THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN THE TAX SYSTEMS OF BOSNIA AND HERZEGOVINA: OPPORTUNITIES, LIMITATIONS, AND CHALLENGES

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Abstract

This paper examines the opportunities and limitations of applying artificial intelligence (AI) within the tax administrations of Bosnia and Herzegovina through an analytical framework that integrates the normative, institutional, and technological preconditions of the system. The objective of the research is to provide a comprehensive understanding of how AI can enhance risk management processes, supervision, regulatory interpretation, and the relationship between tax authorities and taxpayers, while simultaneously identifying obstacles arising from a fragmented fiscal structure, uneven administrative practices, and the lack of standardized data.

Methodologically, the paper relies on a qualitative analysis of the existing legislative framework, comparative international practices, and principles of public revenue management, complemented by a theoretical perspective on the transformative effects of digital technologies in public administration. The findings indicate that AI has the potential to serve as an instrument of institutional modernization; however, its effective application depends on the level of technical readiness, data quality, and institutional willingness to adopt an analytical, evidence-based approach.

The conclusion emphasizes that artificial intelligence does not represent a substitute for existing institutions, but rather a mechanism capable of strengthening their efficiency and transparency, provided that modernization is implemented gradually and within a clearly defined strategy for the development of tax administrations.

Keywords: *artificial intelligence, tax administration, risk management, digital transformation, public administration, fiscal policy, data analytics*

JEL Classification: *H21, H26, H83, O33*

1. INTRODUCTION

Tax administrations worldwide are facing a rapid increase in data volumes and increasingly complex forms of economic transactions. Traditional operational models, based on manual processing and experience-based judgment, are becoming insufficient in an environment where financial flows occur almost in real time. Bosnia and Herzegovina faces similar challenges, but within a more complex institutional framework characterized by inconsistent records, fragmented jurisdictions, and varying levels of digital maturity.

For this reason, digital transformation in Bosnia and Herzegovina is not merely a technical issue, but a process requiring stable registries, standardized procedures, and coordination across different levels of government. The experience of OECD member states confirms that technological progress yields results only when grounded in reliable data and clearly defined administrative responsibilities (OECD, 2023). In Bosnia and Herzegovina, these preconditions are still evolving, raising the question of the extent to which AI can be effectively applied under existing conditions.

Within this context, the development of the "AI Poreznik" model provides valuable insight into the potential application of artificial intelligence even in systems that are not fully standardized. The model demonstrates that AI can improve regulatory interpretation, increase consistency, and reduce subjectivity, even when administrative infrastructure is suboptimal. This confirms that the core potential of AI in tax administrations lies in its ability to process large volumes of data and identify patterns that remain invisible to traditional methods (Davenport, 2018).

2. METHODOLOGICAL FRAMEWORK

The methodological framework of this study is based on a combination of theoretical sources, institutional analysis, and insights into contemporary public revenue management practices. The research proceeds from the assumption that the application of artificial intelligence in tax administrations is inseparable from the institutional context of the tax system of Bosnia and Herzegovina.

At the core of the research is a comparative analysis of international practices, used as a basis for assessing domestic institutional capacities. Relevant models developed within the OECD, the European Union, Australia, and the United States were analyzed in order to identify key prerequisites for the successful application of AI in tax administrations, particularly with regard to data standardization, unified registries, and clearly defined institutional responsibilities.

The second component of the methodological approach consists of a documentary analysis of legal and technical sources governing the operation of tax authorities in Bosnia and Herzegovina. This analysis includes laws, by-laws, technical guidelines, and publicly available reports, with a focus on data recording, exchange, and interpretation in practice. Special attention is given to the relationship between normative solutions and their implementation, as inconsistent records and partial enforcement of regulations directly affect the development of reliable analytical models.

The third methodological element includes qualitative insights derived from the professional practice of tax experts, based on the analysis of concrete cases and standard administrative procedures. This approach enables the identification of differences in regulatory interpretation and risk assessment that are not visible through

normative sources alone, yet significantly affect the functioning of the tax system and its readiness for advanced technologies.

The methodological framework is further complemented by a case study of the domestic "AI Poreznik" model, which serves as a practical test of AI application in an administratively fragmented environment. The analysis provides insight into algorithmic behavior under conditions of inconsistent regulations, diverse reporting formats, and limited data centralization, thereby illustrating the realistic scope and limitations of AI implementation.

Despite certain methodological limitations such as the lack of access to internal tax authority databases, reliance on publicly available sources, uneven data updates, and the inability to conduct quantitative analysis, the combined use of comparative analysis, documentary research, qualitative insights, and a case study provides a sufficiently reliable basis for drawing conclusions regarding the real opportunities and constraints of AI application in the tax system of Bosnia and Herzegovina.

3. OVERVIEW OF THE TAX SYSTEM OF BOSNIA AND HERZEGOVINA

The tax system of Bosnia and Herzegovina represents a unique example of fiscal architecture that is simultaneously functional and restrictive, stable yet fragmented, legally defined yet operationally inconsistent. Its specificity stems from the constitutional structure of the state, as well as from a prolonged administrative development that has not followed a uniform trajectory across all levels of government. Consequently, this system cannot be analyzed through a conventional framework of a unified tax administration; instead, it requires a holistic approach, as each of its components exists at a different stage of institutional and digital maturity.

In international contexts, tax systems over recent decades have evolved into highly centralized, data-intensive mechanisms. In Bosnia and Herzegovina, however, taxpayer interaction with the state is divided among multiple administrative units that do not share a unified logic of record-keeping. This creates a paradox: although jurisdictions are formally well defined, the fiscal reality cannot be observed from a single point; it is dispersed, fragmented, and layered.

From this fragmentation arises the necessity to view the tax system of Bosnia and Herzegovina as a dynamic network of parallel structures rather than a unified whole. Each structure operates autonomously, yet their functions are deeply interdependent, creating an institutional environment in which even minor procedural differences can have multiplied effects on data quality, analytics, and oversight

3.1. The Indirect Taxation Authority of Bosnia and Herzegovina as a Pillar of Fiscal Stability

The Indirect Taxation Authority of Bosnia and Herzegovina (ITA BiH) represents the most centralized and technically developed component of the fiscal system. Its database functions as a unified information system, enabling the monitoring, recording, and analysis of value added tax, excise duties, and customs revenues in a manner that is not achievable within the remainder of the tax structure.

The ITA demonstrates that it is possible to establish a high-quality, standardized system in Bosnia and Herzegovina, while simultaneously revealing its inherent limitation: its jurisdiction is confined exclusively to indirect taxes. Key fiscal information that should ideally be available within a single fiscal center such as income tax, corporate profit tax, social security

contributions, real estate transfer taxes, and records of sole proprietors remains outside its competence.

As a consequence, the state level provides a clear and comprehensive overview of indirect tax flows, but not of the taxpayer's overall fiscal position. From the perspective of advanced AI applications, this implies that constructing a complete risk profile is not feasible, as a taxpayer may appear fully compliant within the VAT system while simultaneously exhibiting significant irregularities in income tax or contribution obligations in segments that fall under the jurisdiction of entity-level tax administrations.

3.2. Entity and District Tax Administrations: Institutional Diversity within the Fiscal System

The Tax Administration of the Federation of Bosnia and Herzegovina, the Tax Administration of Republika Srpska, and the Tax Administration of the Brčko District constitute the second, substantially more complex layer of the tax system. Each authority administers direct taxes, but does so based on its own software solutions, by-laws, reporting formats, and operational protocols.

Although all three administrations formally apply the same fundamental principles of taxation, differences in data collection procedures, coding structures, and internal processing are so pronounced that the same taxpayer may effectively appear as a "different fiscal entity" depending on which administration maintains the records. For example:

- In one administration, a change of address is automatically linked to the taxpayer identification number;
- In another, the change is recorded only at the level of the tax card;
- In a third, it is entered manually and may remain inconsistent for years.

Due to such discrepancies, the data are not merely incompatible; they cannot be systematically compared or merged without prior cleansing, transformation, and standardization. In practice, this means that no domestic institution possesses a unified historical record of taxpayer behavior, which represents a fundamental prerequisite for the development of machine learning models.

3.3. The Taxpayer as "Four Administrative Entities"

From a systemic perspective, a single taxpayer in Bosnia and Herzegovina simultaneously exists within:

- The ITA BiH – for indirect taxes;
- the Tax Administration of the Federation of BiH – for direct taxes within the Federation;
- The Tax Administration of Republika Srpska – for direct taxes within Republika Srpska;
- The Tax Administration of the Brčko District – for direct taxes within the Brčko District.

Each of these institutions maintains separate records, characterized by different data depths, fields, validation rules, and storage methods. When this is combined with the fact that:

- Portions of records are still maintained manually;
- Many corrections are entered retroactively;
- There is no automated exchange of information between levels of government;

the result is a tax system that is not fragmented by accident, but is institutionally multilayered and operationally divergent.

For AI model development, this represents one of the most significant obstacles: an algorithm cannot be reliable if the foundation on which it operates is not consistent, continuous, and standardized.

3.4. Digital Asymmetry as a Source of Systemic Constraints

The level of digital maturity among tax administrations in Bosnia and Herzegovina ranges from relatively modernized segments (such as the ITA) to systems that continue to operate on semi-digital foundations. Documents that are automatically retrieved from registries in advanced administrations are often, in Bosnia and Herzegovina:

- Manually transcribed;
- Scanned as PDF files;
- Transmitted via e-mail as unstructured data;
- Entered through web forms lacking validation mechanisms.

Such operational practices generate three direct consequences:

- Data cannot be automatically analyzed;
- Stable data lineage cannot be established;
- Risk analyses exhibit a high error rate due to unclean inputs.

AI systems are highly sensitive to data quality. While they can handle large volumes of information, they cannot compensate for a high degree of inconsistency.

3.5. The Human Factor and Procedural Variability

Despite frequent references to digitalization, the essence of tax practice in Bosnia and Herzegovina continues to rest on the tax officer as the central interpreter of regulations. The human factor represents both the strength and the weakness of the system:

- A strength, because an experienced officer can identify anomalies that systems may overlook;
- A weakness, because subjective judgment produces inconsistent outcomes.

In practice, four officers may reach four different interpretations of the same legal provision, depending on experience, prior cases, or even internal guidelines applicable only to a specific organizational unit.

For artificial intelligence, this means that the algorithm does not inherit a “rule,” but rather a “variation of the rule.” Without a unified standard of procedure, AI cannot construct a predictable decision-making model.

3.6. Why These Factors Define the Scope of Artificial Intelligence

The weaknesses described above do not represent barriers to digitalization; they constitute the reality from which digitalization must begin. The application of AI is not a question of technological capability, but of institutional readiness. AI can:

- Analyze data;
- Identify patterns;
- Detect irregularities;
- Enhance transparency.

However, AI cannot:

- Replace fragmented data foundations;
- Create standards where institutions have not established them;
- Compensate for inconsistent practices;
- Build inter-institutional connections that are not provided for by law.

Bosnia and Herzegovina therefore stands between two points: the technical possibility of implementing AI and the

institutional constraints that define its effective reach.

This leads to the central thesis of this chapter:

AI will not improve the tax system of Bosnia and Herzegovina on its own but it can become the most reliable diagnostic tool for understanding its weaknesses and a guide for future modernization.

4. CASE STUDY: AI POREZNIK AS A DOMESTIC RESPONSE TO GLOBAL CHALLENGES

The third methodological component of this study is a case study based on a detailed analysis of the domestic model **"AI Poreznik."** In this section, the focus is not on the promotion of a technological solution, but on understanding its architecture and its capacity to function under the real conditions of the tax system of Bosnia and Herzegovina.

The analysis covers the following elements:

- The structural design of the model and the manner in which tax regulations are processed;
- The types of queries the system is capable of analyzing;
- The accuracy of responses in relation to applicable laws and administrative practice;
- Limitations arising from fragmented institutional jurisdictions;
- The potential application of the model as an assistive tool for tax officers and tax professionals.

This case study serves as a practical illustration of how intelligent systems may operate within the Bosnian and Herzegovinian context, while simultaneously demonstrating that domestically developed solutions possess the capacity to address highly specific regulatory challenges.

Beyond its technical characteristics, the case study enables an assessment of the actual feasibility of implementing algorithmic solutions within an administratively complex system such as that of Bosnia and Herzegovina. In this sense, the model is not viewed merely as a technological demonstration, but as an analytical instrument for identifying barriers, opportunities, and the conditions under which similar systems could be integrated into the institutional framework of tax administrations.

5. APPLICATION OF ARTIFICIAL INTELLIGENCE IN THE TAX ADMINISTRATIONS OF EU AND OECD COUNTRIES

The digital transformation of tax administrations in European Union and OECD countries represents one of the central processes of contemporary public governance. This transformation does not involve the mere introduction of new technologies, but a fundamental change in the way fiscal institutions collect, integrate, and analyze data, as well as in how administrative and supervisory decisions are made. Within this context, the development of artificial intelligence constitutes a logical continuation of reforms initiated when traditional oversight models —based on partial inspections and ex post controls— proved insufficient in relation to the dynamics of modern economic activity.

Experience from OECD tax administrations shows that the application of artificial intelligence is built upon two core prerequisites: standardized and reliable data, and advanced analytical capacities. In such systems, tax returns no longer represent the primary source of information, but rather one element within a broader fiscal ecosystem. Data are automatically linked, analytics assume a central role in risk identification, and the human factor

intervenes primarily at the stage of expert assessment and decision-making. Oversight is no longer based on isolated actions, but on continuous monitoring of behavioral patterns. The OECD emphasizes that successful AI implementation in tax administrations is contingent upon institutional clarity and a high level of data standardization (OECD, 2023).

In contrast, the tax administration of Bosnia and Herzegovina faces constraints arising from a fragmented institutional structure and uneven levels of digital maturity. While administrations such as those in Estonia or the Netherlands apply highly automated analytics based on unified registries, Bosnia and Herzegovina continues to rely on parallel records, heterogeneous data formats, and limited interoperability among institutions. These differences are not merely technical challenges, but reflect deeper institutional preconditions without which the full application of AI models is not feasible.

It is important to emphasize that artificial intelligence in tax administrations does not function as a substitute for administrative reform, but rather as its catalyst. AI systems cannot compensate for inconsistent regulations or misaligned registries; however, they can clearly indicate where the system loses coherence and where structural interventions are required. This constitutes their comparative value, particularly in administrations that remain at an earlier stage of digital transformation.

Institutional capacity to absorb artificial intelligence defines the boundary of its effectiveness. In advanced tax systems, this capacity includes standardized registries, clear identifiers, interoperable databases, a stable normative framework, and trained personnel capable of understanding data-driven logic. In the context of Bosnia and Herzegovina, the absence of some of these prerequisites does not preclude the application of AI, but necessitates a gradual and controlled approach, adapted to existing institutional capabilities.

Under current conditions, artificial intelligence can be effectively applied in regulatory analysis and case law review, preliminary legal interpretation, document classification, compliance verification, and the identification of anomalies in taxpayer behavior. More complex applications such as systemic risk assessment or automated decision-making remain constrained until a unified fiscal infrastructure is established.

The experience of EU and OECD countries confirms that digital transformation of tax administrations is fundamentally an institutional rather than a technological process. Artificial intelligence can accelerate and deepen reform efforts, but their sustainability depends on the system's ability to develop reliable data foundations and cultivate a culture of analysis-based decision-making. In this sense, AI does not represent the final objective of reform, but rather an instrument of its gradual and measurable advancement.

6. MODEL FOR IMPLEMENTING ARTIFICIAL INTELLIGENCE IN THE TAX SYSTEMS OF BOSNIA AND HERZEGOVINA

The development of artificial intelligence in tax administrations raises the question of institutional readiness to adopt a technology that fundamentally alters the processing and interpretation of data. In advanced tax systems, AI is built upon stable digital infrastructures, whereas in Bosnia and Herzegovina it is introduced under conditions of fragmented records, inconsistent procedures, and varying levels of technological maturity. Within this context, artificial intelligence represents not only a technological innovation, but also a mechanism that exposes structural weaknesses within the system and highlights the need for their gradual resolution.

The value of artificial intelligence lies in its capacity to identify patterns, irregularities, and deviations that remain invisible in traditional administrative procedures. In doing so, AI assists institutions in gaining insight into their own processes, particularly in areas where the absence of standards is compensated by individual judgment. However, compared to systems equipped with unified fiscal registries, the tax administration of Bosnia and Herzegovina faces a fundamental limitation: data instability and inconsistency. AI can analyze large volumes of information, but it cannot compensate for outdated records or divergent administrative approaches, making standardization an institutional rather than a technical obligation.

The application of AI also alters the role of tax officers, whose work gradually shifts from operational tasks toward analytical interpretation of data and decision-making based on a combination of professional expertise and algorithmic findings. At the same time, AI can improve the relationship between tax administrations and taxpayers, as earlier identification of irregularities reduces oversight costs and contributes to greater predictability and trust in the system.

Ultimately, the scope of AI implementation in Bosnia and Herzegovina depends not on algorithmic complexity, but on the willingness of institutions to develop standardized, interoperable, and reliable data foundations. Only with strengthened institutional capacities can artificial intelligence become an integral component of tax administration, serving as a foundation for a more modern and transparent decision-making system.

7. ANALYTICAL INTERPRETATION OF THE CASE STUDY AND INSTITUTIONAL IMPLICATIONS

The application of artificial intelligence within the tax system of Bosnia and Herzegovina enables a renewed understanding of how institutions operate within a fragmented fiscal reality. Unlike traditional administrative models, AI introduces an analytical logic based on data integration and pattern recognition across structures that are, in practice, separated by levels of authority and procedural boundaries. In this sense, artificial intelligence does not represent a technical add-on, but rather a new approach to understanding the existing system.

AI functions as an analytical layer that enhances the visibility and consistency of institutional information flows. In a system that relies heavily on human judgment and informal knowledge, such an approach enables the identification of irregularities arising from misaligned records, divergent interpretations of regulations, and procedural limitations—rather than from intentional non-compliance.

The use of AI also reshapes how tax administrations perceive risk and compliance. Algorithmic analysis of a large number of variables enables the detection of patterns that remain invisible in manual processing, clearly distinguishing between consistent procedures and those based on improvisation. In this respect, AI does not replace institutions; instead, it provides them with a tool for systematically identifying internal weaknesses and governance challenges.

The application of artificial intelligence is particularly significant for improving the relationship between tax administrations and taxpayers. Earlier detection of irregularities reduces the scope for

subjective interpretation, enhances procedural transparency, and contributes to increased trust in fiscal institutions. At the same time, clearer interpretation of tax regulations narrows the gap between the normative framework and administrative practice—an especially important factor in systems characterized by legal uncertainty.

In a broader context, AI facilitates a gradual transition from a model based on documents and experiential knowledge to one grounded in structured data. In Bosnia and Herzegovina, this process is only beginning and requires the standardization of registries, clearer information flows, and institutional readiness to accept data-driven analysis as the foundation for decision-making. The key conclusion is that artificial intelligence within the tax administration of Bosnia and Herzegovina does not represent a sudden transformation, but rather an instrument of gradual change that strengthens the system's capacity to deliver more consistent, fair, and efficient decisions.

8. DISCUSSION

An examination of the application of artificial intelligence in the tax system of Bosnia and Herzegovina indicates that the primary limitations of this technology stem from the institutional and normative framework rather than from its technical capabilities. Under current conditions, the central challenge lies in data quality and consistency, as a significant portion of administrative records continues to rely on practices developed in an analog environment. Inconsistent formats, partial databases, and the absence of interoperability across levels of government directly constrain the development of reliable analytical models.

An additional source of limitation is found in the normative structure of the tax system. Regulations have evolved incrementally and without a unified digital concept, resulting in ambiguous provisions and divergent interpretations in practice. In such an environment, artificial intelligence cannot overcome normative indeterminacy; it can only reproduce existing interpretative patterns. This confirms that technological solutions cannot substitute for the need for regulatory harmonization and legal clarity.

Cultural and organizational factors further influence the scope of AI implementation. Administrative practice in Bosnia and Herzegovina relies heavily on the experience of tax officers and flexible, often informal procedural rules. By contrast, algorithmic systems require standardization, consistency, and verifiability. This disparity generates resistance to full analytical integration and demonstrates that digital transformation entails a change in institutional culture, not merely the adoption of new technologies.

A particularly significant limitation is the shortage of specialized personnel who simultaneously understand tax regulations, administrative processes, and analytical methodologies. While technical solutions may be available, their effective application remains partial without an adequate professional framework.

Nevertheless, these limitations should not be viewed solely as obstacles. They provide an analytical basis for understanding the system's actual capacities and indicate areas where standardization and institutional strengthening are essential. In this context, artificial intelligence currently delivers its greatest value as a diagnostic and analytical tool, rather than as a mechanism for automated decision-making.

The discussion confirms that successful AI implementation in the tax administrations of Bosnia and Herzegovina depends on the parallel development of data infrastructure, normative clarity, and professional competencies. Only within such a framework can artificial intelligence evolve from a supportive analytical instrument into

a genuine driver of institutional modernization.

CONCLUSION

The application of artificial intelligence in tax administrations demonstrates that this process extends beyond technological innovation into the realm of institutional design. The analysis confirms that the effectiveness of AI solutions depends on data quality, regulatory clarity, and administrative coordination. In Bosnia and Herzegovina, where the tax system is fragmented and digital infrastructure unevenly developed, AI can currently deliver its greatest contribution through data analysis, deviation detection, and improved consistency in regulatory interpretation.

The case study of the "AI Poreznik" model shows that it is possible to enhance the standardization of tax regulation interpretation even within an institutionally complex system such as Bosnia and Herzegovina. This creates a foundation for a more predictable tax environment and greater transparency in public revenues. Nevertheless, the scope of AI application remains constrained by existing records and the normative framework, as algorithms cannot achieve their full potential without accurate and harmonized registries.

The research findings indicate that the digital transformation of tax administrations in Bosnia and Herzegovina must simultaneously be a technological and an institutional process. Artificial intelligence does not replace the professional judgment of tax officers, but complements it, requiring clearly defined procedures for the use of analytical recommendations and continuous development of professional capacities. Only through changes in work practices, information flows, and risk management approaches can artificial intelligence become a foundation for a modern and efficient tax administration.

- Based on the conducted research, three priorities for the sustainable integration of artificial intelligence into the tax administrations of Bosnia and Herzegovina have been identified:
- Standardization and consolidation of tax registries;
- Introduction of unified identifiers and interoperable information systems
- Strengthening analytical and digital competencies within tax administrations.

These priorities constitute an institutional roadmap for the gradual and measurable modernization of the tax system in alignment with international best practices.

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