INTERNATIONAL JOURNAL OF SOCIAL SCIENCES BULLETIN
ISSN: (E) 3007-1917 (P) 3007-1909
Volume 4, Issue 2, 2026

AN ANALYZE THE EFFECT OF ROBOTIC PROCESS AUTOMATION ON ACCOUNTING AND AUDITING PRACTICES WITH MODERATING EFFECT OF REGULATORY FRAMEWORK IN THE PUBLIC SECTOR ORGANIZATIONS OF KHYBER PAKHTUNKHWA

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DOI: https://doi.org/10.5281/zenodo.18765960

Received	Accepted	Published
26 December 2025	10 February 2026	25 February 2026

ABSTRACT

Robotic Process Automation plays a key role in improving efficiency, accuracy, and transparency in accounting and auditing practices. Robotic Process Automation has emerged as an effective tool for automating routine, rule-based tasks, improving efficiency, accuracy, and compliance. However, empirical evidence on the effect of robotic process automation on accounting and auditing practices in public sector organizations of Khyber Pakhtunkhwa, particularly under varying regulatory conditions, remains limited. This study investigates the effect of robotic process automation on accounting and auditing practices with the regulatory framework as a moderating role in public sector organizations of Khyber Pakhtunkhwa, Pakistan. The study adopts a quantitative research design based on primary data collected through a structured questionnaire from 562 accounting and auditing professionals working in public sector organizations in district Peshawar. A multi stage sampling technique was employed to ensure representativeness. Data were analyzed using descriptive statistics, correlation analysis, multiple regression, and structural equation model. The findings reveal that robotic process automation has a significant positive effect on both public sector accounting and auditing practices, enhancing efficiency, accuracy, audit quality, and compliance. Moreover, the regulatory framework significantly moderates these relationships, indicating that clear regulations, compliance mechanisms, and institutional support strengthen the effectiveness of robotic process automation adoption. The results highlight the importance of combining technological innovation with a supportive regulatory framework to improve public sector accounting and auditing practices. This study contributes to the limited empirical literature on robotic process automation in public sector accounting and auditing practices in developing economies and offers practical insights for policymakers, regulators, and public administrators seeking to enhance transparency, accountability, accuracy and efficiency through robotic process automation.

Keywords: *Robotic Process Automation, Accounting Practices, Auditing Practices, Regulatory Framework, Public Sector Organizations, Khyber Pakhtunkhwa*

Introduction

The rapid advancement of technology has significantly transformed organizational processes across the globe, including financial management systems in the public sector organizations. Governments are increasingly adopting digital and artificial intelligence-based tools to enhance efficiency, transparency, accountability, and

compliance in public financial management (Moll & Yigitbasioglu, 2019). Robotic Process Automation is an advanced artificial intelligence tool designed to automate repetitive, rule-based tasks by simulating human interactions with information systems. Robotic Process Automation combines artificial intelligence, rule-based logic, and workflow automation, making it particularly effective for accounting and auditing processes that handle large amounts of structured data (Aldemir & Uçma Uysal, 2025; Preprints.org, 2026). In accounting practice, robotic process automation has the potential to automate routine activities such as transaction recording, ledger maintenance, invoice processing, payroll management, and account reconciliation. These tasks are traditionally labor intensive and prone to human error, particularly in public sector organizations where financial transactions are numerous and governed by strict procedural requirements (Lu & Wu, 2025; OECD, 2025). By automating these processes, Robotic Process Automation improves processing speed, enhances accuracy, and ensures consistency in financial reporting, allowing accounting professionals to focus on higher value activities such as financial analysis, budgeting, and strategic planning. Similarly, Robotic Process Automation plays a critical role in strengthening auditing practices by enabling continuous auditing, automated compliance testing, and comprehensive examination of financial data. Unlike traditional auditing methods that rely on sampling, Robotic Process Automation allows auditors to analyze entire datasets in real time, thereby improving audit coverage, increasing the detection of irregularities, and reducing audit risk (ISACA, 2024; Phuangthuean & Nuansang, 2024). Automated audit trails generated through RPA systems also enhance traceability and support robust internal controls, which are essential for maintaining transparency and accountability in public sector governance (Ibra et al., 2024). The importance of Robotic Process Automation adoption is particularly strong in the public sector, where organizations operate under complex regulatory environments and face increasing pressure to ensure the efficient use of public funds. Public sector accounting and auditing practices are subject to stringent standards, rules, and oversight mechanisms, making accuracy and compliance essential (World Bank, 2024). In this context, robotic process automation supports regulatory compliance by ensuring that accounting and auditing practices are executed consistently and in accordance with established guidelines. Automated processes also reduce the likelihood of intentional or unintentional manipulation of financial records, thereby strengthening governance and public trust. However, the effectiveness of robotic process automation adoption in public sector organizations largely depends on the regulatory framework in which these organizations operate. The regulatory environment defines accounting standards, auditing procedures, data security requirements, and accountability mechanisms. A supportive and adaptive regulatory framework enhances the positive effects of robotic process automation by facilitating its integration into existing accounting and auditing practices and ensuring alignment with compliance requirements (Sulistyantoro et al., 2024; Abbas et al., 2025). In contrast, rigid or outdated regulations may hinder robotic process automation implementation, limit its scope, and reduce its potential benefits. Despite growing global interest in robotic process automation, empirical evidence on its impact within the public sector of developing economies remains limited. In Pakistan, and particularly in the province of Khyber Pakhtunkhwa, public sector organizations are still at an early stage of adopting advanced automation technologies for accounting and auditing. Most existing studies focus on private sector contexts or developed countries, creating a research gap regarding how robotic process automation improves public sector accounting and auditing practices under different regulatory conditions (Preprints.org, 2026). To address this gap, the present study analyzes the effect of robotic process automation on accounting and auditing practices, with a focus on the moderating role of the regulatory framework in public sector organizations of Khyber Pakhtunkhwa. By providing empirical evidence from this context, the study contributes to the literature on robotic

process automation adoption in public financial management and offers practical insights for policymakers, auditors, and public administrators seeking to enhance financial governance, transparency, and efficiency through technological innovation.

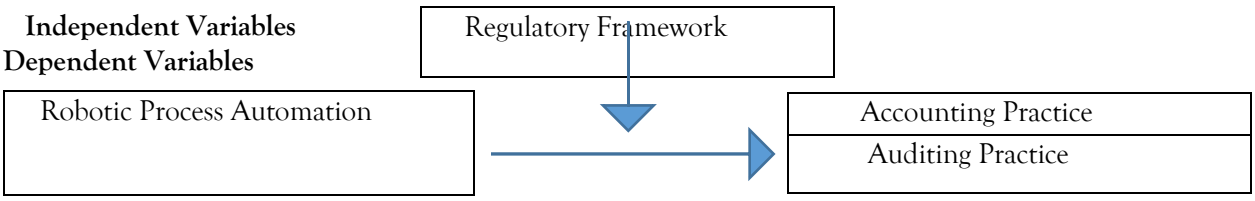
Almaleeh (2025) conducted a systematic review on the impact of automation technologies, including robotic process automation and artificial intelligence on external audit practices globally. The study investigates that robotic process automation improves audit efficiency and quality by automating repetitive, rule based tasks while still requiring human judgment in complex areas. This research confirms the growing relevance of robotic process automation across both private and public sector auditing practice. Wulandari et al. (2023) investigated the role of robotic process automation in enhancing internal audit efficiency. Their study found that robotic process automation automates internal control testing, transaction processing, and data analysis, improving audit speed and accuracy. The study also emphasized challenges such as technology integration and data security, highlighting the need for alignment between robotic process automation capabilities and regulatory requirements to maximize benefits. Alassuli (2025) examined the effects of robotic process automation on internal audit operations in Jordanian commercial banks. The study showed that robotic process automation adoption improves audit planning, execution, and overall audit performance, demonstrating the technology's positive impact on internal auditing effectiveness. Boydas and Toplu (2023) reviewed robotic process automation applications in accounting practices. Their findings indicate that robotic process automation streamlines core accounting processes, increasing processing speed, accuracy, and strategic contribution to organizations. However, barriers such as workforce resistance, integration challenges, and data privacy concerns were noted as significant impediments to successful robotic process automation implementation. Tritama et al. (2025) explored the combination of robotic process automation with artificial intelligence and machine learning in auditing workflows. The study reported that this integration allows for full automation of data extraction, ledger reconciliation, and report generation, enhancing transparency, compliance, and audit documentation. Emerging Digital Technologies (2024) further emphasized that skilled IT auditors and regulatory oversight are critical to maintaining audit quality in automated processes. Lanz (2025) highlighted the regulatory dimension of robotic process automation adoption. The Committee of Sponsoring Organizations of the tread way Commission (COSO) issued guidance outlining governance frameworks for effective internal control over robotic process automation implementations. The guidance stresses bot usage management, access controls, and alignment with existing control frameworks, demonstrating the importance of regulatory structures in ensuring successful robotic process automation outcomes. While most research focuses on private sector applications, studies suggest that public sector accounting and auditing practice can gain substantial benefits from robotic process automation adoption, provided supportive regulatory frameworks are in place. However, empirical studies analyzing the effect of robotic process automation on accounting and auditing practices in the public sector organizations, including Pakistan and Khyber Pakhtunkhwa, remain limited. This indicates a clear research gap, emphasizing the need for context specific investigation of how regulatory environments moderate the effectiveness of robotic process automation in public sector accounting and auditing practices, which forms the core focus of this study. This study is based on the Technology Acceptance Model (Davis, 1989; Venkatesh & Davis, 2000) and Institutional Theory (DiMaggio & Powell, 1983; Scott, 2014). TAM suggests that robotic process automation is adopted when it enhances efficiency and accuracy in accounting and auditing, while Institutional Theory emphasizes that regulatory rules and compliance shape the effectiveness of robotic process automation in public sector organizations (Curtis & Payne, 2008; Rozario & Vasarhelyi, 2018; Moll & Yigitbasioglu, 2019). This study investigates the effect of robotic process automation on

accounting and auditing practices with the regulatory framework as a moderating role in public sector organizations of Khyber Pakhtunkhwa. The following hypotheses are examined based on existing literature and theories.

H_1: Robotic Process Automation has a positive and significant effect on accounting and auditing practices in the public sector organizations of Khyber Pakhtunkhwa.

H_2: The regulatory framework positively moderates the relationship between Robotic Process Automation and accounting and on auditing practice in the public sector organizations of Khyber Pakhtunkhwa.

Conceptual Model



Source: (Owonifari, et al. 2023; Reda, and Ibrahim, 2023; Al Wael, et al. 2024).

Materials and Methods

Population of the Study

The population of the study consists of employees working in accounting, finance, and auditing related positions in public sector organizations of Khyber Pakhtunkhwa. This includes accountants, audit officers, account officers, finance officers, internal auditors, and other officials directly involved in accounting and auditing practices. These respondents are considered appropriate as they possess relevant knowledge and experience regarding accounting and auditing practices in the public sector organization of Khyber Pakhtunkhwa.

Sample Size and Sampling Technique

The sample size for this study has been determined to be 562 employees, representing accounting and audit related personnel in public sector organizations of Khyber Pakhtunkhwa. This sample is drawn from an overall population of 32,500 employees engaged in accounting and auditing roles in the public sector organizations of Khyber Pakhtunkhwa, including positions such as finance officer, account officer, audit officer, accountant, auditor, and other similar roles. At least five cases per item for factor analysis, this study ensures an adequate sample size for factor analysis (Tabachnick and Fidell ,2001). Furthermore, a sample size of 200-300 is sufficient for reliable study results (Gaur and Gaur 009) and the sample size should be at least 300 for reliable study results (Tabachnic ,2007). Supporting the robustness of the 562 employees sample used in this study. This sample size ensures strong representation of the population and provides a strong basis for a comprehensive analysis of the effect of robotic process automation on accounting and auditing practices within public sector organizations of Khyber Pakhtunkhwa.

Table 1 *Distribution of Sample Respondents in the Study Area*

Descriptions	KP	District Peshawar
Total Public Organizations	210	146
Total Employees related to Accounts and Audit Sections	32500	3750
Selected Sample of account & audit related employees in the public sector organizations of KP located in Capital District Peshawar		562

Source: (AG Khyber Pakhtunkhwa Human Resources Information Management, 2024).
(Gaur and Gaur, 2009; Tabachnick, 2007; Tabachnick and Fidell, 2001).

This study employs a multi stage sampling technique to select a representative sample from the large and geographically dispersed population of accounting and auditing professionals working in public sector organizations across Khyber Pakhtunkhwa. This approach ensures both practical feasibility and methodological rigor through three systematic stages. In the first stage, district Peshawar is purposively selected as the research site due to its strategic importance as the provincial capital of Khyber Pakhtunkhwa. The district contains the highest concentration of public sector organizations and accounting and auditing professionals in the province, making it an appropriate context for examining the implementation of robotic process automation in accounting and auditing practices within public sector organizations of Khyber Pakhtunkhwa. The selection of Peshawar provides access to a diverse and contextually relevant population while narrowing the geographical scope to ensure practical feasibility. This purposive approach ensures that a substantial proportion of the target population is captured within an administratively significant region, thereby enhancing the relevance and focus of the study while facilitating access to meaningful data. In the second stage, stratified random sampling is applied to the 146 public sector organizations located in Peshawar. These organizations are categorized by sector, including the Accounts and treasure offices, Finance, Health, Education, Municipal Services, to ensure proportional representation across major types of public organizations. Following stratification, organizations are randomly selected from each category to preserve sectoral diversity and improve the representativeness of the sample. In the third stage, simple random sampling is used to select individual accounting and auditing staff within the public sector organizations of Khyber Pakhtunkhwa, ensuring that every eligible and experienced professional has an equal opportunity for inclusion and minimizing selection bias. In the final step, a total of 562 individual participants are selected using a simple random sampling method. This approach ensures equal chances of participation for all eligible professionals, thereby supporting statistical generalizability within the sampled context. While the overall sampling strategy emphasizes randomization and stratification to enhance representativeness, elements of convenience sampling are incorporated at the final stage of participant recruitment to address logistical constraints. This pragmatic adjustment facilitates accessibility and cooperation within participating organizations while maintaining the core principles of diversity and inclusion across public sector organizations. Overall, this multi stage sampling strategy balances methodological rigor with practical considerations, enabling efficient data collection while ensuring the validity and reliability required for a meaningful analysis the effect of robotic process automation on accounting and auditing practices within public sector organizations of Khyber Pakhtunkhwa.

Data Collection Method

This study employs a structured questionnaire to collect primary quantitative data directly from accounting and auditing professionals working in public sector organizations of Khyber

Pakhtunkhwa. The instrument captures respondents' self-reported perceptions, attitudes, and contextual insights regarding the adoption of specific robotic process automation, their impact on accounting and auditing practices and the moderating influence of the regulatory framework in the public sector organizations of Khyber Pakhtunkhwa. The data collection instrument is grounded in well validated measurement scales from prior studies (Owonifari et al., 2023; Reda & Ibrahim, 2023) and is organized into clearly defined sections: demographic information (Section A); multi-item Likert scale measures for robotic process automation as independent variables (Section B); measures of accounting and auditing practices as dependent variables (Section C); and measures of the regulatory framework as a moderating variable (Section D). All constructs are measured using a standardized five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) to ensure consistency and comparability. The data collection procedure follows a systematic and ethically approved process. Formal permission is obtained from participants prior to data collection. The finalized survey is administered using a mixed mode approach, combining online distribution through platforms such as Google Forms with in person distribution of hard-copy questionnaires to enhance response rates. A structured follow up protocol, including reminder emails and phone calls, supports participant engagement. Collected data are carefully compiled, with online responses automatically recorded and paper based responses manually entered into a spreadsheet. A data verification process, such as double-entry of a randomly selected subset of responses, is employed to ensure accuracy and reliability. The entire data collection phase spans approximately 5–8 weeks and is conducted under strict ethical standards, including informed consent, assurance of privacy and confidentiality, secure storage of data on password-protected systems, and the removal of all identifying information. All data are used solely for academic purposes and are reported in aggregate form.

Data Analysis Techniques

This study analyzes the effect of robotic process automation on accounting and auditing practices in public sector organizations of Khyber Pakhtunkhwa, with the regulatory framework as a moderating variable. Descriptive statistics include mean, standard deviation, minimum, and maximum were first calculated to summarize respondents' perceptions. Correlation analysis was then performed to examine the strength and direction of relationships among robotic process automation, accounting practices, auditing practices, and the regulatory framework, providing preliminary support for hypothesis testing. Structural equation modeling was used as the primary technique to test direct effects of robotic process automation on accounting and auditing practices and to evaluate the moderating role of the regulatory framework through interaction terms robotic process automation with Regulatory Framework. Multiple regression analysis complemented structure equal Model results, confirming the significance of both direct and moderating effects. This integrated approach ensures a rigorous and comprehensive analysis of how robotic process automation adoption, under varying regulatory conditions, influences accounting and auditing practices in public sector organizations (Hair et al., 2019).

Econometric Model

The following econometric models are specified for empirically analyze the effect of robotic process automation on accounting and auditing practices with the moderating effect of regulatory framework in public sector organizations of Khyber Pakhtunkhwa.

The general model is expressed as:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots\ldots\ldots\ldots B_5 X_5 + \epsilon$ Equ (i)

Econometric Model for Accounting Practice

$AP = \beta_0 + \beta_1 RPA + \beta_2 RF + \varepsilon$ (Eq. ii)

Econometric Model for the moderating effect of the regulatory framework on accounting practice,

$AP = \beta_0 + \beta_1 RPA + \beta_2 (RPA \times RF) + \varepsilon$ (Eq. iii)

Econometric Model for Auditing Practice

$AU = \beta_0 + \beta_1 RPA + \beta_2 RF + \varepsilon$ (Eq. iv)

Econometric Model for the moderating effect of the regulatory framework on auditing practice

$AU = \beta_0 + \beta_1 RPA + \beta_2 (RPA \times RF) + \varepsilon$ (Eq. v)

Where:

AP = Accounting Practices

AU = Auditing Practices

RPA = Robotic Process Automation

RF = Regulatory Framework

β_0 = Intercept

β_1, β_2 = Regression coefficients

ε = Error term

Results and Discussion

Descriptive Analysis of Study Variables

Table 1 presents the descriptive statistics of the study variables. The mean values of all variables are above the midpoint of the scale, indicating generally positive perceptions of robotic process automation, accounting practices, auditing practices, and the regulatory framework in public sector organizations of Khyber Pakhtunkhwa. Accounting practices show the highest mean (M = 4.01, SD = 0.58), followed by auditing practices (M = 3.94, SD = 0.61) and robotic process automation (M = 3.87, SD = 0.62), suggesting that respondents perceive robotic process automation as contributing positively to accounting and auditing practices. The regulatory framework records a moderately high mean (M = 3.76, SD = 0.65), reflecting supportive but improvable regulatory conditions. The moderate standard deviations indicate acceptable consistency in responses, while the observed minimum and maximum values confirm adequate data dispersion. Overall, the results support further inferential analysis. Which aligns with prior studies highlighting the benefits of robotic automation process in accounting and auditing practices (Almaleeh, 2025; Wulandari et al., 2023; Boydas & Toplu, 2023). Accounting practices were perceived to benefit most from robotic automation process (M = 4.01), followed closely by auditing practices (M = 3.94) and robotic automation process itself (M = 3.87), confirming that automation contributes substantially to operational efficiency, accuracy, and reliability in public sector accounting and auditing practices.

Table 1 *Descriptive Statistics*

Variable	Mean	Standard Deviation	Min	Max
Robotic Process Automation	3.87	0.62	2.10	5.00
Accounting Practices	4.01	0.58	2.30	5.00
Auditing Practices	3.94	0.61	2.20	5.00
Regulatory Framework	3.76	0.65	2.00	5.00

Source: Primary Survey (2026)

Correlation Analysis of Variables

The Table 2 shows significant positive relationships among all study variables at the 0.05 level. Robotic process automation is strongly correlated with accounting practices ($r = 0.62$, $p < 0.05$) and auditing practices ($r = 0.65$, $p < 0.05$), supporting H_1 and H_2 that robotic process automation positively influences accounting and auditing practices. that robotic process automation also correlates positively with the regulatory framework ($r = 0.58$, $p < 0.05$), while the regulatory framework itself shows significant positive associations with accounting practices ($r = 0.63$, $p < 0.01$) and auditing practices ($r = 0.60$, $p < 0.05$), supporting H_3 and H_4 regarding the regulatory framework's role in enhancing accounting and audit practices in public sector organizations of Khyber Pakhtunkhwa. These significant correlations justify further testing of the proposed hypotheses using structural equation model and moderation analysis. Consistent with previous findings showing that robotic automation process streamlines routine and repetitive tasks, accelerates transaction processing, and enhances audit performance (Alassuli, 2025; Tritama et al., 2025). The regulatory framework also demonstrated significant positive correlations with robotic automation process, accounting and auditing practices, reinforcing prior literature emphasizing the importance of governance structures and compliance mechanisms in maximizing the benefits of automation (Lanz,

2025; Emerging Digital Technologies, 2024; COSO guidance).

Table: 2 ***Correlation Analysis***

Variable Pair	Correlation (r)	Sig. (p-value)
Robotic process automation & Accounting Practices	0.62**	0.01
Robotic process automation & auditing practices	0.65**	0.02
Robotic process automation & Regulatory Framework	0.58**	0.02
Regulatory Framework & Accounting Practice	0.63**	0.01
Regulatory Framework & Auditing Practice	0.60**	0.01

Source: Primary Survey (2024) Note: ** Correlation is significant at the P<.05 level (2-tailed).

Structural Equation Model and Regression Analysis

Table 3 presents the results of the structural equation modeling and regression analysis examining the direct and moderating effects of robotic process automation on the public sector accounting and auditing practices with the regulatory framework as a moderator. The direct effect results indicate that robotic process automation has a significant and positive influence on accounting practices ($\beta = 0.63$, $t = 9.84$, $p < 0.05$, $R^2 = 0.46$) and auditing practices ($\beta = 0.68$, $t = 11.23$, $p < 0.05$, $R^2 = 0.49$). These findings confirm that higher adoption of robotic process automation significantly enhances both accounting and auditing practices, supporting the study hypotheses H_1 and H_2. The moderating effect of the regulatory framework was also significant. The interaction term robotic process automation × regulatory framework positively affects accounting practices ($\beta = 0.21$, $t = 3.76$, $p < 0.05$, $R^2 = 0.51$) and auditing practices ($\beta = 0.25$, $t = 4.12$, $p < 0.05$, $R^2 = 0.55$). This indicates that a strong regulatory framework strengthens the impact of robotic process automation on both accounting and auditing practices, confirming the moderating role of regulatory framework and supporting hypotheses H_3 and H_4. Overall, the structure equation model and regression results demonstrate that robotic process automation is a significant driver of improved accounting and auditing practices in public sector organizations of Khyber Pakhtunkhwa, and its effectiveness is further enhanced by an enabling regulatory framework. This finding aligns with institutional theory, which highlights that regulatory support and compliance mechanisms are essential for effective technology adoption in public sector organizations (DiMaggio & Powell, 1983; Curtis & Payne, 2008).

Table 3. **Structure Equation Model and Regression *analysis***

Relationship	Path Coefficient (β)	t-value	p-value	R^2
Direct Effects				
RPA → Accounting Practices	0.63	9.84	<0.001	0.46
RPA → Auditing Practices	0.68	11.23	<0.001	0.49
Moderating Effects (RF)				
RPA × RF → Accounting Practices	0.21	3.76	<0.001	0.51
RPA × RF → Auditing Practices	0.25	4.12	<0.001	0.55

Source: Primary Survey (2024)

Conclusion

This study analyzed the effect of robotic process automation on accounting and auditing practices in public sector organizations of Khyber Pakhtunkhwa with the regulatory framework as a moderating variable. The findings reveal that robotic process automation adoption significantly improves both accounting and auditing practices by enhancing efficiency, accuracy, reliability, and overall quality of accounting and auditing practices. Furthermore, the regulatory framework was found to strengthen these effects, indicating that clear policies, compliance mechanisms, and institutional support are essential for maximizing the benefits of robotic process automation in public sector accounting and auditing practices. The study also highlights that knowledgeable and experienced personnel are crucial for the effective implementation of robotic process automation, as evidenced by the demographic profile of the respondents. Overall, the findings underscore that integrating robotic process automation with a strong regulatory framework can substantially enhance transparency, accountability and operational efficiency in public sector organizations. This study is limited by its reliance on self-reported questionnaire data, its focus on public sector organizations in Peshawar across other districts and provinces of Pakistan the exclusion of other emerging digital technologies, and its cross sectional design, which restricts causal and long term inferences. Future research should adopt longitudinal and multi region designs, integrate advanced technologies such as artificial intelligence tools as data mining, machine learning, Hybrid system and data analytics to evaluate their combined or comparative impact on public sector financial management and explore mediating factors like skilled personnel and organizational readiness. Additionally, qualitative or mixed method approaches are recommended to capture contextual and regulatory factors influencing robotic process automation adoption and performance.

Recommendations

i. Public sector organizations should use Robotic Process Automation to handle repetitive accounting and auditing tasks, improving efficiency, accuracy, and time management.

ii. Clear rules, compliance guidelines, and monitoring mechanisms should be established to ensure effective robotic process automation implementation.

iii. Employees should receive regular training on robotic process automation tools to ensure smooth integration and maximize their effectiveness.

iv. Robotic process automation should be integrated with existing accounting and auditing processes, with regular performance evaluation to support real time reporting, informed decision making, and alignment with organizational objectives.

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