economics and Communication, Bina Nusantara University, Jakarta, Indonesia, 11480.

**Jonathan Tanuwijaya**, Accounting Department, Faculty of Economics and Communication, Bina Nusantara University, Jakarta, Indonesia, 11480.

**Fransiska Tanciady**, Accounting Department, Faculty of Economics and Communication, Bina Nusantara University, Jakarta, Indonesia, 11480.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

In fact, in 2021, it is predicted that as much as 1.7 MB of data will be produced every minute by everyone in the world.

There is no doubt that more than 80% overall data around all users entirely formed in the last two years. Hundreds or even thousands of data generated every second required a container to be able to accommodate it. Existing data stored in separate places for their respective uses and uses. Not infrequently, identical data are found between divisions within a company. For this reason is, big main frame existed as a way to overcome these conditions. The data generated naturally comes from various sources that have grown to become Big Data which encourages companies / industries to update the dataset to accommodate the data obtained. Without a change that refers to the acquisition of large amounts of data and widespread it will be difficult to process data using traditional systems. Companies will lose the ability to get good information even opportunities and benefits that can be obtained [3].

The conveniences offered by the presence of big data make companies see the increasingly important use of big data in their business processes. A survey conducted by [4], a technology research institute estimates that at least 75% of companies have planned to use big data by the end of 2018. Corporate investment in big data has also increased by \$ 198 billion to \$ 232 billion since 2016. This further strengthens the argument that the use of big data has become one of the fundamental factors of every company. Presence current latest technology can be seen to have a very large impact on increasing productivity, profits, and management. However, big data will not have a significant impact on the process and are analyzed first. Moving on from this problem, data analytics has become one of the technical and technical strategies being undertaken to process data that has become more useful and useful. By doing data analytics, the patterns and connections that exist in the big data can be revealed, so as to produce a variety of diverse information. It is this information which can then become an insight and assist in the decision-making process [5]. As time goes by the amount of data obtained increases drastically, even in just a few years, the data obtained can increase many times over. Therefore auditors cannot use their traditional methods to audit, for example, the sampling method. The existence of big data analytics, make auditors no longer conduct sample-based testing, but can do the overall testing. Big data provides the potential and a clearer picture of everything that is done by a company, which of course will also be followed by more relevant audit decision making.

# Big Data in Auditing for the Future of Data Driven Fraud Detection

The use of sampling methods has become no longer effective or accurate for auditing. Because with the very large amount regarding data that develops into Big Data it can be a challenge for the auditor in analyzing and evaluating a data within a certain period of time so that it cannot be represented by sampling methods alone.

What's more this method will also take a long time in dealing with this big data. Therefore making this paper is directed to find existing solutions regarding problems from Big Data in auditing by doing Big Data analytics where it can be a solution to solve existing problems at this time [6].

## II. LITERATURE REVIEW

### A. Big Data

According to [7] it is said as large data batch in a very large number, complex and unstructured, so it is hard to manage when rely on traditionally or manual approach system. This was originally a technology that was introduced to cope with the explosion of information caused by the growth of mobile device users and internet data [8]. Purpose for its use, big data presents an ease in data processing in a company. Because each module in big data is connected to one another, identical data is stored only once. This method provides several advantages, including memory efficiency, and non-redundant data.

[9] explains this issue in 4 important sections, which is: volume of data, varieties, data velocity then veracities. When computer applications in an organization have become the main source of information from data producers, digital data communication devices, both social and personal, will increase the volume of data exponentially [10]. Volume is anything related to the total size of bytes generated and collected. Data increases rapidly from terabytes to petabytes. Velocity contains the purpose of measuring the speediness ability to access information creation. How fast the data is processed and generated to meet data requests. Variety refers to various types of data that are being created. Veracity interpreted with unreliable related data sources [11].

As one of the parties that use big data, auditors have their own challenges about how the data that is available in large amounts is managed and utilized. Big data analytics, which are methods for analyzing big data, can be used to process available data to be more useful and useful. This method not only helps auditors to uncover patterns and connections that might not be seen, but can also assist in the decision making process [7].

### B. Big Data in Audit

Acquisition of large amounts of data that exceeds the limit of the specified capacity will also affect the auditing process both from the internal and external sides. The auditing process carried out by analyzing a large population with relevant audit data (for example: buying and selling transactions) is no longer efficient and accurate. Because the amount of data is very large and complicated, the use of sampling methods cannot represent accurate results, and cannot be completed within the available timeframe. To obtain more precise result output also reliable commercial views, accurate analysis and a high degree of vigilance are needed [12] and [13].

As one of the parties that used big data, auditors have their own challenges regarding how the data that is available in large amounts is managed and utilized [14]. Big data analytics, which are methods for analyzing big data, can be used to process available data to be more useful and useful. This method not only helps auditors to uncover patterns and connections that might not be seen, but can also assist in the decision making process.

### C. Data Driven Fraud Detection

Significantly, big data analytics will add value to organizations by discovering hidden patterns [15]. Big data makes an important contribution for examination process because usefulness for financial examiner to improve reliability of material also facilitated irregularities detection. First preferred usage regarding this large amount data was very large number of automatic audit capabilities, which can produce more relevant audit evidence. In addition, this issue able to enhance the overall performance of the audit personnel and audit firm as a whole. This analysis can provide descriptive analytics to overall data in database [16], provide database in very large, establish relationship in financial report and actual company performance, and identification the existence of fraud symptoms. Of course, auditors can provide more relevant audit results because they minimize the bias and risk of traditional analysis techniques (using samples).

## III. RESEARCH METHODOLOGY

### A. Primary Data and Qualitative Research

This research is a descriptive qualitative research. In this study, we discuss the auditor's adaptation to the development of big data and data analytics funds. We use self-collected primary source of data. We collected data through interviews with informants, regarding the development of big data and its impact on the financial auditor profession in Indonesia.

### B. Data Analysis Method

Qualitative data analysis is an effort made by working with data, organizing data, breaking it down into manageable units, synthesizing it, searching and finding patterns, discovering what is important and what is learned and deciding what can be told to others [17]. We do several stages in analyzing on this research, that is: simplification of large sum, show what is illustrated, later reporting output. After that, we use coding. Coding means process of processing material or information into writing segments before interpreting them. After coding, we continue with categorization. This step involves several stages, namely, taking data writing or pictures that have been collected during the collection process, segmenting sentences or pictures into categories and then labeling these categories with special terms that are often based on correct terms / language really came from participants. In data display, we are show how these descriptions and themes will be restated in a qualitative narrative or report. Finally, this was situation which we looking for solution for our problem identification with the method of determine approach to identify object and through deep analyze for exploration in observing material also relation, in other word we do comparable to detect both contrasts and comparisons.

**C. Validity and Reliability**

Valid data is no different data between the data reported by the researcher and the data that actually occurs on the object of the study.

If there are reports that are different from the actual conditions, it means that the results of the study cannot be said to be valid. Validity in qualitative research shows the extent to which the level of interpretation and concepts obtained has an appropriate meaning between the researcher and the participants. In other words, participants and researchers have suitability in describing an event, especially in interpreting the event.

Dependability is also called reliability. Reliable research is when other people can repeat / replicate the research process. In qualitative research, the dependability test is carried out by auditing the entire research process. Dependability testing is done by auditing the entire research process. The method is carried out by an independent auditor or supervisor to audit the overall activities of researchers in conducting research [17].

**IV. RESEARCH ANALYSIS**

**A. Big Data in Audits for Future Data Analytics**

With the amount of data that continues to increase drastically, and the limitations of traditional methods that do not allow to meet the target point and time limit provided, making the auditor must use a more effective and accurate method, namely the analytical method.

Big data and analytics can enable auditors to identify financial statements, fraud, and operational business risks properly, and adjust their approach to deliver more relevant audit processes [15].

This change in the future does not happen overnight. This change is a big leap to move from the traditional audit approach to an approach that fully integrates big data and analytics.

**B. Advantage of Big Data in Audits**

**Better decision making:** Using analytic methods can provide data to help decision making so that companies can compete and grow. In the [18], it was found out that 36.2% of respondents said that their main goal of analytics from big data was to help better decision making, more than 78% has begun aiming towards destination, thus 60% has achievement result, that can be measured, with an overall success rate of 69%. **Increase Productivity Level:** According to a survey from [19] and [18], 59% use "modern tools" to increase company performance. With the presence of modern software, it can help in analyzing Big Data to be more accurate, faster, and structured to increase productivity activities. **Reducing Costs:** Reporting from both surveys from [19] and [20] stated data driven business help corporation deregulate expenditures. 60% from the audience said [19] that data driven already assisted their improved business cost down effectively, also around 70% around audiences in [19] research proven people already adopting data driven system in reduce costs and by more than 10% overall audiences chose that minimization is main purpose on investing in data driven business. **Improving Service to Customers:** Companies can improve the quality of their services by analyzing big data from e-commerce and building relation with buyers, also

that's where companies will be able to obtain data and use that data to create better service than before. According a survey in [19], improving the quality of service to customers is the second goal that must be achieved in carrying out Big Data Analytic, and 53.4% of the companies that have implemented it have successfully achieved their goals.

**Detect Fraud:** One of the uses of Big Data Analytic is to detect fraud that usually occurs in the financial sector. With the help of technology, analytics can help to detect patterns and anomalies, so banks and credit card companies can detect stolen credit cards or fraud in purchases, often even before cardholders know that something is wrong. Anomaly is an irregularity that can occur due to weak internal control within the company. Often, a lack of supervision and an individualistic attitude lead to higher levels of fraud. Example: asset theft, duplicated data, fraudulent statements, and corruption.

**Increase revenue:** When companies use big data to make better decisions and improve service to customers, increasing opinions is one of the results obtained automatically. By gaining broad insight will be able to provide many opportunities in making decisions to increase company revenue. **Improve the intelligence of using technology:** Many companies were adopting data driven in order to gain balance Informatics Engineering also their corporation usage to support changes to their business strategies and tactics, faster and more often. **Greater innovation:** Companies invest in analytics primarily as a means of innovation. If companies can gain input from competition do not has, business gain more market share. **Rapid change in market place:** Using technology that helps the analytic process to translate Big Data into information; can help send information to the market.

**C. Disadvantage of Big Data in Audits**

Data Analytics can penetrate customer privacy as information in the form of online transactions, purchases that can be seen by the parent company. There are various opportunities for companies to turn customer databases into their own profits. The price of a program depends on the features and applications they have. The better the feature will be more expensive. Some programs will be complex and require proper training. Information obtained by the company can be misused by doing analytics. Example: the choice of wrong tools selection, and inability to use it [21]. Here is the tabular review of advantage and disadvantage of big data in audits.

**Table- I: Advantage and Disadvantage of Big Data**

Advantage	Disadvantage
Better decision making	Customer privacy threat
Increase productivity	Expensive price
Reduce cost	Misuses of big data
Improving service to customers	Information overload
Detect fraud	Time consumption in learn new system
Increase revenue	Invest new hardware (costly)
Greater innovation	
Rapid change in market	

## D. Current Issue and Challenge

Many obstacles when integrating data driven and analytics into audits, although this is difficult to overcome. First, the level of user-friendliness, audit staff need time to adjust to the new system. Second, information overload, previous research has exposed large data influence auditor's judgment skill in term of restrict the process of information. While effective application of big data can reduce negative impacts by providing more accurate and relevant information. Third, suitable software that can handle analysis efficiently will be very expensive [7].

**Table- II: Current Issue and Challenge of Big Data**

Current issue	Challenge
Big data collection	Unable to access the data
Impactful and up-to-date information	Bad quality of data
Visual representation of data	Work-related pressures
Information from various sources	Need more assistance
	Limited of budget
	Lack of human resources with special skills

## E. Big Data Collection

Today's big data based organizations were mostly surpassed by large quantity stream of data. Business can gained info about each event also interact which occurs every day, making the analyst dealing with very large related stream of information received.

Almost every medium to large business have demand for automatic processing. Doing this process manually is too long and doesn't need to be done in the current environment. This new environment benefit the company with time saving, the officer can use the saved time for do another work.

Software to collect manages and notifies expert people in order to do problem solving. Officers able to enter business purposes thus develop reports provide solution fast almost at the same time. Management which obligated to make decision, actually need source of reliable information as basic for consideration.

A powerful data system allows report generation by clicking the keyboard. Officers and management soon gain whatever kinds of data form with practical and academician point of view.

## F. Gather Impactful and Up-to-date Information

In situation of a lot information stream, make this hard to explore and acquire more useful one. While the officers were overloaded with work, the officers ignored analytical function the data driven and only took convenience ways rather than taking actions that actually increase the quality. Some special condition required officer to sort manually; this is not possible gain up-to-date insight into occurring situation. Information that is old and not updated affects significant to the quality decrease for business policy maker.

## G. Visual Representation of data

In order to be understood and impacted, data often needs to be presented visually in a graph or graph. Although this method is very useful, it is difficult to make it manually. The time spent on processing information from various fields and

putting it into reporting tools is frustrating and time-consuming.

## H. Information from various sources

The data collected can come from various sources with different formats. The way of writing the name, date, and also the use of "designation" which is different even though it has the same meaning also affects the data collected.

Not to mention the data provider sources were not necessarily reliable.

With a comprehensive and centralized system, employees will have access to all types of information in one location. Not only is free time spent accessing various sources, it also allows cross-comparison and ensures complete data.

## I. Unable to Access the Data

Data analytics process will not be able to have a major impact if the data stored is not accessible to the people who need it. Decision makers and risk managers need access to all organizational data for insight into what is happening at any given moment, even if they work off site. Accessing information must be the easiest part of data analytics.

An effective database will eliminate any accessibility problems. Authorized employees will be able to safely view or edit data from anywhere, describe organizational changes and enable high-speed decision making.

## J. Bad Quality of Data

There is nothing more dangerous for data analytics than inaccurate data. Without good input, the output will not be reliable. The main cause of inaccurate data is manual errors made during data entry.

This can have significant negative consequences if analysis is used to influence decisions. Another problem is asymmetric data: when information in one system does not reflect changes made in another system, leaving it out of date.

Centralized system eliminates this problem. Data can be entered automatically with mandatory fields or drop-downs, leaving little room for human error. System integration ensures that changes in one area are immediately reflected across the board.

## K. Work-related Pressures

Every employee is eager to have a boss who is cooperative and always supports his subordinates to always be productive at work.

But there are superiors whose are less in line with subordinates, thus affecting the relationship between superiors and subordinates themselves. Be aware if there is a boss who wants his subordinates to try to be independent without burdening himself/herself as a boss.

When people are doing their main work that hasn't finished yet, there's just another job coming up. Actually this is perfectly natural, but if the work that comes not only one or two but more than those thus the leader asks them to work quickly in completing all tasks given, will automatically affect your physical and mind. Especially if they add to the work that you are not supposed to do or that is not your responsibility or job desk. This is also reason why people need automatic system processing

## L. Need More Assistance

If the information driven does not get support from the company either from Top to Low Management then it cannot run effectively while the company is operating. Risk Managers are not powerful enough in many ways if the executive does not provide the ability to act. Employees also play an important role in sending data using systems to make it easier to make information that can be followed up.

## M. Limited of Budget

Another challenge faced is the budget. Risk is often a small department, so it is difficult to get approval for significant purchases such as analytic systems. In a small department that has a small budget.

Risk managers can secure budgets for data analytics by measuring the return on system investment and making a strong business case for the benefits to be achieved. For more information about getting support for a risk management software system

## N. Lack of Human Resources who have Special Skills

It is often difficult for companies to conduct analytics due to the lack of human resources who have special expertise in the analytical field. Some employees still don't have one knowledge or ability to carry out deep data analysis. Special skills like this are widely owned by people or young workers. This is because they are accustomed to using technology from an early age. This fact threatens older workers, it is impossible for companies to terminate them because they have missed the use of technology. Like it or not, older workers have to change, learn and follow technological developments.

## O. The Relevance of Implementing Big Data for Audits

The implementation of big data itself will not run well without the cooperation between parties related to the auditor. The main challenge that will actually be faced is how to encourage companies to want to open their big data to the auditor. Just imagine, two companies engaged in the same field must have the same fear to open their company's big data to the auditors, which in this case came from the same public accounting firm. This condition can occur because both parties are afraid that big data will leak from one of the parties, considering the big data owned by the company is private and important.

In addition to the aforementioned matters, the implementation of big data can also be disrupted by the information protection and governance policy, which is currently being rife by companies. Moving on from that policy, related parties can deliberately set barriers to determine in advance which information they will open. Of course, with the lack of transparency from related parties, it will also affect the effectiveness of implementing big data for audits.

The next thing that must be a concern is how large amounts of data can be processed in such a way as to solve an existing problem. The auditors themselves will definitely find it difficult to process it without a strong understanding in the field of technology. In addition, big data itself saves a lot of information often much noise, or things that are not really needed by the auditor. Given the limited time available, it will be very difficult for the auditor to sort the data in a short time. For this reason, an application is needed to facilitate the auditor's work in sorting the data.

In the end, all the success in implementing big data depends on the company itself. If the company in this case wants to open its big data transparently, the detectable fraud will be even greater and the risk that can be minimized will be even greater. Conversely; the company does not want to open its big data transparently impact on the smaller the fraud that can be detected and the risk that can be minimized.

## V. CONCLUSION AND SUGGESTION

### A. Conclusion

Today, many more companies are using big data in their business operations. Auditors who do not have sufficient knowledge in technology and analytics skills will certainly have difficulty being able to understand the client's business. This will also have an impact on the results of the audit itself, because the usage of technology for the client's business operations will affect the way the audit works. The information to be tested by auditors is not just a sample, but in a variety of related formats.

Traditional audit methods have assisted the auditor's work over the past few decades, but as technology advances and client demand continues to grow auditors must continue to innovate and transform. This condition makes analytics skill an important key for auditors as well as a reason for us to master it [22].

Significantly Big Data analytics will add value to organizations by discovering hidden patterns [23] that will not be seen from limited data sets (such as limited audit samples). According to [24] that the main function of generalized audit was for detecting irregularities [24]. For example, [25] and [25] uses analytic data to predict the possibility of fraud to anticipate future actions in the financial statements. So, the process of implementing Big Data Analytics to audits will be able to find hidden information and look for fraud that occurs due to misstatement, ghost vendors, and duplicate data.

### B. Suggestion

Based on various studies taken, in our opinion the implementation of Big Data Analytics has been running in the company operational activities, but there are still obstacles that hamper the process system. These constraints include the lack of data security, the level of fraud percentage that is more risky, as well as the suboptimal use of some tools in carrying out analytic processes. In this case the company (audit firm) must be aware of the obstacles that come from internal and external. The way that can be done is by studying activities that occurred in the past that can be done by Vouching Tracing documents and updating more modern systems by following the times such as training in the use technology for makes it easier to get Big Data more quickly and accurately.

## REFERENCES

1. M. Hermann, T. Pentek, and B. Otto, "Design principles for industrie 4.0 scenarios," Proc. Annu. Hawaii Int. Conf. Syst. Sci., vol. 2016-March, pp. 3928–3937, 2016.
2. DOMO, "Data Never Sleeps 6.0 | Domo," DOMO: Data Never Sleeps, 2018. .
3. F. Almada-Lobo, "The Industry 4.0 revolution and the future of Manufacturing Execution Systems (MES)," J. Innov. Manag., vol. 3, no. 4, pp. 16–21, 2016.

# Big Data in Auditing for the Future of Data Driven Fraud Detection

4. R. Rahayu and J. Day, "Determinant Factors of E-commerce Adoption by SMEs in Developing Country: Evidence from Indonesia," *Procedia - Soc. Behav. Sci.*, vol. 195, pp. 142–150, 2015.
5. J. Peterson, "Auditor Independence," *Bus. Prof. Ethics J.*, 2018.
6. Rusmin and J. Evans, "Audit quality and audit report lag: Case of Indonesian listed companies," *Asian Rev. Account.*, vol. 25, no. 2, pp. 1–30, 2017.
7. H.-J. Kim, A. Kotb, and M. K. Eldaly, "The use of generalized audit software by Egyptian external auditors," *J. Appl. Account. Res.*, vol. 17, no. 4, pp. 456–478, 2016.
8. A. Ahmi and S. Kent, "The utilisation of generalized audit software (GAS) by external auditors," *Manag. Audit. J.*, vol. 28, no. 2, pp. 88–113, 2013.
9. IBM Big Data & Analytics Hub, "Extracting business value from the 4 V's of big data," *IBM Big Data Anal. Hub*, 2017.
10. A.-H. G. Abulrub, Y. Yin, and M. A. Williams, "Acceptance and Management of Innovation in SMEs: Immersive 3D visualisation," *Procedia - Soc. Behav. Sci.*, vol. 41, pp. 304–314, 2012.
11. V. L. Rubin, "Veracity roadmap: Is big data objective, truthful and credible?," in *Advances in Classification Research Online*, 2014.
12. M. C. Jensen and W. H. Meckling, "Theory of the firm: Managerial behavior, agency costs and ownership structure," *J. financ. econ.*, vol. 3, no. 4, pp. 305–360, 1976.
13. H. Guénin-Paracini, B. Malsch, and A. M. Paillé, "Fear and risk in the audit process," *Accounting, Organ. Soc.*, 2014.
14. P. L. Joshi and G. Marthandan, "The Hype of Big Data Analytics and Auditors," *EMAJ Emerg. Mark. J.*, vol. 8, no. 2, pp. 1–4, 2019.
15. J. Dai and M. A. Vasarhelyi, "Imagining audit 4.0," *J. Emerg. Technol. Account.*, vol. 13, no. 1, pp. 1–15, 2016.
16. C. Schultz, "Information Security Trends and Issues in the Moodle E-Learning Platform: An Ethnographic Content Analysis," *J. Inf. Syst. Educ.*, vol. 23, no. 4, pp. 359–371, 2012.
17. U. Sekaran and R. Bougie, "Research Methods For Business. A Skill Building Approach. 7th Edition," Book, 2016.
18. M. Kornberger, L. Justesen, and J. Mouritsen, "When you make manager, we put a big mountain in front of you': An ethnography of managers in a Big 4 Accounting Firm," *Accounting, Organ. Soc.*, 2011.
19. G. Schuh, T. Potente, R. Varandani, C. Hausberg, and B. Fränken, "Collaboration moves productivity to the next level," in *Procedia CIRP*, 2014.
20. V. Midrigan and D. Y. Xu, "Finance and misallocation: Evidence from plant-level data," *Am. Econ. Rev.*, 2014.
21. J. P. Near and M. P. Miceli, "After the wrongdoing: What managers should know about whistleblowing," *Bus. Horiz.*, vol. 59, no. 1, pp. 105–114, 2016.
22. N. A. Ismail, "Accounting information systems: education and research agenda," *Malaysian Account. Rev.*, vol. 8, no. 1, pp. 63–80, 2009.
23. J. Nagy, J. Oláh, E. Erdei, D. Máté, and J. Popp, "The role and impact of industry 4.0 and the internet of things on the business strategy of the value chain-the case of hungary," *Sustain.*, vol. 10, no. 10, 2018.
24. EY, "Digital supply chain: it's all about that data," Ernst & Young, 2016.
25. A. Gepp, M. K. Linnenluecke, T. J. O'Neill, and T. Smith, "Big data techniques in auditing research and practice: Current trends and future opportunities," *J. Account. Lit.*, vol. 40, pp. 102–115, 2018.

## AUTHORS PROFILE



**Bambang Leo Handoko**, Associate Professor. Bambang was born in Indonesia on year 1985. He is an expert in research and teaching. He won many grant in research from the government body, company or corporation, institution and from the university. He has a lot of publication in international reputable journal. In teaching he is well experience in the auditing and fraud examination. He was experienced as auditor in audit firm and special staff in government. He has attended many international conferences and presented his research paper to be published in international proceedings. He was one of notably associate professor in Bina Nusantara University of Indonesia.

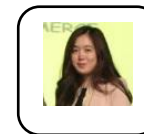


**Archie Nathanael Mulyawan**, he was born in 1999, currently study accounting in bachelor program in Bina Nusantara University. He took major in auditing studies. He was notably one of the most talented students in his

audit field. He often represent the university in various competition inside and abroad the country in national and international tournament. He won several competitions in accounting and auditing. Other than that, he is often engaged in non profit activity such as community development, he develop the community around campus by teaching entrepreneurship. The communities were micro entrepreneurship business owner. He is also doing research in data driven audit



**Jonathan Tanuwijaya**, he was born in 1999, currently study accounting in bachelor program in Bina Nusantara University. He took major in auditing studies. He was notably one of the most talented students in his audit field. He often represent the university in various competition inside and abroad the country in national and international tournament. He won several competitions in accounting and auditing. Other than that, he is often engaged in non profit activity such as community development, he develop the community around campus by teaching entrepreneurship. The communities were micro entrepreneurship business owner. He is also doing research in data driven audit



**Fransiska Tanciady**, she was born in 1999, currently study accounting in bachelor program in Bina Nusantara University. She took major in auditing studies. She was notably one of the most talented students in her audit field. She often represent the university in various competition inside and abroad the country in national and international tournament. She won several competitions in accounting and auditing. Other than that, she is often engaged in non profit activity such as community development, she develop the community around campus by teaching entrepreneurship. The communities were micro entrepreneurship business owner. She is also doing research in data driven audit.