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Application of big data and data analytics at Vietnamese Auditing Firms

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Abstract

Digital transformation has led to the application of technology in a variety of industries. This study aims to synthesize the landscape of applying big data and data analytics in auditing and proposes recommendations for Vietnamese audit firms. The authors used a qualitative data analysis method to examine the research topic, collecting relevant information relating to the application of technology in Vietnamese and foreign audit firms. The research shows several advantages of using big data in auditing and opportunities for local audit firms. However, with the lack of human resources and guidance from professional bodies, the effectiveness of applying big data and data analytics in local audit firms is limited. Therefore, the authors suggest that Vietnamese audit firms should invest in capital and human resources to adapt to the modern trend of using big data and data analytics for providing effective assurance services. Besides, they need guidance and training from professional bodies such as MOF and VACPA for local firms, and support from universities in providing the necessary knowledge for students.

Keywords: *big data, data analytics, foreign audit firms, Vietnamese audit firms*

1. Introduction

In the current era of technological advancement, people are generating and accumulating more data than ever. The widespread use of smart devices such as smartphones, laptops, desktops, and tablets has generated vast amounts of data in various forms. This phenomenon is commonly referred to as "Big data." Big data illustrates extremely large datasets, typically greater than 1015 bytes, with specific storage challenges that need to be analyzed using computational methods (Cockcroft & Russell, 2018). Big data transforms the way companies compete in the market. Ginni Rometty, CEO of IBM, stated, "*Big data will become the basis for competitive advantage, replacing the traditional competitive advantage of having the best resources, the best people, or the best strategy*" (Frank, 2017). Big data is the expression of a mass data file or a large, diverse, and complex amount of structured data, which makes it difficult to store, analyze, and visualize. Big data holds great potential for sequential processes, reveals hidden indices and secret correlations, as well as generates outcomes that influence decision-making (Balios, Kotsilaras, Eriotis, & Vasiliou, 2020). Data comes from different sources and has diverse characteristics and properties; therefore, the classification of data also has multiple applications. However, the most common classification is based on the structure of the data: structured and unstructured. The history of common data to big data dates to the 1960s, when computers were developed to process and store data. In the 1990s, owing to the development of the Internet and networking technologies, data became more common and was transmitted over the network. During the 2000s, cloud technologies enabled data storage and process on remote servers. In recent years, the development of technologies such as sensors and machine learning has created many new data sources and provided new methods for analyzing and processing big data.

Data analytics refers to the methods, tools, and applications used to collect, process, and derive insights from diverse, high-volume, and high-speed datasets. IAASB (2016) defines data analysis for auditing as the science and art of identifying and analyzing patterns, discrepancies, and biases and extracting useful information from underlying data. The issues of the audit will be analyzed, modeled, and visualized to plan and perform the audit. The field of auditing is no exception to the trend in big data and data analysis. Big data will significantly change the way the audit profession operates. Big data and data analytics enable auditors to examine items that require a comprehensive inspection. As a result, users of financial statements can expect auditors to provide a higher level of assurance for financial statements (Yadav, 2020). Different from traditional auditing, technology-enabled audits have high-quality audit evidence that comes from a variety of new sources, such as big data, exogenous data, and analytics (Edubirdie, 2022). These audits (Titera, 2013). Vietnamese auditing firms are currently seeking to leverage the advantages of big data and data analytics to enhance audit quality. However, these firms encounter several challenges when applying big data and data

analytics to the audit process. Moreover, there is a lack of in-depth research on the potential benefits and difficulties faced by Vietnamese auditing firms when applying big data and data analytics.

2. Objectives

The main objective of this study is to review and summarize the landscape of big data and data analytics applications in Vietnamese audit firms. This research provides implications for stakeholders to improve the implementation and utilization of big data and data analytics in audit firms in Vietnam.

3. Materials and Methods

This theoretical research synthesizes previous studies to find patterns of big data and data analytics. The themes of the research are definitions/concepts of big data, opportunities and challenges of big data and data analytics, and the landscape of big data and data analytics in audit firms in Vietnam. The research was conducted in the following four steps:

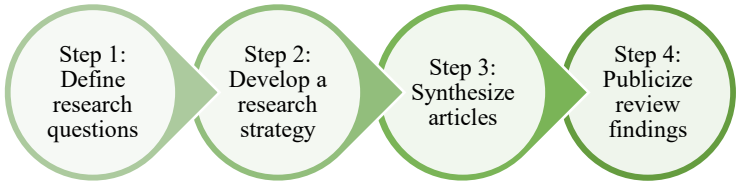

Figure 1. Literature Review Flow (Hezam, Anthonysamy, & Suppiah, 2023)

Step 1: Define research questions

The research poses one main question related to big data and data analytics: What recommendations should be made to promote the application of big data and data analytics in Vietnamese auditing companies?

Step 2: Develop a research strategy

The strategy included keyword identification, screening, and eligibility. The identification of keywords is based on research questions in journals, research websites, and other sources over the last ten years. Furthermore, the selected databases have published many peer-reviewed articles in the studied field. (see Table 1)

Table 1: Summary of research strategy

No.	Topic definition	Select criteria
1	Keyword identification	Big data and data analytics in audit, big data and Auditor, the opportunities and challenges of big data and data analytics, big data in Vietnamese and foreign audit firms
2	Databases	ResearchGate, Studocu, Accounting Horizons, Google Scholar, Social Science Research Network, DOAJ, Vietnam Trade and Industry Review, Vietnam Review of Finance, VNU Library and Information Center, etc.
3	Time	From 2013 to 2023
4	Selection of articles	Studies published in Vietnamese and English language, in reputed journals, and the context of big data, data analytics, and auditing.

Step 3: Synthesize articles

Synthesizing is the process of analyzing and evaluating information from various sources, making connections between the information found, and combining the recently acquired information with prior knowledge to create something new. At this stage, the steps are performed as follows:

1) Review of the gathered literature: After gathering a substantial amount of literature, documents with appropriate content and supporting the research topic based on the abstracts of the articles were selected for further research.

2) Read the literature and take notes: Each article has been read and recorded as following questions: What is the author's objective? What evidence do they use to support their ideas? What are the research results? What recommendation do the authors give based on this result?
3) Synthesize all the information gathered from the literature: Compare and contrast the main ideas and other pertinent information in each source, evaluate the quality and significance of these main ideas, and interpret the main ideas in the context of the research objective.
4) Conclude: The synthesis of information was made into logical conclusions about the suitability of this research objective.

Step 4: Publicize review findings

The results of the research provide conclusions and proposed recommendations for Vietnamese auditing firms.

4. Results and discussion

4.1. The current landscape of applying big data and data analytics at foreign auditing firms

Foreign auditing firms in Vietnam are well-known as the Big 4. Big4 audit firms, including Deloitte, PwC, KPMG, and EY, have been developing artificial intelligence software to automate data processing and big-data-based processes. According to Kapoor (2020), four major auditing companies, KPMG, EY, PwC, and Deloitte, have invested about 9 billion USD in developing tools to support the use of big data and data analysis in the audit process.

Deloitte leveraged Kira Systems' machine learning contract review software, Kira, across services to accelerate and improve the accuracy of contract reviews in a large variety of multidisciplinary projects. Powered by Kira, Deloitte helps companies accurately and efficiently extract information from contracts required to comply with the lease accounting standard, significantly reducing implementation time and cost for their clients (Huq, 2023). Deloitte used Kira to accelerate the lease review process by up to 30% compared to manual review. Moreover, Deloitte LLP has committed $1.4 billion to boost the technology and leadership skills of its thousands of employees in a bid to get ahead of customer demands and support the career growth of its workforce (Iacone, 2022).

PwC plans to invest $1 billion in generative artificial intelligence technology in its U.S. operations over the next three years, working with Microsoft Corp. and ChatGPT-maker OpenAI to automate aspects of its tax, audit, and consulting services (Loten, 2023). In October 2017, the International Accounting Bulletin named PwC's "GL.ai" 'Audit Innovation of the Year'. This technology examines every uploaded transaction, user, amount, and account to find unusual transactions in the general ledger, which could indicate error or fraud, without bias or variability (Loten, 2023).

EY invested $500 million globally to bolster its big data and data analytics capabilities. At the heart of the multi-year investment lies the setup of a Global Analytics Center of Excellence (COE), in addition to the firm expected to complete several acquisitions in the analytics space. In addition, EY launched a recruitment drive aimed at attracting talent in areas such as data sciences and advanced statistical modeling to complement, to significantly grow its global talent base (Consultancy.uk, 2014). EY has applied AI technology to the automation of routine tasks, such as auditing by using its proprietary Robotic Process Automation (RPA) system. EY claims that this technology helps the firm deliver more accurate, efficient audits for its clients.

KPMG firms are making substantial investments into enhancing data acquisition, governance and processing techniques for all types of data, to drive the audit of the future The enhancements to KPMG's audit software, called KPMG Clara, is designed to facilitate more seamless and transparent interactions between you and your engagement team (Stöckle, 2023). This secure platform offers a centralized portal that serves as a single source for the exchange of important information. KPMG committed to investing $2 billion in Microsoft AI and Cloud services over the next five years. This is expected to open potential growth opportunities of more than 12 billion USD for KPMG (Venture Beat, 2023).

The opportunities of application big data and data analytics in audit service

Big data enhances the quality of audit evidence by increasing its relevance and completeness. Big data can improve the reliability of audit evidence by ensuring the independence of the supplier, the effectiveness of internal control systems, and timeliness. Regarding supplier independence, big data from external sources can provide important non-financial evidence that can be used to evaluate financial accounts. For example, when a product receives negative comments on social media, while the company's revenue in its financial statements increases, this may be a sign for further investigation (Yoon, Hoogduin, & Zhang, 2015). Audit clients can test the internal control system from the design side and determine whether the designs are implemented for adjustment. When internal audit processes are automated, audit clients and audit firms will save costs, conduct audits more frequently, and minimize audit staff involvement (Balios et al., 2020). By implementing big data and data analytics, hundreds of thousands of lines of non-standardized accounts payable and accounts receivable data that took several months to complete could now be completed within a week.

Completeness was determined based on the amount of available evidence. İdil, Akbulut, and Ozoner (2018) concluded that big data analytics allows auditors to identify anomalies by thoroughly scanning entire datasets, especially those that are thoroughly masked in the event of fraud or collusion. In the research of Perera and Abeygunasekera (2021), most respondents stated that audit procedures no longer need to depend on sample testing; instead, they can rely on 100% sample analysis which can improve the quality of analysis, which is one other motivation for the use. For example, when auditors attempt to gather evidence for fraud, e-mail evaluation can be quite useful, whereas traditional audit evidence is inadequate (Holton, 2009).

Big data enhances the efficiency of audit procedures and processes. Newman, Muzvuwe, and Stephen (2021) show that 96.67% of respondents from KPMG agreed with the assertion that Data Analytics improves audit efficiency. In financial statement audits, auditors can update traditional substantive tests, tests of controls, and analytical tests by applying problem-oriented data analysis techniques to big data. Audit quality will be improved if auditing firms apply big data in audit processes, from input and implementation procedures to output toward enhancing the quality of audit reports (Trang, Thuy, & Binh, 2022). Data analytics has an impact on audit procedures, especially performing analytics by integrating data that was previously outside the scope of auditing but can predict and warn of abnormalities (Salijeni, Samsonova-Taddei, & Turley, 2019).

Big data benefits audit clients by improving the relevance and specificity of the questions asked by auditors and the quality and effectiveness of their responses. Rather than focusing on what happened, audit questions often focus more effectively on why an important issue arose and its consequences. Managers and auditors are more likely to speak the same language and share the same views when discussing audit matters. Moreover, Perera and Abeygunasekera (2021) considered big data and data analytics as a competitive advantage in the audit market; auditors can focus on drawing better conclusions and adding value to their clients by providing better recommendations to comply with new standards. Simultaneously, to be compatible with changes in market conditions, auditing standards are being revised from time to time.

The challenges of application big data and data analytics in audit service

Big data and data analytics, on the other hand, bring several problems to the auditing business. If gathering audit evidence requires a lengthy time and money, the auditor will be unable to properly apply the outcomes of the study (Yoon et al., 2015). Furthermore, network security and safety must be considered. Concerns regarding independence may emerge when auditors know too much about their clients. Earley (2015) stated that because the use of data analytics implies that most operations would be automated, there is a risk that hackers will steal private client data and that auditing tools will be contaminated. Another issue is the use of tools for data analysis during the audit process, which causes auditors to spend more time on an engagement (Newman et al., 2021).

Currently, there are no standards that specify when big data and data analytics should be performed during the audit process (Rose, Rose, Sanderson, & Thibodeau, 2017). Auditing standards generally lack guidance regarding the practical use of big data. Whether these standards are suitable for big data is another issue that must be considered. Previously, revised standards mentioned leveraging big data in auditing. Auditing standards classify sources of information, with the evidence obtained being the most reliable

externally and the least reliable being interviews with the management. However, there are no standards that regulate the type of evidence provided by big data. Appelbaum, Kogan, and Vasarhelyi (2017) argue that customers increasingly rely on big data to conduct business, making audit tracking more difficult and fraud assessment more difficult. However, the auditing profession is a step behind using big data in auditing procedures.

The audit industry also has problems in training human resources in big data and data analytics. In a study by Bozhinovska Lazarevska, Tocev, and Dionisijev (2022), 45.5% of surveyed auditors believe that the limitation of using big data analysis in auditing is due to the lack of auditors' capacity and training programs on essential skills of big data analytics. Manual operations can be significantly reduced by automation, and integrating large amounts of data requires more advanced skills. It is now necessary to collect and analyze other relevant evidence supported by big data. Therefore, auditors may require expertise in both auditing and information technology. The growing demand for such skills represents a challenge for official educational institutions, and new training programs need to be implemented at both the undergraduate and graduate levels. Auditors or accountants, as well as other professionals dealing with big data and data analytics, need to be adequately trained (Balios et al., 2020).

4.2. The current landscape of applying big data and data analytics at Vietnamese auditing firms

In terms of practical applications, many Vietnamese auditing firms have promoted the application of information technology to big data and big data analysis in professional activities. Vo (2018) pointed out that the reality is that major auditing firms today have spent considerable investments in developing tools and methods related to big data and data analytics. Currently, many businesses apply software in the field of accounting and auditing, such as electronic invoice software, electronic accounting software, electronic sales software, and electronic office software (Pham, 2023). However, the level of applying big data in firms is not high (Duyên, Bình, & Nga, 2023). The State Audit Office of Vietnam also provides policies, roadmaps, and goals for the application of big data and data analysis in businesses in general, and auditing in particular.

However, Vietnamese auditing companies still face difficulties applying big data. First, local auditing firms are unable to take advantage of the benefits of big data and data analytics. There are almost no studies or articles clearly stating the application of big data and data analysis in the process of performing audits at Vietnamese auditing companies, some research focuses mainly on state audit applications (Mai, 2020). Although audit clients and local auditing firms are aware of applying big data and data analytics, these firms are slow to adopt big data because there is no mandatory regulation of big data research and learning. According to Mr. Do Thanh Danh - Deputy General Director of Digital Transformation and Information Technology Strategy Services, Deloitte Vietnam: "*The number of businesses that have changed their business methods and applied technology is at a high rate. While 2.2% businesses have only reached the basic level of digitalization"* (Tung Anh, 2023).

Second, the cost of big data research and development is high, making it difficult for Vietnamese auditing firms to conduct these costs. According to(*Barriers and difficulties for businesses when digitally transforming*, 2021), 60.1% of businesses participating in the survey said the barrier when applying digital technology is due to high investment and technology application costs. Stolen data and software errors owing to poor network security systems can lead to financial losses and increased business costs. The cost of deploying big data and data analytics not only includes the cost of investing in additional technologies but can also incur additional costs such as process change costs, personnel training costs, set-up information technology infrastructure costs, and costs of building network security. Having to equip and invest without seeing the results is a huge challenge for business owners in deciding to invest their budget.

Finally, Vietnamese auditing firms face a lack of human resources with big data analysis skills. According to research by the Vietnam Association of Certified Public Accountants, up to two-thirds of accounting graduates do not meet the needs of employers in many respects. Meanwhile, today's digital era with new technologies requires very high qualifications in finance, accounting, and auditing personnel (Pham, 2023). Most auditors today lack the necessary skills to use data analysis technology accurately and effectively from big data and businesses will have to spend large costs on training and hiring leading experts in the field of data analysis (Giang, 2023).

5. Recommendations and conclusion

Based on our findings, this research proposes the following recommendations for stakeholders:

Regarding the role of administrative agencies, the Ministry of Finance and the Vietnam Association of Certified Public Accountants should establish guidelines and reduce the challenges associated with audit evidence resulting from big data and data analysis in corporate auditing. These standards require references from foreign nations that have effectively implemented them to draw lessons and develop relevant regulations for the audit environment in Vietnam. Furthermore, it is vital to extend big data training sessions to enable auditors to acquire critical knowledge and abilities, boosting auditor effectiveness when applying big data to the real audit processes for audit customers.

Regarding the role of Vietnamese auditing firms, companies must make specific plans to gradually adapt and effectively apply big data and data analysis. Companies need to consider and balance the effectiveness of big data with their financial health, thereby planning long-term budget estimates. Regarding technology, local audit firms should invest in research and applications from auditing companies that have successfully applied big data and data analytics and cooperate with data analysis services or solution providers to develop and adjust to suit the audit process in Vietnam. It is critical to focus on developing a network security system to protect the safety of accounting and auditing data. Simultaneously, firms need to prioritize the development of high-quality audit human resources to adapt to industry development. Internal personnel training courses should be conducted regularly to improve expertise and big data analysis skills.

As a result, future accountants and auditors should have knowledge and abilities in the disciplines of law, information technology, communication, and management in addition to accounting and auditing experience. Understanding how to use new technologies and the analysis of audit data to generate audit evidence and draw conclusions from it is a learning process. Furthermore, to supply a large number of high-quality human resources and anticipate the ongoing expansion and development of big data in the future, encouraging investment in establishing training courses is critical. Educational institutions in Vietnam should offer subjects related to big data and data analytics to students, cooperate, and organize seminars with auditing firms to provide courses suitable to the needs of the labor market.

Digital transformation using a large number of technologies benefits all firms in every industry. Audit firms serving accounting and auditing services have adopted big data and data analytics in their procedures. This research highlights that there is a difference in applying big data and data analytics between Big4 firms and Vietnamese audit firms. Moreover, applying modern technologies, like big data and data analytics, has both advantages and disadvantages for audit firms. The study proposes recommendations to promote the application of big data and data analytics in Vietnamese auditing firms. However, the study also has limitations. In the limitation of the article, the author does not have access to specific data on the data of audit firms in Vietnam applying big data and big data analysis, but only collects information from previous studies. In addition, the author cannot connect with existing auditing firms and auditors in Vietnam, so it is not possible to collect all the necessary information related to topical issues such as big data. In the future, the author intends to carry out further studies as well as build a questionnaire to collect quantitative data and test some relevant hypotheses, thereby recommending effective solutions and more effective.

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7. References

Appelbaum, D., Kogan, A., & Vasarhelyi, M. A. (2017). Big Data and analytics in the modern audit engagement: Research needs. *Auditing: A Journal of Practice & Theory, 36*(4), 1-27. doi:https://doi.org/10.2308/ajpt-51684

Balios, D., Kotsilaras, P., Eriotis, N., & Vasiliou, D. (2020). Big data, data analytics and external auditing. *Journal of Modern Accounting and Auditing, 16*(5), 211-219. doi:10.17265/1548-6583/2020.05.002

Barriers and difficulties for businesses when digitally transforming. (2021). Paper presented at the Enterprise digital transformation annual report 2021: Barriers and needs for digital transformation.

Bozhinovska Lazarevska, Z., Tocev, T., & Dionisijev, I. (2022). How to improve performance in public sector auditing through the power of big data and data analytics?: the case of The Republic of North Macedonia. *Journal of Accounting, Finance and Auditing Studies, 8*(3), 187-209.

Cockcroft, S., & Russell, M. (2018). Big data opportunities for accounting and finance practice and research. *Australian Accounting Review, 28*(3), 323-333. doi:https://doi.org/10.1111/auar.12218

Consultancy.uk. (2014). EY invests 500 million in Big Data and Data Analytics. Retrieved from https://www.consultancy.uk/news/690/ey-invests-500-million-in-big-data-and-data-analytics

Duyên, N. T. H., Bình, V. T. T., & Nga, N. T. H. (2023). Mức độ chuyển đổi số trong kế toán tại doanh nghiệp của Việt Nam [The maturity of digital transformation in accounting in Vietnamese firms]. *Tạp chí Kinh tế & Phát triển, 314*, 88-98. doi:10.33301/JED.VI.1260

Earley, C. E. (2015). Data analytics in auditing: Opportunities and challenges. *Business horizons, 58*(5), 493-500. doi:https://doi.org/10.1016/j.bushor.2015.05.002

Edubirdie. (2022). The Big Four's Implementation of Artificial Intelligence. Retrieved from https://edubirdie.com/examples/the-big-fours-implementation-of-artificial-intelligence/

Frank, A. D. (2017). IBM CEO Rometty Says Big Data Is the Next Great Natural Resource. Retrieved from https://www.thedailybeast.com/ibm-ceo-rometty-says-big-data-is-the-next-great-natural-resource

Giang, N. H. (2023). Some solutions for the audit service industry of Vietnam in the context of digitization. *Vietnam Trade and Industry Review, Results of scientific research and technological applications*. Retrieved from https://tapchicongthuong.vn/bai-viet/mot-so-giai-phap-cho-nganh-kiem-toan-viet-nam-truoc-xu-huong-so-hoa-106361.htm

Hezam, Y. A. A., Anthonysamy, L., & Suppiah, S. D. K. (2023). Big Data Analytics and Auditing: A Review and Synthesis of Literature. *Emerging Science Journal, 7*(2), 629-642.

Holton, C. (2009). Identifying disgruntled employee systems fraud risk through text mining: A simple solution for a multi-billion dollar problem. *Decision support systems, 46*(4), 853-864. doi:https://doi.org/10.1016/j.dss.2008.11.013

Huq, A. (2023). Case Study: Deloitte Harnesses the Power of Kira for Lease Accounting Contract Review. Retrieved from https://prod.litera.com/customers/case-study/deloitte/

IAASB. (2016). Exploring the growing use of technology in the audit, with a focus on Data Analytics. Exposure Drafts and Consultation Papers. Retrieved from https://www.iaasb.org/publications/exploring-growing-use-technology-audit-focus-data-analytics

Iacone, A. (2022). Deloitte Bets Big on Tech, Staff With $1.4B Training Pledge. Retrieved from https://news.bloombergtax.com/financial-accounting/deloitte-bets-big-on-tech-staff-with-1-4b-training-pledge

İdil, K., Akbulut, D. H., & Ozoner, K. (2018). Big data analytics in internal audit. *PressAcademia Procedia, 7*(1), 260-262.

Kapoor, M. (2020). Big Four Invest Billions in Tech, Reshaping Their Identities. Retrieved from https://news.bloombergtax.com/financial-accounting/big-four-invest-billions-in-tech-reshaping-their-identities

Loten, A. (2023). PricewaterhouseCoopers to Pour $1 Billion Into Generative AI. Retrieved from https://www.wsj.com/articles/pricewaterhousecoopers-to-pour-1-billion-into-generative-ai-cac2cedd

Mai, N. T. T. (2020). Application of Data Analytics and Big Data in financial auditing- the promises and challenges for auditing firms. *Banking Science & Training Review, 218*, 72-82.

Newman, W., Muzvuwe, F., & Stephen, M. (2021). The impact of the adoption of data analytics on the gathering audit evidence: A case of KPMG Zimbabwe. *Journal of Management Information & Decision Sciences, 24*(5).

Perera, M., & Abeygunasekera, A. (2021). Big data and big data analytics in external auditing: motivations and challenges. *International Journal of Accounting and Business Finance, 7*.

Pham, T. H. (2023). Digital transformation in the field of Accounting - Auditing in Vietnam. *Vietnam Review of Finance*. Retrieved from https://tapchitaichinh.vn/chuyen-doi-so-trong-linh-vuc-ke-toan-kiem-toan-tai-viet-nam.html

Rose, A. M., Rose, J. M., Sanderson, K.-A., & Thibodeau, J. C. (2017). When should audit firms introduce analyses of Big Data into the audit process? *Journal of information systems, 31*(3), 81-99. doi:https://doi.org/10.2308/isys-51837

Salijeni, G., Samsonova-Taddei, A., & Turley, S. (2019). Big Data and changes in audit technology: contemplating a research agenda. *Accounting and Business Research, 49*(1), 95-119. doi:https://doi.org/10.1080/00014788.2018.1459458

Stöckle, S. (2023). All eyes on: Leveraging Big Data to drive the audit. Retrieved from https://kpmg.com/xx/en/blogs/home/posts/2023/02/all-eyes-on-leveraging-big-data-to-drive-the-audit.html

Titera, W. R. (2013). Updating audit standard—Enabling audit data analysis. *Journal of information systems, 27*(1), 325-331.

Trang, V. T. T., Thuy, L. T. D., & Binh, V. T. T. (2022). *Factors Influencing the Qualified Opinion on the Audit Report: Evidence from the*

Listed Companies in Vietnam. Paper presented at the ICFAA 2022, National Economics University.

Tung Anh. (2023). Deputy General Director of Deloitte: Nearly 100% of Vietnamese businesses are at the "bottleneck" of the digital transformation process. Retrieved from https://www.vietnam.vn/pho-tgd-deloitte-gan-100-doanh-nghiep-viet-nam-dang-o-diem-nghen-cua-qua-trinh-chuyen-doi-so/

Venture Beat. (2023). KPMG to invest $2 billion in AI in expanded partnership with Microsoft. Retrieved from https://venturebeat.com/ai/kpmg-to-invest-2-billion-in-ai-in-expanded-partnership-with-microsoft/

Vo, T. B. H. (2018). *Analyzing the impact of Big Data on the data analysis process at Vietnamese auditing firms.* (Master of Economics.), University of Economics HCMC, HCMC.

Yadav, S. (2020). *The Impact of Big Data on Audit Evidence and the Level of Assurance.* (degree of Honors), University of Southern Mississippi,

Yoon, K., Hoogduin, L., & Zhang, L. (2015). Big data as complementary audit evidence. *Accounting Horizons, 29*(2), 431-438.