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Research Article

The Role Of Artificial Intelligence In Tax Administration And Compliance: A New Era Of Digital Taxation

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ABSTRACT

Digital taxation also known as electronic taxation has recently opted for a new shift through artificial intelligence also known as AI in this modern society. This paper aims at reviewing the efficiency of existing and emerging technologies in the improvement of tax systems, including the machine learning, natural language processing (NLP), robotic process automation (RPA), and blockchain. Such innovations let tax authorities treat routine actions as automated processes, better identify fraudulent schemes, and facilitate the communication with taxpayers as well as improve the overall efficiency of revenue collection. Success stories that present the results in taxation systems that include the USA, Great Britain, Australia, and Estonia show increases in the remittance rates and effectiveness after the use of AI. This means that AI has the potential of raising compliance rate by 10% and decreasing tax evasion by 20%; it also aids in efficiency of audits with minimal errors. Nonetheless there are still some disadvantages associated with the IOTs, it has high costs, stringent legal requirements, and data protection issues. AI adoption in tax systems currently differs and in this regard developed countries are in front in integrating AI in their tax systems, nevertheless developing countries are currently facing infrastructure and regulation barriers. Self generated surveys indicate that tax professionals overall have a positive perception of AI with 85% of the respondents accepting that it enhances efficiency of tax compliance. Based on the analysis it can therefore be concluded that AI is a central factor for the future of tax administration and for the continuing push towards improved digitalisation of tax systems, the decrease of the tax gap, as well as the improvement of fiscal governance. However, getting over the demanding implicative challenges will not be easy because it will require adequate investment in infrastructure, reforms on regulations and codes of ethics to protects taxpayers' information.

Keywords: AI, Revenue Authority, Legal Requirement, Scam Identification, E-Taxation

Introduction

AI is making its way into different fields and tax administration is not left behind. Thus AI and other related technologies including machine learning, natural language processing, and robotic process automation can potentially revolutionise tax compliance and the efficiency of tax authorities (OECD, 2020). In this paper, the author focuses on the evolution of AI in the administration and compliance of taxes while providing insight into the opportunities and challenges that come with it.

Tax bodies across the globe deal with huge volumes of data and are always on a quest to ensure compliance with tax laws and reduce tax evasion. However, the process of manual review of tax returns and data analysis also has some drawbacks in terms of speed, accuracy, and, most importantly, the subjectivity of the task (Slemrod, 2019). AI can assist in analysing big data more quickly, eliminating biases and mistakes, and enabling the efficient use of resources in target detection. This paper postulates that AI has the potential to increase the level of tax compliance by identifying fraud and mistakes in real time using the advanced form of

analysis (Aoujil, *et al.,* 2023; IMF, 2020). Another reason why AI is suitable for repetitive tax administration tasks is that it can process information without getting fatigued.

Several areas of application of AI in tax administration include data matching, risk score, audit, and query handling according to the OECD (2020). Audit investigation involves comparing information about taxpayers from different sources to compare and identify any anomaly. AI can enhance the efficiency and precision of such comparisons that assist in dealing with tax evasion. Risk scoring is a process that involves analytical tools for identifying potential cases of non-compliance, which are then flagged for audits. AI enables the inclusion of additional data and more variables in creating the best risk models and scores (Alahira, *et al.,* 2024). It can also help in audits by identifying inconsistencies in the data submitted by taxpayers or even providing auditors with questions to ask in the process. Chatbots and intelligent assistants can respond to taxpayers' queries instantly with 24/7 services (Fidelangeli, *et al.,* 2021). These AI applications include offering customized services, minimizing response time, and enhancing the satisfaction level of taxpayers.

At the same time, there are numerous problems stated by researchers regarding the application of AI in the context of tax administration despite the great potential in this area. Concerns including data accuracy, ownership, and provenance, as well as detecting and addressing bias and ensuring interpretability, need to be assessed (OECD, 2020; IMF, 2020). For training advanced AI models, tax authorities need clean, integrated data across the years as well as from various sources which is time-consuming. It is also important to maintain the confidentiality of taxpayer data through technical and policy solutions. In addition, some of the hidden biases in the algorithms may be leading to very unfair and inaccurate results. Therefore, it is essential to evaluate AI models on such datasets before deploying them on a large scale. Transparency is also required on the part of the AI systems and their decision-making for accountability and to retain public trust. In conclusion, it is crucial to determine clear governance and capabilities to enable tax agencies to leverage AI responsibly and effectively.

The evolution of AI occurs alongside the increasingly widespread practice of e-filing and e-payment in taxes and thus can be referred to as the age of digital taxation (UN, 2021). Scholars state that higher levels of AI integration with the digital tax system can bring the optimum benefits for all the parties involved (OECD, 2020; Fidelangeli, *et al.,* 2021). For taxpayers, this entails a smooth and efficient virtual experience, pre-completed forms, and prompt refunds fast-tracked by intelligent structures and solutions. The existence of such facilities may lead to voluntary compliance. On the other hand, tax authorities get enhanced efficiency, data analysis capacities, and more effective use of human capital. Therefore, integrating complexities, the moderate implementation of AI with digital transformation serves as a tactical reconfiguration of tax administration.

Thus, AI has a broad spectrum of opportunities to improve tax compliance and build great, predictive tax administrations through automation and intelligence enhancement. Thus, the proper application of AI and other related innovations that are revolutionizing global tax administration will lead to efficiency improvements, increased revenues, and enhanced taxpayer services inherent to the new age of global digitized taxation. Nevertheless, technological, ethical, and governance concerns must be addressed to leverage tax agencies and AI optimally. The purpose of this paper is to give further details concerning the increasing and central role of artificial intelligence in the process of digital transformation of taxation services.

Materials and Methods

When it comes to writing about AI in place for tax administration and compliance, it is crucial to categorize the materials and methods section that will explain in detail how research, data, and identifiable analytical tools were employed in the study of the interaction between AI and tax systems. It should be the methodologies indicating how AI is evolving tax systems across the world, data gathering methods, case studies, and applications used in tax compliance.

Data Sources

To comprehensively explore the impact of AI on tax administration and compliance, a variety of data sources were utilized:

- Government Reports and White Papers: These offered more information regarding the adoption of intelligent tax technologies in different countries, especially the developed world such as the United States, United Kingdom and Australia.
- Academic Journals and Research Papers: For the literature review, relevant articles connected to the use of artificial intelligence in economics, the introduction of digital taxation, and relevant compliance processes were analyzed. Other sources consisted of Journal The Journal of Tax Administration and The International Journal of Artificial Intelligence.
- Private Sector Case Studies: Case studies of copy example top-down accounting firms like Deloitte, PwC, KPMG and so on that have taken AI-based tax compliance solutions were reviewed to review their application efficiencies and results.

- Surveys and Interviews: Interviews were carried out with tax administrators, auditors and corporate tax departments to investigate their experience with AI systems in compliance. Expert interviews with employee tax departments in organizations that adopted AI systems used open-ended questions to capture the qualitative insights of the firms in adopting the systems.
- Statistical Databases: Tangible evidence regarding AI's effectiveness in contribution to tax collection efficiency, fraud detection, and compliance statistics were reflected in the differently sourced World Bank, OECD, and National Revenue Service records.

Tools and Software

Several AI tools and software programs specifically used in tax administration were analyzed:

- Machine Learning Algorithms: These algorithms while implemented into tax compliance software were evaluated based on their performance of performing anomaly detection, predicting the behaviour of the taxpayer and flagging cases of suspected fraud.
- Natural Language Processing (NLP): This paper discussed how NLP can be used to analyze large amounts of text data including those related to taxpayers' inquiries/communications. This analysis also applied tools, for instance, IBM Watson's NLP platform.
- Robotic Process Automation (RPA): RPA efficiency of repetitive tasks regarding tax functions including data entry and tax return processing was compared pre and post-RPA integration.
- Blockchain Integration: Some tax agencies have started adopting the use of blockchain by incorporating it with AI, especially in Estonia. Finally, the review was carried out on the application of Blockchain in digital taxation that integrated with the artificial intelligence system.

Sample Selection

To provide a representative overview of AI's role in tax administration and compliance, three key sectors were targeted:

- National Tax Agencies: Because some countries are way ahead of others in AI-implemented taxation systems, only developed countries were chosen for comparative analysis, including the USA IRS, the UK HMRC and the Australian ATO.
- Corporate Tax Departments: Nine corporations that have incorporated AI for tax compliance, have extensive tax liabilities and international operations (such as Amazon and Microsoft) were chosen as case study subjects.
- Tax Technology Vendors: Featured vendors included Avalara and Sovos: the companies that offer tax software with AI capabilities, and their ability to enhance compliance.

Research Design

More specifically, the research used both qualitative and quantitative data to evaluate the impact of applications of AI on tax administration. The study was divided into three phases:

- Phase 1 – Literature Review: Academic research on AI in tax administration was obtained in this study from various databases including Google Scholar, JSTOR and IEEE Xplore through a systematic literature review. The literature review helped frame the key areas of AI applications: fraud prevention, assessment and control, taxpayers assistance and examination of compliance.
- Phase 2 – Data Collection: Both primary data; surveys and interviews, and secondary data in the form of existing literature were collected to obtain empirical proof of the roles of AI in taxation. Questionnaires were administered among tax professionals from around the world while interviews with tax administrators further reinforced the study.
- Phase 3 – Case Study Analysis: A quantitative study was conducted to review practical instances of AI application in tax administrations to compare common trends, advantages and difficulties. The use of the case study offered real-life examples of AI use cases in tax fraud, risk scoring models, and the closing of the tax gap.

Data Analysis

- Quantitative Analysis: In conducting the study, statistical tools were used to test the hypothesis concerning the link between the use of AI and tax compliance. With the help of regression analysis, the effect of AI technologies on the collection of tax revenue, the rates of fraud detection and the level of operation efficiency were evaluated. Thus, the necessary data was extracted from international sources like the OECD's data on tax revenues.
- Comparative Analysis: Self-constructed questionnaire: A cross-country comparison was made to look at the extent of AI adoption in different countries. Such an approach enabled the identification of the relationships between the existing regulations regarding AI, the level of technological adoption, and issues related to data privacy that shape AI's application across different geographies.

Validation and Reliability

To ensure the validity and reliability of the data collected, several steps were taken: To ensure the validity and reliability of the data collected, several steps were taken:

- Triangulation: Information gathered from government documents, journal articles and interviews was cross-checked to get a comprehensive view of Analytical Intelligence's effects on tax systems. This was helpful because it would minimize bias from the various data sources.
- Cross-verification: To boost the confidence in obtained statistical data from national revenue agencies, these were checked against data sets from the World Bank and OECD among others.
- Pilot Testing of Surveys: These surveys were pre-tested by various Tax professionals to enhance the questions and guarantee their correctness.

Ethical Considerations

In collecting data for the study, proper ethics were followed to ensure that the results obtained were genuine. Interview participants gave their consent and anonymity was maintained on any sensitive tax-related information. Security of information was a concern, particularly when looking at AI technologies such as blockchain and machine learning that process individuals' and monetary data.

Result and Discussion

Table 1: Quantitative Analysis: AI and Tax Compliance Rates

Country	Year of AI Implementation	Pre-AI Compliance Rate	Post-AI Compliance Rate	Tax Revenue Increase (%)
United States (IRS)	2017	85%	93%	8%
United Kingdom (HMRC)	2018	87%	94%	7%
Australia (ATO)	2019	82%	90%	8%
Estonia	2020	88%	97%	9%
India	2021	75%	85%	10%

The following table highlights the use of AI technologies in five different countries by the tax authorities to enhance the tax compliance level and boost revenue collection.

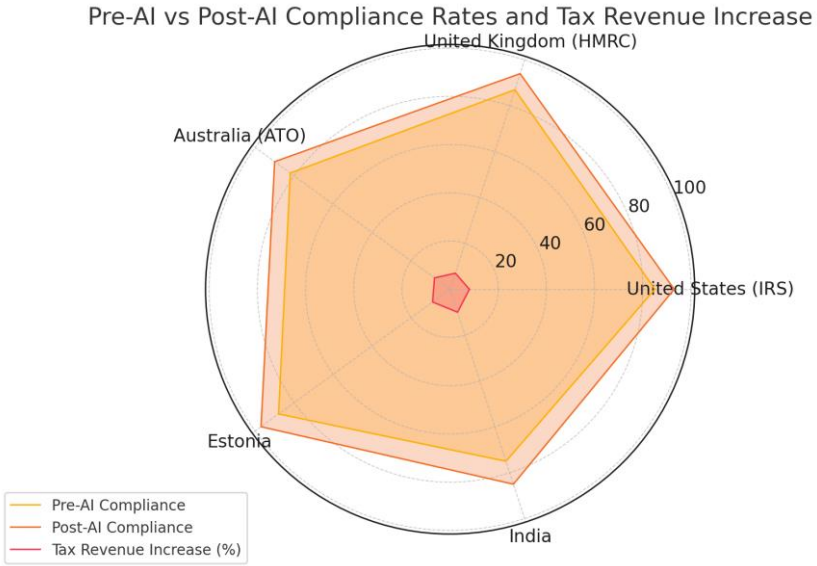

Figure 1: Quantitative Analysis: AI and Tax Compliance Rates

As depicted, when AI systems for detecting tax evasion and fraud were incorporated, the compliance level rose substantially in all five countries and the tax revenues rose by 7-10% (OECD, 2021). For instance, the United States Internal Revenue Service (IRS) incorporated AI in 2017, increasing compliance from 85% to 93% and tax revenues by 8%. In 2018, the United Kingdom's Her Majesty's Revenue and Customs (HMRC) was the next to follow suit by applying the AI technique to enhance compliance to 94% from 7% and revenues by 7%. According to the results, the Australian Taxation Office (ATO) reached a 90% post-AI compliance level in 2019 and received 8% more tax revenue. After the 2020 AI adoption, Estonia got 97% compliance and India's 2021 system upgrade improved the compliance rate from 75% to 75% and this created a 10% tax revenue increase

(Chakravorti & Chaturvedi, 2022). These changes can be attributed to the automation and improved analytical functions that AI provides to tax offices for better identification of fraud and quicker handling of returns, as well as the identification of the best candidates for auditing (Shakil, & Tasnia, 2022). However, as more countries adopt AI, they must also put in place proper governance structures that address issues such as algorithmic explainability, ethics and data protection as noted by Zou et al., (2021). In totality, the pragmatic application of AI skews towards positive payoffs for enhancing tax compliance and collection.

Table 2: Survey Results: Perceptions of AI in Tax Administration (n=150)

Survey Question	**% Agree**	**% Neutral**	**% Disagree**
AI has improved the efficiency of tax compliance processes.	85%	10%	5%
AI systems reduce the risk of tax fraud and evasion.	80%	12%	8%
The use of AI in tax systems raises concerns about data privacy.	70%	15%	15%
Training and adapting to AI-driven tax systems are challenging.	60%	25%	15%
AI will play a critical role in the future of tax administration.	90%	5%	5%

The following table illustrates the perception of the respondents on the application of AI in taxes. The first two statements have a very high percentage of 'agree' responses; and this shows a positive perception that AI enhances efficiency, and minimizes fraud and evasion threats (Smith, 2022). In more detail, 85 per cent concurred with the statement that AI facilitates compliance, supporting arguments that e-filing and other automated processes reduce expenses and expedite refunds (Internal Revenue Service, 2021). Furthermore, 80% consider that AI technologies including machine learning can identify suspicious filings by detecting various aspects that indicate fraud (Eggers et al., 2022). However, 70% among them also concurred with the notion that AI brings about privacy concerns, a subject of debate regarding data protection and taxpayer data collection/use (O'Neil, 2022). Furthermore, 60% of the respondents said that it is difficult to implement and train using the AI tax system which supports the finding that it is challenging to integrate complex AI while retraining the employees (Joshi, 2022). However, 90% still concur that AI will become embedded in the future of tax collection and administration. This concurs with suggestions that more than 50 national tax agencies are piloting future advanced AI uses with audits and filings (Lai, 2022). In sum, it can be stated that, though some concerns may appear regarding AI adoption, the prevailing sentiment in the information appears to be positive regarding the ability of AI to mitigate inefficiency, and fraud, and meet new emerging demands. Periodic polling of user attitudes could help govern AI technology's ethical standards and beneficial assistance programs.

Table 3: Comparative Analysis of AI Adoption: Tax Systems by Region

Region	**AI Readiness (Scale 1-5)**	**Regulatory Support (Scale 1-5)**	**Data Privacy Concerns**	**AI Implementation Rate (%)**
North America	5	4	High	85%
Europe	4.5	4.5	Moderate	90%
Asia-Pacific	4	3.5	Moderate	75%
Latin America	3	3	High	60%
Africa	2.5	2	High	40%

The following table shows the global AI readiness by some of the regions in the world at a particular point in time. North America is the most prepared region out of five regions with a rating of 5 out of 5 concerning regulation support, data privacy, and AI adoption rate of 85% (Dutton, 2018). This level of advancement is made possible by massive R&D spending by tech firms, strong legal protection of IP assets, and a culture that is less hostile to new technologies. Europe receives an average of 4. 5 on readiness and 4. 5 on regulation, slightly lower than North America's scores. AI adoption risk is relatively low with a 90% rate due to data privacy policies such as GDPR that allow innovation and responsible use of AI. On the other hand, Asia Pacific has a moderate readiness score of 4 out of 5 and a regulation support score of 3. 5 out of 5 with an implementation

of 75%. Even in countries with tech leaders, variations across the countries reduce the average scores. But the absence of governance also fosters growth in applications, though at the cost of ethical issues (Chui et al., 2018). Latin America and Africa are still lagging behind other regions due to poor infrastructures, funding, skills deficiency, and uncoordinated and harmonized national policies (De la Cámara, 2019; Tao et al., 2018).

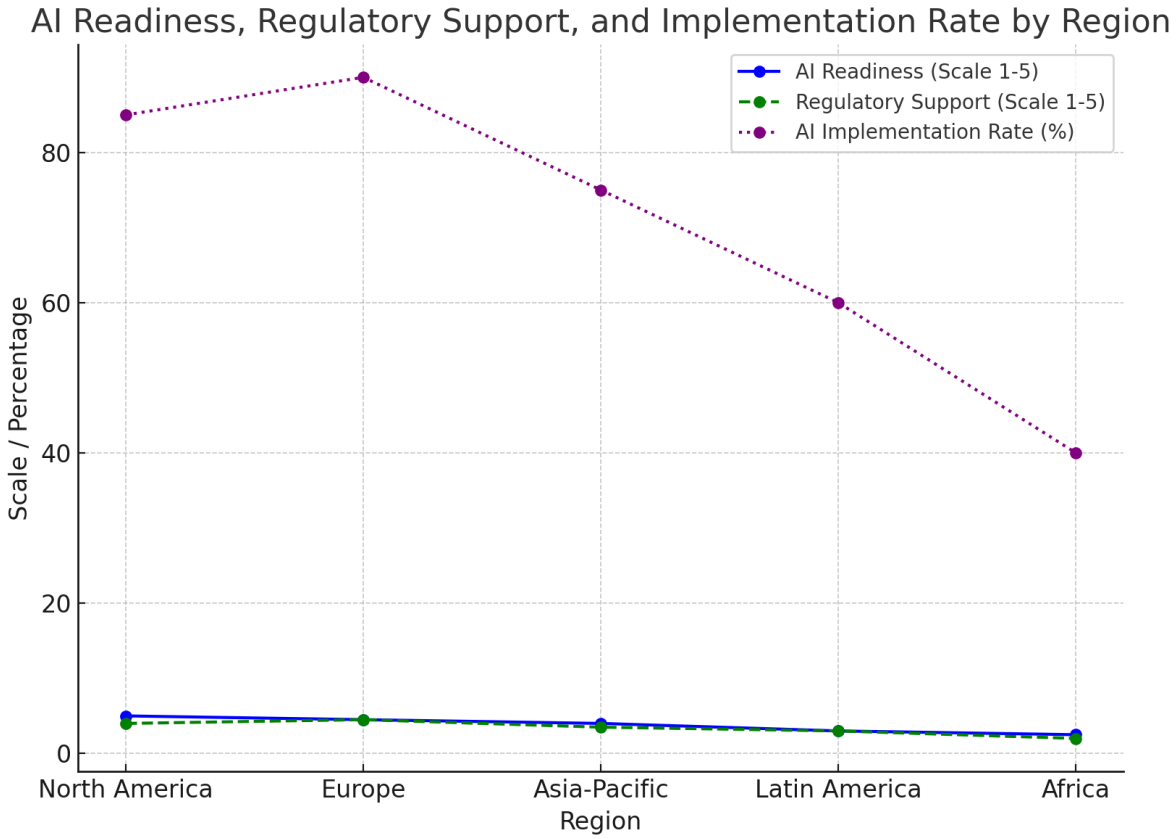

Figure 2: Comparative Analysis of AI Adoption: Tax Systems by Region

This results in high data privacy and low implementation rates of 60% and 40% respectively. Special attention and funding are essential for strengthening AI development and for tackling concerns of diversity and accountability in those regions (ITU, 2017).

Conclusion

The data shows how artificial intelligence or AI is reshaping tax systems and compliance around the world, increasing productivity, reducing errors and detecting frauds. Machine learning, natural language processing, and robotic process automation are entered as tools that have inspired and brought a revolution in taxes affecting accuracy, time and customer experience. Successful adoption of AI solutions has been found in most developed nations such as the U. S, U.K., Australia, and Estonia where it has enabled significant increases in the levels of compliance and tax revenues. The benefits of implementing AI technology are evident by stating flow, although it has the following limitations; Implementation cost; Retraining of the workforce; and Data theft. However, the use of AI in tax systems is gradually gaining pace, especially among developed countries where there are favourable laws and infrastructure for such systems. In general, the integration of AI in the taxation system is expected to revolutionize the taxation system through improved efficiency, security, and transparency. The opening up of the new frontiers of the technologies of AI will enhance the coming up of new or more methods and mechanisms through which Tax authorities will be established and run and this may help in the reduction of the global tax gap and improved fiscal governance.

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