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Smarter Decisions, Stronger Businesses: Industry 4.0 and the Future of Management Accounting in Botswana

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ABSTRACT

Combining digital technology, improving decision-making, and increasing corporate efficiency, Industry 4.0 is revolutionizing management accounting. This study examines how digitization has affected management accounting procedures in Botswana, emphasizing both the advantages and disadvantages for regional companies. We examine the use of Industry 4.0 tools, their impact on financial performance, and regulatory considerations using a mixed-methods approach. Key findings show that although digitization improves forecasting, strategic planning, and cost control, issues like infrastructure constraints and skills shortages still exist. In order to promote Industry 4.0 adoption in Botswana's management accounting environment, the report makes recommendations for changes to education and policy. Businesses by embracing digital transformation, can achieve smarter decisions and stronger financial sustainability.

1. Introduction

Under the aegis of Industry 4.0, the swift development of digital technologies has revolutionized a number of industries worldwide, including financial management, healthcare, and manufacturing. By improving efficiency, automation, and data-driven decision-making, Industry 4.0 which is defined by the integration of cyber-physical systems, artificial intelligence (AI), big data analytics, cloud computing, and the Internet of Things (IoT) is transforming conventional corporate operations. Management accounting is one of the most important areas of transformation, since automation, predictive analytics, and real-time data processing allow for more precise and strategic financial decisions.

The use of Industry 4.0 technology is still in its infancy in Botswana, a nation renowned for its steady economic growth and reliance on sectors like mining, financial services, and tourism. Even if businesses are becoming

more aware of the potential advantages of digital transformation, a number of obstacles stand in the way of its broad adoption, such as a lack of adequate IT infrastructure, a lack of skilled workers, and organizational resistance to change. In spite of these obstacles, progressive companies are progressively incorporating smart technology into their management accounting procedures in order to promote innovation, increase cost effectiveness, and improve decision-making. This study looks at how Industry 4.0 adoption in management accounting has affected Botswana's business environment, assessing the ways in which these technologies affect automation, timeliness, and correctness of decision-making.

1.1 The Current State of Industry 4.0 in Management Accounting in Botswana

Botswana is just beginning to adopt Industry 4.0 technology in the field of management accounting. Due to budgetary limitations and restricted access to technological know-how, many small and medium-sized businesses (SMEs) are trailing behind in the adoption of digital tools like cloud computing and big data analytics, while larger multinational firms and financial institutions have already begun to use them.

Government programs that highlight the significance of technology adoption for economic diversification and sustainable growth include Botswana's Vision 2036 and the National Digital Transformation Strategy. The goal of these frameworks is to promote digital innovation in a variety of fields, including finance. However, infrastructural deficiencies and a workforce that has to be retrained to meet the demands of digital transformation frequently hinder the adoption of such initiatives.

1.2 The primary barriers to Industry 4.0 Adoption in management accounting within Botswana.

i. Technological Readiness

Many businesses lack the cybersecurity and IT infrastructure required to operate cutting-edge digital technologies.

ii. Skills Gap

Full-scale implementation is hampered by a lack of experts in data analytics, artificial intelligence, and automation tools.

iii. Organizational Culture and Opposition to Change

Conventional accounting methods are still widely used, and some companies are reluctant to adopt technology-driven strategies.

iv. Financial Restrictions

SMEs are discouraged from adopting innovative technology due to the high initial investment expenses.

v. Issues with Regulation and Policy

The legislative environment for data protection and digital finance is still in its infancy, despite the existence of governmental policies that encourage digital transformation.

Notwithstanding these obstacles, there has been some advancement in the integration of digital accounting solutions in Botswana's financial industry, especially with regard to cloud-based financial management software and analytics powered by artificial intelligence. These developments mark the start of a transition to more intelligent frameworks for decision-making that depend on automation and real-time data.

1.3 The Impact of Industry 4.0 on Management Accounting in Botswana

Organizations in Botswana could greatly improve their financial decision-making by implementing Industry 4.0 technologies in management accounting. Several significant effects have been determined based on research findings:

i. Increased Precision in Making Decisions

In management accounting, Industry 4.0 technologies like artificial intelligence (AI), big data analytics, and machine learning enable accurate and data-driven decision-making. Accountants can evaluate financial trends, identify irregularities, and produce accurate forecasts with the use of advanced analytics. Businesses in Botswana that have implemented AI-powered financial management solutions report improved cost control, forecasting, and budgeting accuracy.

ii. Improved Timeliness of Financial Decisions

Decision-making speed is greatly increased by Industry 4.0 technology' real-time data processing capabilities. Organizations may access financial data instantly thanks to cloud computing and the Internet of Things, which removes the delays that come with traditional accounting procedures. Consequently, the top companies in Botswana's banking and telecommunications industries have reported making financial decisions more quickly and intelligently, which has improved operational efficiency.

iii. Automation of Repetitive Accounting Processes

Robotic process automation (RPA) and artificial intelligence (AI) are enabling process automation, which is decreasing the need for human intervention in repetitive accounting processes including financial reporting, data entry, and reconciliations. In addition to reducing mistakes, this frees up accountants to concentrate on making strategic decisions. Smaller businesses in Botswana are still in the early phases of the digital transition because of cost concerns, even as larger enterprises have started automating financial procedures.

iv. Cost Optimization and Financial Efficiency

By optimizing resource allocation, decreasing manual labor, and streamlining financial procedures, 4.0 technologies maximize cost efficiency. Financial institutions in Botswana have seen a considerable decrease in IT expenses thanks to cloud-based accounting systems, and AI-driven insights assist companies in finding areas where they may save costs.

v. Fostering Innovation in Financial Management

Businesses can create creative financial plans if they have access to real-time financial data and predictive analytics. Although its implementation in Botswana is still in its experimental stage, blockchain technology is showing promise as a means of guaranteeing safe and transparent financial transactions. Businesses investigating blockchain for fraud detection and financial audits are establishing a standard for eventual industry-wide adoption.

vi. Challenges in Adoption and Future Outlook

Despite the advantages, different businesses in Botswana are still adopting Industry 4.0 in management accounting in different ways. While companies that postpone adoption run the risk of falling behind, those who embrace digital transformation gain a competitive edge. The government's backing of technological education, higher investments in digital infrastructure, and a change in organizational mindsets toward automation and data-driven decision-making are all critical to Botswana's Industry 4.0 future.

1.4 The Impact of Industry 4.0 on Management Accounting in Botswana Summary

Botswana's financial decision-making environment is changing as a result of the incorporation of Industry 4.0 technology into management accounting. Organizations who invest in digital transformation are seeing improvements in decision-making accuracy, timeliness, and cost efficiency, despite ongoing hurdles like technology readiness, skills shortages, and financial constraints. Maximizing the advantages of Industry 4.0 in management accounting will depend on cultivating an innovative culture and providing professionals with the required digital skills as Botswana continues its transition to a digital economy.

Businesses in Botswana can improve operational efficiency, fortify financial decision-making procedures, and gain sustained competitive advantages in a global economy that is becoming more and more digital by tackling these issues and utilizing smart technology.

1.5 Research Questions

1. What factors influence the strategic adoption of Industry 4.0 technologies in management accounting within Botswana's organizations?
2. How does the adoption of Industry 4.0 technologies impact the accuracy of management accounting decision-making in Botswana?
3. What is the relationship between Industry 4.0 technology adoption and the timeliness of management accounting decision-making in Botswana?
4. To what extent does the automation of management accounting decision-support systems improve efficiency and cost optimization in Botswana’s organizations?
5. What challenges and readiness gaps exist in the adoption of Industry 4.0 technologies for management accounting in Botswana?

2.0 Literature Review

2.1 Introduction

Many industries, including management accounting, are being revolutionized by Industry 4.0. The implementation of Industry 4.0 technologies, including cloud computing, big data analytics, artificial intelligence (AI), and the Internet of Things (IoT), is changing how decisions are made, increasing operational effectiveness, and promoting sustainability (Müller, 2018) (Tortorella, 2019). To improve strategic financial management, businesses in Botswana are progressively incorporating these technologies into their accounting systems (Mbizi, 2022). With an emphasis on digital transformation, decision-making effectiveness, and implementation issues in Botswana, this literature review critically analyzes the current conversation surrounding Industry 4.0 and its implications for management accounting.

2.2 Theoretical Framework

Several theoretical frameworks can be used to examine how Industry 4.0 technologies are being adopted in management accounting. **The Technology Acceptance Model** (TAM) (Rogers, 2003) describes how adoption rates are influenced by perceived utility and ease of use. According to **Contingency Theory** (Fiedler, 1964), organizational and environmental factors affect how effective new technology is. **The theory of diffusion of innovation** (Tomatzky, 1990) sheds light on how cutting-edge technology proliferate inside businesses. These frameworks aid in placing the incorporation of digital tools within the context of financial management in Botswana.

2.3 Digitalization and Management Accounting

Traditional methods have changed dramatically as a result of management accounting's digitization. Digital accounting solutions improve real-time data processing and simplify financial reporting (Piosik, 2022). Organizations can more precisely foresee market trends because to AI-driven financial modeling's enhanced predictive capabilities (Bhimani, 2020). Furthermore, remote access and cooperative financial decision-making are made easier by cloud-based accounting systems (Sokolenko, 2020) (Marsintauli, 2021).

Additionally, Industry 4.0 encourages sustainability in accounting procedures. By incorporating sustainability data into financial reporting, Digital Environmental Management Accounting (DEMA) improves eco-efficiency (Abdelhalim, 2023). This is especially important in Botswana, where two of the main governmental goals are environmental preservation and economic diversification (Muchuchuti, 2021).

2.4 Impact of Industry 4.0 on Decision-Making in Accounting

Financial decision-making becomes more strategic and informed when big data and AI are integrated (Frank, 2019). Digital technologies greatly increase the timeliness and precision of administrative decisions, according to studies (Buer, 2021). To maximize performance measurement in Industry 4.0 contexts, a balanced scorecard approach that integrates both financial and non-financial data has been modified (Frederico, 2021).

But problems still exist. The full use of Industry 4.0 tools is hampered by the skills gap among accountants, especially in digital literacy (Mbizi, 2022). Furthermore, data integrity and financial transparency are issues brought up by cybersecurity threats connected to cloud-based accounting solutions (Naciri, 2023).

2.5 Challenges and Barriers to Implementation in Botswana

There are a number of barriers to the effective implementation of Industry 4.0 in Botswana's management accounting environment,

1. **Technological Readiness** - Widespread adoption of AI, IoT, and cloud computing is hampered by Botswana's inadequate infrastructure (Agostini, 2019).
2. **Training and Skill Development** - The efficiency of digital tools in financial decision-making is limited by accountants' lack of digital capabilities (Alsughayer, 2023).
3. **Regulatory and Policy Gaps** - The consequences of automated accounting procedures are not adequately covered by current financial legislation (Molokwane, 2019).
4. **Cultural reluctance** - The adoption of new technology is slowed down by organizational inertia and reluctance to change (Singaram, 2022).

2.6 Future Directions and Research Gaps

Additional research should examine the following topics in order to optimize the advantages of Industry 4.0 in Botswana,

1. The function of government incentives in encouraging digital transformation in accounting.
2. Techniques to close the digital accounting skills gap.
3. How Botswana's corporate governance procedures are affected by AI-driven financial models.

2.7 Literature Review Summary

There are a lot of potential in Industry 4.0 to improve management accounting procedures in Botswana. Although digital technologies increase the sustainability and efficiency of decision-making, issues including talent gaps, regulatory restrictions, and technology readiness must be resolved. Future studies must to concentrate on methods for getting beyond these obstacles so that Botswana's financial management industry may take full use of the advantages of digital transformation.

3.0 Materials and Methods

3.1 Introduction

This section describes the research approach used to investigate how Industry 4.0 technologies might be included into management accounting in Botswana. To guarantee a methodical and empirical approach, it offers a thorough explanation of the study's research design, target population, sampling strategies, data gathering tactics, and analytical processes.

3.2 Research Design

To obtain a comprehensive grasp of how Industry 4.0 technologies impact management accounting practices and business performance in Botswana, the study used a mixed-methods approach, combining qualitative and quantitative methodology. This method made it easier to conduct a thorough examination of adoption patterns and the fundamental elements influencing the digital transformation of financial decision-making.

3.3 Quantitative Component

The quantitative component sought to measure the rate of Industry 4.0 adoption and assess how it related to important business performance metrics. Because of its ability to produce objective, quantifiable insights into adoption trends and the related influencing factors, a quantitative approach was judged appropriate (Bryman, 2016). A thorough assessment of variable correlations was made possible by the study's use of statistical techniques to test research hypotheses.

i. Sampling Strategy

To guarantee a representative sample from a range of industries and business sizes, a stratified random sampling technique was applied. To capture a wide variety of adoption experiences, organizations were grouped according to industry, size, and location. This stratification improved the reliability of the results and reduced selection bias (Creswell, 2017).

ii. Data Collection – Structured Surveys

Structured questionnaires were used to collect data from important stakeholders, such as decision-makers, IT specialists, and management accountants. These people were chosen because of their proficiency in financial management and technology integration. Quantitative analysis was made easier by the questionnaire's uniform format, which guaranteed consistency in data collection (Fowler Jr, 2013).

iii. Data Analysis – Chi-Square Test

The Chi-Square Test in SPSS statistical software was used to examine the connection between Industry 4.0 adoption and business performance KPIs. Because of its capacity to evaluate correlations between categorical variables and ascertain statistical significance in observed trends, this approach was selected (Agresti, 2018). The test shed light on the relationships between organizational characteristics and various adoption levels.

iv. Justification for Methods

To ensure empirical rigor and generalizability, a quantitative approach, structured surveys, and Chi-Square analysis were used. A representative view of the larger business environment was offered by stratified random sampling, and the validity and reliability of the results were guaranteed by statistical analysis (Field, 2013).

3.4 Qualitative Component

Deeper understanding of the organizational drivers, obstacles, and contextual factors impacting Industry 4.0 adoption in management accounting was the goal of the study's qualitative phase. The motives and strategic considerations underlying digital transformation were recorded by qualitative methodologies, while quantitative data monitored adoption levels and the effects on business performance.

i. Participant Selection

For the qualitative phase, important informants with prior experience integrating Industry 4.0 were also chosen using a stratified random selection technique (Patton, 2014). Senior management, accounting experts, and IT specialists representing companies at various phases of the digital transformation were among the participants.

ii. Justification for Sampling Approach

A balanced examination of adoption drivers across different business contexts was ensured by the inclusion of multiple perspectives made possible by this sample technique (Creswell, 2017).

iii. Data Collection Methods

In order to investigate the adoption of Industry 4.0 in management accounting, focus groups and semi-structured interviews were used.

iv. Semi-Structured Interviews

Flexible yet facilitated conversations on corporate culture, leadership impact, financial decision-making, and technology adoption were made possible by semi-structured interviews (Kvale, 2009). An in-depth examination of participant experiences was made possible via open-ended questions. Depending on availability, interviews were done both in-person and electronically. Each session lasted 60 to 90 minutes.

v. Focus Groups

Focus groups with the IT and accounting departments of certain companies were conducted to look at the dynamics of cooperation in digital transformation initiatives. Participants were able to share opinions and consider adoption potential and barriers as a group thanks to this approach (Morgan, 1996).

vi. Justification for Qualitative Methods

Focus groups and semi-structured interviews were suitable methods for gathering intricate, situation-specific insights that were not possible with just quantitative data. These techniques made it easier to examine diverse perspectives and new issues in the adoption of Industry 4.0 (King, 2018).

vii. Data Analysis – Thematic Analysis

The qualitative data was analyzed using a thematic analysis approach, which made it possible to find and explain important themes in participant responses (Braun, 2006). These five steps were taken in the process:

a. Data Familiarization: Interviews and focus groups are transcribed, and comprehension is checked by iterative reads.

b. Initial Coding: Responses are systematically coded according to predetermined and developing themes, such as leadership positions, organizational hurdles, and difficulties integrating data.

c. Theme Development: Codes are grouped under broad themes such as financial ramifications of digital adoption, cultural opposition, and strategy alignment.

d. Theme Review: Themes are refined and validated to make sure they are coherent and pertinent to the goals of the study.
e. Theme Definition and Interpretation: Clearly defining topics and connecting them to existing literature and theoretical frameworks.
This analytical strategy preserved methodological rigor while allowing for an organized analysis of qualitative data. By documenting leadership viewpoints, organizational experiences, and changes brought about by technology in management accounting, the qualitative phase enriched the overall findings of the study.

3.5 Study Population

Businesses and organizations engaged in management accounting procedures throughout Botswana were the focus of the investigation. Large corporations, small and medium-sized businesses (SMEs), government agencies, and individual businesses were all represented in the sample. There were 6,127 registered accountants, including chartered accountants, certified public accountants, and accounting technicians, according to the 2022 report from the Botswana Institute of Chartered Accountants (BICA). Since financial management is a dynamic field, there were roughly 20,000 professionals in the entire projected relevant research population.

3.6 Sample Size Calculation

A sample size of 377 respondents was calculated using the Raosoft sample size calculator, taking into account a 50% response distribution, a 95% confidence level, and a 5% margin of error. Key sectors, such as public and private organizations (SMEs and major corporations), were sufficiently represented thanks to stratified random selection.

3.7 Stratification Criteria and Sample Distribution

- **Public Sector Organizations:** 126 participants
- **Private Sector Organizations:**
    - SMEs: 126 participants
    - Large Corporations: 126 participants

By taking organizational size (SMEs vs. large firms) and sectoral variations (public vs. private) into account, stratification provided diversified representation. Understanding how technological and financial capabilities affect Industry 4.0 adoption across different corporate models was crucial.
i. Public vs. Private Sector Considerations
Because of legal requirements, budgetary restrictions, and bureaucratic hurdles, public sector organizations frequently see slower adoption (Molokwane, 2019).
When implementing new technology, private sector companies are typically more inventive, competitive, and nimble (Muchuchuti, 2021).
ii. SMEs vs. Large Enterprises
SMEs are vital to Botswana's economy, but their use of digital technology is constrained by financial and infrastructure issues (Majama, 2017).
Big businesses have the financial and technological resources to propel Industry 4.0 innovation, particularly in the mining and manufacturing sectors (Acquah, 2007).

3.8 Ethical Considerations

The Botswana Ministry of Trade and the University of Zambia Institutional Review Board provided their ethical

approval. Informed consent was obtained after participants were briefed on the goals, methods, risks, and advantages of the study. Coded IDs were used to preserve anonymity and confidentiality, guaranteeing adherence to ethical research guidelines.

4. Results & Discussion

4.1 Discussion on Demographic Results of Industry 4.0 Technologies Adoption

i. Study Response Rate Discussion

The study's 72.9% response rate is comparatively high when compared to other research on the use of technology in management accounting in developing nations. For example, earlier research on Industry 4.0 technology adoption by (Mian, 2020) and (Nankervis, 2021) revealed response rates of 65% and 68%, respectively. This suggests that the study's response rate is marginally higher than average rates in comparable settings, demonstrating the target population's high level of engagement. However, because self-selection may be biased, this should be regarded cautiously.

ii. Calculation of Response Rate

The number of completed responses was divided by the total number of questionnaires issued, and the result was multiplied by 100 to calculate the response rate. A 72.9% response rate was obtained from the 275 completed questionnaires out of the 377 that were sent. This computation is in line with accepted research practices (Singaram, 2022).

iii. Addressing Non-Response Bias

Although a high response rate indicates trustworthy data collecting, non-response bias is still a possibility. Findings may be impacted by the unique characteristics of non-respondents (Anshari, 2022). A systematic evaluation of potential biases was not feasible because non-respondents in this study did not provide any organizational or demographic information. As suggested by (Mbizi, 2022), future studies could think about following up with non-respondents to examine any systemic differences. Further information on potential biases may also be obtained by gathering data on organizational size, industry type, and digital preparedness.

iv. Self-Selection Bias and Representativeness

Self-selection bias is still a possibility because companies that were more likely to embrace Industry 4.0 would have responded more frequently, which could have resulted in an overestimation of adoption rates. By contrasting respondent demographics with national business statistics, the sample's representativeness was assessed (Acquah, 2007). The distribution by organization size, regional presence, and sector type (public vs. private) closely matched Botswana's overall business environment. Future research could examine the potential underrepresentation of smaller firms in remote locations.

v. Use of Incentives

In this study, no financial incentives were offered. Rather, participants were told they would receive a summary of the results, which might have prompted them to participate. To increase response rates, especially among underrepresented groups, future studies should look into small cash incentives or other types of recompense, including participation certificates (Rojko, 2017).

vi. Reliability of Findings and Recommendations for Future Research

The conclusions are more reliable due to the comparatively high response rate, especially when using statistical analysis like Chi-Square Tests. Future research should, however, include strategies to lessen self-selection and non-response bias in order to further increase representativeness. Future research could be strengthened by techniques like weighting changes to account for underrepresented groups and following up with non-respondents. Increasing the sample size and providing focused incentives may also aid in attracting a wider variety of businesses (Bag, 2021).

vii. Participating Organizations – Public vs. Private

Both public and private sector organizations participated in the survey; 31% were from government agencies, including the Ministry of Trade and Finance and its affiliates, while 69% were from private companies. Given the varying operational goals of governmental organizations, which place a higher priority on efficiency and compliance, and private companies, which concentrate on profits, this distribution offered a balanced viewpoint.

viii. Location of Respondent Organizations

The capital of Botswana, Gaborone, was home to the majority of responders (57%) while Francistown came in second. This is consistent with the fact that economic activity is concentrated in these regions. Organizations in Gaborone are more likely than those in rural areas to be exposed to Industry 4.0 technology since the city serves as the focal point for policymaking and efforts related to digital transformation.

ix. Number of Employees

Because the study required participating organizations to have established management accounting processes, larger organizations with more than 100 employees made up the majority of the respondent pool. To optimize the advantages of digital transformation, larger companies are typically better equipped to hire management accountants and invest in Industry 4.0 technologies.

x. Annual Revenue

A majority (65%) of surveyed organizations reported annual revenues exceeding five million pula, indicating financial stability. This financial strength likely correlates with the ability to adopt advanced technologies, as organizations with higher revenue are better positioned to invest in digital transformation initiatives.

xi. Total Asset Value

Most participating organizations reported total assets exceeding ten million pula, suggesting a substantial asset base to support Industry 4.0 investments. Organizations with larger asset bases are typically more equipped to finance the necessary infrastructure for technological advancements.

xii. Participants' Roles

Participants represented a diverse set of roles, including business owners (7%), CEOs and directors (28%), finance directors and managers (17%), accountants (38%), and IT representatives (10%). This diversity ensured a comprehensive understanding of Industry 4.0 adoption from multiple functional perspectives within organizations.

xiii. Participants' Experience

The majority of participants had over five years of experience in their roles, ensuring a knowledgeable respondent base. This experience enhances the reliability of insights regarding the impact of Industry 4.0 technologies on management accounting.

xiv. Participants' Educational Qualifications

Most respondents were professional accountants (holding qualifications such as CIMA, ACCA, CIPFA, and AAT), reflecting a high level of expertise in financial management. This professional background is crucial for assessing the efficiency gains from Industry 4.0 adoption in management accounting.

xv. In-House vs. Outsourced Management Accounting Functions

The study found that 75.27% of organizations conducted management accounting in-house, emphasizing a preference for direct control over financial operations and strategic decision-making. The remaining organizations outsourced these functions, likely to leverage cost efficiencies and specialized expertise in digital accounting tools.

xvi. Outsourced Management Accounting Feedback Rate

Among organizations that outsourced management accounting functions, the frequency of feedback varied. The majority received updates twice a year (8%), followed by quarterly, monthly, weekly, and annual updates (7.64%). Timely financial insights are critical for effective decision-making, and Industry 4.0 technologies are expected to enhance the efficiency and responsiveness of outsourced accounting services.

These demographic insights provide a foundation for analyzing the broader impact of Industry 4.0 technologies on management accounting in Botswana, highlighting key organizational characteristics influencing adoption trends.

4.2 Perceived impact on time and accuracy

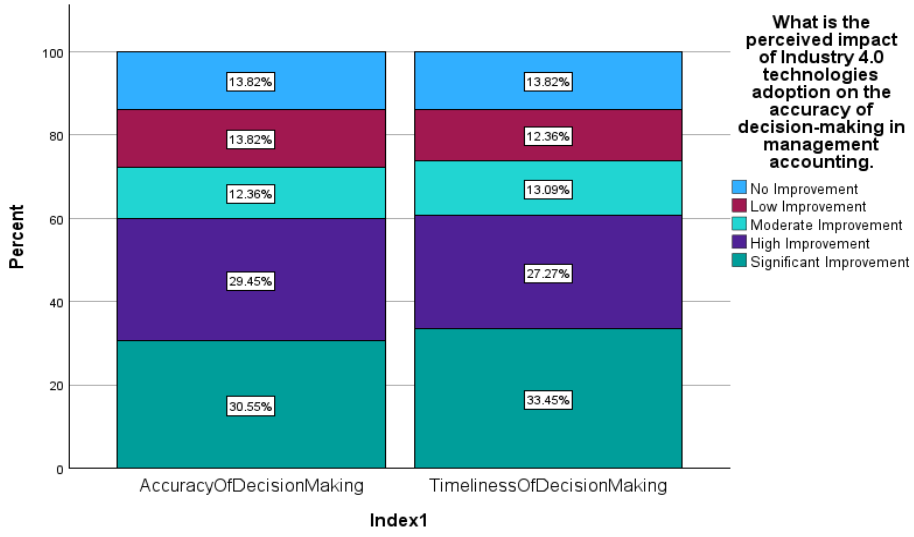

Figure 1. Perceived impact of industry 4.0 technologies adoption on the accuracy and timeliness of decision making in management accounting.

The perceived effect of Industry 4.0 technologies on the timeliness and precision of management accounting decision-making is depicted in the bar chart. It divides the replies into five improvement categories: Not at All, Little Improvement, Some Improvement, Significant Improvement, and Moderate Improvement. The majority of respondents indicated significant (30.55%) and moderate (29.45%) gains in decision-making accuracy. Comparably, there was a significant percentage of gains in both high (33.45%) and moderate (27.27%) timeliness of decision-making. Remarkably, the respondents who said there had been no change were the fewest in terms of timeliness (13.82%) and correctness (13.82%). These findings, which are consistent with respondents' favorable opinions, imply that the use of Industry 4.0 technology primarily improves the timeliness and accuracy of management accounting decision-making processes.

4.3 Effect on Accuracy of Decision Making on Adoption of Each Industry 4.0 Technology

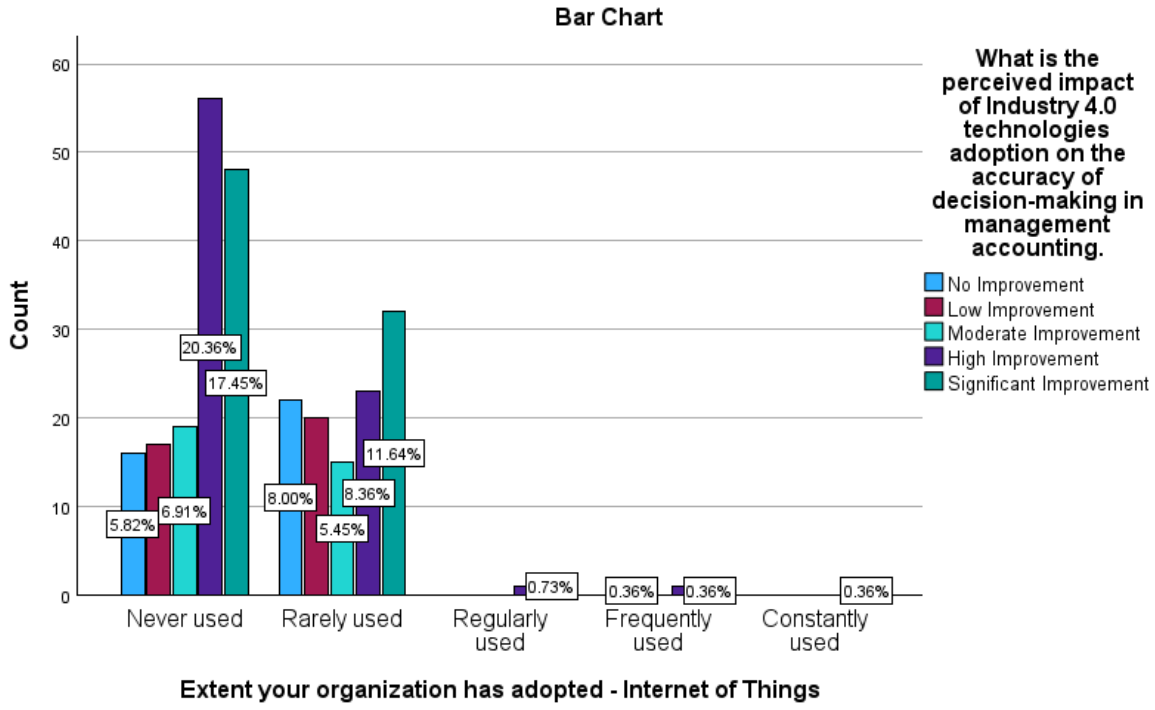

Figure 2. Perceived impact of Internet of Things adoption on the accuracy of decision making in management accounting

Internet of Things adoption in the sampled organisations did not improve the accuracy of decision making in their management accounting function, as could be seen by the majority who either never used or rarely used, as seen on figure 2 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.342[a]	16	.304
Likelihood Ratio	19.863	16	.226
Linear-by-Linear Association	1.451	1	.228
N of Valid Cases	275		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is .12.

Table 1. Figure 2 Chi-Square Tests

There appears to be no statistically significant correlation between adoption of Internet of Things influencing accuracy of decision making in management accounting, according to the findings of the Linear-by-Linear Association, Likelihood Ratio, and Pearson Chi-Square tests as per Table 1 above.

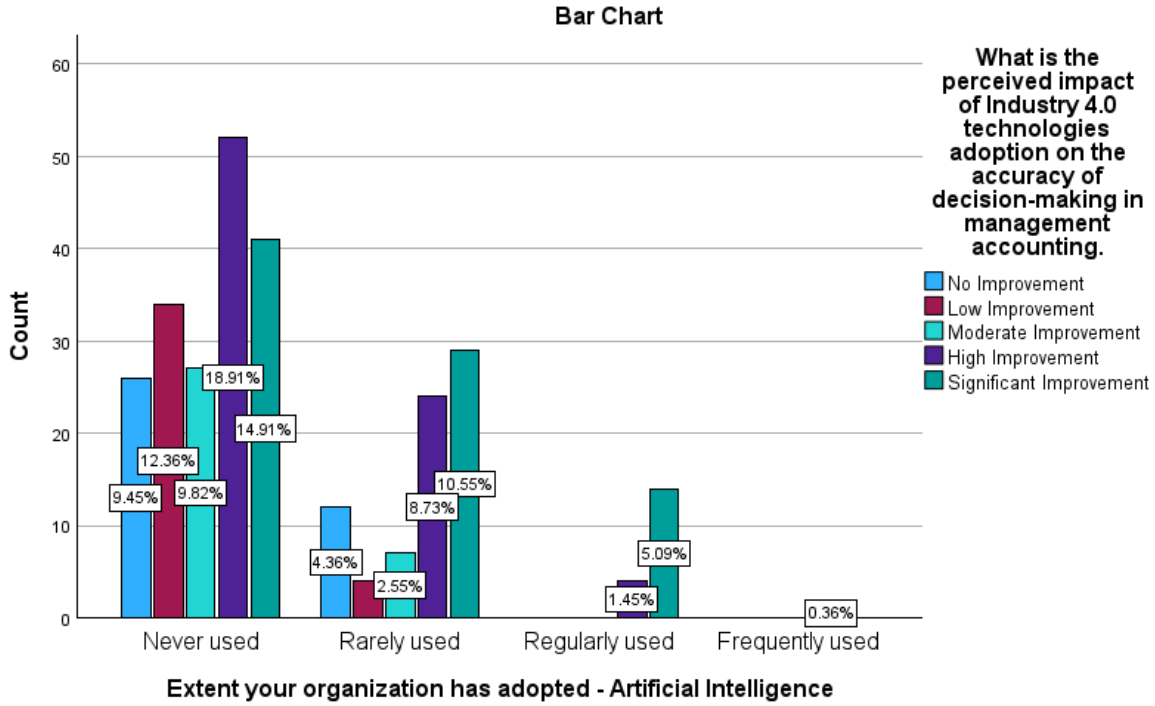

Figure 3. Perceived impact of artificial intelligence adoption on the accuracy of decision making in management accounting

Artificial intelligence adoption in the sampled organisations fairly improved the accuracy of decision making in their management accounting function, as could be seen on figure 3 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	37.457[a]	12	<.001
Likelihood Ratio	41.887	12	<.001
Linear-by-Linear Association	19.384	1	<.001
N of Valid Cases	275		

a. 8 cells (40.0%) have expected count less than 5. The minimum expected count is .12.

Table 2. Figure 3 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of artificial intelligence influencing accuracy of decision making in management accounting as per table 2 above.

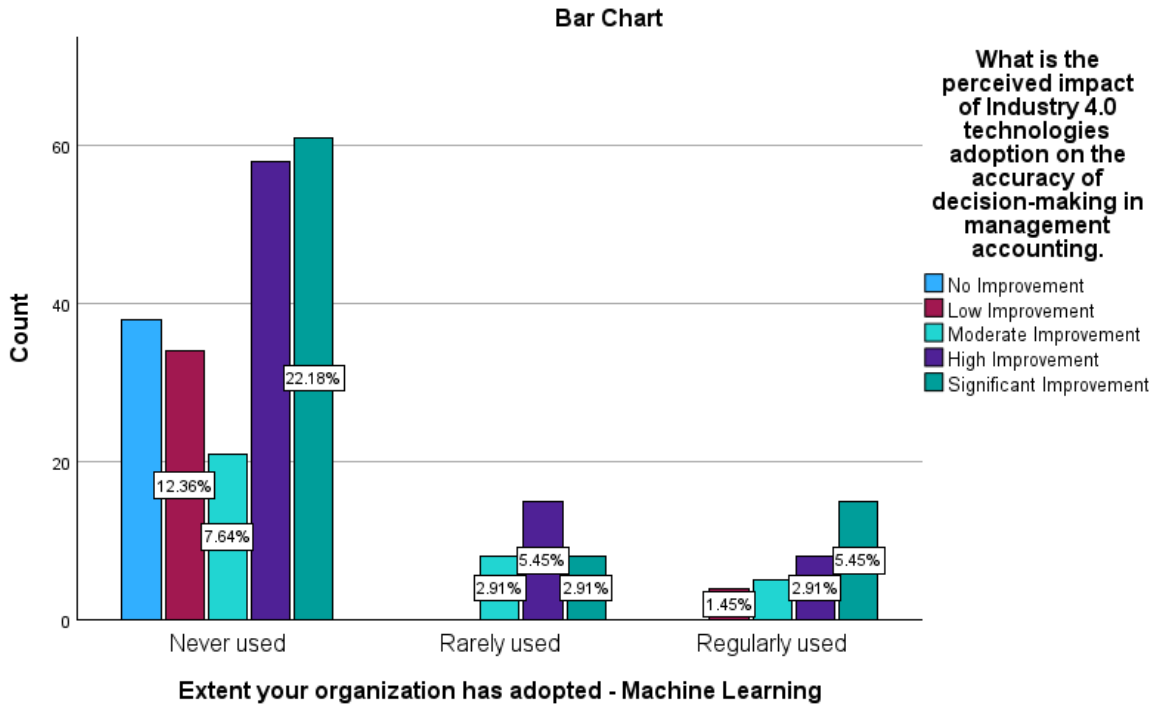

Figure 4. Perceived impact of machine learning adoption on the accuracy of decision making in management accounting

Machine learning adoption in the sampled organisations fairly improved the accuracy of decision making in their management accounting function, as could be seen on figure 4 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	29.758[a]	8	<.001
Likelihood Ratio	40.472	8	<.001
Linear-by-Linear Association	11.011	1	<.001
N of Valid Cases	275		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is 3.83.

Table 3. Figure 4 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of machine learning influencing accuracy of decision making in management accounting as per table 3 above.

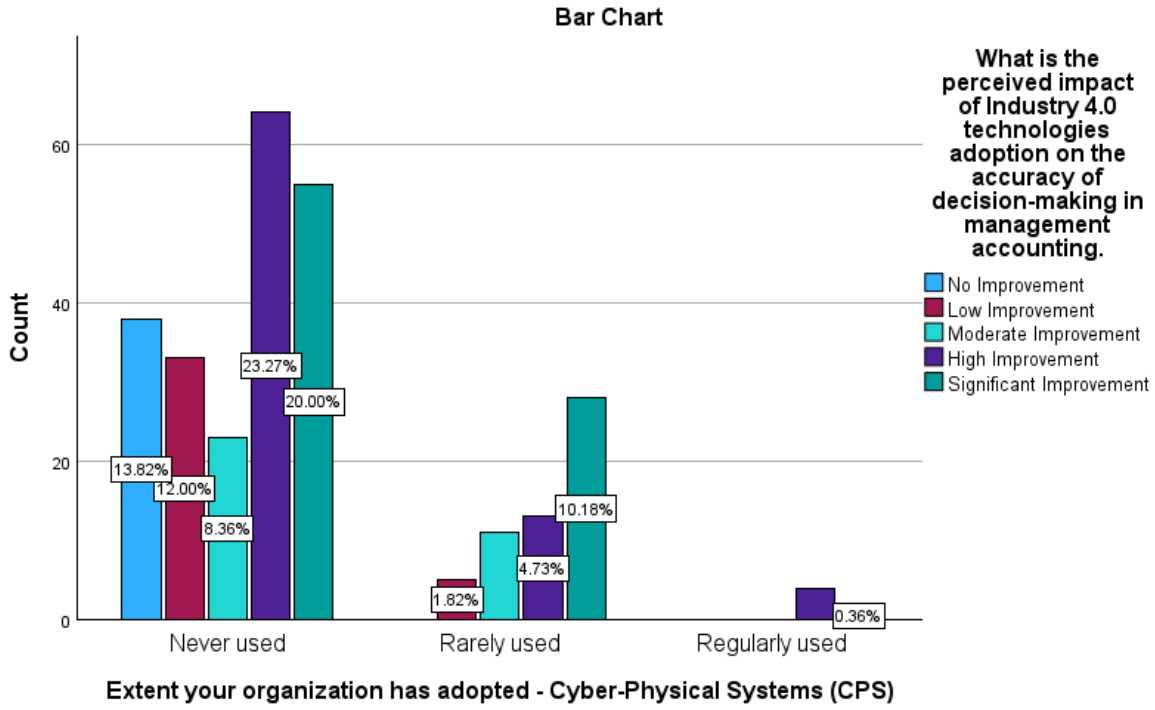

Figure 5. Perceived impact of cyber physical systems adoption on the accuracy of decision making in management accounting

Cyber physical systems adoption in the sampled organisations fairly improved the accuracy of decision making in their management accounting function, as could be seen on figure 5 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	29.888[a]	8	<.001
Likelihood Ratio	37.161	8	<.001
Linear-by-Linear Association	15.520	1	<.001
N of Valid Cases	275		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .62.

Table 4. Figure 5 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of cyber physical systems influencing accuracy of decision making in management accounting as per table 4 above.

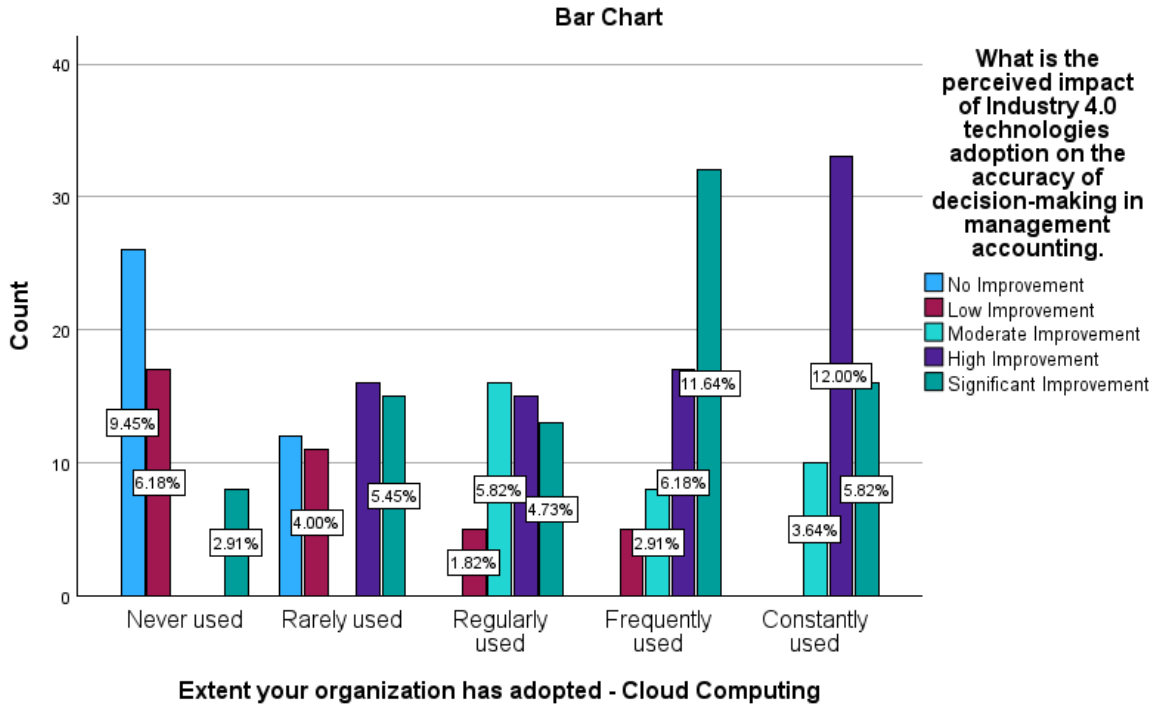

Figure 6. Perceived impact of cloud computing adoption on the accuracy of decision making in management accounting

Cloud computing adoption in the sampled organisations has significantly improved the accuracy of decision making in their management accounting function, as could be seen on figure 6 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	175.863[a]	16	<.001
Likelihood Ratio	201.242	16	<.001
Linear-by-Linear Association	76.522	1	<.001
N of Valid Cases	275		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.06.

Table 5. Figure 6 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of cloud computing influencing accuracy of decision making in management accounting as per table 5 above.

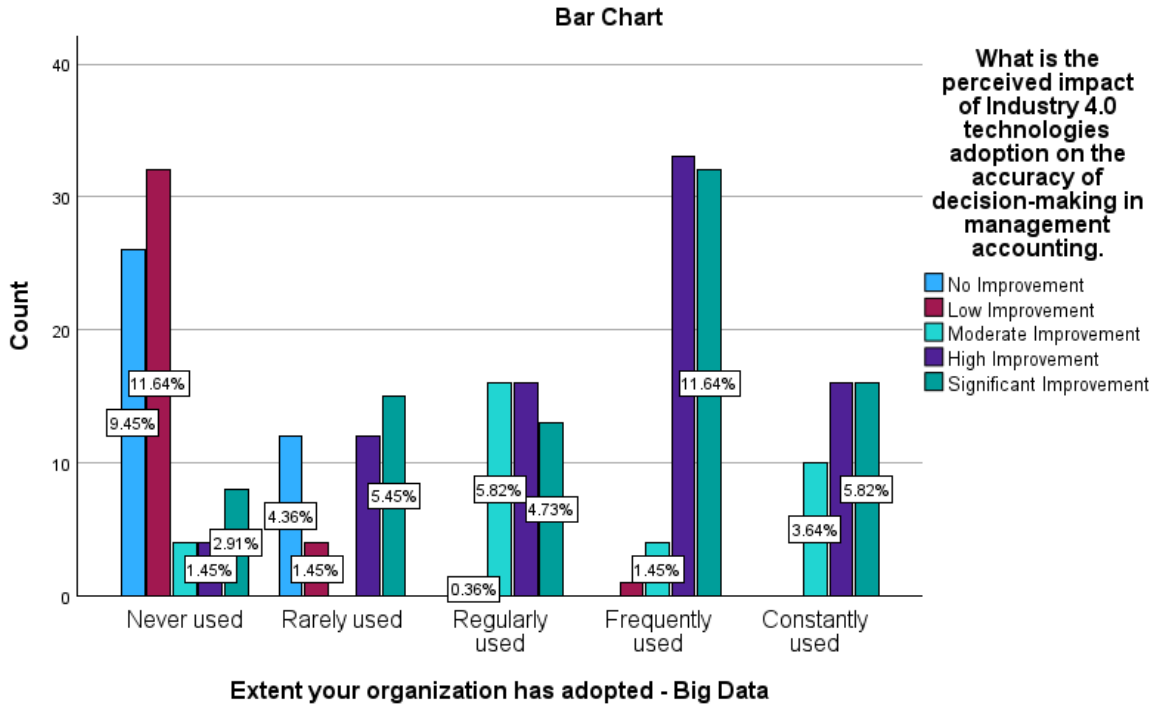

Figure 7. Perceived impact of big data adoption on the accuracy of decision making in management accounting

Adoption of big data in the sampled organisations has significantly improved the accuracy of decision making in their management accounting function, as could be seen on figure 7 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	190.653[a]	16	<.001
Likelihood Ratio	208.373	16	<.001
Linear-by-Linear Association	93.087	1	<.001
N of Valid Cases	275		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.19.

Table 6. Figure 7 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of big data and accuracy of decision making in management accounting as per table 6 above.

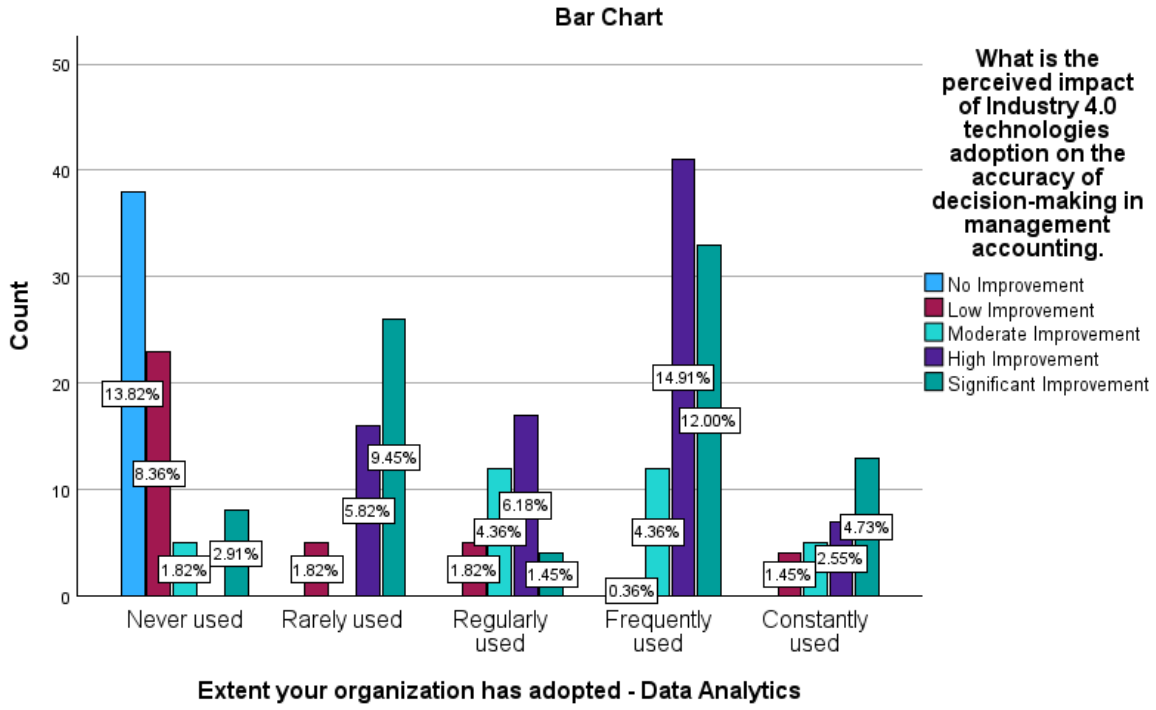

Figure 8. Perceived impact of data analytics adoption on the accuracy of decision making in management accounting

Adoption of data analytics in the sampled organisations has significantly improved the accuracy of decision making in their management accounting function, as could be seen on figure 8 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	211.381[a]	16	<.001
Likelihood Ratio	235.978	16	<.001
Linear-by-Linear Association	80.220	1	<.001
N of Valid Cases	275		

a. 4 cells (16.0%) have expected count less than 5. The minimum expected count is 3.59.

Table 7. Figure 8 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of data analytics and accuracy of decision making in management accounting as per table 7 above.

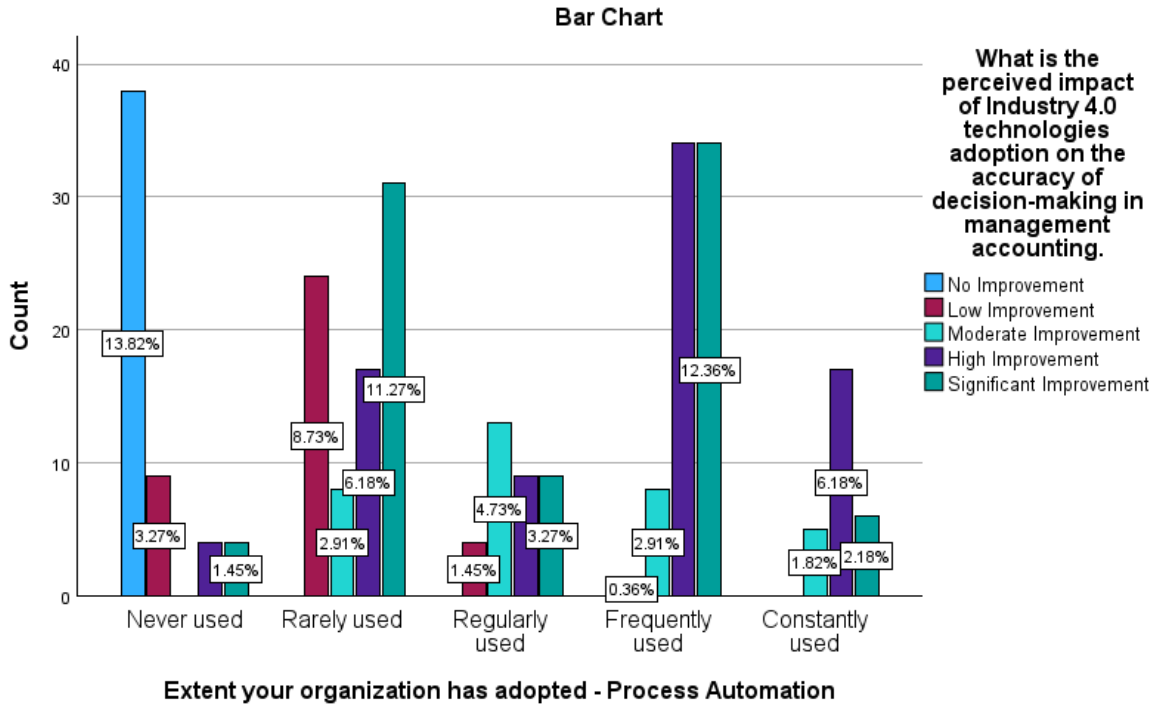

Figure 9. Perceived impact of process automation adoption on the accuracy of decision making in management accounting

Adoption of process automation in the sampled organisations has significantly improved the accuracy of decision making in their management accounting function, as could be seen on figure 9 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	248.971[a]	16	<.001
Likelihood Ratio	230.787	16	<.001
Linear-by-Linear Association	82.057	1	<.001
N of Valid Cases	275		

a. 6 cells (24.0%) have expected count less than 5. The minimum expected count is 3.46.

Table 8. Figure 9 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of process automation and accuracy of decision making in management accounting as per table 8 above.

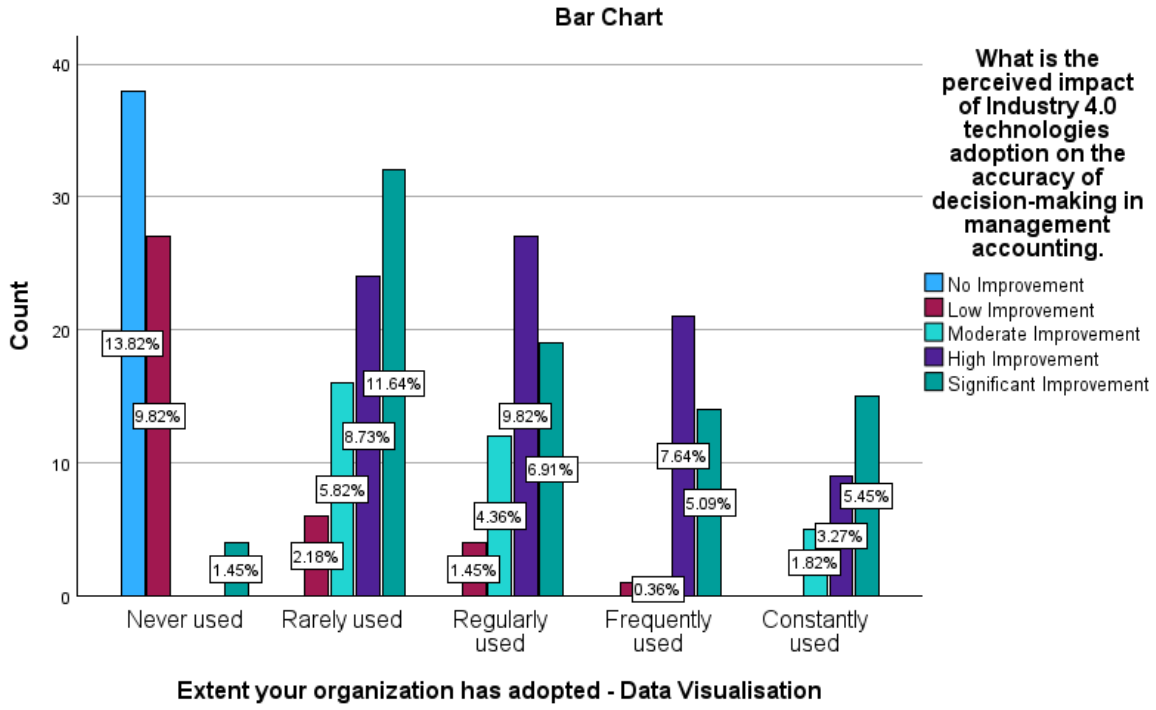

Figure 10. Perceived impact of data visualisation adoption on the accuracy of decision making in management accounting

Data visualisation adoption in the sampled organisations has significantly improved the accuracy of decision making in their management accounting function, as could be seen on figure 10 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	231.316[a]	16	<.001
Likelihood Ratio	251.353	16	<.001
Linear-by-Linear Association	96.132	1	<.001
N of Valid Cases	275		

a. 4 cells (16.0%) have expected count less than 5. The minimum expected count is 3.59.

Table 9. Figure 10 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of data visualisation and accuracy of decision making in management accounting as per table 9 above.

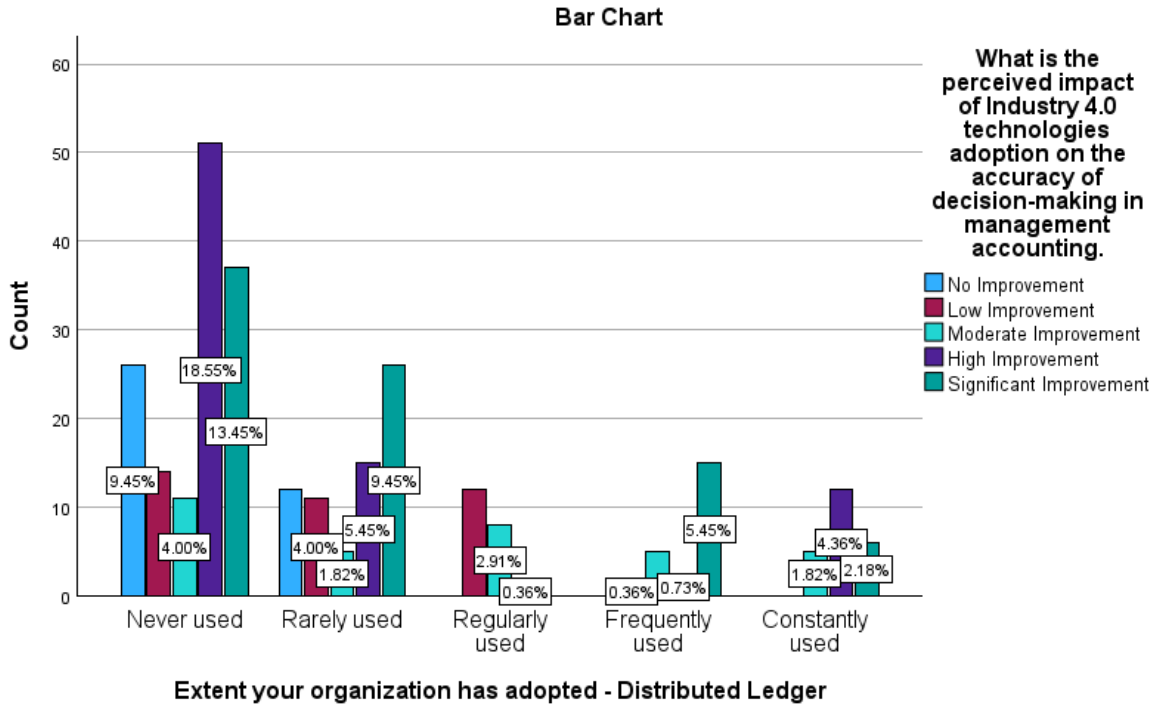

Figure 11. Perceived impact of distributed ledger adoption on the accuracy of decision making in management accounting

Distributed ledger adoption in the sampled organisations has significantly improved the accuracy of decision making in their management accounting function, as could be seen on figure 11 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	98.412[a]	16	<.001
Likelihood Ratio	101.536	16	<.001
Linear-by-Linear Association	4.733	1	.030
N of Valid Cases	275		

a. 9 cells (36.0%) have expected count less than 5. The minimum expected count is 2.60.

Table 10. Figure 11 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of distributed ledger and accuracy of decision making in management accounting as per table 10 above.

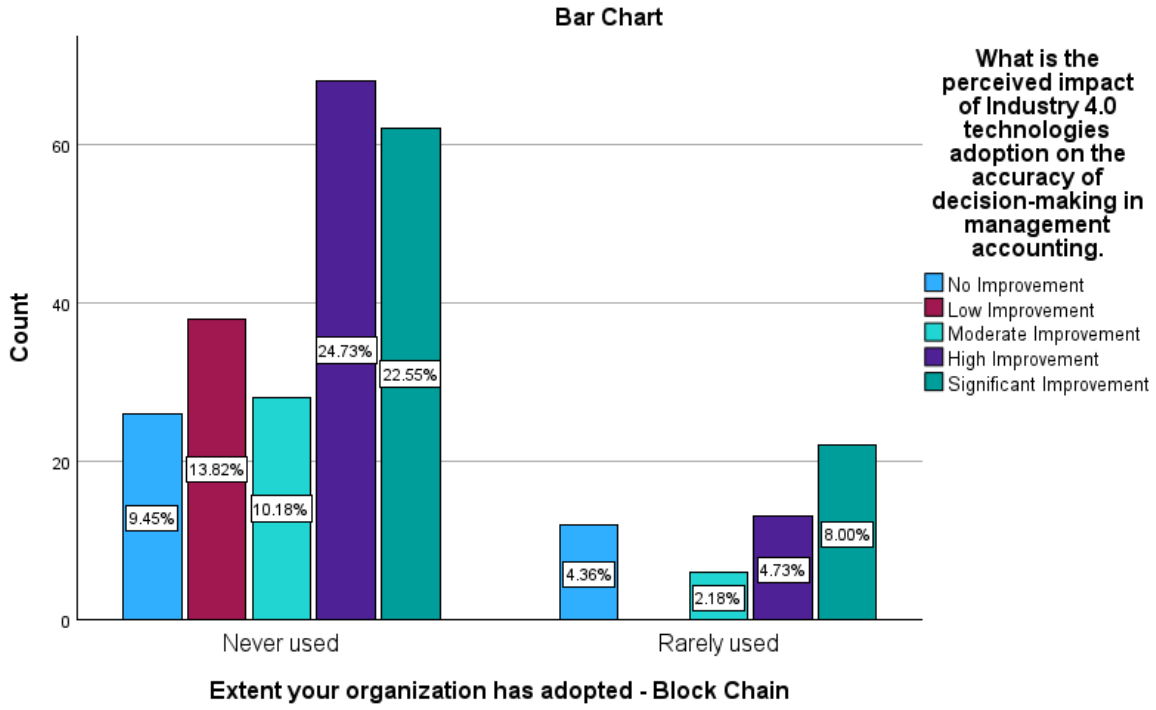

Figure 12. Perceived impact of block chain adoption on the accuracy of decision making in management accounting

Block chain adoption in the sampled organisations has fairly improved the accuracy of decision making in their management accounting function, as could be seen on figure 12 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.953[a]	4	.003
Likelihood Ratio	22.533	4	<.001
Linear-by-Linear Association	.577	1	.447
N of Valid Cases	275		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.55.

Table 11. Figure 12 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of block chain and accuracy of decision making in management accounting as per table 11 above.

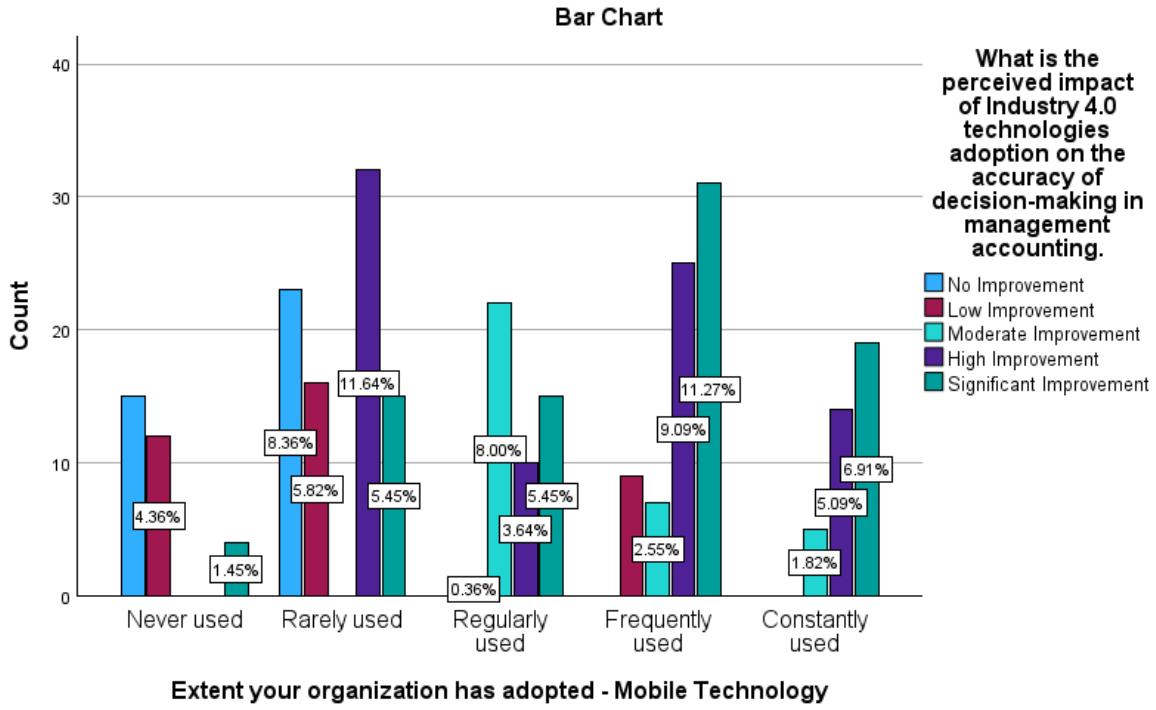

Figure 13. Perceived impact of mobile technology adoption on the accuracy of decision making in management accounting

Mobile technology adoption in the sampled organisations has significantly improved the accuracy of decision making in their management accounting function, as could be seen on figure 13 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	172.752[a]	16	<.001
Likelihood Ratio	191.047	16	<.001
Linear-by-Linear Association	72.973	1	<.001
N of Valid Cases	275		

a. 4 cells (16.0%) have expected count less than 5. The minimum expected count is 3.83.

Table 12. Figure 13 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of mobile technology and accuracy of decision making in management accounting as per table 12 above.

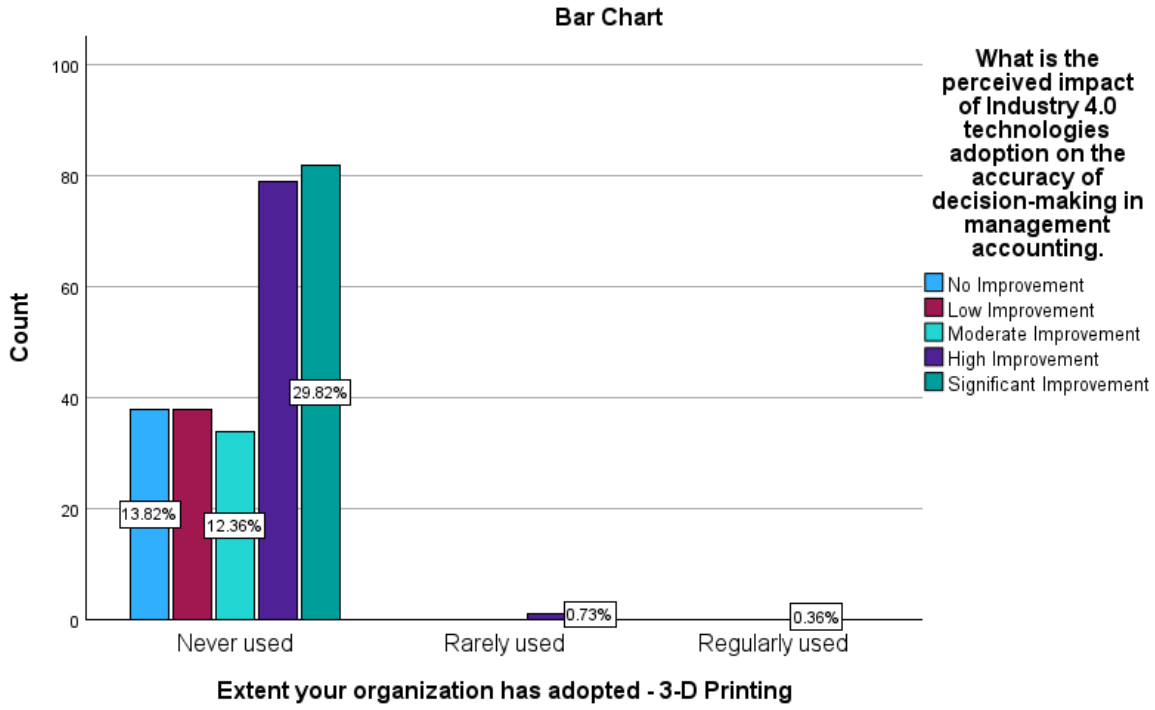

Figure 14. Perceived impact of 3-D Printing adoption on the accuracy of decision making in management accounting

Adoption of 3-D printing in the sampled organisations has not improved the accuracy of decision making in their management accounting function, as could be seen on figure 14 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.931[a]	8	.765
Likelihood Ratio	5.853	8	.664
Linear-by-Linear Association	1.515	1	.218
N of Valid Cases	275		

a. 10 cells (66.7%) have expected count less than 5. The minimum expected count is .12.

Table 13. Figure 14 Chi-Square Tests

There appears to be no statistically significant correlation between adoption of 3-D printing influencing accuracy of decision making in management accounting, according to the findings of the Linear-by-Linear Association, Likelihood Ratio, and Pearson Chi-Square tests as per Table 13 above.

4.4 Effect on Timeliness of Decision Making on Adoption of Each Industry 4.0 Technology

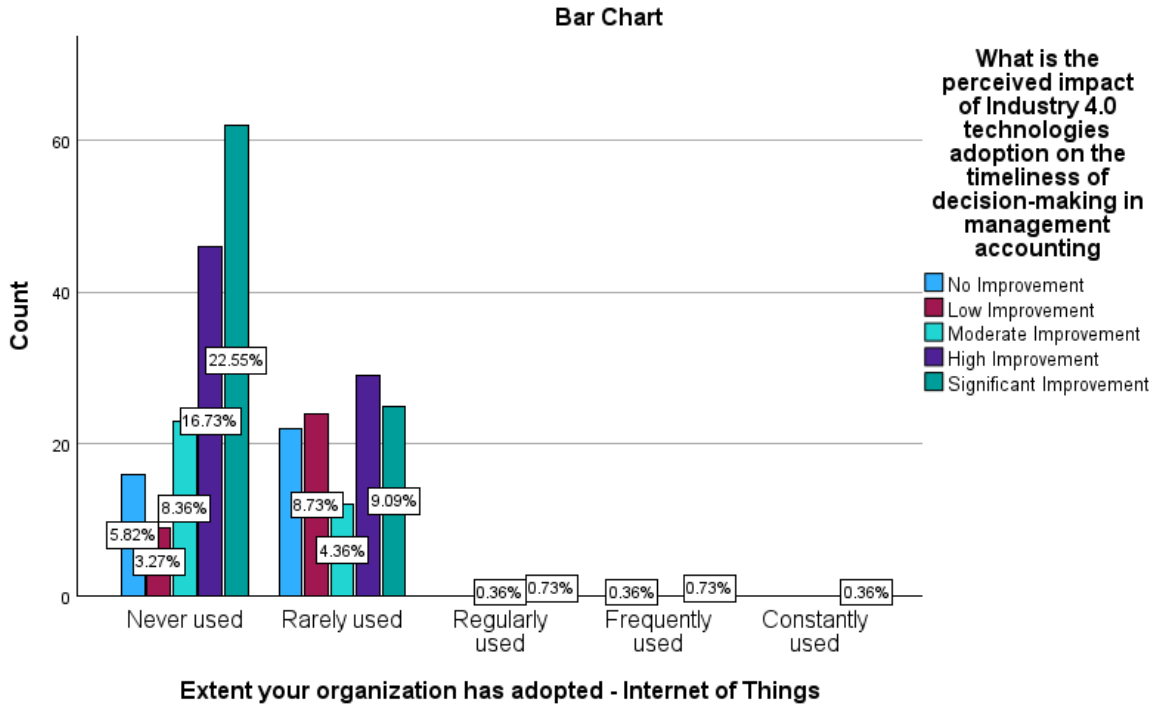

Figure 15. Perceived impact of Internet of Things adoption on the timeliness of decision making in management accounting

Internet of Things adoption in the sampled organisations fairly improved the timeliness of decision making in their management accounting function, as could be seen on figure 15 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	33.477[a]	16	.006
Likelihood Ratio	36.135	16	.003
Linear-by-Linear Association	5.846	1	.016
N of Valid Cases	275		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is .12.

Table 14. Figure 15 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of internet of things and timeliness of decision making in management accounting as per table 14 above.

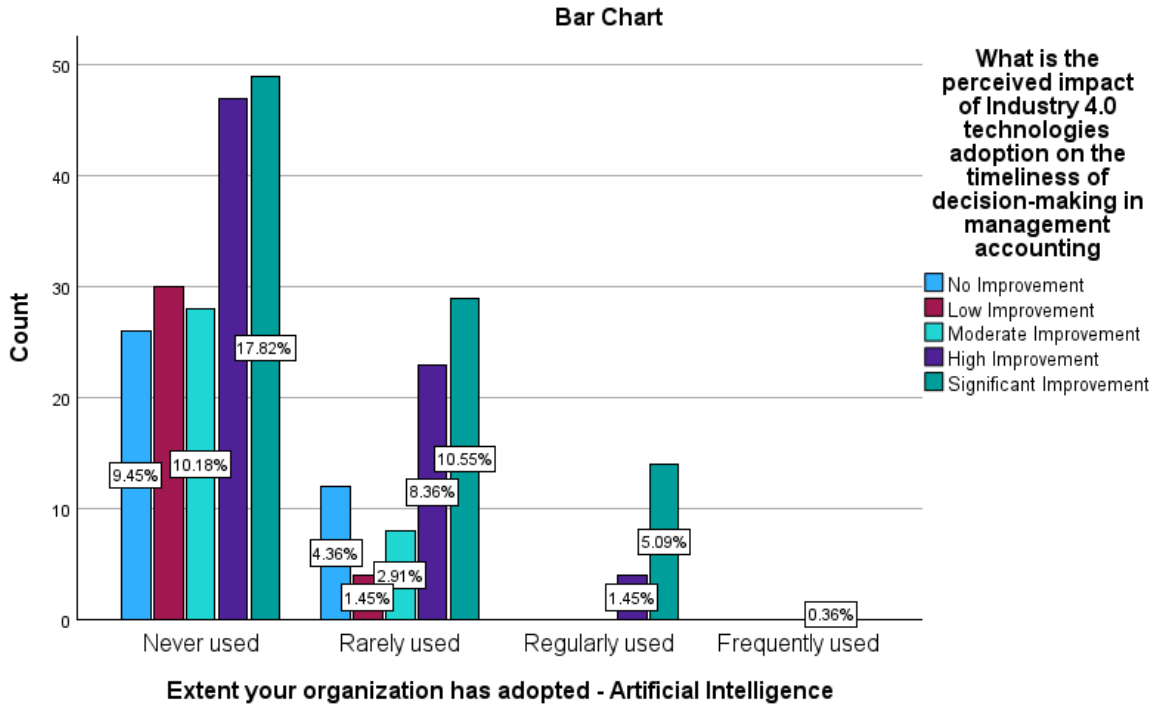

Figure 16. Perceived impact of artificial intelligence adoption on the timeliness of decision making in management accounting

Artificial intelligence adoption in the sampled organisations has fairly improved the timeliness of decision making in their management accounting function, as could be seen on figure 16 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	30.682[a]	12	.002
Likelihood Ratio	35.468	12	<.001
Linear-by-Linear Association	15.272	1	<.001
N of Valid Cases	275		

a. 9 cells (45.0%) have expected count less than 5. The minimum expected count is .12.

Table 15. Figure 16 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of artificial intelligence and timeliness of decision making in management accounting as per table 15 above.

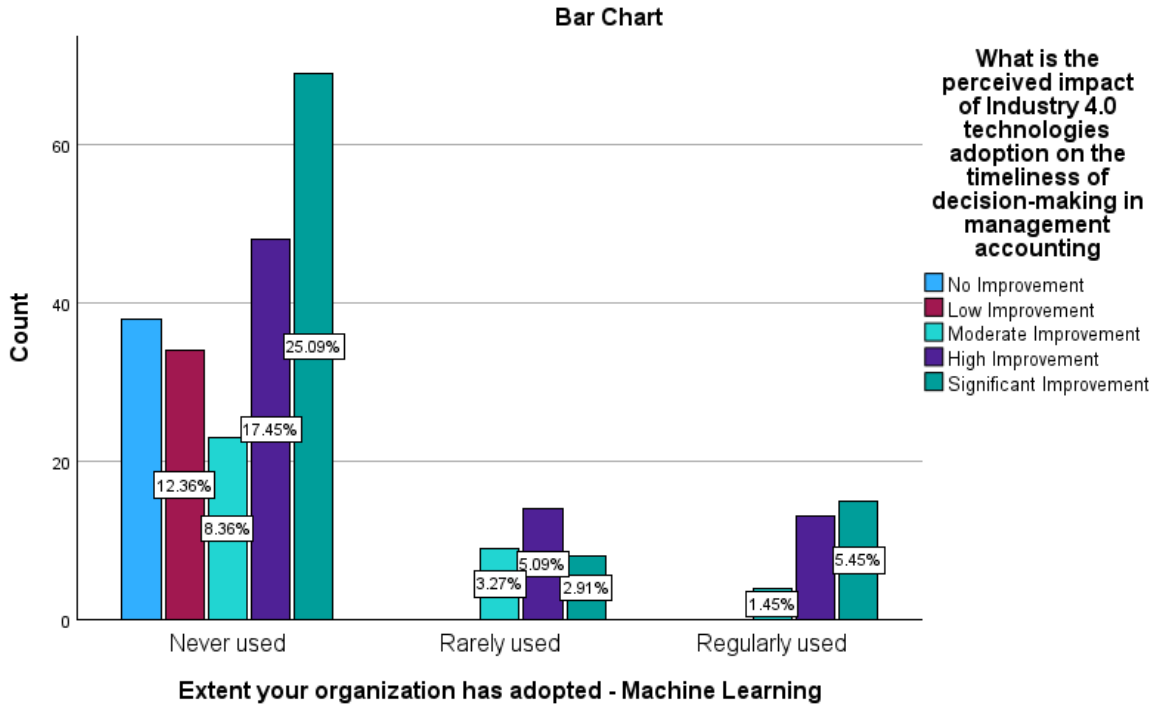

Figure 17. Perceived impact of machine learning adoption on the timeliness of decision making in management accounting

Machine learning adoption in the sampled organisations has fairly improved the timeliness of decision making in their management accounting function, as could be seen on figure 17 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	37.950[a]	8	<.001
Likelihood Ratio	51.582	8	<.001
Linear-by-Linear Association	16.491	1	<.001
N of Valid Cases	275		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is 3.83.

Table 16. Figure 17 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of machine learning and timeliness of decision making in management accounting as per table 16 above.

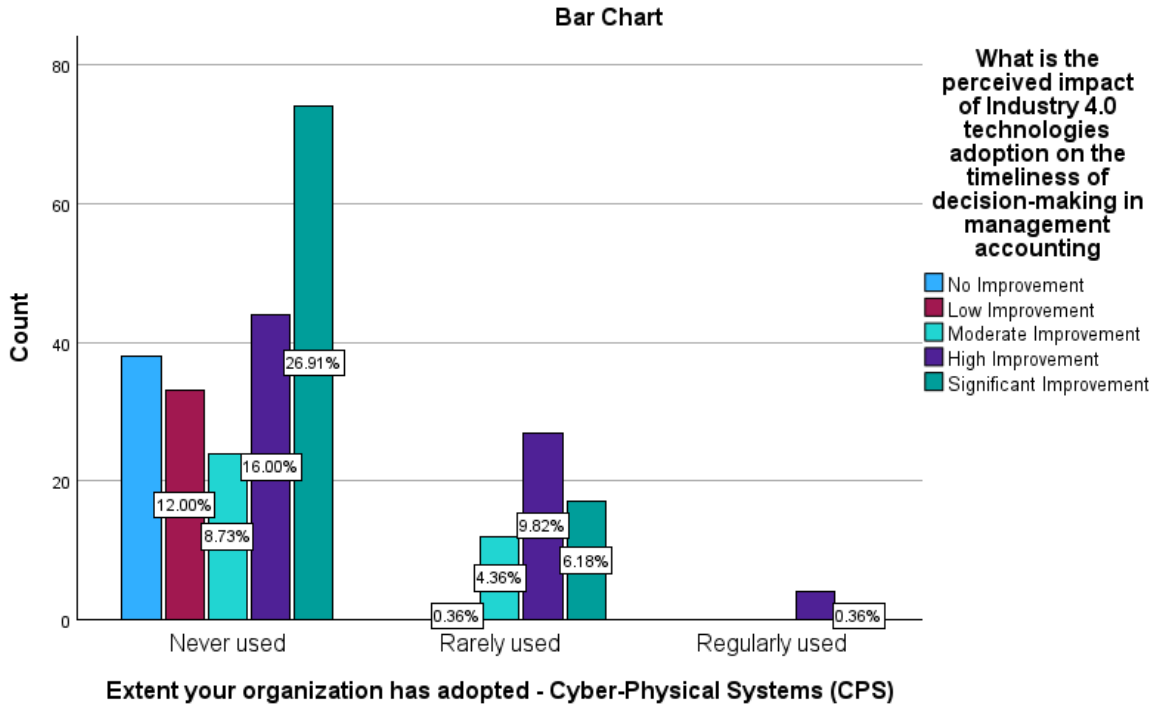

Figure 18. Perceived impact of cyber physical systems adoption on the timeliness of decision making in management accounting

Cyber physical systems adoption in the sampled organisations has fairly improved the timeliness of decision making in their management accounting function, as could be seen on figure 18 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	40.067[a]	8	<.001
Likelihood Ratio	49.232	8	<.001
Linear-by-Linear Association	10.496	1	.001
N of Valid Cases	275		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .62.

Table 17. Figure 18 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of cyber physical systems and timeliness of decision making in management accounting as per table 17 above.

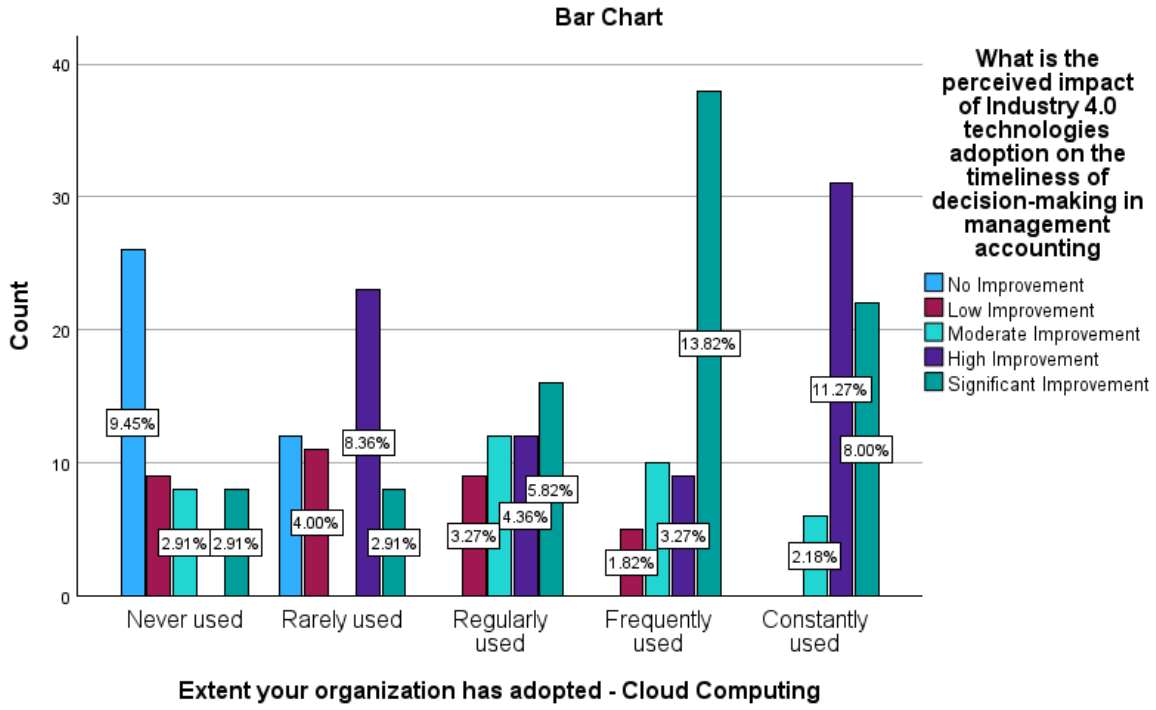

Figure 19. Perceived impact of cloud computing adoption on the timeliness of decision making in management accounting

Cloud computing adoption in the sampled organisations has significantly improved the timeliness of decision making in their management accounting function, as could be seen on figure 19 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	165.098[a]	16	<.001
Likelihood Ratio	190.684	16	<.001
Linear-by-Linear Association	82.832	1	<.001
N of Valid Cases	275		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.06.

Table 18. Figure 19 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of cloud computing and timeliness of decision making in management accounting as per table 18 above.

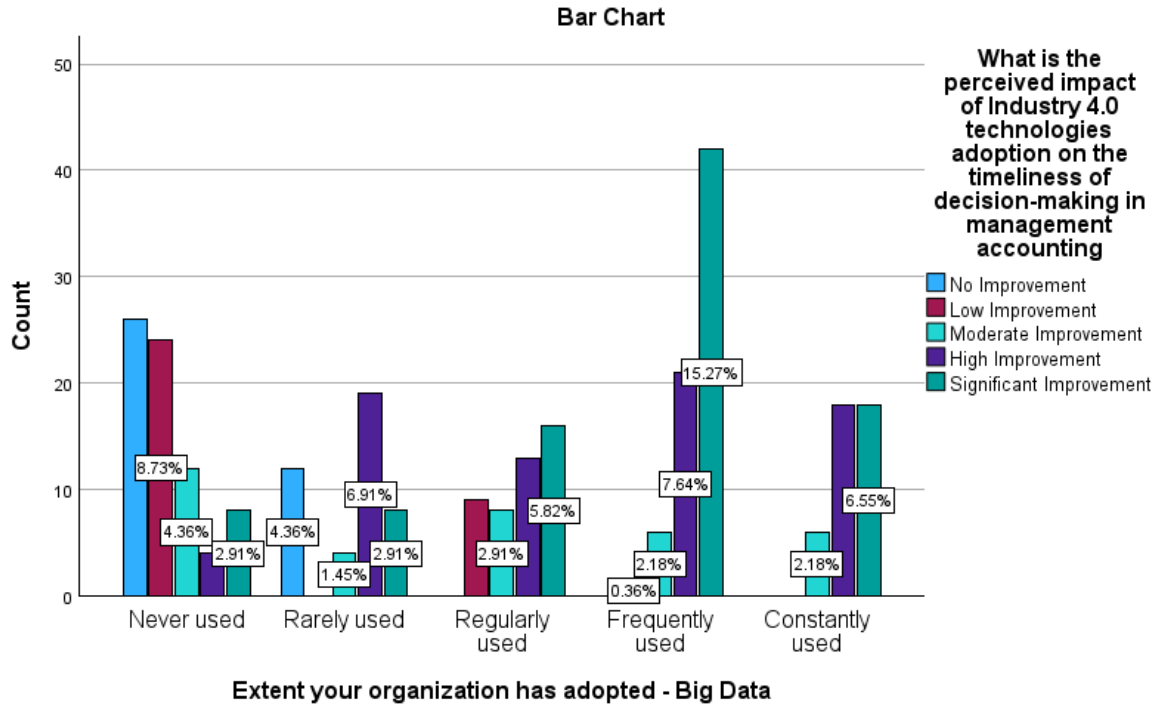

Figure 20. Perceived impact of big data adoption on the timeliness of decision making in management accounting

Dig data adoption in the sampled organisations has significantly improved the timeliness of decision making in their management accounting function, as could be seen on figure 20 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	149.958[a]	16	<.001
Likelihood Ratio	176.906	16	<.001
Linear-by-Linear Association	96.907	1	<.001
N of Valid Cases	275		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.19.

Table 19. Figure 20 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of big data and timeliness of decision making in management accounting as per table 19 above.

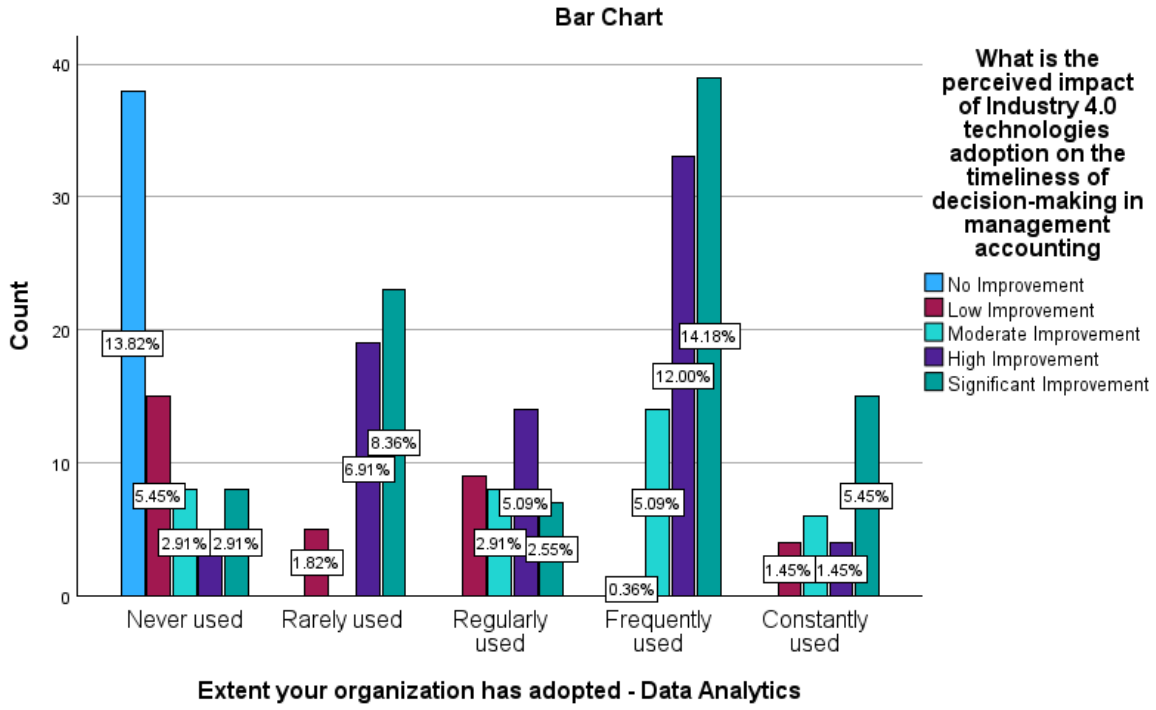

Figure 21. Perceived impact of data analytics adoption on the timeliness of decision making in management accounting

Data analytics adoption in the sampled organisations has significantly improved the timeliness of decision making in their management accounting function, as could be seen on figure 21 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	174.838[a]	16	<.001
Likelihood Ratio	189.438	16	<.001
Linear-by-Linear Association	71.466	1	<.001
N of Valid Cases	275		

a. 5 cells (20.0%) have expected count less than 5. The minimum expected count is 3.59.

Table 20. Figure 21 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of data analytics and timeliness of decision making in management accounting as per table 20 above.

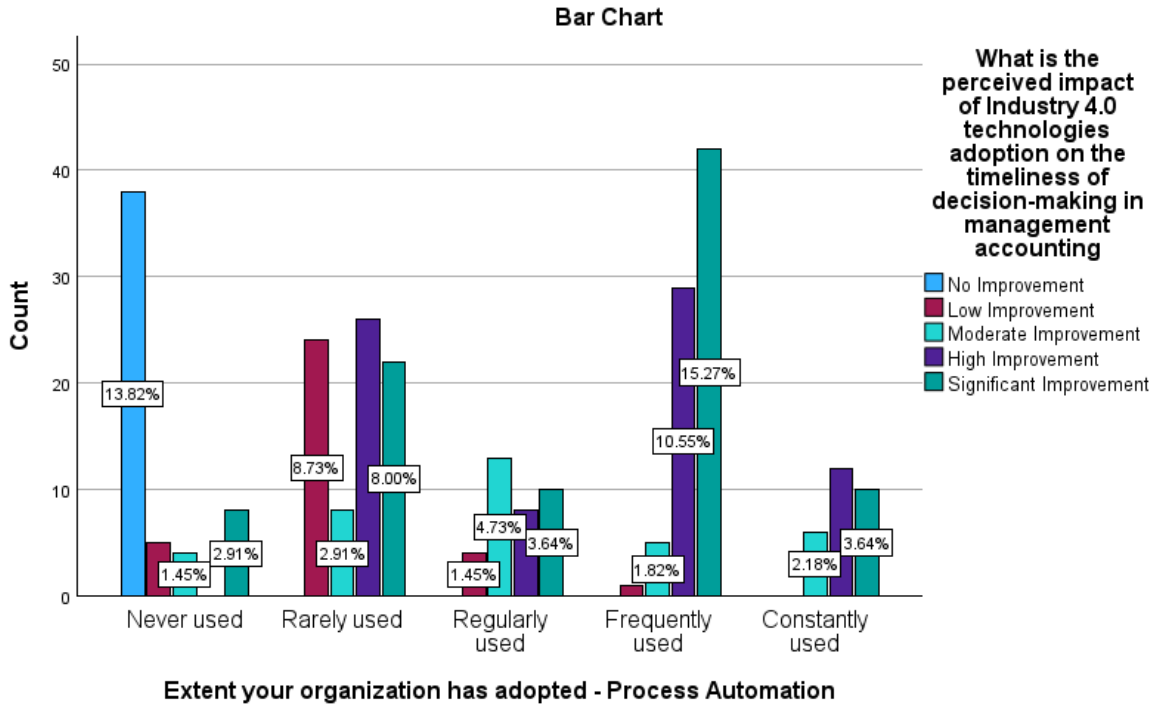

Figure 22. Perceived impact of process automation adoption on the timeliness of decision making in management accounting

Process automation adoption in the sampled organisations has significantly improved the timeliness of decision making in their management accounting function, as could be seen on figure 22 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	244.084[a]	16	<.001
Likelihood Ratio	226.786	16	<.001
Linear-by-Linear Association	88.615	1	<.001
N of Valid Cases	275		

a. 6 cells (24.0%) have expected count less than 5. The minimum expected count is 3.46.

Table 21. Figure 22 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of process automation and timeliness of decision making in management accounting as per table 21 above.

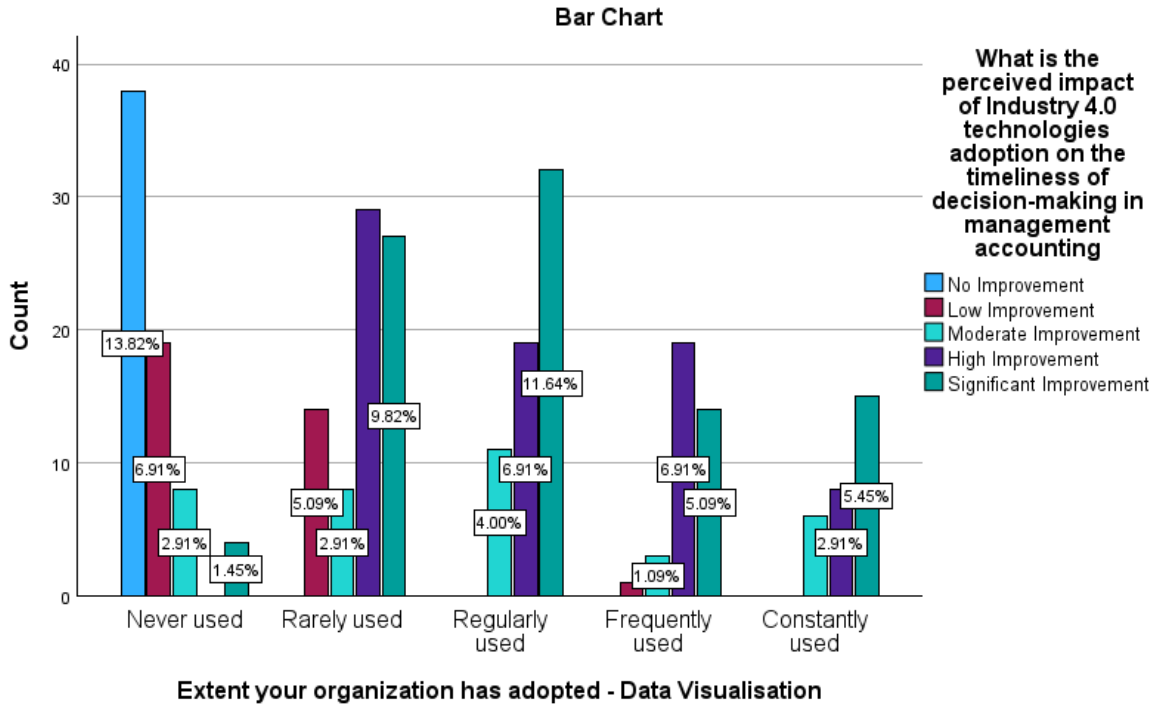

Figure 23. Perceived impact of data visualisation adoption on the timeliness of decision making in management accounting

Data visualisation adoption in the sampled organisations has significantly improved the timeliness of decision making in their management accounting function, as could be seen on figure 23 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	200.686[a]	16	<.001
Likelihood Ratio	225.087	16	<.001
Linear-by-Linear Association	94.267	1	<.001
N of Valid Cases	275		

a. 5 cells (20.0%) have expected count less than 5. The minimum expected count is 3.59.

Table 22. Figure 23 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of data visualisation and timeliness of decision making in management accounting as per table 22 above.

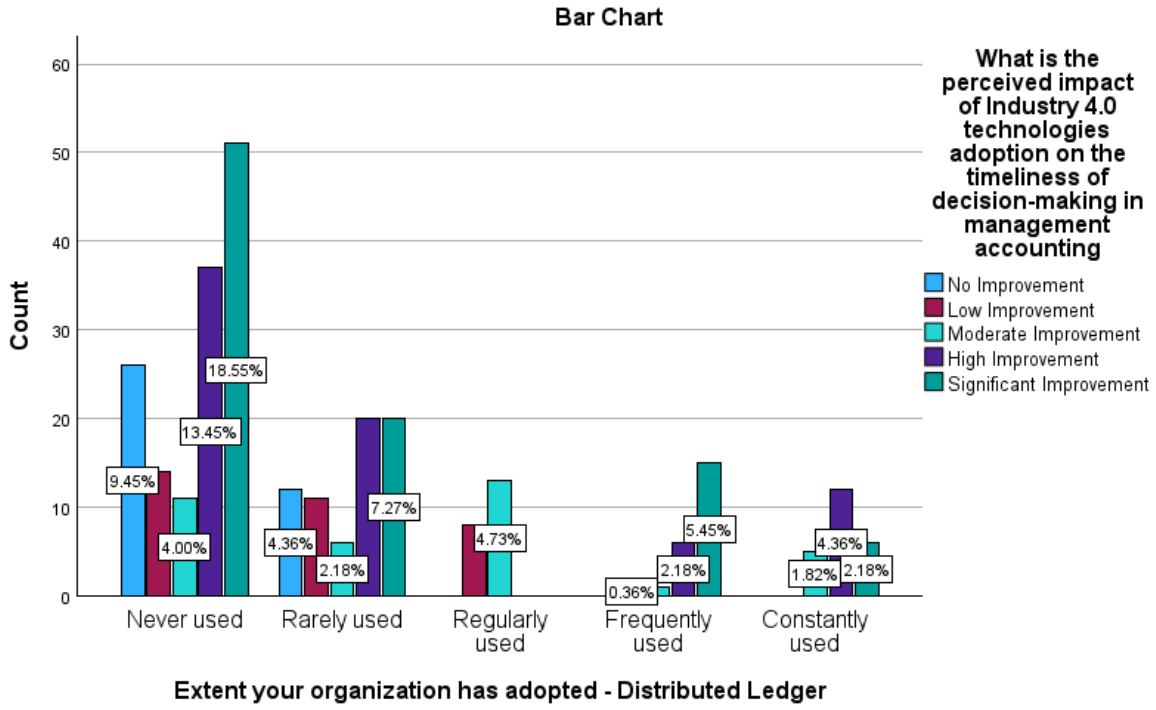

Figure 24. Perceived impact of distributed ledger adoption on the timeliness of decision making in management accounting

Distributed ledger adoption in the sampled organisations has significantly improved the timeliness of decision making in their management accounting function, as could be seen on figure 24 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	99.880[a]	16	<.001
Likelihood Ratio	100.713	16	<.001
Linear-by-Linear Association	4.270	1	.039
N of Valid Cases	275		

a. 9 cells (36.0%) have expected count less than 5. The minimum expected count is 2.60.

Table 23. Figure 24 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of distributed ledger and timeliness of decision making in management accounting as per table 23 above.

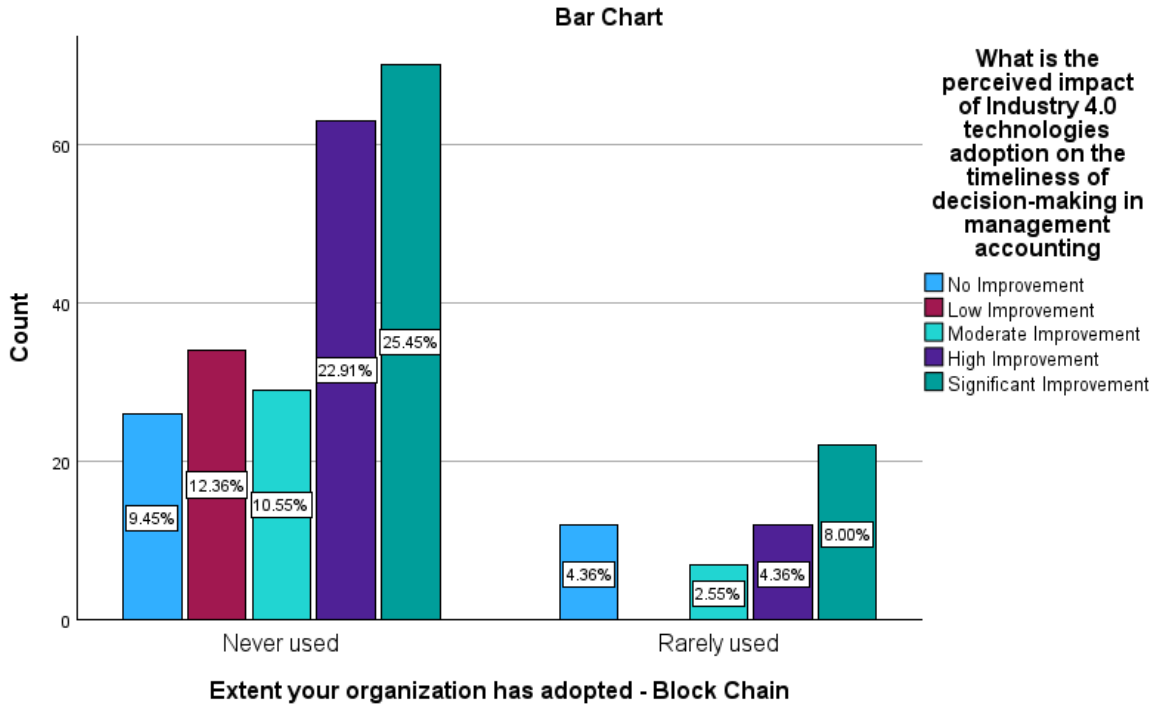

Figure 25. Perceived impact of block chain adoption on the timeliness of decision making in management accounting

Block chain adoption in the sampled organisations has fairly improved the timeliness of decision making in their management accounting function, as could be seen on figure 25 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.606[a]	4	.009
Likelihood Ratio	19.555	4	<.001
Linear-by-Linear Association	.126	1	.723
N of Valid Cases	275		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.55.

Table 24. Figure 25 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of block chain and timeliness of decision making in management accounting as per table 24 above.

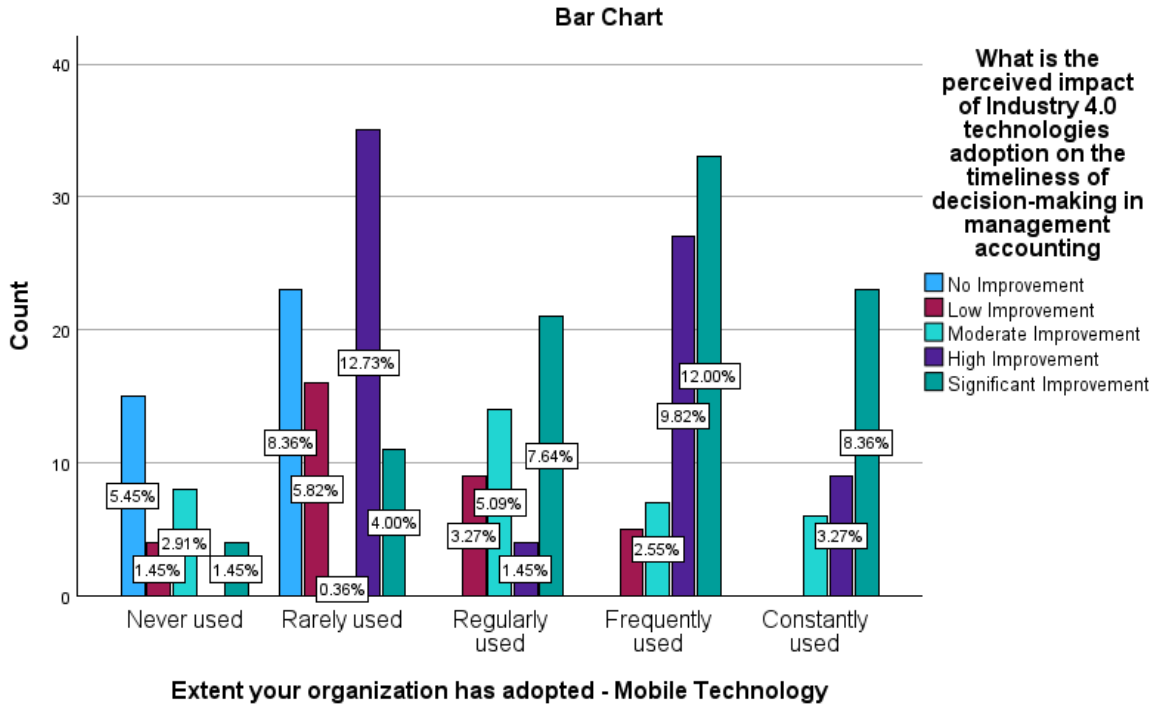

Figure 26. Perceived impact of mobile technology adoption on the timeliness of decision making in management accounting

Mobile technology adoption in the sampled organisations has significantly improved the timeliness of decision making in their management accounting function, as could be seen on figure 26 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	144.661[a]	16	<.001
Likelihood Ratio	173.389	16	<.001
Linear-by-Linear Association	74.877	1	<.001
N of Valid Cases	275		

a. 5 cells (20.0%) have expected count less than 5. The minimum expected count is 3.83.

Table 25. Figure 26 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of mobile technology and timeliness of decision making in management accounting as per table 25 above.

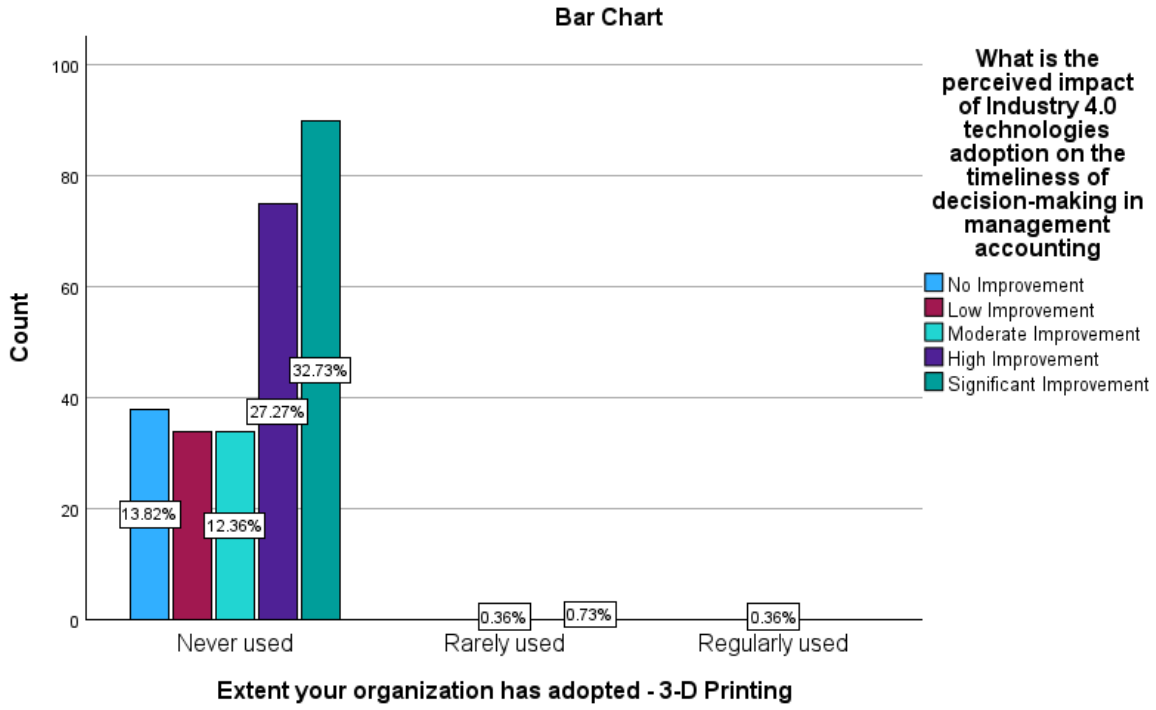

Figure 27. Perceived impact of 3-D Printing adoption on the timeliness of decision making in management accounting

Adoption of 3-D printing in the sampled organisations has not improved the timeliness of decision making in their management accounting function, as could be seen on figure 27 above.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.269[a]	8	.247
Likelihood Ratio	8.792	8	.360
Linear-by-Linear Association	.121	1	.728
N of Valid Cases	275		

a. 10 cells (66.7%) have expected count less than 5. The minimum expected count is .12.

Table 26. Figure 27 Chi-Square Tests

There appears to be no statistically significant correlation between adoption of 3-D printing influencing timeliness of decision making in management accounting, according to the findings of the Linear-by-Linear Association, Likelihood Ratio, and Pearson Chi-Square tests as per Table 26 above.

4.5 Effect of Automation of Decision Making on Adoption of Each Industry 4.0 Technology

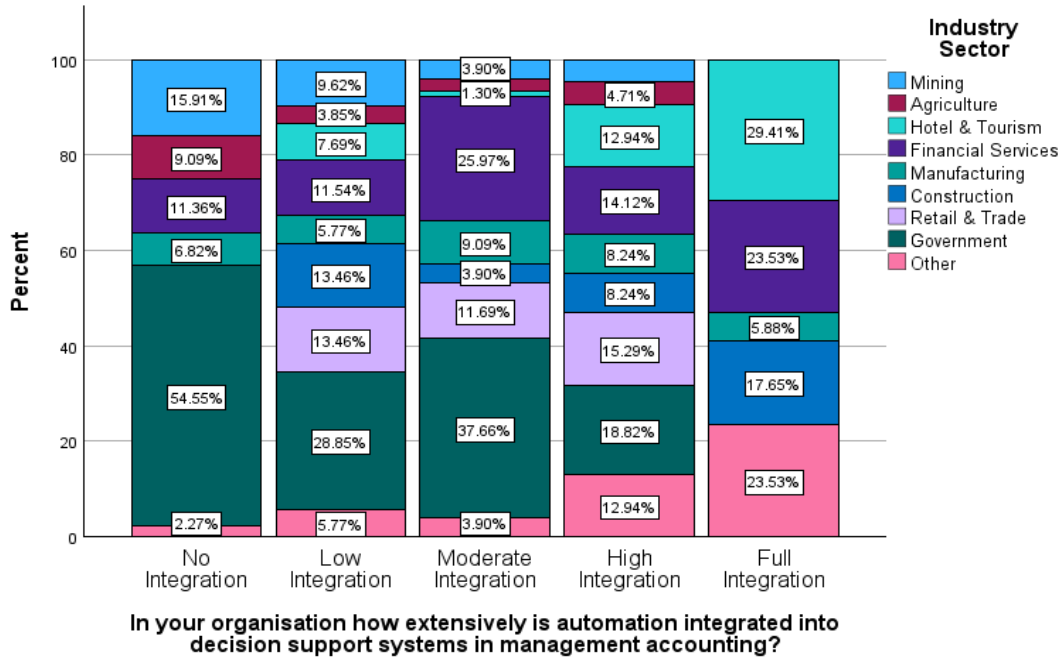

Figure 28. Degree of automation in decision support systems in management accounting industry wise.

Figure 28 above shows the higher degrees of automation due to industry 4.0 technology adoption

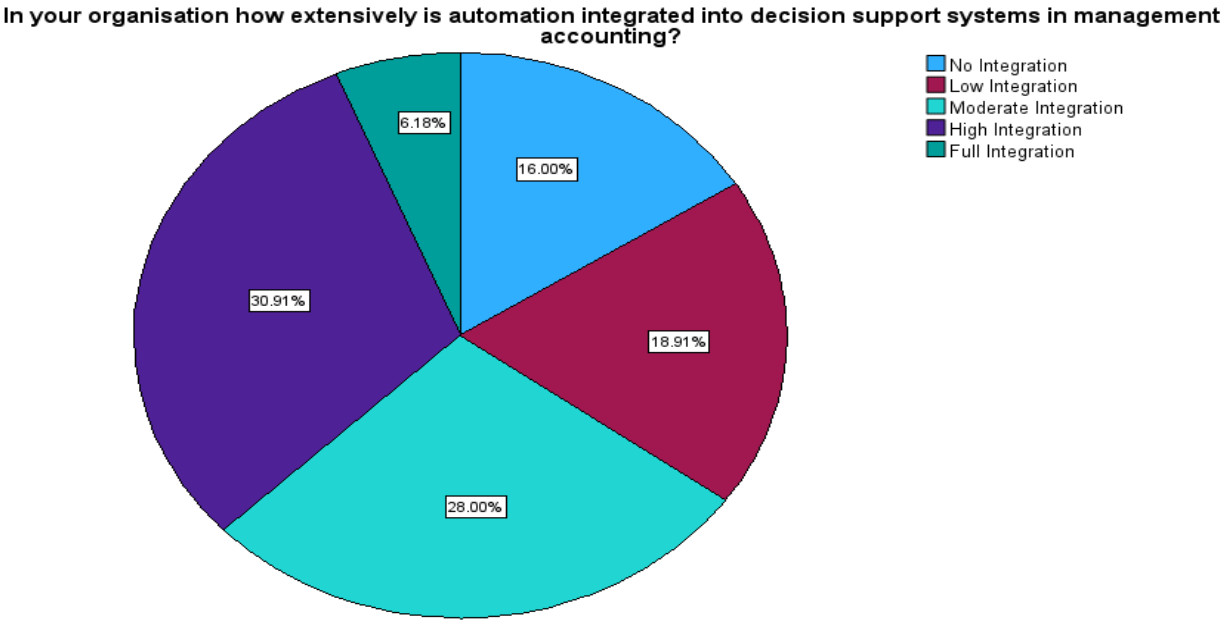

Figure 29. Degree of automation in decision support systems in management accounting.

Figure 29 shows the level of automation powered by industry 4.0 technologies in decision support systems deployed in management accounting.

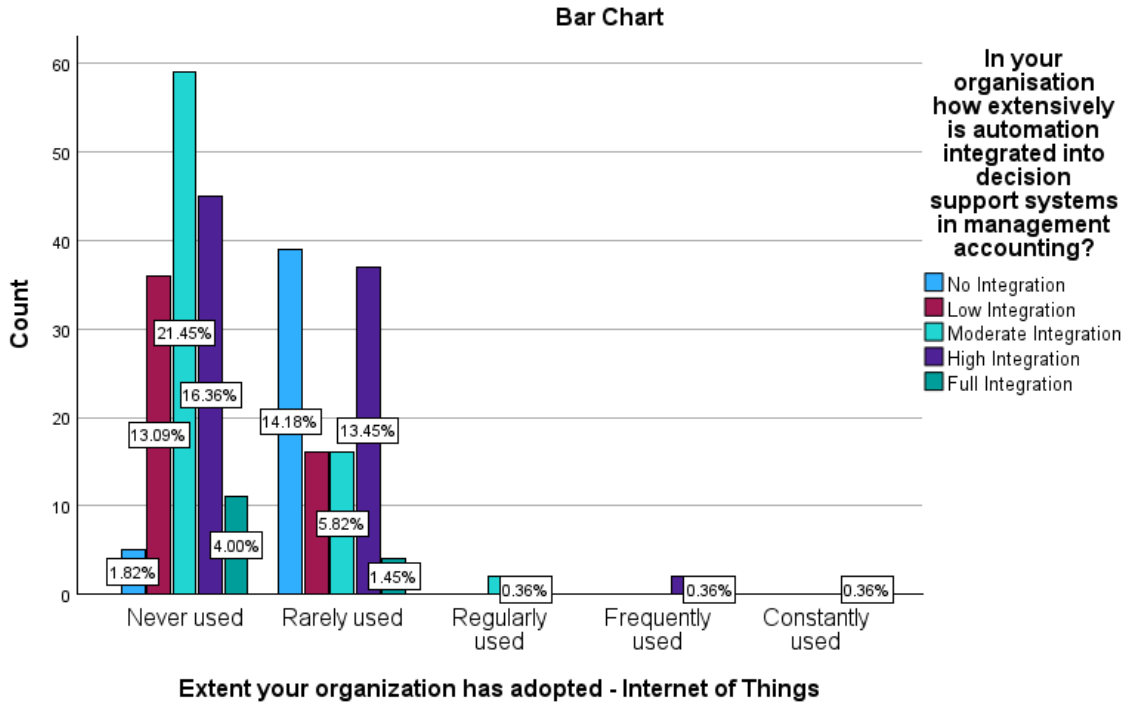

Figure 30. Extent of Internet of Things influence on automation in decision support systems in management accounting.

Figure 30 above shows that the majority of businesses with little to no Internet of Things adoption also have little to no automation integrated into their management accounting decision support systems. This trend indicates that as organizations adopt more Internet of Things, there will be potential for greater automation integration as we will see below.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	82.881[a]	16	<.001
Likelihood Ratio	76.735	16	<.001
Linear-by-Linear Association	1.995	1	.158
N of Valid Cases	275		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is .06.

Table 27. Figure 30 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of internet of things and automation of decision making in management accounting as per table 27 above.

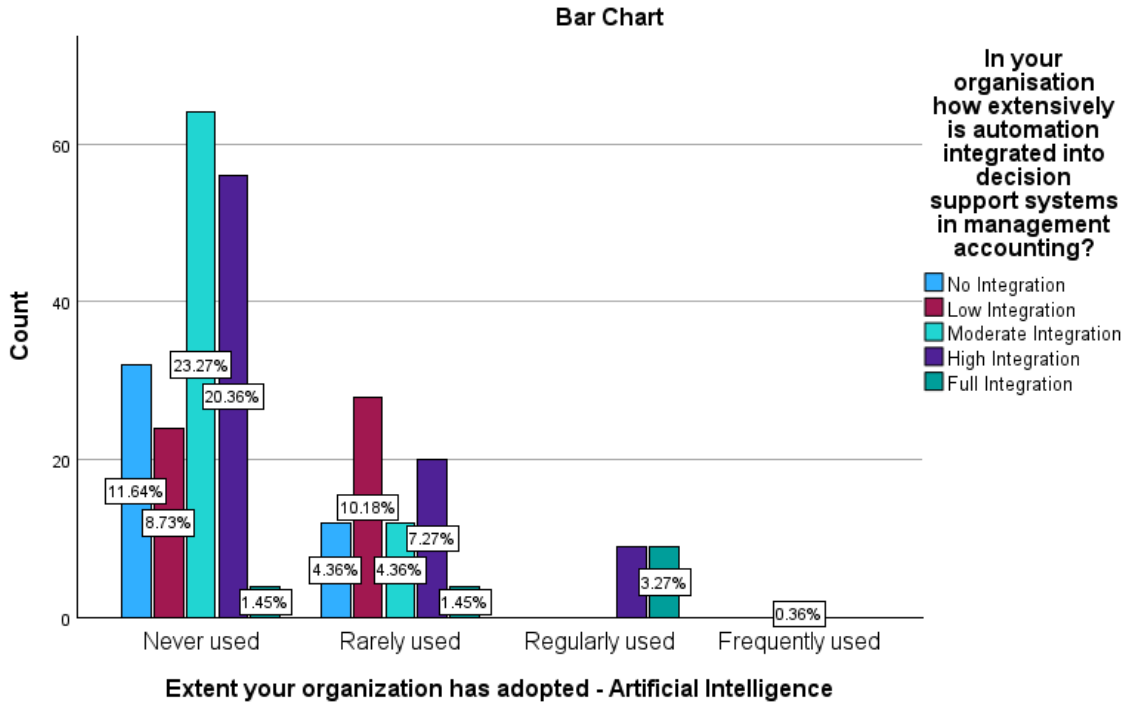

Figure 31. Extent of artificial intelligence influence on automation in decision support systems in management accounting.

Figure 31 above shows slight improvement of businesses with little to regular and frequently artificial intelligence adoption also have slight increased automation integrated into their management accounting decision support systems.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	101.074[a]	12	<.001
Likelihood Ratio	77.490	12	<.001
Linear-by-Linear Association	9.974	1	.002
N of Valid Cases	275		

a. 9 cells (45.0%) have expected count less than 5. The minimum expected count is .06.

Table 28. Figure 31 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of artificial intelligence and automation of decision making in management accounting as per table 28 above.

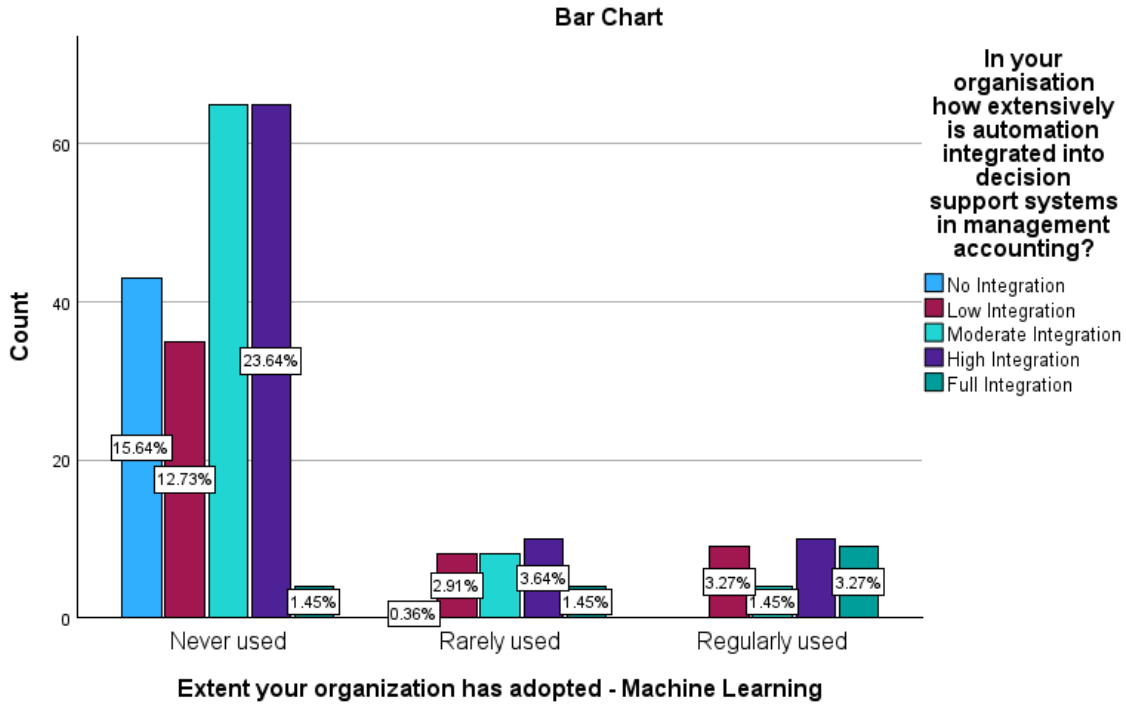

Figure 32. Extent of machine learning influence on automation in decision support systems in management accounting.

Figure 32 above shows that the majority of businesses with little to no machine learning adoption also have little to no automation integrated into their management accounting decision support systems.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	50.450[a]	8	<.001
Likelihood Ratio	47.548	8	<.001
Linear-by-Linear Association	16.232	1	<.001
N of Valid Cases	275		

a. 3 cells (20.0%) have expected count less than 5. The minimum expected count is 1.92.

Table 29. Figure 32 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of machine learning and automation of decision making in management accounting as per table 29 above.

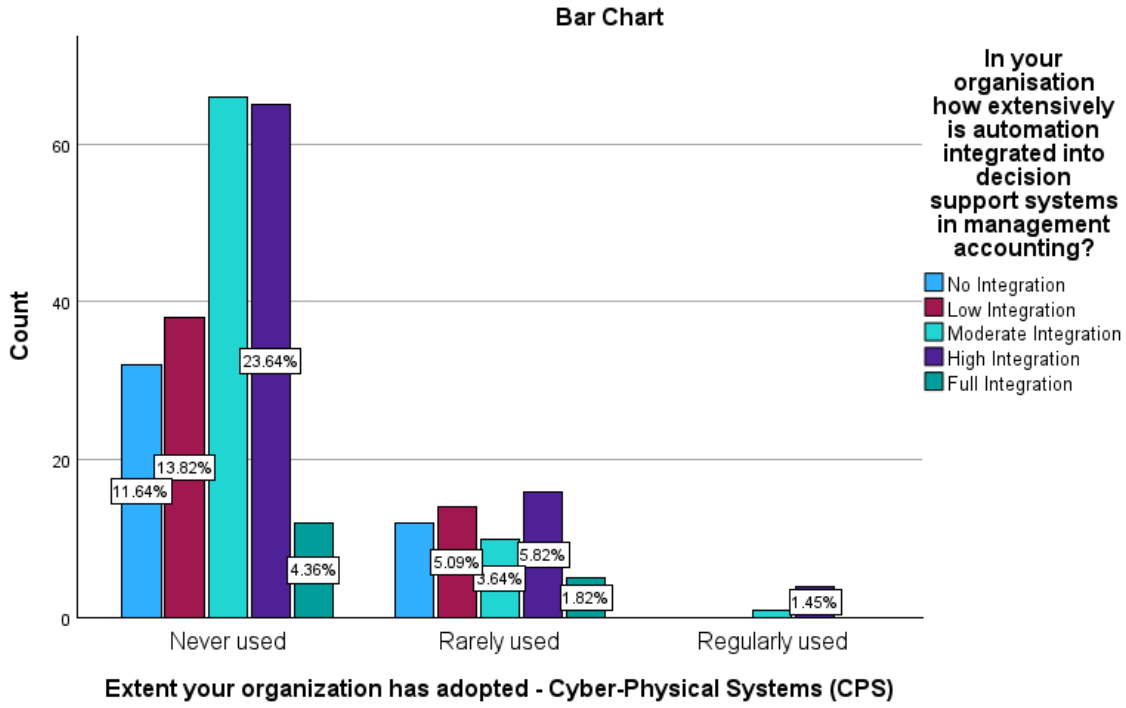

Figure 33. Extent of cyber physical systems influence on automation in decision support systems in management accounting.

Figure 33 above shows that the majority of businesses with little to no cyber physical systems adoption also have little to no automation integrated into their management accounting decision support systems.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.981[a]	8	.152
Likelihood Ratio	12.944	8	.114
Linear-by-Linear Association	.015	1	.903
N of Valid Cases	275		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .31.

Table 30. Figure 33 Chi-Square Tests

There appears to be no statistically significant correlation between adoption of cyber physical systems influencing automation of decision making in management accounting, according to the findings of the Linear-by-Linear Association, Likelihood Ratio, and Pearson Chi-Square tests as per Table 30 above.

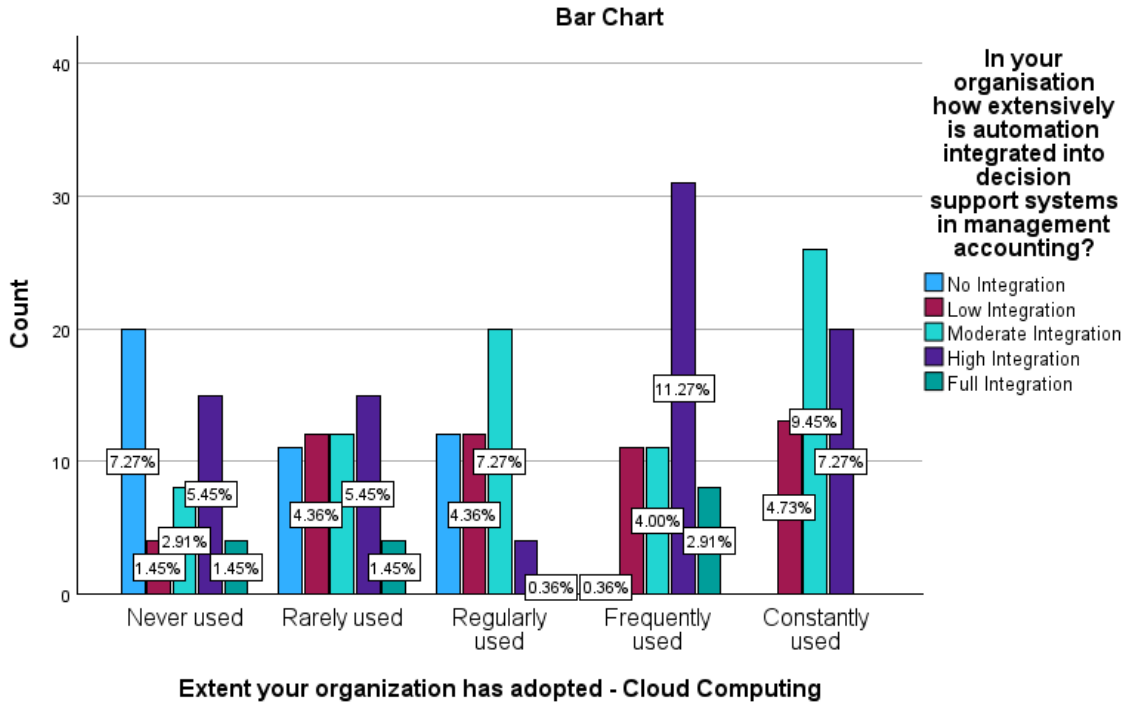

Figure 34. Extent of cloud computing influence on automation in decision support systems in management accounting.

Figure 34 above shows that the majority of businesses have embraced cloud computing adoption also have high automation integrated into their management accounting decision support systems.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	82.103[a]	16	<.001
Likelihood Ratio	97.295	16	<.001
Linear-by-Linear Association	13.787	1	<.001
N of Valid Cases	275		

a. 5 cells (20.0%) have expected count less than 5. The minimum expected count is 3.03.

Table 31. Figure 34 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of cloud computing and automation of decision making in management accounting as per table 31 above.

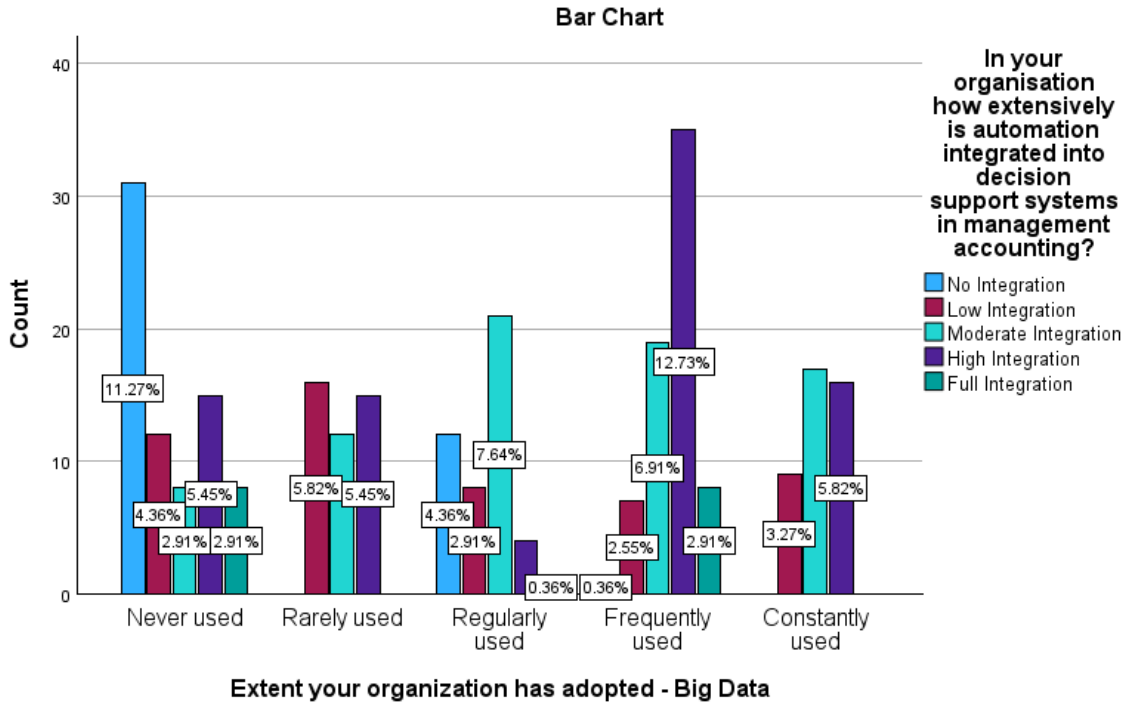

Figure 35. Extent of big data influence on automation in decision support systems in management accounting.

Figure 35 above shows that as businesses increase adoption of big data also does their rate of automation integrated into their management accounting decision support systems. This trend indicates that as organizations adopt more big data, there will be potential for greater automation integration.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	114.497[a]	16	<.001
Likelihood Ratio	130.985	16	<.001
Linear-by-Linear Association	24.808	1	<.001
N of Valid Cases	275		

a. 5 cells (20.0%) have expected count less than 5. The minimum expected count is 2.60.

Table 32. Figure 35 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of big data and automation of decision making in management accounting as per table 32 above.

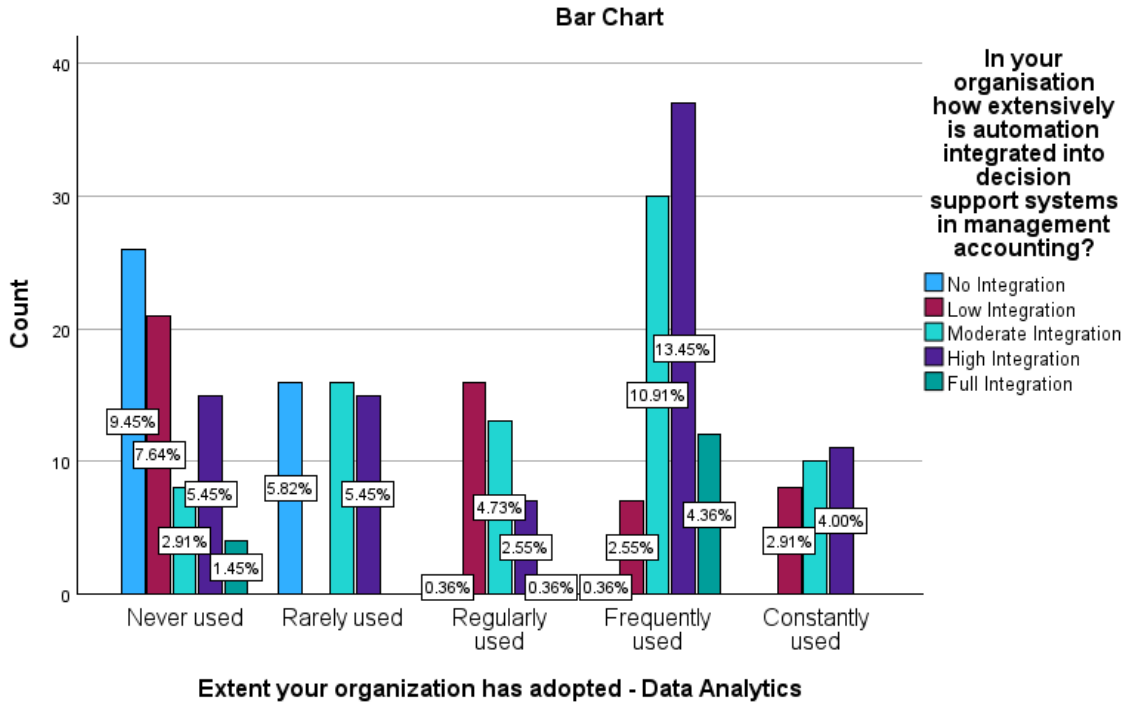

Figure 36. Extent of data analytics influence on automation in decision support systems in management accounting.

The figure 36 above shows a strong relationship between the degree of automation integrated into management accounting decision support systems and the adoption of data analytics. Increased automation integration is more common in organizations that use data analytics extensively.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	110.457[a]	16	<.001
Likelihood Ratio	131.489	16	<.001
Linear-by-Linear Association	39.416	1	<.001
N of Valid Cases	275		

a. 5 cells (20.0%) have expected count less than 5. The minimum expected count is 1.79.

Table 33. Figure 36 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of data analytics and automation of decision making in management accounting as per table 33 above.

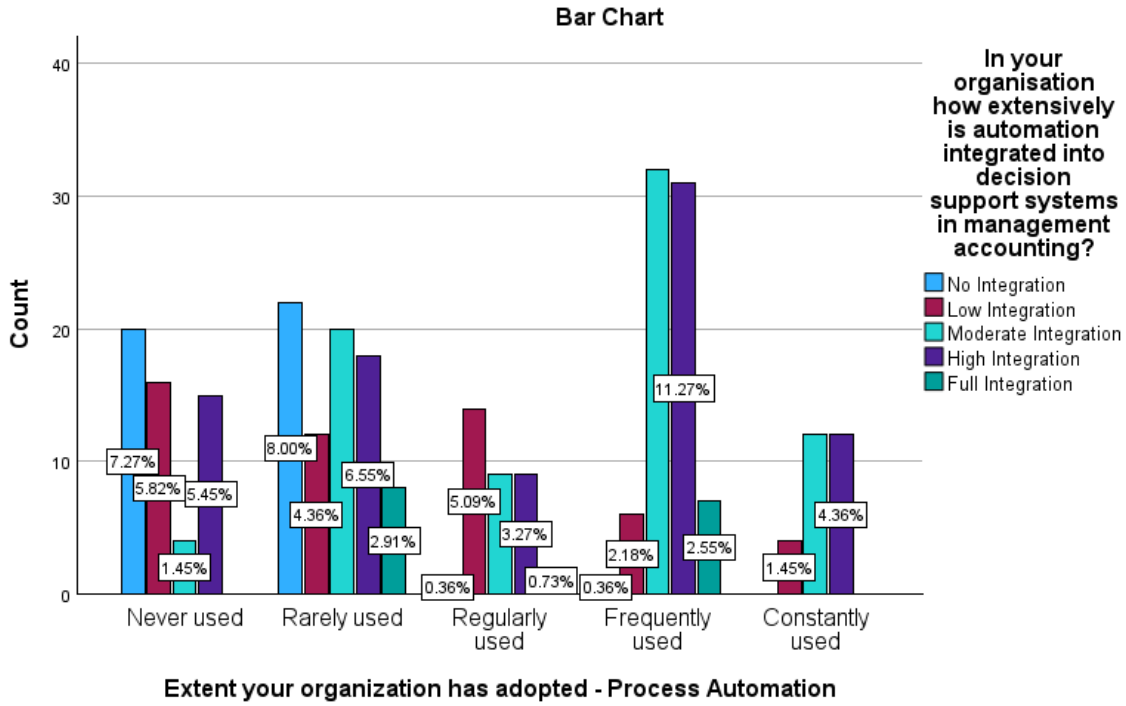

Figure 37. Extent of process automation influence on automation in decision support systems in management accounting.

The figure 37 above shows a strong relationship between the degree of automation integrated into management accounting decision support systems and the adoption of process automation.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	86.722[a]	16	<.001
Likelihood Ratio	101.677	16	<.001
Linear-by-Linear Association	35.265	1	<.001
N of Valid Cases	275		

a. 6 cells (24.0%) have expected count less than 5. The minimum expected count is 1.73.

Table 34. Figure 37 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of process automation and automation of decision making in management accounting as per table 34 above.

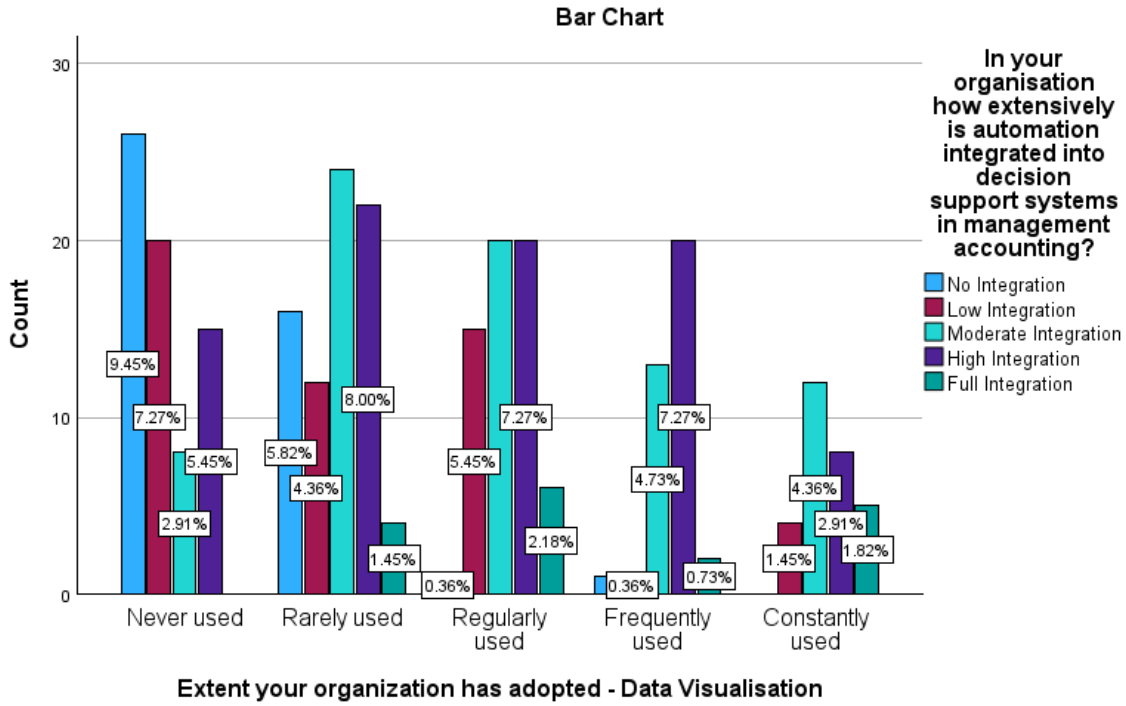

Figure 38. Extent of data visualisation influence on automation in decision support systems in management accounting.

The figure 38 above shows a strong relationship between the degree of automation integrated into management accounting decision support systems and the adoption of data visualisation. Increased automation integration is more common in organizations that use data visualisation extensively.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	78.482[a]	16	<.001
Likelihood Ratio	90.083	16	<.001
Linear-by-Linear Association	44.793	1	<.001
N of Valid Cases	275		

a. 6 cells (24.0%) have expected count less than 5. The minimum expected count is 1.79.

Table 35. Figure 38 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of data visualisation and automation of decision making in management accounting as per table 35 above.

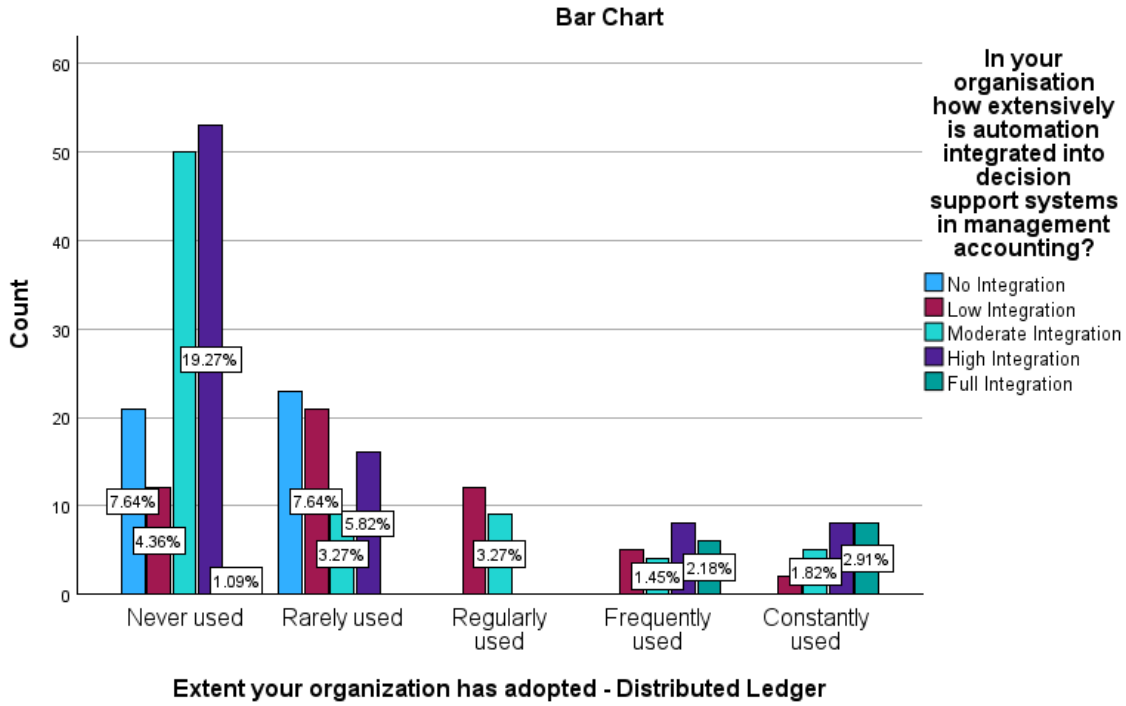

Figure 39. Extent of distributed ledger influence on automation in decision support systems in management accounting.

The figure 39 above shows a strong relationship between the degree of automation integrated into management accounting decision support systems and the adoption of distributed ledger.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	130.295[a]	16	<.001
Likelihood Ratio	125.416	16	<.001
Linear-by-Linear Association	9.764	1	.002
N of Valid Cases	275		

a. 10 cells (40.0%) have expected count less than 5. The minimum expected count is 1.30.

Table 36. Figure 39 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of distributed ledger and automation of decision making in management accounting as per table 36 above.

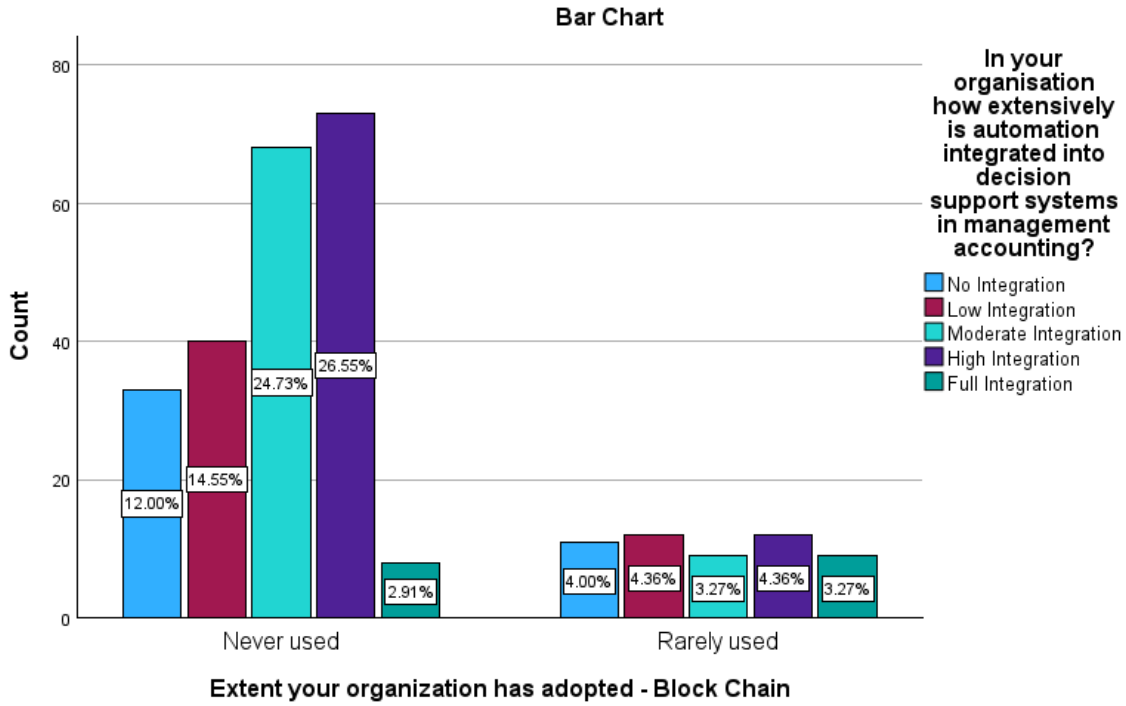

Figure 40. Extent of block chain influence on automation in decision support systems in management accounting.

Figure 40 above shows that the majority of businesses with little to no block chain adoption also have little to no automation integrated into their management accounting decision support systems. This trend indicates that as organizations adopt more block chain, there will be potential for greater automation integration as we will see below.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.096[a]	4	.001
Likelihood Ratio	15.661	4	.004
Linear-by-Linear Association	.000	1	.995
N of Valid Cases	275		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 3.28.

Table 37. Figure 40 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of block chain and automation of decision making in management accounting as per table 37 above.

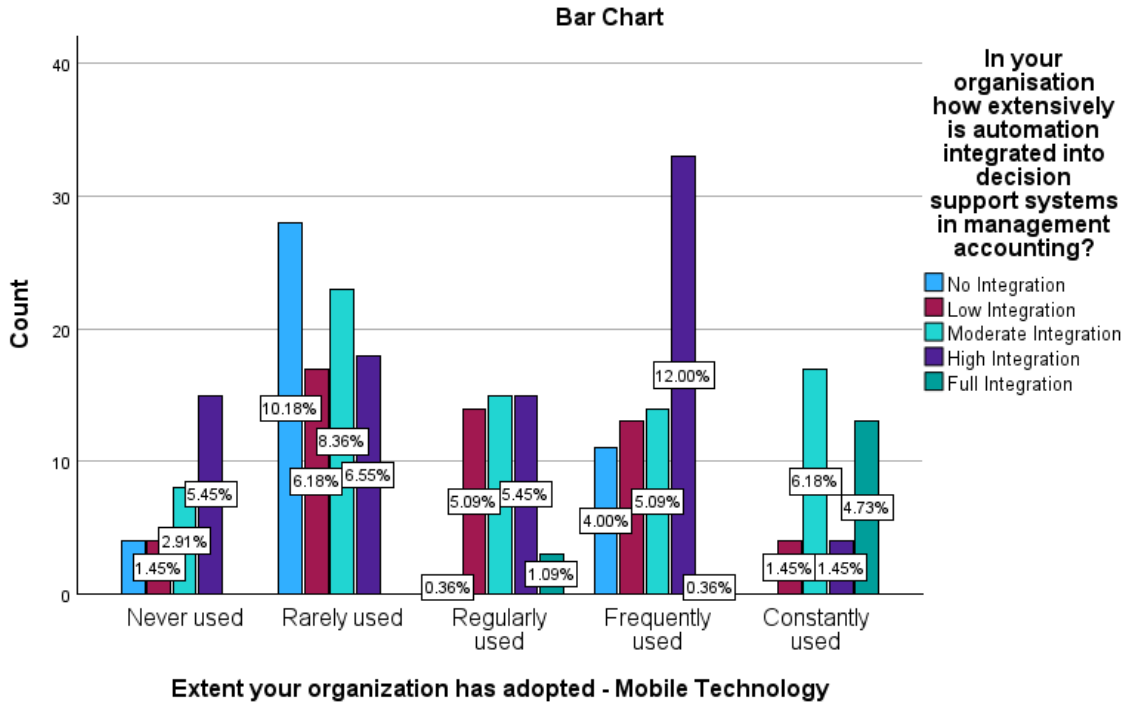

Figure 41. Extent of mobile technology influence on automation in decision support systems in management accounting.

The figure 41 above shows a strong relationship between the degree of automation integrated into management accounting decision support systems and the adoption of mobile technology.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	111.871[a]	16	<.001
Likelihood Ratio	101.958	16	<.001
Linear-by-Linear Association	16.975	1	<.001
N of Valid Cases	275		

a. 5 cells (20.0%) have expected count less than 5. The minimum expected count is 1.92.

Table 38. Figure 41 Chi-Square Tests

With p-values significantly below the 0.05 cut off, the findings of the Likelihood Ratio test, Pearson Chi-Square test, and Linear-by-Linear Association all clearly show a statistically significant association between adoption of mobile technology and automation of decision making in management accounting as per table 38 above.

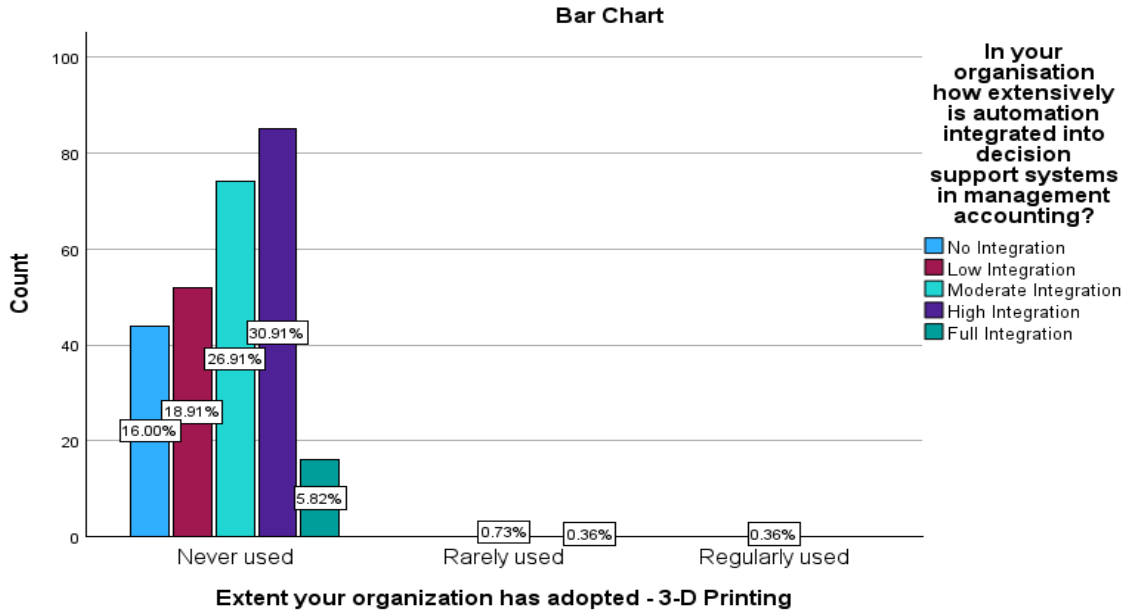

Figure 42. Extent of 3-D printing influence on automation in decision support systems in management accounting.

The graph indicates that while the majority of businesses have never used 3D printing, and also those that show varying degrees of automation integration into their management accounting decision support systems. This pattern implies that obtaining high degrees of automation integration does not require 3D printing, even though it may not be widely used. Companies don't need to use 3D printing technologies to automate their decision support systems significantly.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.845[a]	8	.276
Likelihood Ratio	9.506	8	.301
Linear-by-Linear Association	.593	1	.441
N of Valid Cases	275		

a. 10 cells (66.7%) have expected count less than 5. The minimum expected count is .06.

Table 39. Figure 42 Chi-Square Tests

There appears to be no statistically significant correlation between adoption of 3-D printing influencing automation of decision making in management accounting, according to the findings of the Linear-by-Linear Association, Likelihood Ratio, and Pearson Chi-Square tests as per Table 39 above.

4.6 Qualitative Analysis of Impact on Decision-Making Enhancement

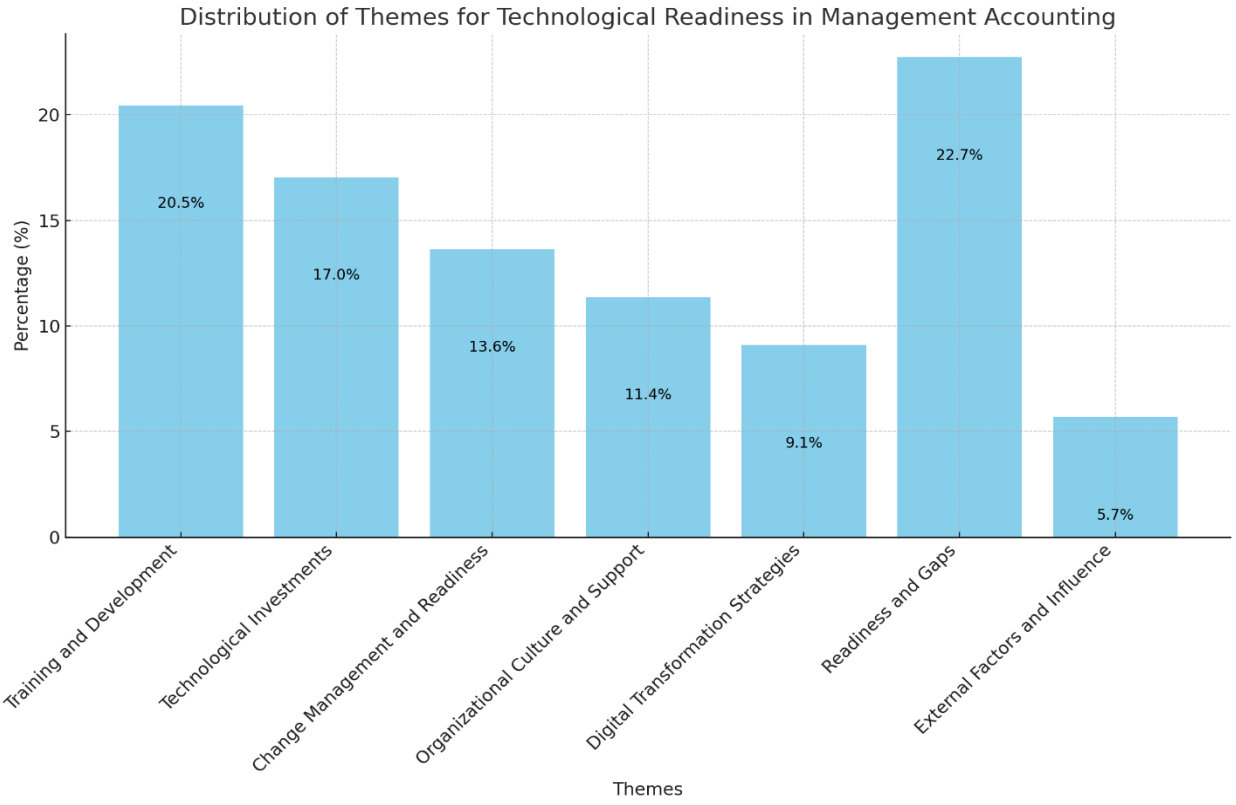

Figure 43. Themes on technological readiness in management accounting

Above is a summary of themes from open ended questions and interviews on organisational readiness to embrace the benefits of industry 4.0 technologies.

4.7 Summary

The study's findings, taken together, demonstrate the crucial significance that Industry 4.0 technologies will play in determining how management accounting develops in Botswana. Organizational behavior is greatly influenced by competitive pressure, technical preparedness, and leadership decisions, all of which play a major role in the strategic adoption of modern technologies. It has a significant effect on decision-making procedures, improving, automation, timeliness and accuracy. Furthermore, the enhancement of cost effectiveness and promotion of inventive methodologies highlight the revolutionary possibilities of Industry 4.0. These results offer a framework for Botswana-based companies to take advantage of technology breakthroughs, enhancing their competitive advantage and overall company performance.

5.0 Result Discussion Introduction

The results of the study on Botswana's organizations' adoption of Industry 4.0 technologies in management accounting are shown in the next section. The findings are arranged to fulfill the main goals of the study, which include figuring out what influences strategic adoption, looking at how it affects decision-making procedures, analyzing cost-efficiency optimization, and gauging its contribution to innovation. Descriptive statistics, reliability statistics, and in-depth interpretations of graphical data representations are all included in the report to provide readers a thorough grasp of how Industry 4.0 technologies are changing management accounting procedures in the context of Botswana businesses.

5.1 Industry 4.0 Technology Adoption and Accuracy of Decision Making.

Within the sampled organizations in Botswana, the implementation of multiple Industry 4.0 technologies has a statistically significant effect on the precision of management accounting decision-making. Specifically, Industry 4.0 technologies offer sophisticated data processing and analysis capabilities that greatly improve the accuracy of management accounting decisions. Cyber-physical systems give real-time data for prompt decision-making, while artificial intelligence and machine learning provide accurate insights and forecasts. Big data technologies reveal patterns and trends in enormous datasets, and cloud computing guarantees scalable and accessible data analysis. Distributed ledger technology and blockchain guarantee data integrity and transparency, while data visualization helps to understand complicated data. Real-time access to financial data is made possible by mobile technology, enabling prompt and well-informed decision-making. When combined, these technologies raise the efficiency, dependability, and accuracy of financial decision-making. Clear financial insights are provided by data analytics tools, and task errors are decreased through process automation. The accuracy of management accounting decisions made with the use of these technologies has been found to increase significantly, indicating that they are useful instruments for enhancing the accuracy and dependability of managerial and financial decisions.

On the other hand, within the sampled organizations in Botswana, the implementation of specific Industry 4.0 technologies does not demonstrate a statistically significant impact on the accuracy of decision making in management accounting. In particular, the following technologies don't seem to have much of an impact, Internet of Things and 3-D Printing. These findings imply that the use of 3-D printing and the Internet of Things does not considerably increase the accuracy of managerial accounting decisions, and that the causes of their limited influence should be investigated.

5.2 Industry 4.0 Technology Adoption Impact on Timeliness of Decision Making

The study's findings point to a significant correlation between enhanced management accounting decision-making timeliness and the adoption of various Industry 4.0 technologies. The Internet of Things, which permits real-time data collection from connected devices, is one of the technologies that has the biggest impact. It probably enhances information access for quicker decision-making. Artificial intelligence can speed up decision-support by automating processes, analyzing massive volumes of data, and producing insights. Machine learning is similar to artificial intelligence in that it can recognize patterns and trends in data, allowing for quicker and more informed decision-making. Processes can be streamlined and decision-making in real time facilitated by the integration of digital and physical systems through cyber physical systems.

Cloud computing speeds up analysis and decision-making by facilitating simple access to data and apps kept on the cloud. Big data makes sure that extensive datasets that are effectively analyzed can identify patterns and trends that enable prompt and well-informed decision-making. Advanced data analysis methods offered by data analytics enable the extraction of insights from data, facilitating quicker and more data-driven decision-making. Process automation allows management accountants to focus more of their time on strategic decision-making by automating repetitive tasks. Timely decision making is supported and information comprehension is accelerated by succinct and clear data visualizations. Making decisions while on the go is made possible by mobile device access to data and apps. Blockchain-enabled transparent and safe data sharing may boost confidence and speed up decision-making in group settings. The findings of the study indicate that there is no

meaningful correlation between the use of 3D printing and decision-making timeliness. This might be because management accounting tasks don't make extensive use of 3D printing.

5.3 Industry 4.0 Technology Adoption Impact on Automation of Decision Making.

The research results demonstrates how much Industry 4.0 technologies have impacted the automation of management accounting decision support systems. The Internet of Things, artificial intelligence, machine learning, cloud computing, big data, data analytics, process automation, data visualisation, and mobile technology all exhibited strong positive correlations. Based on chi-square test results (p-values < 0.05) in the corresponding tables, all of these technologies show a statistically significant positive correlation with decision support system automation. This implies that businesses will probably incorporate automation into their management accounting decision support systems as they implement these technologies. More automation can result in quicker reporting, analysis, and data collection, which will eventually speed up quality decision-making.

There is no statistically significant correlation (p-value > 0.05) between CPS adoption and automation in decision support systems, according to chi-square test results.

The results imply that although CPS may enhance automation, it may not yet be a common practice in Botswana. The analysis shows that there is no statistically significant correlation between the automation of decision support systems and the adoption of 3D printing. This might be the result of the restricted application of 3D printing in management accounting activities, which prioritizes physical models or prototyping over having a direct influence on decision-making speed and quality.

We conclude this section by stating that industry 4.0 technologies have a great deal of promise to automate management accounting decision support systems and speed up quality decision-making. These technologies include Internet of Things, artificial intelligence, machine learning, cloud computing, big data, data analytics, process automation, data visualization, and mobile technology. Although cyber physical systems can improve automation, more research is needed to fully understand how it affects automation in this particular situation. Based on available data, it doesn't seem that the adoption of 3D printing will have a significant impact on automation in management accounting decision support systems in the Botswana context. These findings agree with (Allioui, 2023)but differ slightly in that technologies such as internet of things though widely used elsewhere is being slowly adopted here in Botswana. (Butler-Adam, 2018)agrees with the results above on the reasons why 3D printing does not impact decision making at all, meaning a lot of training and upskilling maybe required to the skilled professionals in Botswana so that they may get to appreciate its worth in management accounting and hopefully slowly begin to implement it in management accounting.

5.4 Qualitative discussion on Industry 4.0 adoption influence on decision making.

Below are the themes coming from interviews and open ended questions.

i. Training and Development

Employee retraining and upskilling are essential for successful technology adoption and ensuring that organisations continue to reap benefits and maintain benefits from on their management accounting function, specifically enhancing the quality of timeous quality decisions. Ongoing Training is therefore essential in order to keep employees abreast of Industry 4.0 developments in management accounting through ongoing training

programs. Specific programs aimed at improving participants' knowledge of digital and data analytics, equipping them to make decisions based on facts may be important. Workshops and other outside the organisation training are essential in order to ensure employees receive both internal and external training so that they are better equipped to use new technologies. (Alsughayer, 2023), (Bhimani, 2020) (Chesbrough, 2003) agree that education and training is the key to organisations realising all the benefits that industry 4.0 technologies have on offer to the management accountants. So that the quality of their management accounting output to decision makers is maintained and continuously improve.

ii. Technological Investments

New and better industry 4.0 technologies continue to be released onto the market daily. It is important that organisations are continually on the lookout for this and where possible be ready to upgrade. To fully realize the advantages of Industry 4.0, cutting-edge instruments and systems are required (Davis, 1989)supports this notion fully. Good examples would include investing in new payroll and accounting software increases efficiency and prepares the organization for the future. Consistent updates guarantee access to the newest features and preserve compatibility with developing technologies. Adoption of artificial intelligence and other digital tools allows for smarter decision making by modernizing and streamlining management accounting procedures.

iii. Readiness and Change Management

Linked to the above point a seamless transition from the old to the newer industry 4.0 technologies depends on efficient change management techniques. Therefore having clear procedures in place helps to reduce resistance and guarantee that new technologies are successfully integrated. (Cai, 2022)Supports this point of view, clearly stating and stipulating that the only constant factor in an organisation is change, therefore organisations need to master the skill of change management. Employee involvement and engagement ensures new tools are successfully adopted and buy-in is fostered.

iv. Organizational Culture and Support

Technological advancements are fostered by an innovative organizational culture. Enhancing management accounting requires fostering an atmosphere that welcomes experimentation and exploration. The organization's strategic direction is determined by strong leadership and a distinct vision for technological integration that ensures that decision making continues to be enhanced. Giving staff members the right equipment and instruction enables them to successfully adopt new technologies and maintain and improve continually quality of their output.

v. Digital Transformation Strategies

It's critical to put strategies in place to take advantage of digital technologies. This can start with putting in place a digital infrastructure and cloud migration since moving data and applications to cloud platforms improves scalability, accessibility, and technology integration. Paperless operations is in fashion these days in management accounting as it entails converting from manual to digital processes increases productivity and optimizes workflows, facilitating quicker access to information for decision-making. Continuous process improvement is essential hereto since it entails constant efforts to enhance procedures and operations guarantee that new technologies are successfully incorporated and utilized.

vi. Readiness and Gaps

It's critical to assess an organization's present level of technological readiness for new industry 4.0 technologies. Businesses that are eager to accept and incorporate new management accounting technologies and are proactive in doing so will always ensure that their decision making enhancement function stays updated.

vii. External Influences and Factors

Getting knowledge from outside sources can help internal decision enhancement initiatives. Readiness in some instances is fostered through alignment with government initiatives and national development plans that support technological integration. Adopting best practices and enhancing internal procedures are made possible by learning from and comparing oneself to other top organizations.

Organizations can cultivate a culture that embraces Industry 4.0 and capitalizes on its potential to improve management accounting decision-making skills by concentrating on these qualitative themes. (Joshi, 2023) agrees that culture is the key to the adoption and fully utilisation of industry 4.0 technologies in management accounting.

5.5 Summary Industry 4.0 Technologies Impact on Decision Making

Adoption of Industry 4.0 technology improves management accounting decision making, according to a conclusion that is largely supported by the analysis of both quantitative and qualitative data. Statistical analysis showed that the level of automation built into management accounting decision support systems increased with the adoption of specific Industry 4.0 technologies (Internet of Things, Artificial Intelligence, Machine Learning, Cloud Computing, Big Data, Data Analytics, Process Automation, Data Visualization, and Mobile Technology). Faster data collection, analysis, and reporting can result from increased automation, which will ultimately improve decision-making timeliness.

The thematic analysis of qualitative factors coming from the interviews as well as open questions identified a number of important domains where the implementation of Industry 4.0 facilitates improved decision-making. They include that employees with advanced and reskilled skills can use technology to analyze data and come to wise conclusions. Forecasts and strategic planning are more accurate thanks to sophisticated tools and systems that offer deeper insights into financial data. Good change management techniques promote a culture that values data-driven decision-making by ensuring a seamless transition and employee buy-in. Creative and well-informed decision-making results from an innovative culture that fosters experimentation and adaptation to new technologies. Migrating to the cloud, going paperless, and ongoing process improvement guarantee effective data access and analysis, which leads to better decision-making.

Organizations can accomplish a lot including the following by implementing Industry 4.0 technologies and cultivating an industry-embracing culture. Decisions are made more quickly as a result of automated reporting and faster data processing. Skilled personnel and state-of-the-art data analysis tools increase the accuracy of financial data, enabling more informed decision-making. Resource-intensive strategic analysis and decision-making are made possible by automated processes and streamlined workflows. When data is used as the basis for decisions, more unbiased and fact-based decisions can be made. All things considered, the research question that Industry 4.0 technology adoption improves management accounting decision making is strongly supported by the combined evidence from both quantitative and qualitative analysis. Digital tools have a significant impact

on decision-making; both (Bhimani, 2020) and (Nørreklit, 2023) concur that they improve the precision and promptness of decisions.

5.6 Summary Results Discussion

The study's findings offer a thorough understanding of the variables impacting the adoption of Industry 4.0 technologies in management accounting, as well as how they affect decision-making procedures, optimize cost efficiency, and promote innovation in Botswana's organizational structures. With Cronbach's Alpha values ranging from.755 to.930, the reliability statistics show a strong degree of internal consistency and robust reliability of the constructs assessed. In particular, the competitive pressure (.756), organizational culture (.723), technological preparedness (.774), and leadership decisions (.872) all have a substantial impact on the strategic adoption of Industry 4.0 technologies. Additionally, the use of these technologies improves decision-making speed (.798), accuracy (.814), and effectiveness (39.64% of respondents rated it as highly effective) in terms of cost savings. It's also clear that the favorable impact is having a good effect on traditional cost management measures; with the majority perceive positive effects. The tools also support creative activities and resource optimization, which improve organizational performance even further.

The chi-square tests, which summarize the hypothesis tests, show a statistically significant correlation between enhanced decision-making procedures, cost effectiveness, and innovation with the use of Industry 4.0 technology. The idea that Industry 4.0 technologies are crucial to Botswana's transformation of management accounting procedures is supported by statistical evidence. The noteworthy enhancement in decision-making precision and promptness, expense minimization, and inventiveness implies that these technologies play a crucial role in augmenting firm performance. Thus, in order to fully utilize Industry 4.0 technologies and gain a competitive edge as well as operational excellence, firms are urged to invest in and incorporate them. The results highlight the significance of technological preparedness, supportive organizational culture, and strategic leadership in enabling the effective adoption and deployment of these cutting-edge technologies.

6.6 Comprehensive Recommendations Industry 4.0 Drivers for Adoption

6.7 Industry 4.0 Drivers for Adoption

i. An edge over competitors

Businesses can use Industry 4.0 technology to boost productivity, cut expenses, and improve product quality in order to obtain a competitive advantage. This is especially crucial in the fiercely competitive global marketplace.

ii. Adherence to Regulations

Adoption of modern technology can help meet the requirement to comply with changing standards and laws. Businesses may maintain compliance by utilizing Industry 4.0 technologies, which offer improved data management and reporting capabilities.

iii. Client Requirement

Organizations are compelled to implement innovative technologies that facilitate more personalized and responsive service delivery in response to growing customer demands for faster, more dependable, and tailored services, such as the industry 4.0 under discussion.

iv. Technological Progress

Businesses can find it increasingly viable to implement Industry 4.0 solutions due to the rapid improvements in technology and the falling costs of digital tools. These developments include more affordable sensors and devices, better data processing capabilities, and increased connection.

v. Government Policies That Are Supportive

Industry 4.0 adoption in Botswana may be accelerated by government programs and policies that support technical innovation and digital transformation, such as the Botswana national development goals as well as the current Vision 2036.

vi. Ready Workforce

One important factor is the availability of a trained labor force that can use new technologies. Putting money into education and training programs guarantees that staff members have the know-how to apply Industry 4.0 technologies and reap its benefits. Botswana governments further ensures that able and suitable workforce that moves with times is ever available, as evidenced by their current educational policy that see government sponsoring 100% all citizen tertiary education in Botswana.

6.8 Enhancing Decision-Making with Industry 4.0

i. Real-Time Data Access

Implement systems that provide real-time access to financial and operational data. This allows for quicker and more informed decision-making, enabling businesses to respond promptly to market changes and internal performance metrics.

ii. Predictive Analytics

Use predictive analytics to forecast future trends and outcomes based on historical data. This aids in proactive decision-making and helps organizations anticipate and prepare for future challenges and opportunities.

iii. Business Intelligence (BI) Tools that are Integrated

Adopt integrated business intelligence (BI) solutions to create detailed dashboards and reports by combining data from several sources. Better data analysis, visualization, and interpretation are made possible by these tools, which aid in operational and strategic planning decisions.

iv. Enhanced Risk Management

By using data analysis and machine learning algorithms to find possible hazards and weaknesses, Industry 4.0 technologies can enhance risk management. This makes it possible for companies to reduce risks by taking preventative action.

v. Platforms for Collaborative Decision-Making

Put in place mechanisms for collaborative decision-making that let stakeholders exchange data and insights instantly. This encourages decision-making that is more inclusive and makes greater use of a range of viewpoints.

vi. Better Management of the Supply Chain

Boost supply chain management using Internet of Things and data analytics. Improved demand forecasting, predictive maintenance of equipment, and real-time inventory tracking all help make supply chain operations more economical and efficient.

6.9 Future Research Areas

Industry 4.0's Long-Term Effects on Accounting Practices

To find out how Industry 4.0 adoption would affect management accounting procedures and business performance in Botswana over the long run, longitudinal studies should be conducted.

Adoption Difficulties for SMEs.

Examine the particular difficulties that small and medium-sized businesses (SMEs) have using Industry 4.0 technologies. Create specialized plans to assist these companies in their digital transformation.

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