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Research Article

Impact of Robotic Process Automation on Accounting

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ABSTRACT

Purpose: The fundamental intent of this study is to investigate application of Artificial Intelligence (AI) with Robotic Process Automation (RPA) under the lens of Technological and Environmental factor of Technology-Organization-Environment TOE Theory. This study aims to address the knowledge gap in the Accounting and Technology Literature in 4IR of emerging technologies such as RPA and Generative Artificial Intelligence. **Design/Methodology/Approach** : The Research Design entailed a detailed systematic analysis of 300 quality articles from ABDC journals, Scopus, Elsevier and other reputed authors from different search engines including IEEE, EBSCO, PROQUEST and Google scholar to gather existing knowledge on RPA Adoption in Accounting. Design science Research Method (DSRM) has been carried out for literature review in this research. Out of 300 over 100 Articles were from ABDC and top reputed Accounting Journals. A total of 453 responses were gathered from survey questionnaire based out of the Literature review and analysed in ADANCO 2.3 statistical tool, hence variance-based SEM was the data analysis approach adopted. Findings: The findings validate the significant impact of Technological factors and Organizational Factors for application of GAI, AI and RPA in Financial Accounting. The technological and environmental factors have significant to highly significant impact on Application based on the SEM analysis. Originality/ Value: This study findings highlights the technological and environmental factors with significant impact on application of AI and RPA for Accounting functions and adds to the Body of Accounting Literature as a first paper to provide validated framework for GAI, AI and RPA integration in Financial Accounting.

Keywords: Financial Accounting, Robotic Process Automation, Generative Artificial Intelligence, Artificial Intelligence, TOE theory.

I. INTRODUCTION

Fourth Industrial revolution 4IR is dynamic with adoption and evolution of emerging technologies. The Artificial intelligence and Generative Artificial Intelligence have transformed to user friendly applications and are still in infancy stage of adoption by companies. Technology is here to stay, and the evolution cannot be reinstated. Hence the application of GAI, AI and RPA in Financial Accounting are studied in this research for providing key insights on the transition factors for the organizations and the accountants.

The list of technologies ideal for Finance and Accounting are [78]:

1. RPA – Automation of Accounting improves accuracy with simple codes (If this = t then that)
2. AI – Data analysis using machine learning for agile decision making
3. Blockchain – An advancement in Blockchain provides data security for financial transactions.
4. Machine Learning through the Deep Learning – Automation without human intervention

The upcoming technologies are either embedded for multi-application connections or augments analytics with the help of machine learning [66]:

A. Motivation for the Research :

There are several motivations for this study as listed:

1. Addressing emerging concerns: Research helps to identify and address the emerging concerns from the application and implication of emerging technologies in Accounting especially RPA, AI and GAI. The technologies compatibility, credibility , ethical standards, tasks for accountants, tasks for automation and compliance are some of the emerging concerns of organizations. This study attempts to address these concerns.
2. Academic contribution: Research in accounting adds to the body of academic literature and contributes to the accounting community. The literature is in need of more Technology in Accounting research conducted preferably by Accountants with consideration to knowledge about Accounting, Technology and understanding of the future accountants role in this transition.
3. Decision making support: Evidence based research findings will help the decision makers and in this context the organizations to guide oneself to informed decisions. Hence this research finding will serve as a guidance to organizations willing to adopt RPA, already adopted and looking to integrate AI and also for those organizations searching for GAI enable RPA empirical evidence.
4. Practical implications: Research in Accounting aims to provide workable and evidence based solutions to the real world problems faced by organizations and Accountants. This research aims to help organizations to adopt RPA and AI in Accounting and subsequently develop good skills training programs for their accountants.
5. Knowledge advancement: The technological theories in Accounting are limited. The TAM and TOE are the two suitable theories for Technology adoption based on prior researches. However TAM doesn't address the organizational and environmental factors. Hence TOE theory with Accounting is tested in this research to provide a holistic insight. TAM has the limitation of perceived usefulness which is subjective and can be biased, hence TOE has been justified for this research process.
6. Policy development: There is still significant need for the harmonisation of accounting standards and transition of Accounting standards to include the emerging technologies. The motivation of this study aims to reiterate the technologies inclusion into accounting standards since the state of accounting now cannot be reinstated. Hence the organizations are facing concerns on adoption of RPA, AI or GAI since there is no unique acknowledgement of all accounting standards as a simple framework.

B. Scope of the study: The scope of the study involves the exploring of application and impact of RPA and AI technologies in various accounting tasks. The scope of the study extends to investigating the factors significant for adoption of RPA, AI and GAI in financial Accounting and to establish a validated framework for decision making in organizational adoption and to be the first study to implore the GAI enabled RPA in Accounting.

This research paper further progresses to the Methodology, Framework in the following section.

II. RESEARCH DESIGN AND METHODOLOGY

A. Methodology

A mixed method is a combination of quantitative and qualitative. The mixed method entails formulating useful questions and providing reliable, justifiable and valid answers for the same [37]. A pre testing of the constructs , variables and the questions were given for their views on the questions and for suggestions. The methodology used in this research is Design Science Research Methodology (DSRM) which is both qualitative and quantitative for this research . The DSRM is used traditionally used in IT Research. However since this thesis is on adoption of RPA in accounting wherein RPA and AI are technologies, the new methodology has been adopted [56]. A theoretical framework for adoption of RPA and GAI into Accounting as a service represents an artifact and hence Design Science Research methodology (DSRM) is applicable in this context

B. Design Sceince Research Methodology

The DSR theory was shaped originally by [44] for research in Information Technology (IT). The IT was implemented to provide meaningful data to the clients from the large volume of information in organization existence [44]. A publication validates the use of DSRM for Accounting Information systems and the enhancement of research rigor by way of this research [26].

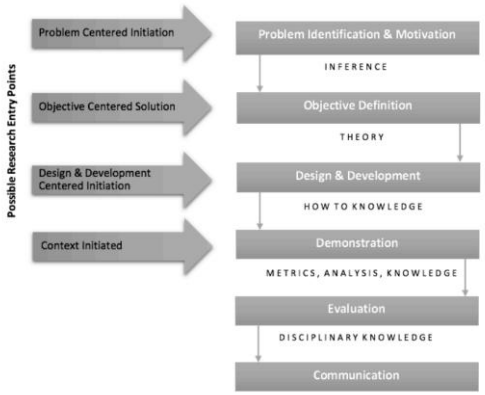

Figure 1 DSRM Research Methodology

Figure Source:[56]

The DSR consists of two dimensions. The first dimension consolidates to Literature presentation and theoretical justification. The second dimension instantiates focus on model creation or framework building[44].

With the rapid development of GAI since year 2022 , the future proposed evolution to Design Science Research Methodology is a third dimension of GAI Integration. This third dimension will entail also the first two dimensions and accentuate the existing two dimensional to multi-dimensional without any narrowing of the dimensions and increase the rigour of the research. The predecessors of these research methods were not at the GAI age and hence the further evolution of this methodology must contribute to the impact of GAI data and model analysis.

C. Research Design:

1) Literature review:

A literature review is a critical analysis and evaluation of scholarly and academic articles on a specific topic or research question. The main aim of the literature review is to identify key concepts, theories, research gaps , limitations, methodologies in existing literature and to identify the future research directions. The intensive literature review assisted in deduction of five independent variables with impact on the one dependent variable.

The two constructs under research in this study are:

1. Technology (TE)
2. Environment (EN)

D. The Pilot Study

The pilot study was a preliminary investigation carried out to assess the feasibility, reliability, validity of the conceptual framework. The formulated questionnaire was shared with potential respondents from the industry relevant in this study and 103 responses were gathered. A few questions in the questionnaire was rephrased for clarity and for easy comprehension for the respondents based on the pilot study feedback

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E. The Main Study

The findings from the primary study are the main focus of this thesis. The validation of the conceptual framework created in the research process was carried out in this sub section. The variables with highest significance were identified, causal relation between the variables were accepted or rejected and mediators were identified. A total of 453 responses completed the survey. Adanco 2.3 was used to test the hypothesis both direct and indirect effects.

Research Framework

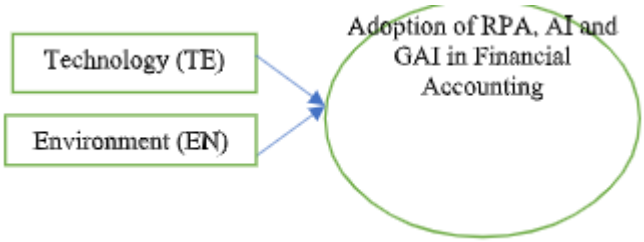


Figure 2: The research framework identified from the Literature review.

Population: The respondents are encompassed of working professionals worldwide and the geographical location is infinite since this research covers the target respondents were selected based on their domain, experience, and organizational size. This gathered data will provide ample information from diverse backgrounds and the diversity helps eliminate the digital divide in technological dispersion. A total of 453 responses were derived scientifically to be sufficient for this study.

Sample size technically ideal for this research was 300-350. However 453 responses were collected in the research process for the main study.

Data collection: An online survey questionnaire was distributed through various online platforms to gather the required data from potential respondents.

Questionnaire: The questionnaire consisted of 30 close ended questions which were topic related for Reponses on a Likert scale. The demographic questions and suggestions were open ended.

1) Primary data

Primary data refers to the original data collected or directly obtained by the researched for the purpose of a specific research survey. Primary data is considered more reliable and accurate for the study. No interviews over phone or in person was conducted for primary data collection. Google forms and online platform was used to upload the questionnaire. There was no direct contact with the respondents to ensure no bias in the primary data. All responses were gathered via Linkedin, professional organizations or online platforms.

2) Secondary data

Secondary data are data that already exists and has been previously published. The secondary data collection for this research entailed an intensive data collection process using secondary data sources using publications from ABCD journals, Scopus, IEEE, Google Scholar, Digital libraries and EBSCO. The literature was gathered systematically in format of publications name, main findings, type of methodology, key words, Limitations or future research scope and gap variables. Relevant articles using relevant keywords published between 2018 to 2023 were gathered in the format and analysed. More than 300 publications were summarized into a single document.

3) Ethical considerations

There was no geographical or gender restrictions. The confidentiality of the participants was ensured throughout the research process. The potential participant profile was screened for relevancy. Confidentiality and privacy were the priority throughout the data collection process. The purpose of the thesis survey was explained and the potential participants were assured of their responses confidentiality before the start of the survey. The honesty and topic relevant knowledge of the participants were essential for reliable and valid survey responses. To maximize response rates 2-3 reminders were sent to those participants who did not respond immediately without invading the privacy and time of the potential participant.

Research Problem:

RPA in Accounting has more benefits for the organization, accountants and the auditors. However there are still some concerns relating to the lack of comprehensive research on RPA in Accounting and address those concerns which may be potential barriers to adoption and realization of RPA benefits for organization. There is lack of theoretical framework for integration of AI with RPA in accounting. There are no previous studies which have tested the GAI In Accounting before 2023. Hence this study aims to be the first to provide validation for this gap with statistical evidence.

The research problem is deduced from the research gaps taken from the literature. A conceptual model will be proposed for adoption of RPA in Financial Accounting. The framework will define the direct and indirect relationships between the variables and sub variables.

F. Research Questions:

1. Does Technology enhance the adoption of RPA in Accounting?
2. Does Environmental factors of TOE Theory have positive influence on the adoption of RPA in Financial Accounting?

G. Research Objective:

The objectives of this research are:

1. To confirm the significant positive impact of Technology on adoption of RPA in Accounting.
2. To determine the significant positive impact of Environment on adoption of RPA in Accounting.

H. Hypotheses:

H1: Technological factors positively influence the adoption of RPA in financial accounting through Technological compatibility, Technological complexity, Trust on Bots, Data Security and Open-Source Cloud Platform

H2: Environmental factors like GAI Enabled RPA, IFRS, Governance, Job Enrichment, and Cultural Shift significantly influence the adoption of RPA in Financial Accounting.

III. LITERATURE REVIEW

A literature reviews also knows as literature survey or literature search is a comprehensive and exhaustive analysis of existing literature such as published scholarly articles, books, articles, and research papers. The literature review is an evidence-based approach for the research process initiation. The different types of Literature review are Traditional, Rapid, Scoping and Systematic literature reviews each tabulated with a time frame. A literature survey is carried out at the beginning of a research for identification of existing information about the research topic, identification of Main Findings, type of Research Methodology, key words used in the Research, Limitations, Future Scope, and Research Gaps. A literature review is an extensive summary of extant literature and grouping of the research gaps from the research of the relevant topic [75].

Importance of the literature review [41] :

1. What is already known? - Solid foundation of the existing knowledge about the topic, theoretical knowledge of the research topic
2. What is needed to be known? – Identification of research gaps
3. Justification of new knowledge to the existing knowledge
4. Framework deducing of the research topic using the literature review including existing topics and theories.

The objectives of a literature review are :

1. To gain extensive knowledge about the adoption of RPA, AI and GAI in Financial Accounting
2. To identify the variables with impact and the frequency of the constructs with impact on the adoption of RPA, AI and GAI in Accounting
3. To evaluate the causal relationships between the constructs and variables

4. To develop a simple framework and test the hypothesis.

A. Literature Review Process:

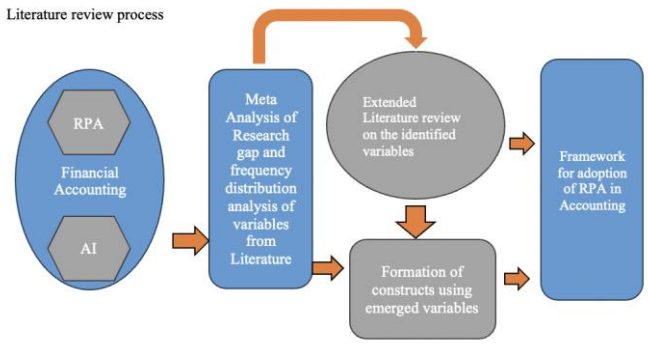


Figure 3: Literature Review Process

B. TOE Theory:

The adoption of RPA in Financial Accounting is analysed with the Technology-Organization- Environment (TOE) theory lens in this study. The best theory to study the adoption of Technology in an organization is TOE [5].

Technology Acceptance Model (TAM) or TOE theories are considered ideal models to study the adoption of Technology as per research findings. The limitations of TAM are that the perceived usefulness is influenced by foreign variables. However the TOE theory analyses the adoption as a whole factor including the organizational and environmental factors. Previous researchers did not see the logical reasoning to modify TOE Framework since it covered all necessary factors [12].

The wake of Artificial Intelligence and Generative Artificial Intelligence, this research has found the logical reasoning to modify TOE framework for this research objective.

C. Emerging Technologies in Accounting

In 2022 multiple emerging technologies suddenly propelled enabling people's creativity [1]. The findings from research suggest that technological software has positive influence and directly proportional to the efficiency of the accounting by reducing time in repetitive task in a firm [53].

Emerging technologies such as RPA, GAI, AI, Block chain etc are used for automation of manual work processes. RPA is an automation software which requires minimal IT influence, hence it is implemented outside of IT function [54][55].

Neural networks have put AI in the hands of people for creativity and as neural networks was investigated emerged Chatgpt [1]. AI is transforming to a more visible form in 2023 since its introduction in 1956, allowing the users to be more productive. However the existence crisis of creativity is also something to think about. The technology is consolidated in to 3 terms : Creation, application and security [45] [46]. Hence Application will be analysed in this research paper.

D. RPA and AI in Accounting:

RPA in accounting is used for reconciliations in balance sheet, journal entries, bank consolidation, GL data management and reporting. Finance and accounting are mostly back end office processes and hence they are more suitable for automation. Account to report is a popular model for RPA automation [63].

With the evolution of AI, study claims that the financial accounting is predestined to migrate to management accounting. The traditional data entry tasks will be automated with help of AI [27].

RPA and AI in finance are used for task automation, decision making and risk management predominantly. The effects of AI in finance are still undetermined and calls for future research. Increased efficiency, productivity , proactive risk assessments are some of the benefits of AI in finance. It is essential to understand what activities are automatable in finance and accounting. 80% tasks which can be automated in finance are accounting operations

including cash disbursement , revenue management and reporting. It is also interesting to see that audits don't fall under automation still. RPA captures one third of the automation tasks especially accounting. RPA with AI and OCR have already been integrated for various finance functions across businesses [57].

E. Technology factor of TOE Framework:

AI has the power to transform accounting profession with applications in entry of data, audits, and data analysis of accounts. The entry of journals, invoices can be automated via integration with AI, analysis of large volume of data cannot be done manually by accountants for its time consuming and AI is require for audits to detect frauds, double entries and non-reconcilable transactions. AI well known benefits are increased accuracy and efficiency[71].

In the era of Automation and Digitalization, RPA has gained the focus of the corporates and businesses [33]. RPA is considered as leading-edge tool in the Digital transformation [25]. Deloitte Survey 2023 claims that 53% of the organizations have moved to the mature stage of the RPA adoption. The organizations are transitioning to Intelligent or hyper automation (RPA+AI) for automated processes. RPA is foreseen as the future of all businesses and RPA is the most adopted automation solution in businesses [4] [55]. Neural networks have put AI in the hands of people for creativity and as neural networks was investigated emerged Chatgpt [1]. AI is transforming to a more visible form in 2023 since its introduction in 1956, allowing the users to be more productive. However, the existence crisis of creativity is also something to think about. The technology is consolidated in to 3 terms: Creation, application and security [45][46].

The audit profession is constantly in demand for accountants with new technological skills and those who will be able to apply the skills for innovative purposes in audits [57]. The finance function is looked upon as the most suitable function for AI adoption. This necessitates requirement for new AI related technological skills ranging from programming to data analytics in finance [20].

The five Indicators of Technology identified from the Literature Review are:

1) Technological Compatibility (TE1): Ernst & Young LLP (Ey) based research confirms the lack of OCR integration with RPA as a major limitation on scalability of RPA across organizational process for increased ROI. The cost of RPA is in general about 20% of an employee and if RPA is offered as Digital service then it may generate 100% ROI [29]. The OCR technology development is recommended for the future investigation. OCR supports for instance extraction of information from the PDF financial documents even if the quality of the document is mediocre. Especially the attended process automation (APA) of RPA extracts data and in case of multiple inputs, alerts the humans and waits for intervention [42]. The lack of integration of RPA with OCR is a major limitation for increased RPA efficiency as identified by one of the research projects. RPA also relies on structured data for task automation [17].

The availability of high volume of unstructured documents are a major limitation to Robotic process automation applicability. Hence the organizations are applying OCR technology to convert this unstructured to structured data. A pretrained natural language processing (NPL) in OCR will be able to read the unstructured data and transform the same to structured data. The study finding confirm that this method is still in infancy, however contributes to 15% increase in performance based on their testing [16].

2) Technological Complexity (TE2):

RPA as a technology has great potential for synergy with other emerging technologies such as AI in particular with neural networks in future to be a powerful tool for the management [47]. RPA is a scalable software which can be implemented without much human intervention to automate processes [21] [38]. The RPA is considered by most of the enterprises because of easy implementation with minimal intrusiveness. The smart contracts by block chain and integration with RPA is of future research recommendation in this study [48].

From the findings based on a case study performed, the outcome was that the early adopters of RPA included IT early on in the design phase only to find out that the IT input was never taken in the implementation of RPA as the implementation of RPA did not require IT Skills [39]. RPA is a low code easy to implement software which helps basic digital transformation in an organization and reduces the entry barrier for complex technologies in to businesses and promotes digital knowledge of the employees. The migration of RPA to Cloud is an added advantage for RPA is a breakthrough for RPA adoption [69].

3) Trust on Bots (TE3):

As per Accenture survey the trust people are likely to have on robots is a stepping stone that needs to be moulded for AI adoption in industries [1]. The World is overwhelmed by the huge amount of data, numbers, and information. Automation for value creation is the only way to consolidate this huge data for analysis. RPA, ICT, AI, and Robots will be the future platforms to process systems work. Once programming enables an employee to focus on expertise work task and value creation [38].

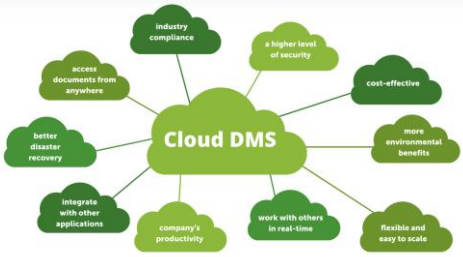
Robots often face issues that they are not programmed for and with exception the robots are unaware of the error and continues to run the process with incorrect data. Hence the RPA requires continuous monitoring which will help the RPA to run error free. There must be diligent checks of the interaction between the RPA and the external data storage [68].

AI is the future of automation of any business processes. The cognitive analysis of data, understanding patterns, probability inference, predictive analytics, ontological model creation, decision making and recommendations are packages required for complete digital transformation of organizations and society at large[63].

4) Data Security(TE4):

A recent research highlights the importance of data security and concludes data security as a key strategic deciding factor for RPA adoption especially in American market [62]. Another recent study also emphasizes the importance of data security with RPA and increases its raising importance as integration of RPA and AI are evolving. Many studies are proliferating on the criticality of data security especially in data abundant functions. For instance accounting has lot of data input. Unauthorized access must be prevented for data security [11].

Unlike blockchain, the CDMS is capable of integration with other applications and secure transaction of data between applications is upgraded necessary feature for future digital transformation. CDMS is digital data and is environment friendly. The 2-factor electronic signature facility to comply with audit regulations are easy features of handling data is CDMS. E signatures with adequate data security provides faster processing times of document with respect to approvals from across the globe, reduced errors and zero requirement for printing of the documents thus contributing to social sustainability from businesses [10].



Source: Google Cloud DMS

Figure 4 Cloud DMS

Data security is a critical as data volume increases with digitalization of businesses. The decisions are made with timely data and the data are extracted from different applications and resources. The ready accessibility to structured data is imperative for both immediate access and to run processes [60][61].

Previous research shows real time application of multilevel cloud secure application for data security by airline which has high volume data every second [79].

Smart contracts can be extended from RPA Bots and stored in block chain for data security by this research finding. The smart contracts can help with automation of cryptocurrencies with adequate security. The accountants will be the consultants to organizations handling smart contracts and in case of crypto transactions [45][46].

5) Open-Source Cloud platform (TE5):

RPA has the unique proposition feature of connecting different platforms, hence a good API as per study. So in future the RPA vendors and service provides will use RPA to connect with different platforms to increase its efficiency along with more cognitive functions [69].

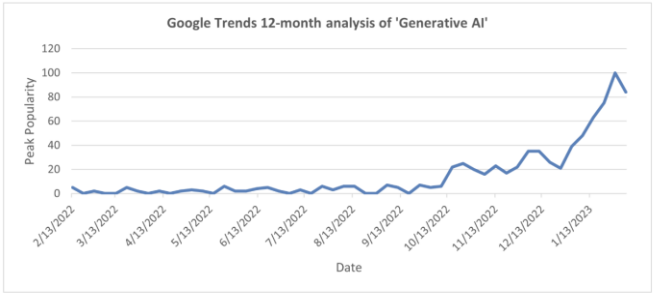
RPA adoption in accounting provides highest level of automation with no errors and increased efficiency. RPA is interoperable and hence has the potential to be extended in its scalability across the organization and automate 100% [81]. The key component in the checklist of RPA adoption for the future is if the RPA deployment must be via open source and if through cloud with external resources [6].

F. Environment

Finance transformation provides an organization with competitive edge to operate in a highly dynamic environment [68].

1) GAI Enabled Chatgpt (EN1):

Generative AI will be the face of the future AI technology. GAI such as Chat Gpt, Bard are some open AI programs which are implemented on experiment basis to public. GAI gained momentum and recognition by end of 2022. Though AI is not new to businesses, GAI is an open source makes AI affordable to most businesses. The current literature review affirms that GAI enabled RPA has the necessary capability and potential to enhance business processes and also calls for focus on the ethics of applying ChatGpt to businesses. The applications od GAI are reading images, text and for creative content. The RPA is used for automation of business tasks. The combining of GAI with RPA is said to enhance business processes. The GAI open interface is easily coupled with any APIs. RPA is a software with API. RPA is program based and less prone to bias hence GAI enabled RPA will be a good combination for introducing machine learning with automation in all ethical context. The main limitation of GAI would be the data concealment. A more transparent method of Data readability and input into AI will mitigate the risk likely to develop by GAI. The ethical concerns with GAI enabled RPA develops from the data, the decision making and the transparency of both. GAI will help RPA with automation of rational tasks. The future research must focus more on the ethical such as ethical infringement and human skills of GAI in RPA [8].



Source: Google Trends; RSM US

Figure 5 Google Trends Generative AI

AI with big data integration is applied as a solution for scalability of RPA . AI is still in infancy stage and is under development. There are four waves of AI which the world will go through as per study. The first wave was Internet AI, the second wave was Business AI which introduced digital finance in world, the third wave of AI is perception AI and the fourth wave of AI is autonomous AI[60][61]. Generative AI falls under the third wave of AI [49].

The existing AI application has set its roots into Business intelligence components of finance such as financial planning, controlling and finance operations. However from Deloitte survey of 2023 the findings confirm the future path of AI in finance will be the AI led automation [20].

2) International Financial Reporting Standard (IFRS)(EN2):

The main function of the IFRS is to control the accounting and reporting quality. Even recent research calls for future research on unified reporting standards from RPA output which complies with international standards such as ICFR and SOX 404 compliance [81]. The RPA in accounting increases productivity by automation structured tasks. The transition from manual to automation will offset considerable changes in the accounting standards such as IFRS. The new changes to the IFRS will enable a robot to adapt to reporting standards faster for providing standard financial reports for audits. RPA is helpful in audits and for controlling. For instance, a substantial difference in net come between fiscal years are alerted to the customer if the RPA is programmed so for a particular limit [50]. The integration of AI with accounting has raised concerns for future about the data privacy,

transparency of the decision models and the support of the accounting bodies for further integration of AI into accounting. The accounting standards are said to go through transformation to accommodate technologies such as AI [71].

3) Governance(EN3):

IT Governance is a topical discussion in the RPA and AI evolution. A Deloitte survey of 2023 asserts the importance of changes in governance and legal regulations for AI adoption in finance. The prevailing AI implementation is on case to case basis with no further potential for enhancing the scalability without proper vision by the regulations [20]. The data auditability efficiency with strict adherence to compliance has improved with the help of RPA for organizations [63].

AI is the next innovation factor in businesses. The Deep learning (DL) capability of AI allows it to be applicable to any type of tasks or processes. Hence the research finding recommends modification of policies both public and private to accommodate AI transformation [2]. This stand point is consistent with recent Deloitte survey in 2023 which proclaims the innovation factor of AI will be a combination of different technologies together with integration of Deep learning to capture information from any format such as text, image and voice [20]. The adoption of AI increases the ethical challenges and requires reformation in regulatory changes to mitigate bias [30]. The emerging technologies in auditing especially will undergo evolution of legal regulations to be able to accommodate future development.

4) Job Enrichment (EN4):

The society is evolving in to technology inherent society with coexistence of RPA, AI and Generative AI. This transformation has led to modifications of most job tasks of the employees with technology as a helpful tool in the work, thus enhancing the digital empowerment of the workforce. The author treads caution as to the prediction of AI capability to be able to automate 99% of the human tasks, hence insisting the necessity for good equilibrium in introduction of AI implementation into businesses. The focus of AI in business will be for profit maximization by cost effective operations [7].

Recent study findings proliferates the important of accountants knowledge and emotional intelligence. Until now there are no rules for AI to take accountability of the tasks run through it. Hence the near future as per the study there will be no job displacement via AI and only further strategic roles will be expected of the accountants. The companies will count on the accountants knowledge for communication with stake holders and for compliance [80]. The accountants job roles are transforming to strategic tasks by the integration of intelligent automation system. The demand for automation was offset especially with the pandemic.

AI with RPA is said to cause a significant level of job displacement and compensate for the same with creation of new job roles with is AI focused. RPA and AI will offer more job flexibility with the easy data accessibility and data processing. And this will in turn be challenging for the employees and the study confirms that emerging technology has not made human job roles obsolete [48].

This research findings argues that the potential effects of Intelligent automation and increased digitalization is job loss in accounting domain [60][61]. Another study also confirms the job displacement as side effects of implementation of AI [13][14]. RPA and emerging technologies are said to bring about some amount of job displacement since they automate those tasks which was previously handled by humans. However emergence of new job roles especially data analytics is inevitable [19].

The addition of AI to the businesses enhances the automation to multi folds, hence the job displacement of various repetitive and mundane tasks will be offset. This offset of tasks will in turn pave way for growth of new job roles. The job displacement happens to those jobs where the central importance of the job is replaceable by AI. And those job tasks where AI can he applied as auxiliary help then the job tasks will enrich [30].

5) Cultural Shift (EN5):

The RPA adoption will primarily result in cultural shift of the organization such as hybrid work culture, resistance to adoption on fear of job loss , responsibility shift and these developments must be addressed by involving employees in adoption process and providing them sufficient information on the mission and vision of adoption of RPA [18]. RPA implementation will chance the structure of the work and the job roles itself. Information will be

more accessible anywhere. Hence the work will not be confined to a specific workplace. The work culture will change by parallel work with robots [3]. The adoption of emerging technologies such as AI brings about a cultural shift in the work place. For successful AI implementation the work culture must unanimously promote innovation and risk taking in business [19].

The emerging technologies are set to be implemented for both dynamic and non-dynamic tasks as future progress. The outcome from the automation and cognitive technological process will require dissemination of this information further to the employees of the organization. Hence this requires a good cultural and internal communication integration in the company as the employees are responsible for process overview [76]. The digital transformation of any company is predominantly influenced by culture of the organization. Resistance to change and change management are factors influencing the cultural shift among employees [31].

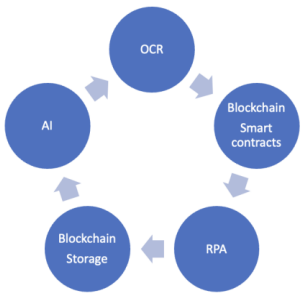


Figure 6: Summary Literature Review Findings

IV. DATA ANALYSIS

PLS SEM has been the recent preferred measurement methodology for determining causal relations between indicators and constructs in Information System (IS) research. PLS SEM is capable of measuring the following: [9]

1. Reflective model
2. Casual formative models
3. Composite model
4. Multiple indicators, multiple causes (MIMIC) model

PLS SEM can encompass also the research types such as exploratory, explanatory, confirmatory, descriptive and predictive. The recent developments in PLS SEM with respect to IS research is explained by this author. The application of PLS SEM to Confirmatory and Explanatory IS research are elaborated with specific measurement methods. Overall model FIT is the main tool in confirmatory research measurement since the testable variance is pre-defined. The explanatory research also measures the causal relationship but with a dependent variable in the model phenomenon, hence the R Squared and path coefficients are the significant measures[9].

PLS SEM application is still in infancy in Accounting Management research. Most relevant reasons for PLS SEM usage for Accounting research data analysis are related to the small sample size and non-normal data distribution of the data. The accounting models exhibit a lot of interrelation between the variables and latent constructs. PLS SEM is the ideal testing method for new theory development in accounting[52].

The automation and accounting combination is relatively new and hence the theories availability was limited and hence data driven learning is required. PLS SEM application has been done since this is a new model for the financial accounting literature. Some of the constructs such as TOE in adoption of RPA in Financial accounting, Diffusion of innovation and eight lean waste elimination theory and the integration of these three theories into one accounting model is tested for the first time in the financial accounting history. Hence PLS SEM is the ideal application for interrelation test.

This thesis has a defined dependent variable and the model is looking to determine any causal relationship between the dependent variable, independent variable and the sub variables. Hence reflective explanatory model has been justified for empirical evidence in this research.

The ADANCO report presents both pictorial and numerical output of the model after its run in the Adanco Software. There are certain criteria for the measures in Adanco to give merit to the model. The overall model Fit in the first part of the report provides evidence for the artifact and the antecedents[51]. The PLS Sem consists of the structural model which is evolution from the theory and representation of the research questions. There are no traditional and conventional methods of data analysis and the information is scattered in literature, hence the interpretation methodology is original and follows the actual report of the Adanco 2.3.2 output.

This research followed the following methodology :

1. The development of a nomological model with constructs Technology (TE) and Environment (EN).The graphical presentation of the model explicitly explains the structural model and the causal relation between the constructs and the indicators in the measurement model.
2. The overall model fit assessment:
3. The Reliability and Validity assessment
4. The structural model assessment

A. Composite Reliability

Construct	Dijkstra-Henseler's rho (ρ_A)	Jöreskog's rho (ρ_c)	Cronbach's alpha(α)
TECHNOLOGY (TE)	0.8201	0.8729	0.8179
ENVIRONMENT(EN)	0.8103	0.8663	0.8073

Table 1: Composite Reliability ADANCO 2.3

The threshold for valid internal consistency reliability via Cronbach's alpha as given in the image to be greater than or equal to 0.708. The Framework for Technology and Environment shows significant and good reliability with values above 0.8.

B. Scale Validity:

Construct	Average variance extracted (AVE)
TECHNOLOGY (TE)	0.5790
ENVIRONMENT(EN)	0.5647

Table 2: Scale Validity

All AVE values in the table are above the AVE threshold of 0.50 and hence confirms convergent validity within the model.

Technology AVE of 0.5790 is interpreted as that around 57.90% of the variance in the observed construct can be explained by the underlying construct.

C. Testing of Hypothesis and Path Coefficients:

The T values are extremely important in hypothesis testing since it facilitates the assessment of significance by evaluation of the quantitative difference between the hypothesized value and sample estimates [28].

Measurement of T-values

Significance	T-values	Decision
p > 0.10	t < 1.65	Not significant
0.10 > p > 0.05	1.65 < t < 1.96	Moderate
0.05 > p > 0.01	1.96 < t < 2.59	Significant
p < 0.01	t > 2.59	Very significant

Figure 7: t-Values Threshold

1) Direct Hypothesis Testing:

a) Testing of Hypothesis related to Technology (TE)

The literature review has inferred Technology (TE) as one of the variables having significant impact on the antecedent to adoption of RPA in Financial Accounting. The five indicators identified in Technology are :

1. Technological compatibility(TE1): [64][65][16][81]
2. Technological complexity (TE2) : [39][70]
3. Trust on Bots(TE3): [58][40]
4. Data Security(TE4: [10][24]
5. Open Source Cloud Platform(TE5): [36][10]

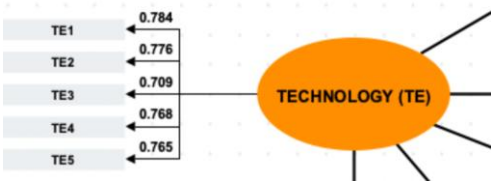


Figure 8 : Path Coefficients TE

Research question 1: How significantly does Technological factors influence the Adoption of Robotic Process Automation and AI in Accounting?

Hypothesis 1 (H1): Technology influences the adoption of Robotic Process Automation and AI in Accounting directly.

No	Determinant Hypothesis	Loadings Loading > 0.8 Strong 0.5 < L < 0.8 Moderate	T-Values t > 2.59 Strong	Inference on Loadings
H1 a	Technological compatibility (TE1) significantly assists the automation in Accounting	0.784	43.4865	Moderate
H1 b	Technological complexity (TE2) positively impacts the Technology on adoption of RPA in accounting	0.776	41.9117	Moderate
H1 c	Trust on Bots (TE3) has great influence on technology in adoption of RPA in accounting	0.709	28.4781	Moderate
H1 d	Data Security (TE4) has significant impact on the Technology in adoption of RPA in accounting	0.768	37.4079	Moderate
H1 e	Open Source cloud platform (TE5) influences technology on adoption of RPA in accounting positively	0.765	40.6714	Moderate

Table 3: t and p values of TE

H1 Technology of TOE Theory significantly influences the adoption of Robotic process automation in Accounting through Technological Compatibility, Technological Complexity, Trust on Bots, Data Security and Open Source Cloud Platform.

Influence of Technology on Adoption of RPA in Accounting:

Hypothesis 2: To test the effect of Technology on the adoption of Robotic Process Automation in Accounting

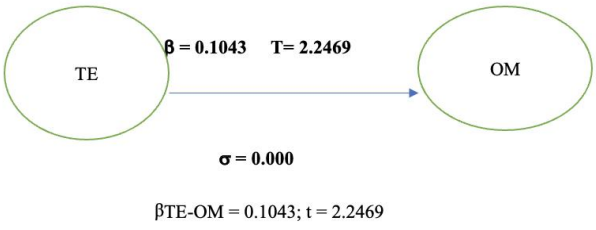


Figure 9: Direct relation of Technology (TE) on Adoption of RPA in Accounting (OM)

Inference : The above results support the direct effects of Technology on adoption of RPA in Accounting with t value of 2.2469 at 5 % confidence level as per (Hair et al., 2011). This reflects that an increase in technological factors are likely to expedite the adoption of Robotic Process Automation in Accounting. The second hypothesis is accepted at 5% Significance level (t > 2.2469) with technology positively impacting the adoption of RPA in accounting.

The highest t value and outer loading value significance is technological compatibility (t value 43.4865) in the adoption of Robotic Process Automation in Accounting which complies with the research findings of [16] that

Intelligent OCR is the technology of future which will facilitate the RPA Technological compatibility to adapt to unstructured data eventually to integrate with AI. The significant but least path coefficient and t value but significant is for trust on bots (t value 28.4781) which also aligns with the research findings of [58]. The transparency in use and decision making by Bots must be considered before implementation of the bots as suggested by [40] and the suggestion for periodical monitoring of RPA to improve the trust on bots align with this research findings. The second highest significance is established for technological complexity with t value (41.9117) and outer loading of 0.776. This significance confirms the research finding of [39] that RPA has the ability to break the complexity and entry barriers because its code free. The data security with significant loading and T value (37.4079)also elucidates the research finding that cloud management provides adequate data security for RPA accounting documents [10].

The effects of Technology on adoption of RPA in accounting is over all highly significant, thus confirming the Technological factors of TOE theory validation in this thesis.

b) Testing of Hypothesis related to Environment (EN)

The literature review has inferred Environment (EN)as one of the variables having significant impact on the antecedent to adoption of RPA in Financial Accounting. The five indicators identified in Environment (EN) are:

1. GAI Enabled RPA(EN1): [8]
2. IFRS (EN2) :[59][43]
3. Governance (EN3) : [15][66][80][11]
4. Job Enrichment (EN4): [72][73][74]
5. Cultural Shift (EN5): [13][14]
6.

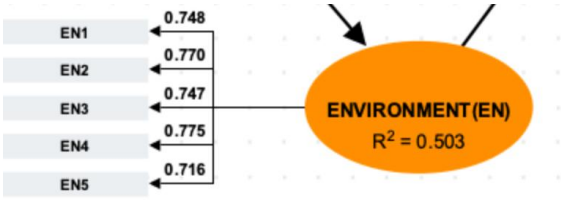


Figure 10: Path Coefficients EN

Research question 2: How significantly does Environmental factors influence the Adoption of Robotic Process Automation in Accounting?

Hypothesis 2 (H2): Environment influences the adoption of Robotic Process Automation in Accounting directly.

No	Determinant Hypothesis	Loadings Loading > 0.8 Strong 0.5 < L < 0.8 Moderate	T-Values t > 2.59 Strong	Inference on Loadings
H2 a	GAI Enabled RPA (EN1) significantly influences the automation in Accounting	0.748	37.0342	Moderate
H2 b	IFRS (EN2) positively impacts the environment on the adoption of RPA in accounting	0.770	46.7599	Moderate
H2 c	Governance (EN3) has great influence on the adoption of RPA in accounting	0.747	34.4298	Moderate
H2 d	Job Enrichment (EN4) has significant impact on the adoption of RPA in accounting	0.775	42.6695	Moderate
H2 e	Cultural Shift (EN5) influences Environment on the adoption of RPA in accounting positively.	0.716	32.2928	Moderate

Table 4: t and p values of EN

The indicators significance ranking based on t value is Job Enrichment, IFRS, Governance, GAI enabled RPA and Cultural shift.

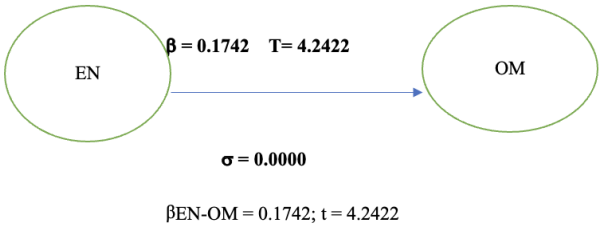


Figure 11: Direct relation of Environment (EN) on Adoption of RPA in Accounting (OM)

Inference : The above results support the direct effects of Environment on adoption of RPA in Accounting with t value of 4.2422 at 1% confidence level. This reflects that an increase in environmental factors are likely to increase the adoption of Robotic Process Automation in Accounting. The fourth hypothesis is accepted at 1% confidence level (t > 4.2422) with organization positively impacting the adoption of RPA in accounting.

The indicators significance ranking based on t value is Job Enrichment, IFRS, Governance, GAI enabled RPA and Cultural shift.

The IFRS (International Financial Reporting Standards) variable with t value (46.7599) at first highest validates the research finding of [59]regarding harmonisation of global reporting standards and evolution of Integrated Reporting. The finding of this study also adds evidence to the [43] on the need for accounting standards transformation.

The Job enrichment with t value (42.6695) > 2.59 shows high significance and along with loading of 0.770 shows moderate to high impact on the adoption of RPA in Accounting. The research finding validates the outcome of

[72][73][74] which confirms that implementation of RPA will change the current roles of the accountants to more strategic tasks.

GAI enabled RPA is a relatively new concept in accounting with t value (37.0342) and outer loading (0.748) placed at third significant variable in Environmental construct. This research outcome corroborates the significance of transparency in GAI implement for ethical compliance and validates the research finding of [8].

Governance has been significant with t value (34.4298) and outer loading of 0.747 at fourth ranking. The study adds empirical validation to previous research emphasis for Governance modification with emerging technologies like RPA in Accounting [80].

The adoption of RPA and AI will require cultural shift in the organizations and this is confirmed by the significant t values in this research. This also aligns with the previous research findings of [13][14].

D. Structural Model:

A SEM structure includes both exogenous and endogenous variables. The endogenous being the dependent variable and exogenous being the independent variables. SEM tests the causal relationship between the exogenous and endogenous variables. SEM has Paths in it with nodes and arrows representing the relations among variables. In SEM diagram by default a latent variable is shown in circles or ellipses and observed variables are seen as rectangles or squares. An arrow shows the causal relation from the base to the head of the arrow. SEM provides a more rigorous model by reliability, validity and causal relationship statistical evidences [35]. In structural model, there are endogenous and exogenous variables. Exogenous variables do not have any arrow pointed to them in a structural model and are specified as the independent variables in the model. The endogenous variables and constructs are predicted by the other variables. Dependent variables are endogenous variables predicted by the other variables in the model [34]. In structural model, the latent or unmeasured variables are expressed by circles and the observed variables are presented as a square or rectangle [35]. If the measurement model is supported then the structural model is analysed by the researcher [29].

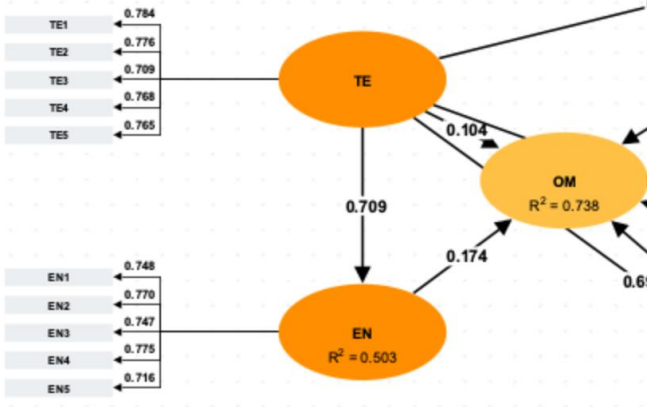


Figure 12: Structural Model ADANCO 2.3

a. Coefficient of Determination(R^2)

The R^2 Value of the structural model is 0.738 for the antecedents to adoption of RPA, AI and GAI in Financial accounting.

The analysis of the structural model is complete only with the determination and interpretation of R Square of the endogenous construct in a quantitative model [67]. The R square is calculated for determining the model's accuracy. R square value represents the consolidated causal effect of the exogenous constructs on the endogenous construct. The adjusted R2 must be relied upon since the R2 is subject to increase in the value with subsequent addition of related endogenous constructs [32][22]. A substantial R2 elucidates that the underlying theory and the framework is well understood [9].

The acceptable R2 Values are: [22] The structural model in the figure shows R2 Value of 0.738 interpreted as 73% of the latent construct Antecedents to adoption of RPA in Financial accounting is explained by the five constructs. R2 value of 0.738 is substantial.

V. CONCLUSION:

A. Objective 1: To confirm the significant positive impact of Technology on adoption of RPA in Accounting.

RPA captures structured data for process. However there are unstructured documents in large volumes especially in Accounting. Hence to capture this technological compatibility, Optical Character recognition (OCR) has been proposed in previous research and findings [64][65][16]. Lack of documentation poses a serious challenge for Bot operation [81]. This study statistics revealed the significance of OCR with path coefficient of 0.784 and t value of 43.4865 which is at 1% confidence level. This outcome aligns with the previous research findings of implement of OCR for enhancing RPA technological compatibility. The technological complexity of TOE Theory is confirmed to be significant with the outer loading of 0.7776 and t= 41.9117 thus confirming the high significance of code free software which helps RPA to break any entry technological barriers in its implementation thus supporting the findings of [70]. Another critical validation of this study supports the findings of [36] and [10]promoting the need for open cloud interfaces for more versatility and modularity with easy data exchange among applications. The t value of 40.6714 open source cloud platform significant impact on the adoption of RPA in accounting. All five indicators under Technology contributes positively to the adoption of RPA. The main study of TE-OM measure values are at βTE-OM= 0.1043 and t value = 2.2469 with significance of Technology at 5% confidence level (1.96 < t <2.59).

Partial mediation signifies the presence of direct and indirect causal relationship through a mediating variable. Four potential indirect effects were tested in this thesis at 1% confidence level. Partial mediation effect of Innovation (IN) (t value= 2.24), Organization(OZ) (t value = 7.53), Environment (EN) (t value = 4.20) and Human Talent (HT) (t value = 6.01) on Technology (TE) were confirmed by significant t values.

Based on the indirect effect ranking of the highest impact of Technology on adoption of RPA in Accounting is through Organizational factors as highest followed by Human Talent, Environment and Innovation.

B. Objective 2: To determine the significant positive impact of Environment on adoption of RPA in Accounting.

The adoption of RPA and AI had led to the unfolding of the synchronization of the accounting standards for more integrated reporting (Quinn & Strauss, 2017). This research finding has been validated in this thesis with the highest impact factor for adoption of RPA in Accounting with t value = 46.7599.

The automation and adoption of RPA in Accounting is expected to cause minimal displacement of job tasks and change of current job tasks to more strategic roles (Stein Smith, 2018). This thesis research t value = 42.6695 also confirms this suggestion of the previous findings.

Generative Artificial Intelligence has gained traction since 2022 more prominently. A RPA enabled by GAI has become essential for the digital eco system. The GAI enabled RPA on ethical and transparency concerns are highlighted in this study [8]. This thesis findings of t value = 37.0342 affirms the GAI Enabled RPA ethics and transparency impact on adoption of RPA in accounting impact on the adoption of RPA in accounting.

Governance and Cultural shift also influences the adoption of RPA in accounting positively.

C. Ranking based impact Summary:

1. Environment3 (βtotal (DL-CV) = 0.1742; t-value = 4.2422),
2. Technology5 (βtotal (BR-CV) = 0.1043; t-value = 2.2469),

From the Research findings it is validated that Technology and Environment have significant impact on Adoption of RPA and AI in Accounting. Hypothesis 1 and 2 are validated.

D. Contribution to Literature and New Methodologies:

The contribution of this thesis to literature encompasses expansion of knowledge, development of theoretical framework, validation of existing literature, to ascertain future research gaps, identifying practical implications and impact on the practice and policy changes. This cognizance is substantiated by extensive analysis of literature review from a five year period of 2018 to 2023. Since the technology is dynamic, the literature has been limited to a five year duration including the most recent literature. The scholarly articles with a conjunction of RPA, AI technology and Accounting function integration are limited. The research outcome of this thesis will contribute to the existing literature Accounting field and for Accountants. The total gathered scholarly articles are 300 in numbers out of which 140 are top indexed journals such as IEEE, SCOPUS, ABDC and Accounting Journals. The literature will also be beneficial to the future researchers in both technological adoption and for accounting researchers. The population used for this study is from diverse background to avoid any digital divide bias, hence the findings of this research are mostly generalized for business markets and contribute to the literature. The research was not confined to any particular language and has all articles published in English, German, Russian and Spanish.

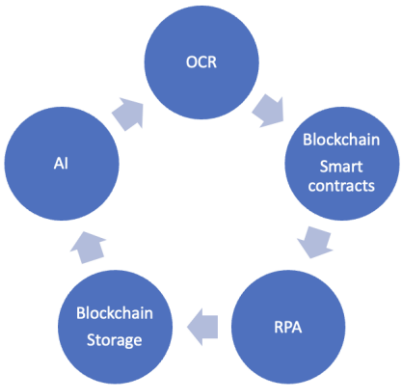


Figure 13: Summary Future Automation Process Model from Literature Review

The above diagram is a pictorial representation from the existing body of literature about the adoption of RPA in Accounting and the future of RPA with integration to AI and other emerging technologies. The OCR or IOCR is expected to enhance the technological compatibility of RPA for capturing unstructured data. The data is stored and forwarded to RPA for processing with the help of smart contract with valid user authorization including triple entry accounting. The data is then processed in RPA automatically. The RPA has no storage inbuilt, hence the block chain will be used as a solution to save the data in encrypted and masked form. This data is then forwarded to AI for Intelligent Data analysis which contributes to decision making, ready availability of meaningful data among other benefits. The cycle then continues in which even the data from AI can be capture with IOCR for processing again. This knowledge is new added addition to the body of Accounting Literature.

E. Development of New Methodologies:

The framework deduced in this thesis is a modification of traditional TOE theory framework. The change wave initiated by technology and especially by Generative Artificial Intelligence is so rapid that traditional frameworks calls for modification and inclusion of the new factors in technology, organization, environment and human talent. The triple entry accounting has been tested for significance in automation of accounting framework as an innovative study exploration. This is a contribution to literature of accounting. Similarly open source cloud platform is a novel construct tested and validated in this thesis for significant impact on adoption of RPA in Accounting. This is a great contribution to literature since the further innovations and any technology is moving towards cloud process. GAI enabled RPA has never been tested before in accounting research and it is a new concept in technology research as well. Hence this thesis research findings contribute to the future researchers who would need empirical evidence for GAI enabled RPA impact on adoption of RPA in accounting. The IFRS and accounting standards combining for integrated reporting is a concept statistically found to have impact on adoption of RPA which validates the framework in wake of the emerging RPA and AI Integration contributing to the accounting literature. Similarly the evidence shown in this thesis on the elimination of non-utilized talent towards a lean management provides the first statistical validation for the accounting literature.

F. Contribution to practice:

The research objective and framework were based on current challenges faced by the companies in adoption of RPA and AI in Accounting functions. The research outcomes provide an insight into the significant variables which have positive impact on the dependent variable.

1. The framework validated in this theory has been deduced from the research process with extensive study of 300 scholarly articles and analysing over 400 research gaps. The framework was tested and found to have positive correlation with the adoption of RPA in Accounting. This framework will benefit the organization for their adoption of RPA and AI integration. The key constructs that can contribute to maximum impact on adoption of RPA in accounting are ranked in order and presented in this thesis.
2. The integration of modified technological factors in adoption of RPA showed the development of good quality of accounting. Technology is a key factor in technological adoption and this thesis helps the organizations to improve their Accounting quality with the mentioned constructs.
3. Compliance with regulations is a major benefit found from the organizational indicators of the organization construct of TOE Theory. The integration to accounting boards for better compliance is worthy for organization looking to adopt RPA. AI and GAI requires extensive input from the regulations to break their adoption barriers.
4. Our results show the organizations that adoption of RPA provides more benefits both for the organizational success for competitive advantage.
5. The TOE theory was expanded and modified according to the current literature.. The framework was tested and found to have positive significant.

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