# BIG DATA IN THE ACCOUNTING PROFESSION: ADAPTATION, ISSUES, AND CHALLENGES

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**Abstract***: This study investigated the utilization of Big Data in the accounting field, with a specific emphasis on the issues and challenges associated with improving the efficiency of forecasting models. The need for precise and dependable forecasting has grown significantly as organizations accumulate large quantities of data. Nevertheless, the integration of Big Data into accounting methodologies poses distinct and specific obstacles. This study investigated how accountants adapt to Big Data technology and discusses issues and challenges of Big Data in the forecasting models. It emphasizes the significance of accountants and experts in the accounting industry to be updated on emerging technologies to effectively utilize Big Data for enhanced forecasting in accounting.*

**Keywords***: Big Data, accounting, data quality, technology, forecasting model*

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## Introduction

The accounting sector has been significantly influenced by the progression of technology, particularly in the realm of Big Data, as seen in the notable advancements in recent years. What constitutes Big Data? The term 'Big Data' refers to a vast collection of data, including structured, unstructured, and semi-structured formats, which is mostly obtained using automated sensing methods (Vasarhelyi et al., 2015). The use of Big Data in the accounting field seems to be observing rapid growth in Malaysia. The Malaysian government has expressed support for and has implemented measures to facilitate the use of Big Data in the accounting sector. The establishment of the Big Data Analytics Centre of Excellence (BDA CoE) by the Malaysian government aims to provide support and training to firms and organizations seeking to use Big Data for their operations.

As a result of technological development, the accounting industry has begun to place a greater emphasis on Big Data as organizations continue to collect and generate enormous quantities of data (Younis,2020). In addition to the 'game-changing' benefits that come with Big Data management, accountants and financial professionals face new obstacles in this area (Muheidat et al., 2022). The accounting industry in Malaysia need to adapt to the changing environment as more organizations use Big Data. Given this need, will Big Data have a beneficial or bad effect on the accounting profession? The accounting industry has been plagued by this question for many years.

Previous research has looked at the relationship between Big Data and the accounting profession. On one hand, the studies focused on Big Data on the internet in relation to accounting ethics education [e.g., Shen and Zheng (2020)]. On the other hand, some studies examined the possible uses of Big Data in accounting and finance practices and research [e.g., Cockcroft and Russell (2018)]. However, there is a need for additional research on the challenges and problems posed by Big Data in the accounting industry. Consequently, the primary objective of this study is to identify the most significant issues and challenges the accounting industry has faced in recent years with the use of Big Data.

The advent of Big Data has significantly transformed organizational practices and decision-making processes, even within the accounting sector. Historically, the core areas of emphasis within the accounting profession have included creating and examining financial statements alongside delivering tax and auditing services (Azzam et al., 2023). The increasing volume of data firms generate in the digital era has led to a rise in the popularity of Big Data analytics in accounting (Richins et al., 2017). The term 'Big Data' encompasses exceptionally large and intricate datasets that need the use of advanced computing techniques and tools for effective management and analysis (Grosanu et al., 2021).

In the accounting field, Big Data has the potential to provide information on an organization's financial performance, risk management, and regulatory compliance that is informative and relevant. Analyzing large amounts of information enables accountants to discover patterns and trends that may not be apparent when using traditional accounting methods (Bose et al., 2023). By utilizing this information, businesses could enhance their financial performance and make more informed decisions. Furthermore, Big Data analytics may help accountants spot possible threats and unearth fraudulent activities (Richins et al., 2017). By examining a sizable volume of transactional data, accountants may spot anomalies and trends that might indicate fraud.

Additionally, Big Data analytics may help accountants streamline their processes and increase efficiency (Bose et al., 2023). In general, the use of Big Data in accounting has the potential to alter the industry and provide invaluable insights that might help businesses improve their financial performance, manage risks, and comply with regulations (Richins et al., 2017). Using Big Data necessitates understanding several variables pertaining to the data's integrity, data sources, and selection of data sets (Vasarhelyi et al., 2015). Therefore, it is essential that accountants possess the skills and knowledge necessary to work effectively with large data.

Past studies [e.g., Agusti and Orta-Perez (2023), Perkhofer et al. (2019), Shen and Zeng (2020), and Rezaee and Wang (2019)] have delved into the topic of Big Data in the accounting field. Most of the preceding studies involve Big Data related to business and analytics (Herath & Woods, 2021; Wongsim et al., 2019; Chen et al., 2012), ethics (Chen & Quan-Haase, 2020; Mittelstadt & Floridi, 2016; Sula, 2016; Larsson, 2015; Qiu et al., 2015), and accounting

curriculum (Birt et al., 2023; Cong, 2021; McLeod et al., 2017; Lawson et al., 2014). Notwithstanding the fact that the use of Big Data in accounting is still evolving, it has already become a crucial instrument for accounting professionals to enhance their work and provide value to clients (Bose et al., 2023). As the accounting profession continues to expand, it is probable that the industry will see even more cutting-edge and creative applications of Big Data. As the use of Big Data becomes more widespread in the accounting profession, interest in how Big Data might be utilized to improve the precision and efficiency of forecasting models increases. Hence, the research questions of this study are: (i) how accountants adapt to the rapid changes in the Big Data technology? and (ii) what are the issues and challenges of Big Data on forecasting models in the accounting field?

**Literature Review**

### Big Data Technology in the Accounting Profession
Keeping alongside the latest developments in the key technologies utilized in the field of Big Data endures an ongoing complexity for a multitude of professionals, including accountants (Younis, 2020). These rapid changes in Big Data technology present challenges and opportunities for organizations. Big Data typically includes data that exceeds the capabilities of conventional databases and tools to capture, store, manage, and analyze it effectively (Bose et al., 2023). However, accountants can take some steps to stay up-to-date with the latest technologies, for example, by investing in continuous learning. Continuous learning can include attending conferences, taking courses, and participating in training programs to improve their knowledge and skills. This action is in line with Jaslove (2017), who claimed that, while the introduction of technology poses no threat to accountants, they should nevertheless adapt to changing technology.

Moreover, accountants can benefit from working together with experts in close professions like data science, statistics, and computer science to stay current with emerging technology (Vasarhelyi et al., 2015). Working with professionals in these disciplines can give useful insights into current trends and recommended practices. In addition, accounting professionals can increase their productivity and optimize their workflow by utilizing automation technologies and software, including accounting software made specially to handle large data, such as machine learning algorithms and data analytic tools. In a study by Al-Htaybat and von Alberti-Alhtaybat (2017), they focused on the effects of Big Data on corporate reporting through 25 interviews. According to the respondents, accountants and data analysts need to work together to enhance financial reporting using advanced analytics.

### Big Data and Forecasting Models
Big Data can significantly enhance the accuracy and effectiveness of forecasting models in the accounting field. According to Cockcroft and Russell (2018), Big Data is primarily made possible by improvements in computer power, including cloud computing and storage, which make it simple to capture, store, share, and process data of any quantity or complexity. Big Data allows financial institutions to access and analyze vast amounts of data from diverse sources, including market data, customer transactions, social media, and news feeds. By incorporating this extensive data into forecasting models, organizations can gain a more comprehensive understanding of the financial landscape, identify patterns, and make more accurate forecasting (Schmarzo, 2013).

Modern accounting practice frequently suggests that Big Data is necessary for customer monitoring to remain competitive and relevant in the current business environment (Groşanu et al., 2021). Big Data provides the necessary infrastructure to implement sophisticated machine learning algorithms (Olaniyi et al., 2023). By training forecasting models on large datasets, these models can learn complex patterns and correlations, improving their accuracy and forecast power. Techniques, such as deep learning, ensemble methods, and reinforcement learning, can be applied to enhance the performance of forecasting models. According to Malau (2021), accountants need to be able to manage company data on the internet and comprehend technology to deal with society 5.0. By improving data quality, forecasting models can avoid biases and reduce the risk of inaccurate predictions caused by poor data.

In addition, Big Data provides a wide range of potential features that can be used in forecasting models. Advanced feature selection algorithms can automatically identify the most relevant variables from large datasets, ensuring that only the most significant predictors are utilized, which can improve the model's performance. Bhimani and Willcocks (2014) suggested that Big Data analytics uses computer technology to analyze massive amounts of data using visualization tools that make it easy to see trends, outliers, and patterns. In the finance industry, Big Data analytics can be employed to detect fraudulent activities by analyzing large volumes of transactional data. By identifying unusual patterns, forecasting models can help detect fraud in real-time and prevent financial losses.

## Discussion

### The Adaptation of Accountants to Big Data

Accountants may stay current on technological advances by investing in continual education (Novakova, 2020). Attending conferences, seminars, and training programs may help them improve their knowledge and talents. They may attend trade exhibits covering the most recent software, accounting best practices, and emerging technologies. Expert speakers are typically in attendance at these events, which also provide opportunities for networking and information sharing. Accountants may also enrol in professional development programs offered by authorized institutions, colleges, or online learning environments (Jackson et al., 2023). These programs provide accountants essential insights and skills in areas such as data analytics, cloud accounting, blockchain technology, and cybersecurity (Jayasuriya & Sims, 2023). Alternatively, accountants may study at their own speed and convenience through webinars and online training courses.

The introduction of new technology has had a big influence on the accounting profession, and working closely with experts from adjacent disciplines may assist accountants in staying current and adapting to these developments. Accountants may benefit from the experience of data science and statistics specialists in sophisticated data analysis methods. With the increased availability of enormous amounts of financial data, accountants may use data science approaches to acquire significant insights and detect patterns or trends that may not be obvious at first. Accounting professionals may benefit from working with data scientists to build more robust and sophisticated analytical techniques (Bose et al., 2023). They may benefit from the assistance of computer science specialists in automating tedious procedures and optimizing processes. Accountants may decrease manual labor, eliminate mistakes, and enhance overall productivity by employing programming and automation solutions. Working collaboratively with computer science specialists may assist accountants in identifying automation possibilities and implementing technology-driven solutions.

Automation technologies and software play a crucial role in increasing accounting professionals' efficiency and workflow optimization, especially when dealing with massive data (Bose et al., 2023). First and foremost, specialist accounting software developed for Big Data management may help to expedite numerous accounting operations. These software solutions often include machine learning algorithms and data analytics capabilities to aid data processing, analysis, and reporting. They can automate repetitive operations like data input and reconciliation, saving time and lowering the possibility of human mistakes. Furthermore, machine learning algorithms may be used to find patterns, anomalies, and trends in accounting data. This capability helps accountants to acquire deeper insights into financial data, uncover fraud or inconsistencies, and make more educated judgments. These algorithms can automate operations like classifying spending, forecasting cash flow, and identifying fraudulent transactions. Lastly, data analytics technologies make it easier to collect, convert, and analyse massive amounts of accounting data. They may assist accountants conduct difficult calculations, prepare financial reports, and present data in relevant ways. These tools allow professionals to discover key performance indicators (KPIs), conduct trend analysis, and offer data-driven recommendations.

### Issues And Challenges in Forecasting Model

The accuracy and reliability of Big Data present significant challenges for businesses, particularly in the realm of financial reporting and analysis. Big Data is sourced from a wide range of diverse and heterogeneous sources, including internal systems, external databases, social media platforms, and sensor networks. Big Data is a massive dataset that traditional databases cannot govern or investigate (Mishra et al., 2017). However, the data obtained from these sources is not always perfect as it can suffer from various quality issues.

Sometimes, questions come up about the quality of the data, how to get it, and how much it would cost (Chen et al., 2016). When using Big Data for forecasting, incomplete data can hinder the accuracy of predictions. This incompleteness can occur due to technical limitations, data collection errors, or intentional omissions. Missing information can lead to gaps in the analysis, potentially resulting in incomplete or biased forecasts. Data cleansing techniques, such as imputation or data interpolation, may be employed to fill in the missing values and ensure a more comprehensive data set for forecasting. Inconsistencies in the data can introduce noise and inconsistencies in the forecasting process. It is crucial to establish data integration and standardization procedures to address variations in data formats and values across different sources. By ensuring consistency in the data, the forecasting model can generate more reliable and accurate predictions.

Incorrect data can significantly impact the forecasting model's results, leading to inaccurate predictions (Herath & Woods, 2021). Incorrect data can stem from human mistakes during data entry, glitches in systems, errors in data extraction and transformation processes, or even intentional manipulation or fraud. According to Daries et al. (2014), such changes affect the 'truth' of the original dataset, resulting in inaccurate statistics owing to missing data and raising serious concerns about the value of open data. Therefore, data validation and verification processes should be implemented to identify and rectify errors in the dataset. Additionally, implementing data quality controls and conducting periodic audits can help minimize the risk of incorrect data negatively affecting the forecasting model's performance.

The emergence of self-service and automation in the domain of Big Data analysis is revolutionizing accounting and transforming the role of accountants (Bose et al., 2023). It is

becoming more proactive in terms of providing information (King, 1991). The importance of traditional internal reporting practices is progressively declining with the availability of advanced technologies and sophisticated analytical tools. This transition towards self-service and automation presents accountants with both challenges and opportunities. The self-service and automation capabilities in Big Data analysis can streamline routine data analysis and reporting tasks. These tasks include data processing, aggregation, and basic analysis, which can now be automated. As a result, accountants can spend less time on these repetitive tasks and focus on utilizing Big Data as a forecasting model to generate more accurate and insightful predictions.

The availability of advanced analytical tools within self-service platforms enables accountants to leverage Big Data for forecasting. These tools offer powerful algorithms and statistical models that can analyze large volumes of data, identify patterns, and generate forecasts. Advanced analytical tools provide a wide array of statistical techniques that accountants can leverage to analyze the data. They can apply regression analysis, time series analysis, clustering, or other statistical methods to identify patterns, relationships, and trends within the data. These analyses can inform the forecasting model and improve the accuracy of predictions. Accountants can use these tools to extract meaningful insights from Big Data and create forecasts that support decision-making processes.

Routine jobs that do not require high degree of knowledge or expertise and only require minimal human interaction may be readily mechanized (Kim et al., 2017). As automation takes over routine tasks, accountants need to adapt and evolve their skills to remain relevant in the changing landscape. They should develop a deep understanding of the underlying principles and methodologies used in Big Data forecasting models. They should have knowledge of statistical techniques, data mining, machine learning, and data visualization. By acquiring these skills, accountants can effectively utilize automated tools and technologies to harness the power of Big Data for forecasting purposes. Accountants may provide value to stakeholders by automating regular operations. Accountants may use Big Data to provide strategic insights, scenario studies, and predictive projections to improve decision-making. They may assist stakeholders to comprehend and make business choices by evaluating and sharing forecasting model data.

The speed at which data is delivered is the most critical factor in Big Data adoption (Baig et al., 2019). Big data is further classified as having three v's, namely, volume (quantity of data), velocity (speed with which data may be accessed), and veracity (types of data) (Chen et al., 2013; Ward & Barker, 2013). This diversity of data sources and formats presents a significant challenge for accountants when integrating and analyzing the data effectively. When using Big Data for forecasting, accountants must integrate data from various sources, such as internal systems, external databases, and sensor networks (Bose et al., 2023). By integrating data effectively, accountants can create a unified view of the information, ensuring that all relevant data is considered in the forecasting model. Understanding the structure and relationships of data elements across different systems is essential for accountants.

By mapping data from various sources, accountants can identify commonalities and align data elements to ensure consistency in the forecasting model. During data mapping, accountants examine the data elements across different systems or sources and identify commonalities. They look for similarities in data structure, naming conventions, and data attributes. By identifying these commonalities, accountants can establish connections and alignments between data

elements, ensuring consistency in the forecasting model. Data mapping enables accountants to bring together data from different sources, harmonize it, and prepare it for analysis.

Accountants need to address data quality issues through data cleansing techniques. Data cleansing involves identifying and rectifying duplicates, inconsistencies, inaccuracies, and other data quality problems. According to Chu et al. (2015), integrity restrictions, statistics, and machine learning cannot guarantee the correctness of repaired data. Nevertheless, with effort to cleanse the data, accountants can improve its reliability and accuracy, leading to more reliable forecasts. Issues with data quality can have a significant impact on the precision and dependability of forecasting models if left unaddressed (Herath & Woods, 2021). Data quality issues can lead to biased or erroneous forecasts. For example, duplicates or inconsistent values within the dataset may skew the analysis and generate misleading insights. Inaccurate or missing data points can result in incomplete or flawed predictions.

Extract, Transform, and Load (ETL) processes and tools are commonly used in data integration for forecasting models. Accountants may utilize ETL tools to extract data from various sources, transform it into a consistent format, and load it into a target system or data warehouse for analysis. In their study on data diversity in Big Data integration, Souissi and BenAyed (2016) introduced GENUS, an ETL tool that can cope with the problem of data variety in a large data context. Thus, familiarity with ETL processes and tools will enable accountants to manage effectively and manipulate the data needed for forecasting. By utilizing the ETL process, accountants can extract, transform, and load big data from multiple sources into a unified and consistent format. Thus, ETL processes enable them to prepare the data for analysis, including forecasting models, by ensuring the data quality, compatibility, and accessibility within the target system or data warehouse.

In the realm of accounting, security is a paramount concern, and it is especially true when dealing with Big Data. According to Boyd and Crawford (2011), the daily generation of digital data has the potential to be highly valuable, especially given the Big Data benefit of being practically entirely networked across different objects and people. However, there are difficult considerations about who has access to the large data, under what conditions, and for what objectives (Qui, 2015). Therefore, the sheer volume, variety, and velocity of Big Data introduce additional challenges and risks pertaining to data security. When handling Big Data, accountants must consider the sensitive nature of the information they are dealing with. This data can include financial records, customer information, intellectual property, and other confidential business data. Protecting this data from cyber theft, unauthorized access, and destruction is of utmost importance.

When using Big Data for forecasting models, it is important to encrypt the data during transmission and storage, and the receiver must have the appropriate key to read the data. These encryption and decryption form a part of the cryptosystem. The sender's data is protected by encryption, which guarantees secrecy, authentication, integrity, and non-repudiation (Rughani & Pandya, 2012). It involves converting the data into a coded form that can only be deciphered with the appropriate decryption key. Encryption during data transmission when transferring data between different systems or over networks is crucial to prevent interception or unauthorized access. Encryption during storage of Big Data in databases, file systems, or other storage systems is vital to secure the data (Azhar et al., 2023). Encrypting data at rest guarantees that the information remains protected, even when there is a compromise to the storage medium. Encrypting the data ensures that even if unauthorized individuals gain access to it, they would

not be able to understand or manipulate the sensitive information used in the forecasting process.

Proper access control measures are crucial in Big Data` forecasting models. Accountants need to carefully manage access to the data used for forecasting, allowing only authorized personnel to view, manipulate, or analyze it. According to de Carvalho Junior and Bandiera-Paiva (2018), access to sensitive data should be granted only after identification, authentication, and authorization have been verified. Accountants must limit access to forecasting data to authorized people only. Role-based access control (RBAC) and multi-factor authentication (MFA) limit data alteration to authorized users. RBAC lets accountants establish jobs like data analysts, administrators, and managers in Big Data forecasting models and allocate access privileges. This action ensures that only job-related data is accessible. Using usernames and passwords is the norm. MFA requires users to supply a fingerprint, SMS code, or hardware token to increase security.

The potential impact of a data breach or cyber-attack can be significant with Big Data forecasting models. Securing information from hackers has become critical for efficient communication (Apau et al., 2016). Hence, accountants must be aware of these potential attacks. Breaches can compromise sensitive financial records, customer information, or proprietary data, which can have severe financial, legal, and reputational consequences. To mitigate these risks, accountants should implement proactive measures such as regular data backups, intrusion detection systems, and incident response plans. These measures help detect and respond to potential breaches quickly, minimizing the impact on the forecasting model and the overall security of the data.

## Conclusion

While Big Data provides many opportunities for the accounting profession, it also brings new challenges to accountants around the world. Big Data is utmost important in an organization because it helps process massive data gained internally and externally. It provides an insight that helps the organization to make informed decisions to achieve short-term and long-term goals. Nevertheless, the accounting profession has become more complex. An accountant is now required to possess skills and broad knowledge on Big Data to benefit from these sophisticated tools in accounting. Big Data demands the accountants to be more analytical as the accuracy and reliability of the data becomes questionable since it is obtained from a variety of sources. Furthermore, the emergence of self-service and automation in Big Data analysis has revolutionized the accounting profession, and accountants must adapt and evolve their skills to remain relevant. Integrating the diversity of data sources and formats and analyzing them is crucial to guarantee the accuracy, consistency, and dependability of the large data. On top of that, the security of Big Data must not be undermined. Accountants are responsible to protect this data from cyber theft, unauthorized access, and unintentional destruction. Recognizing the issues and challenges linked to integrating Big Data into the accounting profession, future accountants must proactively enhance their skills and acquire a more comprehensive understanding of Big Data. This understanding is essential for staying marketable and relevant to organizations that are adopting these tools.

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