

Examining the Role of the ISO 20022 Standard in Enhancing Artificial Intelligence Algorithms to Improve Customer Experience and Personalize Banking Services

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ABSTRACT:

With the expansion of digital transformation in the banking industry, the standardization of financial data exchange has become one of the most critical requirements for improving service quality and enhancing customer experience. As a comprehensive framework for structuring and enriching transactional data, the ISO 20022 standard provides a suitable foundation for the development and strengthening of artificial intelligence algorithms. Under these conditions, examining the role of ISO 20022 in enhancing AI performance is a crucial step toward understanding the future of data-driven banking and designing innovative solutions to improve customer experience. In this study, a systematic review method and searches across academic databases were used to identify and screen studies related to ISO 20022, artificial intelligence, and banking. Out of 146 initial sources, following screening and quality evaluation, 18 relevant articles from 2020 to 2025 were selected for the final analysis. The findings provide a comprehensive overview of the role of ISO 20022 in strengthening AI algorithms and improving customer experience and service personalization in banking. Results indicate that by supplying structured and enriched data, ISO 20022 creates a key infrastructure for enhancing AI capabilities in banking. These data enable precise customer behavior analysis, prediction of future needs, and the delivery of personalized services, thereby significantly improving customer experience. Moreover, the integration of ISO 20022 and AI offers important operational and strategic advantages for banks—including cost reduction, enhanced security, increased customer loyalty, and new revenue opportunities. This conceptual framework demonstrates that combining data standardization with artificial intelligence paves the way for sustainable transformation in modern banking.

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I. Introduction

With the increasing volume of interbank transactions and the growing complexity of payment processes, the need for a unified and standardized messaging framework has become more critical than ever. ISO 20022, known as the global language for financial information exchange, enhances transparency and harmonization in financial processes by providing rich, XML-based data structures. By defining data elements precisely and modeling the semantics of financial messages, this standard reduces errors caused by inconsistent interpretations and enables better data analytics for banks.

Meanwhile, digital transformation in the banking industry has intensified the use of artificial intelligence for customer behavior analysis, personalized services, and improved user experience. However, the success of AI algorithms is closely tied to the quality and structure of input data. The precise, enriched, and standardized data that ISO 20022 provides can offer more suitable inputs for machine learning and natural language processing models, thereby enhancing analytical capacity in banks [1]. The integration of this standard with AI can significantly improve personalization capabilities, strengthen risk management, and create a more seamless and intelligent customer experience [2].

In recent decades, the global financial system has experienced significant growth in transaction volumes, diversification of payment instruments, and expansion of interbank operations. These developments have placed increasing pressure on traditional financial messaging systems, leading to data management complexity, system incompatibilities, and higher error risks. Furthermore, the absence of a shared and enriched data structure for banking transactions has limited banks' ability to conduct data-driven analysis and decision-making [3].

ISO 20022 was designed precisely to address these challenges: this XML-based financial messaging standard enables the exchange of structured and enriched data, allowing detailed payment-related information—such as beneficiary details, transaction purpose, legal identifiers, and other data attributes—to be transmitted. Such high-quality and standardized data not only enhance automation and transparency but also lay the groundwork for advanced analytics and the integration of transaction data with other data sources [4].

On the other hand, modern banking institutions increasingly rely on artificial intelligence and machine learning to personalize services, analyze customer behavior, detect risk and fraud patterns, and improve operational efficiency. However, the performance of these algorithms heavily depends on the quality, structure, and richness of input data. When data are heterogeneous, incomplete, or unstructured, AI models cannot achieve optimal accuracy and efficiency. As a result, many banks encounter data limitations that hinder effective intelligent analysis—impacting

recommendation systems, behavioral analytics, fraud detection, and service personalization [5]. Thus, the core research question emerges: How can the capabilities of ISO 20022 be leveraged to obtain structured and enriched data that serve as effective inputs for AI algorithms, thereby enabling enhanced customer experience, personalized services, and intelligent analytics in banking? Addressing this question bridges the gap between data standardization and data-driven innovation in banking and supports the development of intelligent solutions for the future of financial services.

II. Literature Review

A. ISO 20022 and its importance in the banking industry:

ISO 20022, as the global framework for financial data exchange, was developed to create a unified, structured, and extensible language for financial messaging. The standard enables the transmission of enriched, integrated, and model-driven data, significantly influencing payments, settlements, cards, securities, and regulatory reporting [6]. Due to its XML-based design and process-driven data modeling, ISO 20022 offers notable advantages over traditional message formats such as SWIFT MT, including better readability, semantic consistency, and enhanced data-carrying capacity [7]. Studies show that banks with high transaction volumes benefit through improved data accuracy, reduced ambiguity, and increased processing efficiency [8].

B. Data quality, information integrity, and the role of ISO 20022:

Data quality and information integrity are essential prerequisites for automation, advanced analytics, and the use of AI technologies in banking. Non-standardized data are often inconsistent, incomplete, or lack semantic context, directly affecting the performance of analytical systems [9]. Research by the BIS-CPMI indicates that ISO 20022 significantly improves accuracy, consistency, and reusability of transaction data through its shared data model and semantic definitions [6]. Case studies from major institutions such as J.P. Morgan and UBS show that enriched structured data enhance financial monitoring, AML/KYC processes, and risk analytics [7].

C. Artificial intelligence in banking: applications, challenges, and the need for standardized data:

AI in banking is used for customer behavior analysis, credit risk assessment, fraud detection systems, customer service optimization, and personalized recommendations [10]. However, the performance of machine learning models depends directly on the quality of input data; models perform optimally only when data are structured, clean, and homogeneous [11]. A key challenge

in banks is the fragmentation of data across different systems, lack of standardized formats, and inconsistencies in transaction structures. Research indicates that poor data structures can reduce AI model accuracy by 30–50% [12]. Thus, a standardized data approach like ISO 20022 is essential for building precise and reliable AI models.

D. The role of ISO 20022 in improving AI algorithms and customer experience:

Recent studies show that implementing ISO 20022 provides the data infrastructure necessary for advanced analytics and strengthens AI adoption in banking. The standard’s enriched data—including detailed transaction information, customer identifiers, and structured contextual information—enables AI models to conduct deeper customer behavior analyses and deliver personalized services [7]. For example, richer data on payment purpose, transaction classification, and counterparty details improves the accuracy of banking recommendation systems and supports the delivery of personalized financial suggestions [13]. Research also indicates that AI-based fraud detection systems perform up to 25% better when trained on ISO 20022-standardized data [14]. Overall, ISO 20022 not only enhances data quality but also has a direct impact on the development of AI models and the overall customer experience.

III. Research Background

The following table provides a summary of prior studies related to the role of the ISO 20022 standard in enhancing artificial intelligence algorithms to improve customer experience and personalize banking services.

TABLE I. Summary of Research Background

Authors (Year)	Title of Study	Research Method	Key Findings
Sangiwa & Mutabazi (2025) [15]	Programmable CBDCs, Digital Identity, ISO 20022, and AI	Content analysis and comparative study	Integrating CBDCs, digital ID, ISO 20022, and AI improves efficiency and financial inclusion but centralizes control within financial infrastructures.
Adib (2025) [16]	Integrating Banking Systems with Blockchain	Architectural analysis and case study	ISO 20022 is a key standard enabling banking–blockchain integration by enhancing transparency, security, and regulatory compliance.
Alenezi (2025) [17]	Blockchain, AI, and ISO 20022 in Free Trade	Literature review	These technologies enable streamlined processes, greater transparency, and reduced trade



Authors (Year)	Title of Study	Research Method	Key Findings
			inequalities; more research is needed on responsible implementation.
Singh (2025) [18]	AI-Enhanced NFV Architecture for Financial Data Platforms	Architecture design and case evaluation	Integrating AI with NFV increases interoperability, scalability, and accuracy of financial data processing.
Kistareddygari (2025) [19]	Real-Time Payment Infrastructure	System analysis and case study	Real-time payment systems leveraging data standards and AI improve customer experience and create new revenue opportunities.
Soni et al. (2025) [20]	AI-Orchestrated PayTech for Cross-Border Remittances	Framework design and empirical evaluation	AI and ISO 20022 optimize transaction cost, speed, and audit transparency in cross-border payments.
Areo (2025) [21]	Interoperability and Standards in Financial Systems	Standards analysis	Data standards facilitate information exchange, cost reduction, and operational efficiency in blockchain-enabled financial systems.
Gauci (2024) [22]	ISO 20022 Maintenance Management in a Connected World	Descriptive analysis	Proposes a unified governance structure and common messaging model to enhance harmonization and automated processing.
Josyula (2024) [23]	The Role of ISO 20022 in Improving Payment Transactions	Critical analysis	ISO 20022 enhances efficiency, interoperability, and customer experience but requires data migration and technological upgrades.
Itkin & Treshcheva (2024) [24]	Improving Banking Platforms via Hybrid AI Testing	Case study	Hybrid AI-based testing improves data quality and system performance in banking platforms.
Kotha (2024) [25]	Understanding Bank Identification Numbers (BINs)	Literature review	BINs are essential for bank identification, fraud prevention, and customer satisfaction; can be integrated with ISO 20022.
Lazcano (2024) [26]	Explainability and Operational Resilience in CBDC Design	Design analysis	Digital identity and explainable frameworks enhance transparency and trust in financial transactions.

Authors (Year)	Title of Study	Research Method	Key Findings
Radanović (2024) [27]	Migration of Payment Systems to ISO 20022	Case study and comparative analysis	ISO 20022 enables faster transactions, greater flexibility, and near 100% STP, supporting cross-border compatibility.
Kennel (2022) [28]	Coexistence in the Securities Industry: Importance of ISO 20022 Central Dictionary	Literature review	A central ISO 20022 dictionary strengthens interoperability and data utilization across the securities industry.
Haataja & Stackenäs (2021) [29]	Decentralized Communication System Based on ISO 20022	System design and implementation	Provides a secure, cost-effective, and easily integrable framework ensuring message integrity.
Bennett (2021) [30]	Standards for Knowledge Graphs in Finance	Literature review	Semantic standards such as FIBO enhance data-driven development in the financial sector.
Major & Mangano (2020) [31]	Modernizing Payment Messaging with ISO 20022	Literature and implementation review	ISO 20022 improves data quality, fraud prevention, and straight-through processing (STP) rates.
Satyendra et al. (2020) [32]	Evaluating Banking Standards for Big Data-Based Data Lakes	Standards analysis	ISO 20022 is suitable for developing banking data models and supporting analytical and decision-making needs.

The reviewed studies reveal a clear temporal progression in research on ISO 20022 and its integration with advanced financial technologies. Earlier works published between 2020 and 2021 primarily focused on establishing the foundational messaging and data standards required for interoperability in financial systems. These studies emphasized the technical structure, migration challenges, and standardization benefits of ISO 20022. In contrast, research published from 2024 to 2025 shifts toward exploring the integration of ISO 20022 with emerging technologies such as artificial intelligence, blockchain, programmable CBDCs, and digital identity frameworks. This transition indicates a move from infrastructure development to the intelligent application of data standards for enhanced service personalization and customer experience.

Across the literature, ISO 20022 consistently emerges as the core data and messaging standard enabling secure, structured, and interoperable financial communication. Studies such as those by

Gauci (2024), Radanović (2024), and Josyula (2024) highlight that ISO 20022 enhances transaction speed, automates data processing, and reduces operational errors, thereby improving overall system efficiency. Furthermore, the standard's rich and structured data format provides a strong foundation for leveraging AI-driven analytics, customer behavior modeling, and predictive personalization in banking services.

Recent research demonstrates a growing trend toward combining ISO 20022 with AI and blockchain to develop next-generation financial systems. For instance, Singh (2025) illustrates how AI-enhanced NFV architectures increase scalability and data-processing accuracy, while Soni et al. (2025) show that AI and ISO 20022 significantly improve speed, cost-efficiency, and audit transparency in cross-border payments. Similarly, Adib (2025) emphasizes that ISO 20022 plays a crucial role in ensuring compliance and interoperability within blockchain-based financial networks. Collectively, these studies underscore the importance of ISO 20022 as a shared data layer that enables seamless integration with intelligent and decentralized technologies.

The reviewed literature also highlights the influence of ISO 20022-driven data enrichment on customer experience and service personalization. The structured and granular insights derived from transaction data support targeted recommendations, personalized financial solutions, and improved digital banking interactions. Research by Itkin and Treshcheva (2024) demonstrates that hybrid AI-based testing enhances data quality and system performance, ultimately improving customer satisfaction and trust.

Despite the significant advancements, several challenges remain. Studies such as Josyula (2024) point out that successful implementation requires substantial technological upgrades, complex data migration processes, and strict regulatory adherence. Additionally, combining ISO 20022 with AI and blockchain introduces concerns related to data governance, cybersecurity, and standard harmonization (Singh, 2025; Areo, 2025). As noted by Sangiwa and Mutabazi (2025), broader adoption also depends on user trust and the ability to balance efficiency with decentralization and privacy considerations.

IV. Methodology

This study employs a systematic literature review to examine the role of the ISO 20022 standard in enhancing artificial intelligence algorithms for improving customer experience and personalizing banking services. Following the framework proposed by Silva (2015), relevant studies were identified through searches in national and international scientific

databases using keywords related to ISO 20022, artificial intelligence, customer experience, and banking.

After removing duplicates, articles were screened based on titles and abstracts, followed by a full-text review to assess their relevance to the research objectives. Inclusion criteria focused on studies published between 2020 and 2025 that addressed ISO 20022, artificial intelligence, and banking using quantitative, qualitative, or mixed methods. As a result, 18 high-quality and relevant articles were selected for final analysis.

Data were analyzed using content coding and thematic analysis to identify key dimensions, patterns, and relationships among ISO 20022, artificial intelligence, and banking applications. Overall, this systematic approach provides a structured and comprehensive understanding of the current state of research and establishes a foundation for future studies in modern banking.

V. Findings

Overall, the body of research can be divided into two distinct phases:

- Foundation-building (2020–2021): Emphasis on standardization, messaging frameworks, and creating the technical infrastructure for data interoperability.
- Intelligent application (2024–2025): Integration of ISO 20022 with AI, blockchain, and CBDC systems to enhance customer experience, operational efficiency, and strategic value creation.

This evolution highlights the central role of ISO 20022 as a catalyst for data-driven, intelligent, and customer-centric financial services.

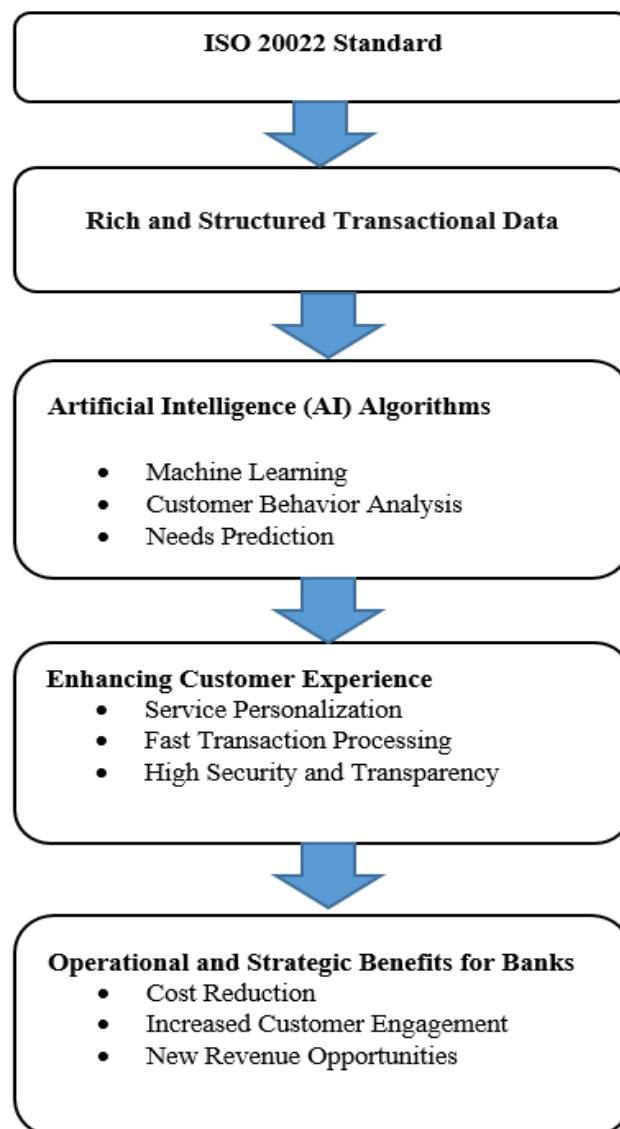


FIGURE I. Research Conceptual Framework

The research conceptual framework can be explained and elaborated as follows:

- **ISO 20022 Standard as the Foundation and Infrastructure:** ISO 20022 is a financial messaging standard that enables the collection of precise, structured, and analyzable transactional data. Standardized data provides the essential foundation for any intelligent and automated analysis within banking systems.
- **Generation of Rich and Analyzable Data:** ISO 20022 structured data includes information about transactions, customers, accounts, and payment details. This data enables the extraction of customer behavior patterns, financial trends, and banking performance indicators.

- **Application of Artificial Intelligence Algorithms:** Using ISO 20022 data, AI algorithms can:

- Analyze and predict customer behavior,

- Anticipate future customer needs and provide personalized services,

- Detect fraud and anomalies, enhancing transaction security.

- Algorithms include machine learning, big data analytics, and neural networks.

- **Enhancement of Customer Experience (CX):** The integration of ISO 20022 with AI accelerates transactions, increases transparency, and enables personalized banking services. Customers enjoy a smooth, secure experience tailored to their individual needs.

- **Operational and Strategic Benefits for Banks:** By improving customer experience, banks can:

- Reduce operational costs,

- Increase customer loyalty,

- Generate new revenue opportunities through value-added services.

This framework simultaneously addresses both customer needs and the strategic objectives of the bank.

VI. Discussion and Conclusion

The examination of the proposed conceptual framework indicates that the ISO 20022 standard can serve as a highly effective starting point for digital transformation in banks. By providing rich, precise, and structured transactional data, this standard establishes a robust foundation for advanced and intelligent analyses. Standardized data enables the extraction of customer behavior patterns, the identification of financial trends, and the analysis of banking performance indicators, which in turn facilitate strategic decision-making.

The integration of this data with artificial intelligence (AI) algorithms—including machine learning, big data analytics, and neural networks—offers diverse opportunities to enhance banking operations and customer experience. Notable capabilities of these algorithms include predicting customer needs, delivering personalized services, detecting fraud, and enhancing transaction security. In this way, AI functions as a predictive and analytical engine that increases the bank's capacity to respond quickly and accurately to customer requirements.

One of the most significant outcomes of this framework is the improvement of customer experience (CX). Leveraging rich data and intelligent analytics enables faster transaction processing, greater transparency, and banking services tailored to individual customer needs—

providing an experience that is both secure and confidence-inspiring, while increasing customer satisfaction and loyalty.

At the operational and strategic level, implementing this framework yields substantial benefits. Banks can enhance efficiency by reducing operational costs, optimizing processes, and increasing customer engagement. Furthermore, the use of precise data and intelligent analytics creates new revenue opportunities through value-added services and innovative products. In other words, this framework not only addresses the day-to-day needs of customers but also reinforces long-term strategic objectives, paving the way for sustainable and competitive development.

Ultimately, it can be concluded that the combination of ISO 20022 and AI constitutes a powerful tool for improving bank performance and enhancing customer satisfaction. Banks that leverage this framework intelligently can achieve significant operational and strategic advantages simultaneously.

The findings of the proposed conceptual framework regarding the role of ISO 20022 in generating rich data, enabling customer behavior analysis, and improving CX through AI algorithms align with multiple previous studies. For instance, Josyula (2024) demonstrates that ISO 20022 enhances efficiency, interoperability, and customer experience; Radanović (2024) emphasizes that migration to this standard enables greater flexibility, faster transaction processing, and easier compatibility with international systems. Studies by Adib (2025), Singh (2025), and Kistareddygar (2025) further indicate that combining ISO 20022 with technologies such as AI and NFV improves data processing accuracy, automation, and customer experience—directly aligning with the key pillars of this framework. Additionally, Soni et al. (2025) and Alenezi (2025) highlight improvements in transaction speed, cost reduction, and transparency, illustrating the theoretical and practical convergence of this framework with recent research.

At the same time, research has highlighted complementary points and practical challenges that should be addressed within the conceptual framework. Sangiwa and Mutabazi (2025) show that integrating ISO 20022 with programmable CBDCs and digital identity increases efficiency and financial inclusion but reinforces centralized control in financial systems. Similarly, Josyula (2024) and Major & Mangano (2020) emphasize the necessity of technology upgrades, data migration, and regulatory compliance for full ISO 20022 adoption. Findings from Gauci (2024) and Haataja & Stackenäs (2021) underscore the need for governance structures and standardized management frameworks to ensure interoperability and automated data processing. Therefore, the proposed framework, in addition to operational and strategic benefits, must address data

governance, security, and responsible implementation to balance customer benefits with banks' long-term objectives.

Based on the results, the following recommendations can be proposed:

- **Implementation of ISO 20022 as the Transactional Foundation:**

Banks should gradually migrate their payment and messaging systems to ISO 20022 to generate rich, precise, and structured transactional data.

This step enables customer behavior analysis, needs forecasting, and enhanced user experience.

- **Integration of AI for Data Analysis and Personalized Services:**

Employing machine learning and neural network algorithms to analyze transactions, detect fraud, and deliver personalized services is recommended.

This combination can accelerate transaction processing, improve security and transparency, and enhance customer loyalty.

- **Establishment of Data Governance and Standards Management Frameworks:**

Banks should design governance structures, security protocols, and common messaging patterns to ensure full interoperability between domestic and international systems. This approach reduces errors and costs while enabling the adoption of innovative technologies such as blockchain and CBDCs.

- **Development of Value-Added Services and New Revenue Opportunities:**

Leveraging rich data and intelligent analytics, banks can offer services such as personalized financial advisory, risk management, and innovative digital products.

This approach enhances customer engagement and creates new revenue streams.

- **Training and Empowerment of Staff and Customers:**

Training bank personnel in messaging standards, data security, and AI is essential. Providing simple guidance to customers on transaction security and digital tools increases trust and satisfaction.

- **Continuous Testing and System Evaluation:**

Banks should implement hybrid testing processes and continuous performance evaluation to ensure data quality, analytical accuracy, and regulatory compliance.

This approach prevents operational errors and enhances system scalability and adaptability.

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