

-RESEARCH ARTICLE-

THE INTEGRATION BETWEEN BIG DATA, CLOUD ACCOUNTING, AND THEIR IMPACT ON REDUCING THE OPERATING COSTS OF FIBRE-TO-THE-HOME INTERNET SERVICES

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—Abstract—

This research investigates the influence of incorporating Big Data (BD) and Cloud Accounting (CA) on the Reduction of Operating Costs (ROCs) associated with Fibre-To-The-Home (FTTH) internet services provided by the General Company for Telecommunications and Informatics. Adopting a descriptive-analytical methodology, the study collected data via a structured questionnaire administered to a purposive sample of 116 individuals, comprising academics, domain experts, and employees of the company. A range of statistical tools was applied, including descriptive statistics, correlation analysis, simple and multiple linear regression, along with mediation

Citation (APA): Faisal, G. M., Abbood, S. K., Azeez, M. A. M. A. (2024). The Integration Between Big Data, Cloud Accounting, And Their Impact On Reducing the Operating Costs of Fibre-To-The-Home Internet Services. *International Journal of Economics and Finance Studies*, 17(01), 30-45. doi: 10.34109/ijefs.202417103

analysis utilising the Bootstrap method. The results affirm the statistically significant and positive impact of BD on ROCs ($\beta = 0.852$, $p < 0.001$), and in the same vein, the adoption of CA is positively influenced by BD ($\beta = 0.768$, $p < 0.001$). Furthermore, CA was confirmed to positively impact the adoption of ROCs ($\beta = 0.449$). The mediation analysis further established that CA acts as the partial mediator in the BD-ROCs relationship ($a \times b = 0.343$, CI: 0.210–0.491). The above results highlight the strategic value in adopting BD together with CA in order to boost operational efficiency and cost-effectiveness. The results reaffirm the pivotal value in boosting organisational performance through digital transformation and the provision of data-driven insights for more sound financial and administrative decision-making.

Keywords: Big Data, Cloud Accounting, Reducing Operating Costs, Fibre-To-The-Home Internet Services.

INTRODUCTION

BD refers to one or more datasets characterised by distinct features such as high volume, velocity, variety, variability, reliability, and validity, which render traditional data processing techniques insufficient for effectively deriving value from them (Hussein et al., 2024). BD analytics addresses the complexities inherent in managing such datasets, which include acquisition, processing, storage, analysis, retrieval, dissemination, transmission, and the safeguarding of privacy (Pramanik et al., 2021). According to the International Telecommunication Union, BD encompasses datasets notable for their massive scale, rapid generation rate, and substantial diversity when compared to conventional data forms (Amirian et al., 2017; Munir et al., 2022; Pan et al., 2017; Shamsuddin & Hasan, 2015). Its hallmark lies in operations that manage extensive volumes of information with high speed and heterogeneity, often associated with relatively low intrinsic value (Paulson, 2022; Zhang & Lv, 2021).

BD can be divided into a number of types: unstructured data, including images and graphical information, with no predetermined forms and being usually difficult to categorize. Nevertheless, unstructured data play an important role in facilitating organisations in curbing fraudulent practices and predicting scenarios in the future, thereby informing well-informed strategic decisions. On the other hand, structured data adhere to an established format, many times in relational database or spreadsheet form, and can be easier to manage and analyse. Unstructured data, which prevail in global data quantities, contrast with the above. Semi-structured data share the characteristics from both groups, having an extent of structure in place while still having the dynamic and unpredictable features of the unstructured data (Manyika et al., 2011; Singh et al., 2023).

The value of BD analytics can be seen in its ability to improve competitive footing, support management in making strategy-driven decisions, and facilitate supply chain

operations based on precise, timely information. It also helps in production planning, such as market adaptation and development, and in the process of innovation, through timely, insights-based information. In addition, BD helps in ensuring strategy alignment through its support in the interpretation of vast market information, and the sharpening of competitive strategies, thereby making the organisations act faster in spotting new business opportunities (Aziz et al., 2023; Dubey et al., 2024). From an accounting point of view, BD presents the chance to advance asset valuation methods, enhance decision-making through the provision of greater personalised and timely insights, and facilitate interdepartmental coordination for detecting areas where BD can drive tangible value. It is increasingly important in risk management—enlarging data sources for honing risk predictions, facilitating fraud detection, and using predictive analysis for investment analysis. Challenges, however, remain, such as proper interpretation of correlations and avoiding the correlation-causation fallacy in large datasets. The dynamic nature of predictive tools and the impact on budgeting and return on investment analysis further complexify the scenario (Bi et al., 2024; Obioha-Val et al., 2025; Onukwulu et al., 2023).

Cost performance remains a core indicator of resource efficiency and project effectiveness (Obaida & Thijeb, 2020). CA is defined as a suite of financial software and data processing applications hosted on remote servers. These are managed externally and accessed via the internet, enabling users to input, retrieve, and process financial data remotely. In this model, all computational processes occur off-site rather than on local machines (Atadoga et al., 2024; Mihai & Duțescu, 2022). Implementing CA necessitates only a moderately capable personal computer with a reliable high-speed internet connection and browser support for cloud-based operations (Wong et al., 2022; Wu et al., 2023). Service providers are responsible for hosting, updating, and maintaining these applications, while users engage with the software without controlling the underlying infrastructure or source code. The platform functions as an integrated operating environment, software interface, and administrative tool, eliminating the need for direct investment in physical IT assets. This aligns with the Infrastructure as a Service (IaaS) model, which enables organisations to manage their technological assets and applications securely over the internet (Sefati et al., 2022).

Cost reduction encompasses all initiatives requiring resource expenditure to support operational activities and fulfil organisational objectives. Companies increasingly adopt technological innovations to eliminate non-value-adding tasks and substitute them with more efficient alternatives. The aim is to enhance competitiveness and ensure customer satisfaction. Cost reduction involves maintaining product or service quality while reducing production expenses, thereby increasing profitability and delivering greater shareholder value. It is a systematic and continuous evaluation of all cost components and operational processes, with the goal of enhancing output quality and organisational efficiency (Kohana et al., 2023; Sunmonu & Odeyale, 2024). Key attributes of cost reduction include its ongoing nature, its emphasis on preserving product quality, its

reliance on data analysis and accounting information for decision-making, and its alignment with administrative and cost management strategies such as Total Quality Management (Herzog & Grabowska, 2021; Vinodh et al., 2021). The broader importance of cost reduction is underscored by its role in boosting profitability, lowering operational expenditure, strengthening competitiveness, improving resource utilisation, reducing waste, and ensuring long-term financial sustainability (Aftab et al., 2023; Al Falah & Ghouri, 2023; Fu & Jacobs, 2022; Haldorai et al., 2022).

The underlying problem being tackled in this research is the constraint in the conventional systems applied in assessing the costs of fibre optic services and the barriers that come with them. The work examines the contribution that the application of BD and CA can make towards the reduction in the cost of such services. The research endeavors to advance the theoretical framework on the convergence of BD and CA, exhibiting their combined contribution towards the minimization of the cost of delivering the service while simultaneously maximizing quality. Its relevance is in providing empirical support and knowledge on the cost-saving benefit achievable through its convergence in the fibre optic service delivery.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Andrejevic (2014) presented the notion of the BD gap, defining the gap as the wide discrepancy between those who collect, save, and process large quantities of data and the individuals who become the objects for such data aggregation. The gap reflects an important divergence in the conception and use of data, perhaps exacerbating power discrepancies in the digital world. Walkowiak, Woźniak, et al. (2015) addressed the potential for optical network advances to improve BD handling through support for high-bandwidth connectivity for BD traffic in core networks. The hypothesis was that it would be an inexpensive, scalable method for overcoming issues in the use of distributed computing environments, e.g., cloud infrastructures. Two major technologies were studied in the investigation: the already widely deployed wavelength division multiplexing (WDM) and the new elastic optical network (EON) technology. It analyzed several performance metrics in pan-European and US networks, including capex and opex, power consumption, optical spectrum utilization, latency, and the cost of computing resources. The result was that delivering BD traffic directly in the optical layer applying the EON method provides the most efficient result.

Bauer (2016) presented an approachable overview of BD analytics, its mechanics, business uses, and connected risks and challenges. Using the UN Guiding Principles on Business and Human Rights, the research analyzed the roles played by governmental and business stakeholders in responding to these challenges. Recommendations consisted of increasing transparency, fortifying data security, increasing user control, and making data controllers accountable through regulatory and business practices. Manyika et al. (2011) analyzed the impact of BD investment on firm performance in

three areas: user interface, supply chain, and competitive strategy. Employing the transient logarithmic production function, the study assessed the complementarities between investments in BD capabilities and human capital, ultimately confirming that BD adoption enhances productivity and is more rapidly embraced by high-performing firms.

Zuo (2017) investigated the implications of CA and BD for corporate budget management, proposing a comprehensive framework aimed at improving the formulation, execution, modification, and evaluation of corporate budgets. The study emphasised that the exponential growth in data generation, driven by technological innovation, has surpassed the capacities of traditional data formats and processing systems. Ahmed (2020) examined the role of CA in enabling economic units to align with contemporary scientific and technological trends. The research tested the hypothesis that cost efficiency achieved through cloud-based accounting platforms constitutes a significant factor in the selection of online accounting systems. Ohlhorst (2012) sought to underscore the strategic value of BD analytics, presenting it as the forthcoming competitive frontier for businesses. The study detailed the financial benefits and outlined processes critical for deriving actionable insights from BD. It further advocated for adopting BD-driven tools to optimise business practices, suggesting that digital platforms for niche markets, such as adult retail, should mirror the operational models of large-scale e-commerce platforms like eBay and Amazon.

Borah (2023) explored the foundational concepts, advantages, and limitations of CA implementation within organisational contexts. Using descriptive methodology, the research consulted existing literature in order to emphasize the ways in which CA technologies augment the efficiency and effectiveness of accountants. Kapish Nautiyal Jaishree Agrawal (2024) centered on BD analytics as an approach for identifying meaningful information, patterns, and trends in large data. The paper covered issues in the fields such as data privacy, security, and the need for advanced computing infrastructure. It covered issues in ethical considerations, with a focus on ethical usage in order to protect privacy and maintain public trust. Chilukoori and Gangarapu (2024) explored the methods for optimizing the efficiency of BD pipelines in Amazon Web Services (AWS) in order to drive operational cost savings. In applying optimised tactics—such as the selection of the right resources, the exploitation of synergies, efficient data lifecycle handling, and smart procurement of resources—the paper showed the realization of 37% cost saving in AWS BD process in actual application analysis.

Vo Van et al. (2025) conducted a systematic literature review to examine research trends, methodological approaches, influential variables, geographic distribution, and causal frameworks relating to CA. The analysis was based on 75 scholarly articles published between 2013 and 2023, sourced from Scopus, SpringerLink, Emerald Insight, and IEEE Xplore, following the PRISMA methodology. The review categorised

the existing literature into four thematic areas: benefits and challenges of CA; determinants of CA adoption; and factors affecting CA implementation. Based on the insights drawn from the preceding studies, the following hypotheses are proposed,

H1: *BD has a positive and statistically significant impact on the ROCs of FTTH internet services.*

H2: *BD has a positive and statistically significant impact on the implementation of CA in organizations.*

H3: *CA has a positive and statistically significant impact on the ROCs of FTTH internet services.*

H4: *CA partially mediates the relationship between BD and the ROCs of FTTH internet services.*

METHODOLOGY

Sample

The General Company for Communications and Information Technology operates under the auspices of the Ministry of Communications and is tasked with the development and operation of information transmission networks. Its mandate includes the provision of internet services, as well as wired and wireless communication systems, alongside a variety of information technology solutions. The company was legally incorporated on 7 February 1998, in response to an incorporation order by the Ministry of Industry and Minerals, in compliance with Companies Law No. 22 of 1997. It was registered as a public company for the provision of communication, postal, and service-based operations, including the transmission of radio and TV, to public sector organizations and private individuals in the country, as well as global markets.

It should be noted that Iraq's telecommunications sector is rooted in history, going back as far as 1924 when the Middle East and Iraq's first telephone exchange was launched in the district of Al-Ashar in the Governorate of Basra. Since then, the company has grown and adapted its operations to the needs of an expanding population base and the growing demand for its facilities. Today, it operates an extensive communications network that encompasses the whole country and consists of optical fibre networks, microwave-based communications systems, and an interconnected network of state-of-the-art communication exchanges and facilities. The company has in its workforce more than 10,000 employees, consisting of engineers, administrators, and technicians spread between its central headquarters and the regional directorates it maintains in Baghdad and throughout the governorates. Since its inception, the General Company for Communications and Informatics has consistently aligned itself with technological advancements in the fields of communications and information technology. It has proactively sought to introduce contemporary technologies for use by governmental bodies, private enterprises, and the public.

Among its strategic objectives is the establishment of sophisticated infrastructure, such as optical fibre cable networks and modern internet distribution systems, to address increasing demand. Notably, it has also undertaken major development projects, including the implementation of FTTH internet services. The study utilised a sample size of 116 respondents, which is considered statistically adequate for conducting mediation analysis using the bootstrapping method. Contemporary literature supports the use of sample sizes exceeding 100 to ensure reliable and consistent statistical estimations, especially when performing 5,000 bootstrap iterations, as was done in the present study. [Table 1](#) presents the demographic characteristics of the sample under investigation. Furthermore, as shown in [Table 1](#), the predominant portion of the sample comprises individuals from the academic sector, accounting for 57.76%. A significant majority, exceeding 79%, possess advanced academic qualifications, including master's and doctoral degrees. Additionally, over two-thirds of the respondents (67.24%) report having in excess of ten years of practical experience, which serves to bolster the robustness and credibility of the data gathered and analysed.

Table 1: Demographic Characteristics of the Study Sample

Variable	Category	No. of Individuals	Ratio(%)
Job Title	Academics in Educational Institutions	67	57.76%
	Accountant	14	12.07%
	Programmer	11	9.48%
	Auditor	9	7.76%
	Engineer	8	6.90%
	Administrator in the Communications Sector	7	6.03%
Academic Qualification	Higher Diploma	2	1.70%
	Bachelor's Degree	22	19.00%
	Master's Degree	34	29.30%
	PhD Degree	58	50.00%
Years of Experience	More than 10 Years	78	67.24%
	Less than 5 Years	22	18.97%
	5-10 Years	16	13.79%

Design of the Measurement Tool

The instrument employed in this study was a closed-ended questionnaire comprising 24 items, detailed in [Table 2](#). The questionnaire was developed following a thorough review of relevant scientific literature and prior research concerning BD, CA, and ROCs. The items were organised into three principal sections corresponding to the principal variables of the study.

Table 2: Number of Questions and their Dimensions for Each Variable

Variables	No. of Vertebrae	Reference
BD	7	(Chilukoori & Gangarapu, 2024; Kapish Nautiyal Jaishree Agrawal, 2024; Manyika et al., 2011; Ohlhorst, 2012)
CA	7	(Ahmed, 2020; Vo Van et al., 2025)
ROCs	10	(Ahmed, 2020; Chilukoori & Gangarapu, 2024; Walkowiak, Woźniak, et al., 2015; Zuo, 2017)

Hypothetical Study Model

The proposed model posits that BD exerts a direct influence on ROCs, in addition to an indirect effect mediated through its impact on CA, which subsequently affects ROCs, as illustrated in Figure 1.

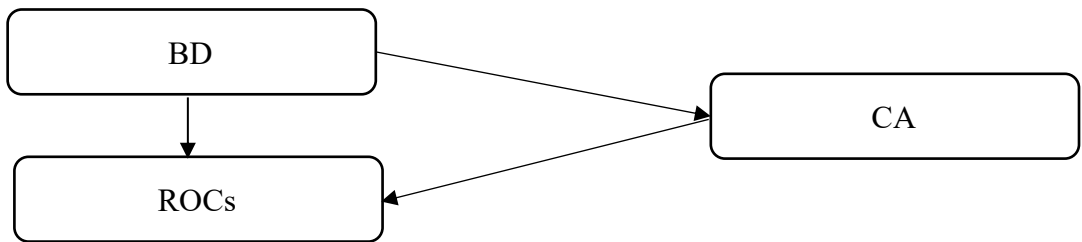


Figure 1: Study Model

RESULTS

Cronbach’s alpha coefficient was utilised to assess the internal consistency of the questionnaire. The alpha values for each dimension are presented in Table 3. Table 3 demonstrates that all values exhibit good to excellent reliability levels ($\alpha > 0.80$), reflecting a strong internal consistency among the items within each dimension and thereby reinforcing the overall reliability of the measurement instrument.

Table 3: Cronbach's Alpha Coefficient to Measure the Internal Consistency of the Study Variables

Pivot	Number of Questions	Cronbach's Alpha Coefficient
BD	7	0.804
CA	7	0.822
ROCs Integrating BD and CA	10	0.895

Method of Measuring Variables

The three variables examined in this study—BD, CA, and the ROCs associated with FTTH internet services—were assessed using a questionnaire employing a five-point Likert scale. The measurement items were formulated based on an extensive review of prior literature and related research in the domains of information systems, accounting,

and operations management. The questionnaire items were categorised as follows:

- A. Big Data: Assessed via statements evaluating the utilisation of BD technologies for analysing customer data, enhancing operational efficiency, and supporting managerial decision-making.
- B. Cloud Accounting: Evaluated through statements reflecting the degree to which CA systems improve the accuracy and timeliness of financial reporting, promote transparency, and facilitate cost reduction.
- C. ROCs for FTTH Internet Services: Measured by statements emphasising the role of BD and CA integration in augmenting operational efficiency and diminishing costs linked to the provision of fibre-optic cable services.

The statistical analysis conducted on the sample of 116 participants yielded several significant findings that elucidate the relationships among the study variables: BD, CA, and the ROCs for FTTH internet services, as outlined below.

Descriptive Analysis

Table 4 presents the descriptive statistics for the primary study variables, detailing the arithmetic means and standard deviations to reflect the participants' responses concerning each dimension. Moreover, Table 4 reveals that the arithmetic means for all variables surpassed 4 on the five-point Likert scale, signifying a notably high degree of consensus among the participants on the significance of BD, CA, and their integration in reducing operating costs.

Table 4: Descriptive Analysis of the Main Axes of the Study

Pivot	Number of Questions	Arithmetic Mean	Standard Deviation
BD	7	4.057	0.475
CA	7	4.097	0.482
Integrating BD and CA in ROCs	10	4.007	0.509

Second: Inferential Statistical Analyses

A range of inferential statistical techniques was utilised to examine the study's hypotheses and explore the relationships between the independent, dependent, and mediating variables, as detailed in Table 5. The results presented in Table 5 indicate that Pearson correlation analysis revealed statistically significant relationships among the variables. The correlation coefficient between BD and the ROCs was ($r = 0.81$), between CA and ROCs was ($r = 0.80$), and between the integration of BD and CA with ROCs was notably higher at ($r = 0.95$). Simple and multiple linear regression analyses were conducted to assess the direct effect of BD on ROCs and to evaluate the mediating role of CA within a multiple regression framework. The regression results demonstrated that BD has a significant positive effect on ROCs ($\beta = 0.852$, $p < 0.001$). When CA was included as a mediating variable, the effect of BD on ROCs decreased to ($\beta = 0.507$),

yet remained statistically significant, indicating partial mediation. Furthermore, a bootstrap mediation analysis with 5,000 iterations was performed to estimate the indirect effect of CA on the BD–ROCs relationship. The average indirect effect was ($a \times b = 0.343$), with a 95% confidence interval ranging from 0.210 to 0.491, confirming the presence of statistically significant mediation.

Table 5: Inferential Statistical Analyses of the Study Variables

Type of Analysis	Relationship or Model	Impact/Correlation Factor	Statistical Significance
Correlation Analysis (Pearson)	BD ↔ ROCs	0.81	$p < 0.001$
Simple Linear Regression	$ROCs = \beta_0 + \beta_1 BD$	0.852	$p < 0.001$
Multiple Linear Regression	$ROCs = \beta_0 + \beta_1 BD + \beta_2 (CA)$	$BD = 0.507CA = 0.449$	Both Variables: $p < 0.001$
Mediation Analysis Using Bootstrap	$BD \rightarrow CA \rightarrow ROC$	$a \times b = 0.343$	95% CI: [0.210 – 0.491]

The study hypotheses were examined as detailed in Table 6, which presents each hypothesis alongside the general direction of the relationships, relevant statistical values, and the level of their significance. Moreover, Table 6 demonstrates that all four study hypotheses were supported by the statistical analysis. The first three hypotheses (H1, H2, and H3) revealed strong and statistically significant direct relationships among the variables, confirming the impact of both BD and CA on ROCs. The fourth hypothesis (H4) showed that CA partially mediates the relationship between BD and ROCs, as evidenced by the bootstrap analysis where the confidence interval excluded zero. This finding highlights a significant indirect effect, underscoring the critical role of integrating modern digital technologies to enhance operational efficiency within the communications sector. Collectively, these results affirm the internal consistency and robustness of the proposed theoretical model, demonstrating its foundation on interconnected and meaningful relationships that accurately reflect the study context.

Table 6: Testing the Study Hypotheses

Hypothesis Symbol	Hypothesis	Statistical Result	Decision
H1	BD has a positive impact on the ROCs of FTTH internet services.	$\beta = 0.852, p < 0.001$	Accepted
H2	BD positively impacts CA.	$\beta = 0.768, p < 0.001$	Accepted
H3	CA has a positive impact on ROC.	$\beta = 0.449, p < 0.001$	Accepted
H4	CA mediates the relationship between BD and ROCs of FTTH internet services.	$a \times b = 0.343, CI = [0.210 - 0.491]$	Accepted (Partial Mediation)

DISCUSSION OF RESULTS

The findings of the present study underscore the significance of integrating BD and CA to achieve effective ROCs for FTTH internet services. These results are mostly

consistent with those of many other earlier studies dealing with the subject from different points of view. Most importantly, the findings agree with those of [Manyika et al. \(2011\)](#), who showed that focused investment in business development can increase the productivity of companies and accelerate strategic decision making. This alignment is reflected in the strong positive relationship observed between BD and ROCs in this study ($\beta = 0.852$). Additionally, the findings corroborate those of [Zuo \(2017\)](#), which emphasised the development of a budget management framework incorporating BD and CA. That study confirmed that the integration of these technologies enhances resource management and improves financial efficiency, consistent with the high correlation coefficient found between their integration and ROCs ($r = 0.95$) in the current research.

Regarding the mediating role of CA, this study's results are consistent with those of [Ahmed \(2020\)](#), who highlighted that CA extends beyond cost reduction to include streamlining accounting processes and supporting decision-making, thereby serving as a vital intermediary between advanced technologies and operational outcomes. This is further substantiated by the statistically significant partial mediation observed in this study ($a \times b = 0.343$, $CI = [0.210 - 0.491]$). Regarding the importance of BD in the digital context, studies such as ([K. N Jaishree Agrawal, 2024](#)) and ([Ohlhorst, 2012](#)) emphasise that BD analytics provides organisations with a competitive advantage by improving customer understanding, ROCs, and resource utilisation. This study supports that through the direct impact of BD on operational and financial decisions. Concerning CA, findings align with ([Borah, 2023](#)) and ([Vo Van et al., 2025](#)), who confirmed that adopting CA enhances transparency, improves data access, and enables accountants to adopt more strategic roles, reflected in CA's significant impact on ROCs ($\beta = 0.449$).

On ethical and regulatory issues, [Andrejevic \(2014\)](#) raised concerns about BD's lack of transparency. Although not directly addressed here, CA as a mediator may enhance governance and transparency, mitigating such risks. Lastly, this study's results correspond with [Walkowiak, Michał, et al. \(2015\)](#), who improved optical network performance by analysing BD traffic and integrating communication technologies, extending this research technically toward enhancing FTTH internet services via digital transformation. The comparison indicates that the findings in this study agree with past literature yet contribute an extra layer through the analysis of the mediating function of CA during the communications-based environment that is dependent on BD—a topic not fully analysed in past works. It is an important scientific contribution linking the financial and technological sides of contemporary cost management.

SOCIAL IMPACTS

The conjoining of BD and CA is an integral part of digital transformation with far-ranging impact on operational efficiency and ROCs, in addition to broader social aspects influencing business, community, and economic relations. Such convergence enhances the clarity and accountability in the performance of institutions, public trust—

especially in key sectors such as telecommunications—increases through ensuring equitable delivery of services. Transparency and reduced cost result through the availability of real-time, accurate data, allowing the monitoring of performance and ensuring equitable delivery of services, while the costs decrease through the availability of internet and fiber-optic infrastructures, bridging the digital gap, and ensuring social justice in the form of access to technology. Therefore, it aids in the use of new generation core technologies and the development of new professions necessitating the use of data analysis, coding, and cloud computing administration skills. It increases professional competency through the training and development provided in these skills, influencing educational institutions in curricular reviews, ensuring digital labour market needs in curriculum offerings. In the end, it enhances evidence-based decision-making, positively affecting economic and social policies, and enhances the development of an equitable and sustainable digital society.

FUTURE BUSINESS

Emphasis should be laid on creating new platforms for cost analysis and demand forecasting using predictive models for planning the expansion of fibre optic networks based on usage patterns and trends. Shift toward dynamic accounting systems linking operating expenditure with the actual service delivery, as the strategy can enhance and drive operational efficiency. Enhance the integration of data among the public and private sectors through data sharing among the Ministry of Communications, service operators, and the public for the sake of amplifying transparency and accountability. Moreover, create artificial intelligence tools to optimize the use of resources through the automated analysis of bills, utilization of resources, and the fibre optic network's technical performance.

CONCLUSION

The paper sought to investigate the effect of the incorporation of BD and CA on the ROCs of FTTH broadband internet, using a theoretical model that brings together technological advancement and organisational operational effectiveness. Descriptive and inferential statistical analysis showed BD and CA to each independently have a statistically significant impact on the ROCs. In addition, CA was shown, through bootstrap analysis with significant indirect effect in a 95% interval, to mediate the linkage between BD and the ROCs. The results for all four hypotheses supported the investment in the use of smart analytic and digital accounting solutions in order to increase efficiency, yield cost benefits, and maximize institutional performance. The study contributes knowledge to financial digital transformation by emphasising CA's strategic role as a bridge between BD and agile financial management, while also paving the way for future research to explore this integration across other sectors or with emerging technologies.

REFERENCES

- Aftab, J., Abid, N., Cucari, N., & Savastano, M. (2023). Green human resource management and environmental performance: The role of green innovation and environmental strategy in a developing country. *Business Strategy and the Environment*, 32(4), 1782-1798. <https://doi.org/10.1002/bse.3219>
- Ahmed, P. I. (2020). Reducing costs by the use of cloud accounting. *Journal of Arts, Literature, Humanities and Social Sciences*(54), 464-480. <https://doi.org/10.33193/JALHSS.54.2020.150>
- Al Falah, K. A., & Ghouri, A. M. (2023). Integrating Lean Management, Sustainability, Circular Capabilities, and Waste Minimization to Optimise Operational Performance in Manufacturing. *Al Falah, KA, & Ghouri, AM (2023). Integrating Lean Management, Sustainability, Circular Capabilities, and Waste Minimization to Optimise Operational Performance in Manufacturing, Operational Research in Engineering Sciences: Theory and Application*, 6(2), 99-122. <https://doi.org/10.2139/ssrn.4605337>
- Amirian, P., van Loggerenberg, F., & Lang, T. (2017). Big Data and Big Data Technologies. In P. Amirian, T. Lang, & F. van Loggerenberg (Eds.), *Big Data in Healthcare: Extracting Knowledge from Point-of-Care Machines* (pp. 39-58). Springer International Publishing. https://doi.org/10.1007/978-3-319-62990-2_3
- Andrejevic, M. (2014). Big data, big questions| the big data divide. *International Journal of Communication*, 8, 17. <https://ijoc.org/index.php/ijoc/article/view/2161>
- Atadoga, A., Umoga, U. J., Lottu, O. A., & Sodiya, E. O. (2024). Evaluating the impact of cloud computing on accounting firms: A review of efficiency, scalability, and data security. *Global Journal of Engineering and Technology Advances*, 18(2), 065-074. <https://doi.org/10.30574/gjeta.2024.18.2.0027>
- Aziz, N. A., Long, F., & Wan Hussain, W. M. (2023). Examining the Effects of Big Data Analytics Capabilities on Firm Performance in the Malaysian Banking Sector. *International Journal of Financial Studies*, 11(1), 23. <https://doi.org/10.3390/ijfs11010023>
- Bauer, J. (2016). Big Data, Big Money, Big Shadows. *Big Money, Big Shadows (May 28, 2016)*. <https://doi.org/10.2139/ssrn.2804760>
- Bi, S., Xiao, J., & Deng, T. (2024). The Role of AI in Financial Forecasting: ChatGPT's Potential and Challenges. Proceedings of the 4th Asia-Pacific Artificial Intelligence and Big Data Forum, <https://doi.org/10.1145/3718491.3718663>
- Borah, A. J. (2023). Accounting “In the Cloud”: A New Paradigm of Accounting. *The Ciência & Engenharia -Science & Engineering Journal*, 11(1), 1330-1336. <https://doi.org/10.52783/cienceng.v11i1.281>
- Chilukoori, V. V. R., & Gangarapu, S. (2024). Strategic Cost Management in Cloud-Based Big Data Processing: An AWS Case Study from Amazon. *International*

Journal for Research in Applied Science and Engineering Technology, 12(9).
<https://doi.org/10.22214/ijraset.2024.64155>

- Dubey, R., Bryde, D. J., Graham, G., Foropon, C., Kumari, S., & Gupta, O. (2024). The role of alliance management, big data analytics and information visibility on new-product development capability. *Annals of Operations Research*, 333(2), 743-767. <https://doi.org/10.1007/s10479-021-04390-9>
- Fu, W., & Jacobs, B. W. (2022). Does increased water efficiency improve financial performance? The important role of operational efficiency. *International Journal of Operations & Production Management*, 42(3), 304-330. <https://doi.org/10.1108/IJOPM-10-2021-0628>
- Haldorai, K., Kim, W. G., & Garcia, R. L. F. (2022). Top management green commitment and green intellectual capital as enablers of hotel environmental performance: The mediating role of green human resource management. *Tourism Management*, 88, 104431. <https://doi.org/10.1016/j.tourman.2021.104431>
- Herzog, I., & Grabowska, M. (2021). Quality Cost Account as a Framework of Continuous Improvement at Operational and Strategic Level. *Management and Production Engineering Review*, 14. <https://doi.org/10.24425/mper.2021.140000>
- Hussein, M. K., Krmln, N. Q., Flayyih, H. H., & Noori, R. B. (2024). Harnessing Technological Innovation and Artificial Intelligence in Iraqi Commercial Banks to Achieve Sustainability. *Explainable Artificial Intelligence in the Digital Sustainability Administration*, Cham. https://doi.org/10.1007/978-3-031-63717-9_18
- Jaishree Agrawal, K. N. (2024). Big Data and Big Data Analytics 3. <https://doi.org/10.58532/V3BGCT9P5CH1>
- Kohana, H. K., Edman, A. Y., & Haralayya, H. H. (2023). Cost Reduction Strategies and Growth of FMCG Companies in Kyoto, Japan. *Journal of Strategic Management*, 7(2), 26-36. <https://doi.org/10.53819/81018102t5157>
- Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., & Hung Byers, A. (2011). Big data: The next frontier for innovation, competition, and productivity. http://dln.jaipuria.ac.in:8080/jspui/bitstream/123456789/14265/1/mgi_big_data_full_report.pdf
- Mihai, M. S., & Duțescu, A. (2022). How cloud accounting and integrated services based on AI can impact accounting companies. *Proceedings of the International Conference on Business Excellence*. <https://doi.org/10.2478/picbe-2022-0079>
- Munir, S., Rasid, S. Z. A., Aamir, M., & Ahmed, I. (2022). Big data analytics capabilities, innovation and organizational culture: systematic literature review and future research agenda. *3c Tecnología: glosas de innovación aplicadas a la pyme*, 11(1), 209-235. <https://dialnet.unirioja.es/servlet/articulo?codigo=8365357>

- Obaida, A. D., & Thijeeb, A. M. (2020). The role of the forensic accountant in achieving the integration of accounting and legal performance. *International Journal of Innovation, Creativity and Change*, 13(5), 104-124. https://www.ijicc.net/images/vol_13/Iss_5/13526_Obaid_2020_E_R.pdf
- Obioha-Val, O. A., Lawal, T. I., Olaniyi, O. O., Gbadebo, M. O., & Olisa, A. O. (2025). Investigating the Feasibility and Risks of Leveraging Artificial Intelligence and Open Source Intelligence to Manage Predictive Cyber Threat Models. *Journal of Engineering Research and Reports*, 27(2), 10-28. <https://doi.org/10.9734/jerr/2025/v27i21390>
- Ohlhorst, F. J. (2012). *Big data analytics: turning big data into big money*. John Wiley & Sons. <https://www.wiley.com/en-us/Big+Data+Analytics%3A+Turning+Big+Data+into+Big+Money-p-9781118147597>
- Onukwulu, E. C., Agho, M. O., & Eyo-Udo, N. L. (2023). Developing a framework for predictive analytics in mitigating energy supply chain risks. *International Journal of Scholarly Research and Reviews*, 2(2), 135-155. <https://doi.org/10.56781/ijssr.2023.2.2.0042>
- Pan, W., Yang, Q., Aggarwal, C., & Koch, C. (2017). Big data. *IEEE Intelligent Systems*, 32(2), 7-8. <https://doi.org/10.1109/MIS.2017.32>
- Paulson, R. J. (2022). Big data, big lies? In (Vol. 3, pp. 293). <https://doi.org/10.1016/j.xfre.2022.11.006>
- Pramanik, M. I., Lau, R. Y., Hossain, M. S., Rahoman, M. M., Debnath, S. K., Rashed, M. G., & Uddin, M. Z. (2021). Privacy preserving big data analytics: A critical analysis of state-of-the-art. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 11(1), e1387. <https://doi.org/10.1002/widm.1387>
- Sefati, S., Mousavinasab, M., & Zareh Farkhady, R. (2022). Load balancing in cloud computing environment using the Grey wolf optimization algorithm based on the reliability: performance evaluation. *The Journal of Supercomputing*, 78(1), 18-42. <https://doi.org/10.1007/s11227-021-03810-8>
- Shamsuddin, S. M., & Hasan, S. (2015). Data science vs big data@ UTM big data centre. 2015 International Conference on Science in Information Technology (ICSITech), <https://doi.org/10.1109/ICSITech.2015.7407766>
- Singh, R. K., Agrawal, S., Sahu, A., & Kazancoglu, Y. (2023). Strategic issues of big data analytics applications for managing health-care sector: a systematic literature review and future research agenda. *The TQM Journal*, 35(1), 262-291. <https://doi.org/10.1108/TQM-02-2021-0051>
- Sunmonu, S., & Odeyale, A. (2024). Cost Reduction Techniques on Firm Performance of Selected Quoted Manufacturing Companies in Nigeria. *Asian Journal of Economics, Business and Accounting*, 24(12), 507-519. <https://doi.org/10.9734/ajeba/2024/v24i121624>
- Vinodh, S., Antony, J., Agrawal, R., & Douglas, J. A. (2021). Integration of continuous improvement strategies with Industry 4.0: a systematic review and agenda for

- further research. *The TQM Journal*, 33(2), 441-472. <https://doi.org/10.1108/TQM-07-2020-0157>
- Vo Van, H., Abu Afifa, M., Nguyen, N., & Bui, D. V. (2025). Cloud accounting: a systematic literature review. *Global Knowledge, Memory and Communication*. <https://doi.org/10.1108/GKMC-04-2024-0246>
- Walkowiak, K., Michał, W., Mirosław, K., & and Kmiecik, W. (2015). Optical networks for cost-efficient and scalable provisioning of big data traffic. *International Journal of Parallel, Emergent and Distributed Systems*, 30(1), 15-28. <https://doi.org/10.1080/17445760.2014.924516>
- Walkowiak, K., Woźniak, M., Klinkowski, M., & Kmiecik, W. (2015). Optical networks for cost-efficient and scalable provisioning of big data traffic. *International Journal of Parallel, Emergent and Distributed Systems*, 30(1), 15-28. <https://doi.org/10.1080/17445760.2014.924516>
- Wong, L.-W., Lee, V.-H., Tan, G. W.-H., Ooi, K.-B., & Sohal, A. (2022). The role of cybersecurity and policy awareness in shifting employee compliance attitudes: Building supply chain capabilities. *International Journal of Information Management*, 66, 102520. <https://doi.org/10.1016/j.ijinfomgt.2022.102520>
- Wu, Q., Yan, D., & Umair, M. (2023). Assessing the role of competitive intelligence and practices of dynamic capabilities in business accommodation of SMEs. *Economic Analysis and Policy*, 77, 1103-1114. <https://doi.org/10.1016/j.eap.2022.11.024>
- Zhang, A., & Lv, N. (2021). Research on the impact of big data capabilities on government's smart service performance: empirical evidence from China. *Ieee Access*, 9, 50523-50537. <https://doi.org/10.1109/ACCESS.2021.3056486>
- Zuo, X. (2017). Research on enterprise's comprehensive budget management system in the view of big data and cloud accounting. 4th International Conference on Education, Management, Arts, Economics and Social Science (ICEMAESS 2017), <https://doi.org/10.2991/icemaess-17.2017.117>