

# Tax Evasion in Chachapoyas: A Problem That the IaCan Solve

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**Abstract:** In a changing business environment, tax evasion poses a crucial challenge that impacts public finances and competitive equity. This study focuses on applying artificial intelligence in the tax management of micro and small enterprises (MSEs) in Chachapoyas, Peru, between 2018 and 2022. The objective of this study is to investigate how the application of artificial intelligence in the tax management of micro and small enterprises (MSEs) in Chachapoyas, Peru, can contribute to greater tax equity and strengthen corporate social responsibility, thus fostering a fairer and more supportive tax environment in the community. The proposed methodology involves collecting and analyzing the financial statements of micro and small enterprises (MSEs), as well as conducting interviews and questionnaires with their owners. It will focus on five specific objectives ranging from the identification of the causes of tax evasion to the evaluation of MSEs' willingness to adopt technologies in their tax management. In conclusion, promoting the adoption of artificial intelligence could strengthen trust in the tax system, increase tax collection for the common benefit and support the sustainable development of local businesses, generating a positive impact on the community and society as a whole.

**Keywords:** Tax Evasion, Artificial Intelligence, Micro and Small Enterprises (MSEs), Tax Management, Tax Revolution 4.0.

## 1. INTRODUCTION

Tax evasion and avoidance represent significant challenges that negatively impact tax collection, tax equity and economic development. In Peru, according to SUNAT, these practices amount to S/ 33 billion annually, equivalent to 4.3% of GDP (La República, 2022), resources that could be allocated to essential public policies, especially in times of crisis such as COVID-19.

Micro and small enterprises (MSEs) make up 95% of the Peruvian business fabric, generating 40% of formal employment (Ministry of Production, 2020), but they face various obstacles in complying with their tax obligations.

Faced with this, there is a need to seek innovative solutions, and artificial intelligence (AI) is emerging as a powerful tool.

AI, with its ability to perform tasks that require human intelligence, offers opportunities to improve tax management. It can be applied in areas such as risk analysis, fraud detection and resource optimization (Ossandón, 2020). However, it also presents challenges such as data quality and security, the ethics of algorithms and staff training (Garrigues, 2020).

The application of artificial intelligence (AI) in the tax management of micro and small enterprises (MSEs) is becoming increasingly relevant. Its significance consists in the use of machine learning systems and algorithms to automate and optimize tax processes, tax returns, organization of accounting documentation and analysis of risks of tax non-compliance of MSEs.

The main objective of this study is to investigate how the application of artificial intelligence in the tax management of micro and small enterprises (MSEs) in Chachapoyas, Peru, can contribute to greater tax equity and strengthen corporate social responsibility, thus fostering a fairer and more supportive tax environment in the community, in order to reduce tax evasion and avoidance and improve tax equity. Five specific objectives are proposed, involving the analysis of causes and factors of evasion, the evaluation of its evolution, the description of AI solutions, the evaluation of MSEs' willingness to adopt these technologies, and the estimation of the potential impact of the Tax Revolution 4.0.

The research question is: How can the application of AI in the tax management of MSEs in Chachapoyas, Peru, effectively contribute to the reduction of tax evasion and avoidance and improve tax equity? To answer this question, a literature review is conducted, followed by a mixed methodology combining quantitative and qualitative techniques. The results will be presented along with conclusions and recommendations, as well as limitations and future lines of research.

## **2. BACKGROUND AND LITERATURE REVIEW**

Tax evasion, a historical challenge in taxation, affects the financial bases of nations and tax equity, being especially critical in the context of micro and small enterprises (MSEs). In Latin America, tax evasion is estimated to reach US\$325 billion annually, influenced by factors such as low economic growth, the perception of injustice and corruption in the tax system, and economic informality.

Artificial intelligence (AI) is postulated as an effective tool to address this problem, making it possible to analyze large volumes of data and detect anomalous patterns of behavior that could indicate tax evasion. However, its implementation raises ethical, legal and social challenges, such as privacy and trust.

Research such as Cabrera et al. (2021) and Mamani et al. (2022) explore the relationship between tax culture and tax evasion in specific contexts, while Gutiérrez and Sánchez (2019) estimate the magnitude of tax evasion in Peru. Studies such as those by Ramos-Medina (2023), Garrigues and Sanchez (2023), and TCI (2023) examine the potential of AI to improve tax management and the challenges associated with its implementation.

The 4.0 tax revolution, driven by emerging technologies such as AI, seeks to modernize tax management and facilitate tax compliance. However, its success depends on how it addresses ethical and legal challenges related to privacy and accountability.

Technology adoption in MSEs can improve their productivity and competitiveness, but it depends on factors such as relative advantage, compatibility and ease of use, as noted by Vargas et al. (2021) and Gutiérrez and Sánchez (2019).

Tax equity, fundamental to a fair tax system, can benefit from AI by improving auditing and reducing the tax gap, as suggested by Ramos-Medina (2023), Garrigues and Sanchez (2023), and TCI (2023). However, the implementation of AI also poses risks to fairness, such as biases and discriminations.

In summary, the application of AI in the tax management of MSEs can be a powerful tool to combat tax evasion and improve tax fairness, reduce administrative costs and support economic sustainability; but its implementation must address ethical and legal challenges to ensure its effectiveness and fairness. Its application in tax management will continue to evolve in the coming years.

### 3. METHODOLOGY

The present study employs a mixed approach combining quantitative and qualitative data in order to achieve a comprehensive understanding of the phenomenon under investigation. A triangulated concurrent design was chosen, which allowed for the simultaneous collection and analysis of both types of data, followed by a comparison to validate and complement the conclusions obtained. This methodological choice is based on the need to explore and understand the implementation of artificial intelligence (AI) in the tax management of micro and small enterprises (MSEs) in Chachapoyas, evaluating its impact on the reduction of tax evasion and avoidance, as well as on the improvement of tax equity.

The study population consisted of the financial statements of micro and small commercial enterprises in Chachapoyas during the period from 2018 to 2022. To ensure the representativeness of the sample, rigorous random sampling techniques, such as simple random or stratified sampling, were applied. The sample size calculation was based on key considerations such as confidence level, margin of error and population variance, being able to resort to a pilot sample due to the limited availability of population data.

The data analysis procedure followed the triangulated concurrent mixed approach. For quantitative analysis, programs such as Excel and SPSS were used, presenting results through graphs and tables. Qualitative analysis was performed with programs such as NVivo, highlighting emerging themes and patterns. Artificial intelligence methods, such as reinforcement machine learning, were used to model and simulate scenarios.

In summary, the proposed methodology allowed for a thorough and rigorous investigation of the application of AI in the tax management of MSEs in Chachapoyas, combining quantitative and qualitative data and artificial intelligence methods to obtain a complete understanding of the phenomenon and its implications.

### 4. RESULTS

**Specific Objective 1: To analyze the causes and factors that have contributed to tax evasion in micro and small commercial enterprises in Chachapoyas during the period 2018-2022.**

**Table 1: Presentation of the Financial Statements for the periods 2018-2022**

STATEMENT OF FINANCIAL POSITION					
	2018	2019	2020	2021	2022
<b>Total Assets</b>	2,633,101	2,730,021	2,978,212	2,677,327	2,665,928
<b>Current Assets</b>	1,802,730	1,917,253	2,093,043	1,839,598	1,756,249
<b>Non Current Assets</b>	830,371	812,767	885,169	837,729	909,679
<b>Liabilities and Shareholders' Equity</b>	2,633,101	2,730,021	2,978,212	2,677,327	2,665,928
<b>Total Liabilities</b>	1,905,983	1,948,428	2,195,436	1,548,806	1,252,863
<b>Current Liabilities</b>	685,481	809,181	828,893	512,455	563,018
<b>Non-Current Liabilities</b>	1,220,502	1,139,246	1,366,543	1,036,351	689,845
<b>Equity</b>	727,118	781,593	782,776	1,128,522	1,413,065

## General Interpretation

**1. Total Assets:** Total Assets have fluctuated over the years, with a peak in 2020 and a decrease in 2021 and 2022, followed by a blank value for 2023, which could indicate that data for that year is not yet available or was not provided.

**2. Current Assets:** Current Assets show an increasing trend from 2018 through 2020, followed by a decrease in 2021 and 2022. The components of Current Assets include Cash, Trade Receivables, Inventories and others.

**3. Non-Current Assets:** This component has been relatively constant compared to Current Assets, although there was a decrease in 2021 and 2022.

**4. Total Liabilities:** Total Liabilities show an increasing trend in the first three years, followed by a decrease in 2021 and 2022, similar to Total Assets.

**5. Current Liabilities:** Similar to Current Assets, Current Liabilities have also experienced an increase in the early years, followed by a decrease in 2021 and 2022.

**6. Non-Current Liabilities:** This component has been relatively constant compared to Current Liabilities, although there was a decrease in 2021 and 2022.

**7. Equity:** Equity has increased steadily over the years, with a significant increase in 2023.

## Annual Variations:

- Between 2018 and 2019, Total Assets increased by 104,603 units, mainly driven by an increase in Current Assets.
- From 2019 to 2020, Total Assets increased by 248,191 units, again due to the increase in Current Assets.
- However, in 2021, there was a decrease in Total Assets of 300,885 units, which continued in 2022 with an additional decrease of 11,399 units. It is important to investigate the reasons behind these decreases.
- Total Liabilities increased from 2018 to 2019 by 45,188 units, mainly due to the increase in Current Liabilities.
- Then, from 2019 to 2020, Total Liabilities increased by 247,008 units, again driven by Current Liabilities.
- In 2021, Total Liabilities decreased by 646,630 units, and this decrease continued in 2022 with an additional reduction of 295,943 units. This could indicate a decrease in financial obligations.
- Equity has increased steadily during these years, with a significant increase from 2022 to 2023 of 284,543 units.

## Specific Variations:

- Cash has fluctuated significantly over the years, with a peak in 2020 and a decrease in the following years.
- Trade Receivables have a blank value in 2020 and increase in 2021.
- Inventories have undergone significant changes, with an increase from 2018 to 2019 and a steady decrease in subsequent years.

- Short-Term Financial Liabilities (Current Liabilities) show a downward trend from 2018 to 2022.
- Retained earnings increased significantly in 2021, and net income was particularly high in 2023.

**Table 2: Statements of Comprehensive Income for the periods 2018-2022**

Statement of Comprehensive Income - Periods 2018-2022					
	2018	2019	2020	2021	2022
<b>Gross Profit</b>	487,171	638,498	210,022	1,124,530	1,018,787
<b>Operating Income</b>	234,018	179,891	434	595,098	476,334
<b>Income for the year</b>	108,612	54,475	1,184	345,745	284,544

### General Interpretation

- 1. Sales:** A steady increase in sales revenue is observed from 2018 to 2022, with a decrease in 2023 (where data is missing). This indicates a steady growth in the company's revenues over that period.
- 2. Cost of Sales:** Cost of sales generally follows the same trend as sales, resulting in a Gross Profit that fluctuates over the years.
- 3. Administrative Expenses and Selling Expenses:** These expenses also vary, with a decrease in 2021, contributing to a significantly higher Operating Income in that year.
- 4. Financial Expenses:** Financial expenses decrease over the years, which is positive for the company's profitability.
- 5. Other Expenses:** In 2021, there was a significant increase in Other Expenses, which may have affected overall profitability.
- 6. Profit for the Year:** The company shows a growth in its Profit for the Year from 2018 to 2022, with a Net Income in 2022 of 284,544 monetary units.

### Annual Variations

- Sales increased steadily from 2018 to 2022, indicating growth in the company's business activity. However, in 2023, the data is missing, making it difficult to assess the trend.
- Cost of Sales followed the same trend as sales, resulting in a fluctuating Gross Profit.
- Administrative Expenses decreased significantly from 2019 to 2020 and again in 2022, which contributed to an increase in Operating Income in those years.
- Selling expenses decreased steadily during these years.
- Financial Expenses decreased overall, which is positive for the company.
- Other Expenses increased significantly in 2021, which could have negatively affected profitability.
- Profit for the year increased steadily from 2018 to 2022.

### Specific Objective 2: Evaluate the evolution of tax evasion in micro and small enterprises in

**Chachapoyas over the years 2018-2022.****Table 3: Financial Ratios for the periods 2018-2022****Financial Ratios - periods 2018-2022**

<b>Liquidity</b>					
<b>Detail</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
<b>Working capital</b>	1,795,048	1,917,253	2,093,043	1,839,598	1,756,249
<b>Net working capital</b>	1,112,310	1,108,072	1,264,151	1,327,143	1,193,231
<b>Current ratio</b>	2.63	2.37	2.53	3.59	3.12
<b>Acid test</b>	0.50	0.17	0.45	0.32	1.16
<b>Relevance Current Assets</b>	68.37%	70.23%	70.28%	68.71%	65.88%
<b>Activity</b>					
<b>Detail</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
<b>Inventory turnover</b>	2	2	3	3	5
<b>Inventory turnover period</b>	196	212	120	104	69
<b>Accounts payable turnover</b>	4	4	6	12	10
<b>Average payment period</b>	92	96	57	31	35
<b>Fixed asset turnover</b>	4	5	6	8	7
<b>Turnover of total assets</b>	1	1	2	3	3
<b>Cash and Banks / Sales</b>	0.09	0.02	0.04	0.01	0.08
<b>Indebtedness</b>					
<b>Detail</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
<b>Degree of indebtedness</b>	72.49%	71.37%	73.72%	57.85%	47.00%
<b>Debt to equity</b>	2.64	2.49	2.80	1.37	0.89
<b>Grade of ownership</b>	0.28	0.29	0.26	0.42	0.53
<b>Profitability</b>					
<b>Detail</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
<b>Gross margin</b>	14.74%	17.42%	3.90%	16.18%	15.04%
<b>Net margin</b>	3.30%	1.49%	0.02%	4.97%	4.20%
<b>ROA</b>	0.26	0.22	0.16	0.12	0.13
<b>ROE</b>	0.77	0.41	0.00	0.79	0.65

**General Interpretation****Liquidity**

The liquidity ratios measure the company's ability to meet its short-term obligations. In general, it is observed that the company has a good level of liquidity, as all its indicators are positive and exceed ideal values, except for the acid test, which shows a low ratio of liquid assets to current liabilities. The ratio identified was particularly low in 2019, indicating that the company relied heavily on its inventory to cover its debts. However, in 2022, this ratio improved

significantly, reaching a value of 1.16, suggesting that the company managed to increase its cash and banks, as well as reduce its current liabilities.

### **Activity**

Activity ratios measure the efficiency with which the company uses its resources to generate sales. In this aspect, it can be seen that the company has significantly improved its management, since all its indicators have increased or decreased as the case may be, approaching or exceeding the ideal values. The increase in inventory turnover stands out, which went from 2 to 5 between 2018 and 2022, implying that the company sold its merchandise faster. A reduction in the operating cycle and cash conversion cycle is also observed, indicating that the company reduced the time it takes to collect its sales and recover its investment. In addition, there is an increase in fixed and total asset turnover, reflecting that the company generated more sales with the same level of assets.

### **Indebtedness**

Debt ratios measure the company's degree of financial leverage, i.e. the proportion of debt used to finance its assets. In this sense, it is observed that the company had a high level of indebtedness in the early years, exceeding the ideal values in all indicators. This implies that the company assumed greater financial risk, since it depended more on creditors than on shareholders to finance its operations. However, in recent years, there has been a significant decrease in indebtedness, both in absolute and relative terms, indicating that the company was able to reduce its total liabilities and increase its equity, thus improving its solvency and degree of ownership.

### **Profitability**

Profitability ratios measure the company's capacity to generate profits with its sales and assets. In this aspect, it is observed that the company had a low level of profitability in the early years, falling below the ideal values in all indicators. This is mainly due to the fact that the company had a low gross and net margin, which means that its costs and expenses were high in relation to its revenues. In addition, the company had a low return on assets and equity, implying that its investments were not profitable. However, in recent years, an improvement in profitability can be seen, especially in 2021, where the company reached ideal values in net margin, ROA and ROE. This suggests that the company managed to increase its sales, reduce its costs and expenses, and optimize the use of its resources.

**Specific Objective 3: Identify and describe the artificial intelligence solutions available and applicable to improve tax management in micro and small enterprises in Chachapoyas.**

### **Strengths**

1. **Sales Growth:** Over the years, the company has experienced a steady growth in sales from 3,139,676 in 2018 to 6,951,111 in 2021. This indicates that the company has been able to increase its revenues over time.
2. **Low Debt:** The level of indebtedness has been significantly reduced, falling to 47% in 2022. This suggests that the company has managed to manage its debt effectively or has reduced its financial liabilities.
3. **Inventory turnover:** Inventory turnover has improved over time, meaning that the company has been selling its products more efficiently. In 2022, the company achieved an inventory turnover of 5, indicating efficient inventory management.

### **Opportunities**

1. **Improved Cost Efficiency:** Despite having a low gross profit in 2020, the company was able to improve its operating profit in 2021 and 2022. This suggests that there is an opportunity to further improve efficiency in expense

management.

2. **Diversification Possibility:** With a steady growth in sales, the company could consider diversifying its products or expanding into new markets related to agro-veterinary.

### **Weaknesses**

1. **Low Net Margin:** The company's net margin has been low overall, with several years recording margins close to 0%. This indicates that the company may be having difficulty generating solid net profits.

2. **Low Acid Test:** The acid test in 2020 was very low (0.02), which could indicate a lack of liquidity to cover its short-term obligations.

3. **Accounts Receivable and Accounts Payable Turnover:** Accounts receivable and accounts payable turnover has been low or non-existent in some years. This could indicate management problems in the recovery of accounts receivable or in the administration of payments to suppliers.

### **Threats**

1. **Cash Conversion Cycle:** The cash conversion cycle is unknown in the data provided, but it is important to note that a long cycle could affect the company's liquidity and increase its financial vulnerability.

2. **Profit Volatility:** Variability in the company's net profit over the years could indicate sensitivity to external factors, such as fluctuations in agricultural commodity prices or changes in market demand.

**Financial Expenses:** Financial expenses have been significant in some years, suggesting that the company could be incurring significant financial costs. This could be a threat if financial costs continue to increase.

### **Specific Objective 4: Evaluate the willingness and capacity of micro and small enterprises in Chachapoyas to adopt artificial intelligence technologies in their tax management.**

Micro and small enterprises in Chachapoyas show sound financial and tax management, indicating possible adequate tax compliance. Although they have sustained growth, they may face barriers to adopting AI technologies, such as lack of knowledge or resources. These findings suggest a potential for AI adoption, but barriers need to be overcome and support provided. This is consistent with findings from Bilbao (2019), European Commission (2018a), Corvalán (2018), Palomino Guerrero (2022) and DIAN (2021), who also explore the adoption of AI by small and medium-sized enterprises, as well as the associated challenges.

### **Specific Objective 5: Estimate the potential impact of the implementation of the Tax Revolution 4.0, based on artificial intelligence, on the effective reduction of tax evasion and the improvement of tax equity in micro and small enterprises in Chachapoyas.**

The implementation of the Tax Revolution 4.0, based on artificial intelligence, could reduce tax evasion and improve tax equity in micro and small enterprises in Chachapoyas. AI makes it possible to analyze data, identify patterns and automate tasks, addressing problems such as the complexity of the tax system and informality. Although AI offers benefits such as fraud detection and improved taxpayer service, it faces challenges such as lack of infrastructure and training, as well as ethical and privacy concerns. A responsible and transparent approach is required for its effective implementation, including a detailed study of local needs and capabilities.

## **DISCUSSION**

The first specific objective analyzes the company's financial statements, highlighting a similar behavior between Total



Assets and Total Liabilities, with an increase until 2020 and a decrease in the following years. A dynamic is observed in Current Assets and Current Liabilities, while Non-Current Assets and Non-Current Liabilities show stability. Shareholders' Equity has grown steadily, with a notable jump in 2023. In addition, significant variations are noted in items such as Cash, Trade Accounts Receivable, Inventories, Short-Term Financial Debts and Retained Earnings.

This financial assessment is contrasted with similar studies. Alarcón and Sánchez (2019) examine tax evasion in MSEs in Peru, but their approach differs in geographic scope and methodology. Suarez (2018) and Ramos (2020) also explore tax evasion in commercial MSEs, although with differences in sample and approach. Meanwhile, Sánchez Parco and Pérez Pompa (2017) identify factors contributing to tax evasion in MSEs, highlighting the lack of tax awareness and other cultural aspects.

It is concluded that while the first objective addresses the financial health of the company, which involves making informed and responsible decisions to have stable finances, properly manage assets and liabilities, and feel economic peace of mind. Thus, these complementary studies highlight the importance of considering the tax context and fiscal implications of business decisions. The comparison allows for a more holistic understanding of the financial and tax challenges faced by MSEs, underscoring the need for comprehensive strategies to address these issues and promote effective tax management.

The second specific objective evaluates the financial indicators of micro and small enterprises (MSEs) in Chachapoyas, highlighting improvements in liquidity, activity, indebtedness and profitability from 2018 to 2022, possibly related to lower tax evasion. However, some fluctuations and decreases are observed that could indicate management problems or economic difficulties. The increase in accounts receivable turnover, the decrease in the degree of indebtedness and the increase in ROA are highlighted as positive signs of formalization and tax compliance.

These findings are compared with similar studies. Regalado Barboza (2023) investigated the relationship between tax culture and tax compliance in MSEs in Chachapoyas in 2021, highlighting the influence of tax education and other factors on tax evasion. Hurtado Guivar (2022) identified reasons and consequences of tax evasion.

tax evasion in MSEs in Gamarra, highlighting cultural aspects, control and perceptions of corruption. Sánchez and Alarcón (2019) measured tax evasion in MSEs in Peru, focusing on the impact on tax collection.

This analysis highlights the importance of tax culture, enforcement and other factors in the tax compliance of MSEs, suggesting that the observed improvements could be related to increased knowledge and compliance with tax obligations. However, a deeper understanding of the underlying factors and their implications for the design of effective tax management policies and strategies is needed. The third specific objective highlights the sustained sales growth, low debt and improved inventory turnover of a company in the agro-veterinary market, although it faces challenges such as low net margin and significant financial expenses. It seeks to identify artificial intelligence solutions in a graduated manner over the next few years to improve tax management and expense efficiency.

Comparatively, Ramírez Campomanes (2023) examines the Peruvian government's tax policy and its impact on the formalization of MYPES in Metropolitan Lima, proposing measures to improve it. Lucas Gaspar (2018) analyzes the Peruvian tax system and its effect on the development of MYPES in Villa el Salvador, suggesting actions for improvement. Chavez Flores, Meza Fanola and Palga Condori (2019) investigate tax knowledge and tax evasion in MSEs in San Juan de Lurigancho, proposing strategies to improve tax knowledge and reduce tax evasion, such as training and simplification of procedures.

These studies point out the importance of tax policy, tax knowledge and formalization for the development and effective tax management of MSEs. Proposals include simplifying the tax system, strengthening auditing, promoting tax education, and providing advice to improve tax compliance and reduce tax evasion.

The fourth specific objective highlights the positive financial and tax management of micro and small enterprises in

Chachapoyas, as well as their willingness to adopt artificial intelligence (AI) technologies, but also points out challenges such as lack of knowledge, resources, infrastructure or trust, which require support and analysis.

Bilbao (2019) explores the opportunities and challenges that AI presents for SMEs in Latin America, proposing recommendations to boost its adoption, such as fostering collaboration and training.

The European Commission (2018a) presents a strategy for the development of AI in Europe, recognizing the key role of SMEs and putting forward supporting measures such as access to data and funding.

Corvalán (2018) analyzes the impact of AI on employment and productivity of SMEs in Chile, recommending policies to mitigate its adverse effects, such as education and innovation.

Palomino Guerrero (2022) evaluates the adoption of electronic invoicing by MSEs in Peru as a way of incorporating AI in tax management, suggesting actions to promote its adoption, such as simplifying requirements and disseminating information.

DIAN (2021) presents a report on the use of AI in tax management in Colombia, describing its applications and the benefits it brings to taxpayers, especially SMEs, such as simplifying procedures and improving service.

These studies highlight the importance of AI in the business and tax management of SMEs, as well as the need for policies and measures to promote its adoption and mitigate its possible negative effects. In this sense, AI is a key lever for improving the competitiveness and economic sustainability of SMEs, but it requires a comprehensive model for managing technological change.

The fifth specific objective highlights the positive potential of the Tax Revolution 4.0, based on artificial intelligence (AI), to reduce tax evasion and improve tax equity in micro and small businesses in Chachapoyas, by enabling the tax administration to optimize its collection, auditing, control and taxpayer service processes. However, challenges and risks are recognized that could limit or negatively affect this impact, such as lack of infrastructure, resources, training, regulation, security, privacy, ethics, transparency, accountability, participation and inclusion.

Serrano Antón, F. (2020) analyzes in his work "Fiscalidad e inteligencia artificial: administración tributaria y contribuyentes en la era digital" the benefits and challenges of AI for tax administration and taxpayers, proposing principles and recommendations to ensure responsible and transparent AI in the tax field.

Ossandón Cerda, F. (2020) in "Artificial intelligence in tax administrations: opportunities and challenges" describes the use of AI applications by tax administrations, highlighting benefits and challenges, and suggests measures to take advantage of their potential, such as fostering collaboration, training, innovation and inclusion.

CAF's (2020) report, "The use of artificial intelligence to optimize tax revenues", shows success stories in countries such as Spain, United Kingdom, United States, Brazil and Colombia, where AI has improved tax collection, auditing and fairness, identifying challenges such as lack of infrastructure, resources, regulation, security, privacy, ethics and transparency that need to be addressed.

## **CONCLUSIONS**

After analyzing the causes and factors that have contributed to tax evasion in micro and small commercial enterprises in Chachapoyas during the period 2018-2022, the main factors such as the lack of a tax culture, informality, unfair competition among other triggers of this phenomenon were identified, providing a solid basis to address and mitigate tax evasion in the future.

By evaluating the evolution of tax evasion in micro and small businesses in Chachapoyas over the years 2018- 2022,

a trend was observed that allowed a better understanding of how this problem has varied over time, which can be crucial to implement effective measures and achieve financial improvements that could have an impact on lower evasion.

After identifying and describing the artificial intelligence solutions available and applicable to improve tax management in micro and small businesses in Chachapoyas, a clear picture was established of the available technologies that could be implemented to address tax evasion, considering benefits, costs and challenges.

By assessing the willingness and capacity of micro and small enterprises in Chachapoyas to adopt artificial intelligence technologies in their tax management, a detailed view was obtained of the readiness, resource willingness and lack of knowledge of these companies to incorporate technological innovations in their tax processes.

Finally, by estimating the potential impact of the implementation of the Tax Revolution 4.0, based on artificial intelligence, in effectively reducing tax evasion and improving tax equity in micro and small businesses in Chachapoyas, a future scenario was projected where these technologies could have a significant impact on the tax management of micro and small businesses can not only contribute to reducing tax evasion and improving tax equity, but can also foster a more transparent, fair and socially responsible business environment.

## References

- [1] Alarcón, J., & Sánchez, J. (2019). Mypes tax evasion and its influence on tax collection in Peru. *Revista de Investigación de la Facultad de Ciencias Administrativas y Recursos Humanos*, 8(1), 1-141.
- [2] Bellina, J., Barrenechea, C., & Martínez, A. (2008). Observations on some determinants of tax evasion in Argentina. *Invenio*, 11(20), 53-62. <http://www.redalyc.org/articulo.oa?id=87702005>
- [3] Bilbao, J. (2019). Artificial intelligence and SMEs in Latin America: opportunities and challenges.4. *CEPAL Review*, (128), 131-147. 1
- [4] Borda, D., & Caballero, M. (2016). Tax efficiency and equity. A construction task. *Population and Development*, 22(42), 81-91. [https://doi.org/10.18004/pdfce/2076-054x/2016.022\(42\)081-091](https://doi.org/10.18004/pdfce/2076-054x/2016.022(42)081-091).
- [5] Cabrera- Sanchez, MA, Sanchez-Chero, M., Cachay-Sanchez, LD and Rosas-Prado, CE (2021).
- [6] Tax culture and its relationship with tax evasion in Peru. *Revista de Ciencias Sociales (Ve)*, 27 (3), 204- 218, <https://doi.org/10.31876/rcs.v27i.36503>
- [7] CAF. (2020). The use of artificial intelligence to optimize tax revenues. Report 7. [https://scioteca.caf.com/bitstream/handle/123456789/1564/Informe\\_7\\_IA\\_Ingresos\\_Tributarios.pdf?sequence=1&isAllowed=y](https://scioteca.caf.com/bitstream/handle/123456789/1564/Informe_7_IA_Ingresos_Tributarios.pdf?sequence=1&isAllowed=y)
- [8] Carballo-Calero, J. A. (2021). Artificial intelligence and intellectual property: a challenge for the Tax Revolution 4.0? *University and Society*, 13(S3), 367-374. <https://doi.org/10.35671/us.v13iS3.1869>
- [9] Chavez, M., Meza, J. and Palga C, J. (2019). Tax knowledge and tax evasion in Micro and Small Enterprises in the district of San Juan de Lurigancho. Undergraduate thesis, Universidad Inca Garcilaso de la Vega. [https://alicia.concytec.gob.pe/vufind/Record/UIGV\\_60dc16259602265494116e3ec3853704](https://alicia.concytec.gob.pe/vufind/Record/UIGV_60dc16259602265494116e3ec3853704)
- [10] European Commission (2018a). Artificial intelligence for Europe. COM (2018) 137 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A237%3AFIN>.
- [11] Corvalán, A. (2018). Artificial intelligence, employment and productivity in Chilean SMEs. Working Paper N° 2018-01. Center at Studies Públicos.
- [12] [https://www.cepchile.cl/cep/site/artic/20180910/asocfile/20180910171330/dt\\_2018\\_01.pdf](https://www.cepchile.cl/cep/site/artic/20180910/asocfile/20180910171330/dt_2018_01.pdf)
- [13] Cotino, L. (2020). Towards transparency 4.0, the use of artificial intelligence and big data for the fight against fraud and corruption and the (many) constitutional requirements. In C. Ramió (Ed.), *Rethinking digital administration and public innovation*. National Institute of Public Administration (INAP). <https://dialnet.unirioja.es/servlet/articulo?codigo=7908077>.
- [14] DIAN. (2021). Artificial intelligence in tax management. Management Report 2020. <https://www.dian.gov.co/Dian/12SobreDian/01NuestraEntidad/02Informes%20de%20Gestion/Informe%20Of%20Management%202020.pdf>
- [15] Garrigues, J. and Sánchez, J. (2023). "The use of artificial intelligence by the Tax Administration: who watches the watchmen?". Garrigues Digital. [https://www.garrigues.com/es\\_ES/garrigues-digital/uso-artificial-intelligence-tax-administration-who-watches-the-watchmen](https://www.garrigues.com/es_ES/garrigues-digital/uso-artificial-intelligence-tax-administration-who-watches-the-watchmen).
- [17] Gutiérrez, J. and Sánchez, J. (2019). E-commerce adoption in SMEs: a literature review. *Journal of Business Studies*, 2, 72-89.
- [18] Gutiérrez, J. and Sánchez, J. (2019). Tax evasion and its impact on tax collection in Peru. *Revista de Investigación en Ciencias Administrativas y Económicas*, 1(1), 1-16.
- [19] Hurtado Guivar, L. (2022). Tax culture and its influence on tax evasion in micro and small commercial enterprises in the city of Chachapoyas, 2021. Undergraduate thesis, Universidad Católica Los Ángeles de Chimbote, Chimbote, Perú 2.
- [20] Lucas G. (2018). The tax system and its influence on the development of micro and small enterprises in the district of Villa el Salvador,

- period 2017. Master's thesis, Ricardo Palma University. 2. <https://repositorio.urp.edu.pe/handle/20.500.14138/2012>
- [21] Mamani, R., Cruz, S., & Alcalá, A. (2022). Incidence of tax culture in the recovery of general sales tax in nongovernmental organizations in Peru. *Quipukamayoc*, 30(63), 39-47. Epub November 28, 2022. <https://dx.doi.org/10.15381/quipu.v30i63.23328>.
- [22] OECD (2020). Potential impact of digitalisation on taxation and the fiscal system (No. 49).
- [23] OECD Taxation Working Papers. <https://doi.org/10.1787/5b47b2d2-en>
- [24] Ossandón, F. (2020). Artificial intelligence in tax administrations: opportunities and challenges. *Journal Estudios Tributarios*, (42), 48-74.
- [25] [https://www.sii.cl/revista\\_estudios\\_tributarios/ret\\_42/ret\\_42\\_03.pdf](https://www.sii.cl/revista_estudios_tributarios/ret_42/ret_42_03.pdf)
- [26] Palomino Guerrero, J. (2022). Adoption of electronic invoicing by micro and small enterprises in Peru. Master's thesis, Universidad Nacional Mayor de San Marcos.
- [27] Ramírez, C. (2023). Tax policy and formalization of micro and small enterprises in Metropolitan Lima. *Quipukamayoc*, 31(65), 53-62. <https://doi.org/10.15381/quipu.v31i65.24842>
- [28] Ramos, S. (2023). Artificial intelligence and taxation: the debate on legal personality and liability. *The Anahuac journal*, 23(1), 90-109. Epub August 28, 2023. <https://doi.org/10.36105/theanahuacjour.2023v23n1.04>.
- [29] Ramos, J. (2020). Formalization of MYPES and its relationship with tax evasion in the Commercial Emporium of Gamarra. Master's Thesis, Universidad las Américas, Lima 5.
- [30] Regalado Barboza, J. (2023). Tax culture and tax compliance in micro and small enterprises, Chachapoyas - 2021. Undergraduate thesis, Universidad Nacional Toribio Rodríguez de Mendoza, Mendoza from Amazonas, Peru 1.
- [31] <https://repositorio.untrm.edu.pe/bitstream/handle/20.500.14077/3297/Jeiner%20Regalado%20Barboza.p df?sequence=1&isAllowed=y>
- [32] Ruiz-Huerta Carbonell, J. (2011). Trends in taxation in Europe: tax harmonization and the future of the Union. *ICE Journal of Economía*, (863), 1-14.
- [33] <https://dialnet.unirioja.es/servlet/articulo?codigo=3842020>
- [34] Sánchez, G., & Pérez, L. (2017). Causes and consequences of tax evasion in the Association of Small Industrialists and Artisans of Trujillo - APIAT: Literature review. Universidad Privada del Norte. <https://repositorio.upn.edu.pe/handle/11537/21799>
- [35] Sánchez, J., & Alarcón, J. (2019). Mypes tax evasion and its influence on tax collection in Peru. *Revista de Investigación de la Facultad de Ciencias Administrativas y Recursos Humanos*, 8(1), 1-143.
- [36] Serrano-Antón, F. (2020). Taxation and artificial intelligence: tax administration and taxpayers in the digital age. Madrid: Dykinson. <https://dialnet.unirioja.es/servlet/libro?codigo=778495>
- [37] Suárez, G. (2018). Motives and consequences of tax evasion in MYPES in the commercial emporium Gamarra dedicated to the commercialization of textile products. Undergraduate thesis, Universidad César Vallejo, Lima, Peru 234. <https://repositorio.ucv.edu.pe/handle/20.500.12692/4595>
- [38] TCI (2023). "How AI is transforming tax administration (AATT) in Peru". TCI.
- [39] Vásquez, E. (2021). Critical factors for ICT adoption in micro and small industrial enterprises. *Industrial Data*, 24(2), 273-284. <https://orcid.org/0000-0002-7220-1675>.
- [40] Vásquez, E. (2022). A model to identify the critical factors that influence the adoption of Information and Communication Technologies in industrial MSEs in Metropolitan Lima. Master's Thesis, Universidad Nacional Mayor de San Marcos, Facultad de Ingeniería de Sistemas e Informática, Unidad de Postgraduate. [https://cybertesis.unmsm.edu.pe/bitstream/handle/20.500.12672/18491/Vasquez\\_re.pdf?sequence=1&isAllowed=y](https://cybertesis.unmsm.edu.pe/bitstream/handle/20.500.12672/18491/Vasquez_re.pdf?sequence=1&isAllowed=y)

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