



# InsightX Platform: An Integrated Web-Based System for Trading Analysis, Marketing Analytics, and AI-Powered Decision Support

Osama Abo Elela<sup>1,\*</sup>

<sup>1</sup> Department of Communications and Electronics, Delta Higher Institute of Engineering and Technology, Mansoura 35111, Egypt

Email: [CH2000133@dhiet.edu.eg](mailto:CH2000133@dhiet.edu.eg)

Received: February 02, 2026 Revised: April 05, 2026 Accepted: June 03, 2026 \* Corresponding author

## ABSTRACT

The rapid expansion of digital data in financial markets and business environments has increased the need for intelligent, accessible, and integrated analytical systems. Traditional tools for trading analysis, marketing analytics, and user assistance often operate separately, forcing users to move between different platforms and making data interpretation more complex. This project presents InsightX, a web-based analytical platform that combines trading analysis, marketing analytics, and an AI-powered chatbot within a unified interface. The system is designed to support data-driven decision-making by transforming raw financial and marketing data into interactive visualizations, performance indicators, and user-oriented insights. The platform consists of three main modules. The Trading Analysis Module enables users to examine market data through real-time charts, historical comparisons, and technical indicators such as moving averages and RSI. The Marketing Analysis Module supports customer data analysis, segmentation, campaign performance evaluation, and KPI-based insight generation. The AI Chatbot Module enhances usability by allowing users to ask questions, receive explanations, and navigate analytical results through natural language interaction. InsightX is implemented using Python and Streamlit, supported by libraries such as Pandas, NumPy, Plotly, yfinance, and AI API integration for chatbot functionality.

**Keywords:** InsightX; Trading analysis; Marketing analytics; AI chatbot; Streamlit; Python; Data visualization; Decision support; Financial technology; Business intelligence

## 1. INTRODUCTION

The rapid expansion of digital technologies has transformed the way individuals, organizations, and educational institutions interact with data. In the modern information-driven environment, data is no longer viewed merely as a collection of raw values or isolated records; rather, it has become a strategic asset that supports planning, prediction, monitoring, evaluation, and decision-making. Financial markets generate large volumes of price movements, trading volumes, historical trends, and technical signals, while business and marketing environments continuously produce customer-related data, campaign metrics, engagement indicators, and perfor-

mance measurements. As a result, users increasingly require intelligent systems that can process complex datasets, extract meaningful insights, and present analytical results in a clear and accessible form. This growing reliance on integrated digital platforms reflects the broader shift toward platform-based infrastructures in the digital age, where multiple services, tools, and data flows are combined to create more effective user experiences [1].

In this context, the InsightX Platform is introduced as an integrated web-based system that combines trading analysis, marketing analytics, and an artificial intelligence chatbot within a single unified environment. The project responds to a practical problem faced by many users: analytical tools are

often fragmented across separate platforms, each requiring different skills, interfaces, accounts, and workflows. A user interested in financial analysis may need one tool to view market charts, another to calculate technical indicators, and a third to interpret the meaning of the results. Similarly, a marketing user may need separate software to upload campaign data, compute key performance indicators, visualize results, and generate strategic conclusions. This fragmentation increases complexity, reduces productivity, and limits the ability of non-specialist users to benefit from data-driven decision-making. InsightX addresses this issue by offering a centralized platform where different analytical functions are available through a simple and interactive interface.

The importance of such a system becomes clearer when considering the increasing role of digital platforms in contemporary computing environments. Modern platforms are not limited to delivering a single function; instead, they create value by connecting users, data sources, analytical models, and interactive services. A well-designed platform provides both technical integration and user-centered accessibility, allowing users to perform multiple tasks without moving between disconnected systems. InsightX follows this concept by combining three main modules: a trading analysis module, a marketing analysis module, and an AI-powered chatbot module. Each module performs a distinct function, yet all modules are connected through a common interface and shared system logic. This modular structure supports scalability, flexibility, and future development, which are essential characteristics of digital platforms in rapidly changing technological environments [2].

The trading analysis component of InsightX is designed to help users understand financial market behavior through charts, historical data, and technical indicators. Financial markets are dynamic and complex, and many beginner users find it difficult to interpret raw stock prices or market movements without guidance. Technical analysis provides a practical method for examining price trends, momentum, volatility, and possible market signals. Indicators such as moving averages, the Relative Strength Index, Moving Average Convergence Divergence, and Bollinger Bands are commonly used to simplify market information and help users recognize patterns in price behavior. In the InsightX Platform, these indicators are not presented as guaranteed prediction tools, but rather as educational and analytical instruments that assist users in understanding market conditions. This approach is important because financial analysis should be treated as a decision-support process rather than a source of absolute certainty. The project therefore emphasizes interpretation, visualization, and user education instead of promoting direct investment advice.

Artificial intelligence has also become increasingly relevant in financial analysis, especially as researchers and developers explore the use of machine learning and large language models in trading environments. AI-based systems can process large amounts of information, identify hidden patterns, and support users in interpreting financial data more efficiently. However, the use of AI in trading must be handled carefully because market behavior is affected by many uncertain factors, including economic conditions, investor sentiment, policy changes, and unexpected global events. For this reason,

InsightX adopts a conservative and educational approach to AI integration. The chatbot is not designed to replace professional financial judgment or provide direct investment recommendations. Instead, it helps users understand charts, explain technical indicators, clarify analytical outputs, and interact with the system using natural language. This design reflects the growing research interest in language-model-based financial environments while maintaining a responsible focus on explanation and learning [3].

The marketing analysis component of InsightX addresses another important area of modern data-driven decision-making. Businesses, marketing professionals, students, and small business owners increasingly rely on campaign data to evaluate performance and improve strategy. Key marketing indicators such as return on investment, cost per acquisition, cost per click, click-through rate, conversion rate, and total revenue are essential for assessing whether a campaign is successful. However, many existing marketing analytics platforms are either too expensive, too complex, or too dependent on enterprise-level integrations. This creates a barrier for students, researchers, and small businesses that need practical analytics without advanced technical requirements. InsightX responds to this challenge by allowing users to upload marketing datasets, view performance metrics, identify strong and weak campaigns, and generate insights through an accessible dashboard. By simplifying marketing analytics, the platform supports evidence-based decision-making and helps users understand the relationship between data, customer behavior, and business performance.

The AI chatbot module serves as an intelligent bridge between users and the analytical system. Instead of requiring users to understand every technical detail of financial indicators or marketing metrics, the chatbot enables natural language interaction. Users can ask questions, request explanations, and receive guidance based on the available system outputs. This feature is particularly valuable for educational use, where students may need additional support to understand unfamiliar concepts. It also benefits non-technical users who may feel overwhelmed by dashboards, charts, and numerical indicators. Through conversational interaction, the chatbot improves usability and makes the platform more inclusive. The integration of AI assistance reflects broader developments in human-AI interaction, where intelligent assistants are increasingly used to support user decisions, simplify complex tasks, and provide personalized explanations [4].

The educational value of InsightX is one of the most important aspects of the project. The platform is not designed only as a technical tool, but also as a learning environment where users can explore real analytical workflows in a safe and guided manner. Students can use the system to understand financial indicators, marketing metrics, data visualization, and AI-supported interpretation. Researchers can evaluate the integration of analytics and chatbot technologies within a unified platform. Marketing professionals can use the dashboard to assess campaign performance and identify actionable insights. Small business owners can benefit from accessible analytics without needing advanced software or specialized technical knowledge. This broad target audience demonstrates the practical significance of the project and shows how integrated analytics can support different levels of users.

The design of InsightX also reflects the importance of usability and accessibility in software development. A system may contain advanced analytical functions, but if users cannot easily access or understand them, its practical value becomes limited. Therefore, the project emphasizes a simple web-based interface developed using Python and Streamlit. Streamlit allows rapid development of interactive dashboards and supports a user-friendly experience without requiring complex deployment procedures. Python provides a flexible programming environment supported by powerful libraries for data processing, visualization, numerical computation, and API integration. The combination of these technologies enables the system to process data, create visual outputs, and connect analytical modules in a practical and maintainable way. As a result, InsightX balances technical functionality with simplicity, making it suitable for both academic demonstration and real-world educational use.

Another key motivation behind the project is the need to reduce the cognitive load associated with data interpretation. Many users can access data, but access alone does not guarantee understanding. Raw tables, numerical values, and technical charts may be difficult to interpret without explanation. InsightX improves this process by transforming raw data into structured insights, visual dashboards, and natural language responses. In the trading module, users can observe market movement and technical signals through interactive charts. In the marketing module, users can evaluate campaign performance through calculated metrics and comparisons. In the chatbot module, users can ask questions and receive explanatory responses that make the results easier to understand. This layered approach supports both analytical depth and user comprehension.

Ethical and responsible AI use is also an essential consideration in the InsightX Platform. Any system that supports financial or business decisions must be designed carefully to avoid misleading users. AI models may generate confident-sounding explanations even when the underlying information is incomplete or uncertain. In financial contexts, this problem is particularly serious because incorrect interpretations may influence risky decisions. For this reason, InsightX positions the chatbot as an educational assistant rather than an authority for investment or business strategy. The system should include clear warnings, transparent explanations, and careful limitations regarding the interpretation of financial and marketing outputs. This responsible design direction is consistent with current concerns about explainability, accuracy, and compliance in financial AI systems [5].

From a system-development perspective, InsightX follows a modular architecture that separates the major functional areas while keeping them integrated through a unified application structure. The trading module handles financial data retrieval, technical indicator calculation, and market visualization. The marketing module processes uploaded datasets, calculates performance indicators, and generates campaign insights. The chatbot module receives user queries, identifies the relevant context, and produces natural language assistance. This architecture improves maintainability because each module can be developed, tested, and updated independently. It also supports future expansion, such as adding predictive analytics, integrating additional data sources, improving chatbot

intelligence, deploying the system to the cloud, or creating a mobile application.

The project also addresses several limitations found in existing tools. Trading platforms often provide advanced charts but may be difficult for beginners to understand. Marketing analytics systems may offer powerful enterprise features but can be costly or technically demanding. AI chatbots may provide explanations, but they are often disconnected from actual computed data. InsightX combines these areas into one environment, thereby reducing the gap between analysis and explanation. The system does not claim to replace specialized financial terminals, enterprise marketing platforms, or professional consulting tools. Instead, its contribution lies in making analytical concepts more accessible, educational, and interactive for users who need a practical introduction to data-driven decision support.

Overall, the InsightX Platform represents a meaningful attempt to integrate financial analytics, marketing analytics, and AI-assisted interaction into a single web-based system. It responds to the growing demand for tools that are intelligent, accessible, interactive, and suitable for both educational and practical use. By combining real-time visualization, technical indicators, marketing performance metrics, and chatbot-based explanation, the platform helps users move from raw data toward clearer understanding. The significance of the project lies not only in its technical implementation, but also in its focus on usability, learning, responsible AI integration, and decision-support efficiency. Therefore, InsightX can be viewed as a practical model for how modern analytics platforms can support users in interpreting complex information and making more informed decisions in financial and business environments.

## 2. LITERATURE REVIEW

The development of integrated analytical platforms has become increasingly important as digital systems continue to expand across finance, business, education, and artificial intelligence. Modern users no longer depend only on static reports or manual calculations; instead, they require interactive systems that can collect, process, analyze, visualize, and explain data in real time. The InsightX Platform is positioned within this technological direction because it combines trading analysis, marketing analytics, and an AI-powered chatbot into one unified web-based environment. This integration responds to a growing need for systems that reduce fragmentation, improve accessibility, and support decision-making through intelligent and visual methods. The literature surrounding digital platforms, financial technology, artificial intelligence, explainable systems, user acceptance, and ethical design provides the academic foundation for understanding the importance of this project.

Digital platforms are commonly understood as technological environments that connect multiple functions, users, services, and resources through a shared infrastructure. In the case of InsightX, the platform does not operate as a single-purpose tool; rather, it combines different analytical domains into one interface. This reflects the wider platform-development trend in which modularity, interoperability, and boundary resources allow systems to grow beyond their original design. A platform that supports multiple modules must balance flexibility

with control so that new features can be added without weakening system reliability. This is relevant to InsightX because the trading, marketing, and chatbot modules must remain independent enough to perform specialized tasks while also being integrated into a single user experience. The idea of balancing platform control and external contribution supports the importance of designing systems that can expand while maintaining structured governance and technical stability [6].

Artificial intelligence has become a major driver of transformation in digital systems because it allows platforms to move beyond simple data display toward interpretation and user assistance. In financial and business environments, AI can help users identify patterns, summarize information, automate routine analysis, and make complex data easier to understand. However, AI should not be viewed as a complete replacement for human judgment, especially in domains where uncertainty, context, risk, and ethical considerations are important. InsightX follows this balanced view by using an AI chatbot as an assistant rather than as an autonomous decision-maker. The chatbot supports the user by explaining indicators, answering questions, and improving navigation, but the final interpretation remains with the user. This design aligns with the view that AI can improve research and decision-making efficiency while still requiring human understanding and oversight [7].

The trading analysis component of InsightX is strongly connected to earlier research on AI-based trading systems and distributed analytical environments. Financial markets are complex because they are influenced by price movements, investor behavior, economic events, company performance, and global conditions. Traditional trading platforms often provide large amounts of data, but they may be difficult for beginners to interpret. AI-based trading environments attempt to address this issue by combining computational analysis with user-oriented decision support. For InsightX, this means that the trading module should not only present stock data, but also organize it through charts, indicators, and explanatory outputs. Earlier work on AI-based trading in distributed environments highlights the importance of system architecture, communication between components, and the ability of intelligent agents to support trading-related processes [8].

Another important research direction is the relationship between artificial intelligence, data ownership, and distributed model use. As machine learning models become more advanced, the value of data and trained models increases. This has led to research on marketplaces where AI models, datasets, and incentives can be exchanged or coordinated through secure technological infrastructures. Although InsightX is not a blockchain marketplace, the principle is relevant because the platform depends on the movement of data between modules, the use of analytical functions, and the transformation of information into practical value. In the future, InsightX could be expanded to include external data sources, secure user datasets, or shared analytical models. Research on AI model trading and blockchain-based incentives demonstrates that modern intelligent systems increasingly depend on trusted data exchange, fair valuation, and secure computational workflows [9].

The democratization of artificial intelligence is especially important for platforms such as InsightX because the system

is designed for students, researchers, marketing professionals, and small business users. Advanced trading platforms and financial terminals are often expensive, technical, and difficult for non-specialists to use. AI-supported systems can reduce this gap by helping users interpret information that would otherwise require advanced expertise. In financial contexts, generative AI has the potential to reduce information asymmetry by making complex textual and analytical signals more accessible to retail users. This supports the educational and practical value of InsightX, because the platform can help less-experienced users understand market behavior, technical indicators, and analytical results without requiring professional-level financial training [10].

Forecasting and predictive analysis are also central themes in the literature on AI and financial or trade-related decision-making. Traditional econometric models have long been used for forecasting, but hybrid approaches that combine statistical techniques with artificial intelligence can improve the ability to capture nonlinear patterns and complex relationships. InsightX currently focuses on visualization, technical indicators, and user assistance, but its future work includes predictive analytics. This future direction is academically justified because hybrid econometric-AI approaches have been explored for forecasting complex economic data, showing that intelligent computational methods can support prediction in data-rich environments. For InsightX, predictive analytics could eventually allow users to move from descriptive analysis toward forecasting-based decision support, provided that uncertainty and risk are clearly communicated [11].

Portfolio performance and financial management are additional areas where AI has become increasingly relevant. Investment-related decisions often depend on multiple variables, including market trends, risk exposure, macroeconomic indicators, trading volume, and user goals. AI-based financial management can support users by identifying relationships between financial variables and by helping organize complex data into actionable insights. The trading module in InsightX can be understood as an early step in this direction because it allows users to view historical trends, calculate indicators, and interpret market behavior through visual dashboards. Research connecting AI financial management with portfolio performance and trade volume supports the idea that intelligent financial tools can improve the interpretation of financial activity when they are designed with clear analytical objectives [12].

A major challenge in financial AI is explainability. Deep learning and machine learning models can produce useful outputs, but users may not trust or understand those outputs if the decision process is unclear. In finance, this problem becomes more serious because decisions may involve money, risk, legal responsibility, and user confidence. Therefore, systems that support financial analysis should not only generate results but also explain them in a way that users can understand. InsightX addresses this need through its chatbot module and visual interface. Instead of presenting technical indicators as isolated numbers, the platform can explain what RSI, MACD, moving averages, and other outputs mean in practical terms. Explainable financial AI research emphasizes that interpretability is necessary for adoption, especially in regulated or high-risk domains where black-box systems may

be rejected by users or institutions [13].

Human-AI collaboration is another key concept that supports the design of InsightX. Effective AI systems should not simply automate tasks without considering the user; they should cooperate with users by adapting to their needs, supporting their goals, and improving the overall experience. In InsightX, the chatbot functions as a collaborative assistant that helps users interact with trading and marketing data. The platform does not remove the user from the decision-making process; instead, it allows the user to ask questions, explore results, and understand the meaning of dashboard outputs. Research on human-AI collaboration shows that system performance alone is not enough, because user preferences, perceived usefulness, trust, and interaction quality also shape whether people accept and benefit from AI tools [14].

Ethical decision-making is especially important when using AI systems in contexts involving financial interpretation, business performance, and user guidance. Chatbots may generate responses that sound confident even when the underlying information is incomplete, outdated, or uncertain. This creates a risk of misleading users, particularly if the system appears more authoritative than it actually is. InsightX should therefore present the chatbot as a support tool rather than a source of guaranteed recommendations. It should also clarify the limitations of technical analysis and avoid presenting financial indicators as certain predictions. Studies comparing human and ChatGPT-based ethical decision-making highlight that AI responses may differ from human reasoning, especially when trade-offs and contextual judgment are involved [15].

The ethical design of AI systems also requires attention to the trade-offs between technical development, organizational goals, user needs, and responsible deployment. In practical software projects, developers may prioritize performance, speed, and feature expansion, while ethical concerns such as transparency, fairness, privacy, and accountability may receive less attention. For InsightX, ethical design should be embedded into the system from the beginning. This includes protecting user-uploaded marketing data, explaining chatbot limitations, avoiding misleading investment language, and ensuring that outputs are understandable. Research on ethical AI co-design emphasizes that responsible AI development often involves balancing competing priorities rather than applying simple rules after the system has already been built [16].

User acceptance is another important factor in determining whether a platform like InsightX can be successful. Even if a system is technically functional, users may avoid it if they find it difficult, confusing, or irrelevant to their needs. Since InsightX targets students, researchers, marketing professionals, and small business users, the interface must be simple, interactive, and educational. The platform's use of Streamlit supports this goal by enabling a web-based dashboard that can be accessed easily without requiring complex installation procedures. Studies on AI acceptance among students show that users' willingness to engage with AI technologies depends on perceived usefulness, ease of use, educational value, and confidence in the technology [17].

Predictive analytics in trading is a major area of research that directly connects to the future development of the InsightX Platform. The current system provides users with

indicators and visualizations, but future versions could include machine learning models for volatility forecasting, risk mitigation, and strategy evaluation. Such extensions would allow the system to move beyond descriptive dashboards toward more advanced decision-support capabilities. However, predictive models must be implemented carefully because financial markets are uncertain and model outputs may be affected by noise, overfitting, or changing market conditions. Research on AI-powered predictive analytics for derivatives trading supports the value of machine learning in financial forecasting while also highlighting the importance of risk control and strategic decision support [18].

The ethical use of AI in trading becomes even more complex when applied to high-volatility markets such as cryptocurrency. Cryptocurrency trading often involves rapid price movement, speculative behavior, and limited user protection compared with traditional financial markets. Although InsightX is not limited to cryptocurrency, the ethical issues discussed in cryptocurrency AI research are still relevant. Any platform that supports trading analysis must avoid encouraging risky behavior, must communicate uncertainty, and must ensure that users understand that indicators are analytical aids rather than guarantees. Research on responsible AI and machine learning in cryptocurrency trading shows that ethical frameworks are necessary when intelligent systems influence financial behavior [19].

Recent evidence on retail investor behavior further supports the relevance of AI-assisted trading tools. Retail investors often face disadvantages compared with institutional investors because they may have less access to professional analysis, faster information channels, or advanced technical systems. AI tools can potentially narrow this gap by helping users process information more efficiently and interpret market signals with greater confidence. InsightX reflects this democratizing potential by presenting trading data through an accessible dashboard and by using chatbot interaction to simplify complex concepts. Evidence from account-level trading data suggests that AI can influence retail investor behavior, which reinforces the need for platforms to be both useful and responsible in how they present financial information [20].

Marketing analytics represents the second major analytical domain within the InsightX Platform. In modern business environments, marketing decisions increasingly depend on measurable indicators such as campaign cost, revenue, conversion rate, click-through rate, cost per acquisition, customer segmentation, and return on investment. Many small businesses and students may understand the importance of these metrics but lack access to professional analytics platforms. InsightX addresses this gap by allowing users to upload marketing datasets and view performance through interactive dashboards. The literature on AI, digital decision support, and user acceptance supports this approach because analytics platforms are most valuable when they transform raw data into meaningful, understandable, and actionable outputs. For marketing users, the value of InsightX lies not only in calculating KPIs but also in making the results easier to compare, interpret, and use for campaign improvement.

The chatbot module strengthens the relationship between trading analytics and marketing analytics by creating a conversational layer above the technical dashboard. Rather than

forcing users to interpret every chart or KPI independently, the chatbot can explain results, guide navigation, and answer system-related questions. This is particularly useful in educational settings because students may need repeated explanations before they understand financial indicators or marketing metrics. In business settings, a chatbot can reduce the time needed to interpret dashboard outputs and help users focus on practical decisions. The combination of dashboard visualization and natural language assistance therefore gives InsightX a dual function: it operates both as an analytical tool and as an interactive learning environment.

The literature also supports the need for integrated systems rather than isolated tools. A user working with trading data may need technical indicators, charts, explanations, and historical comparisons. A user working with marketing data may need dataset upload, KPI calculation, segmentation, visualization, and insight generation. If these tools exist separately, the user must move between applications, manually transfer data, and interpret outputs without unified support. InsightX reduces this fragmentation by placing multiple modules in one platform. This improves workflow efficiency and supports the project's main objective: simplifying complex data interpretation through integration, visualization, and AI-based assistance.

Another important theme in the literature is scalability. A successful platform must be designed not only for its current functions but also for future expansion. InsightX already includes three core modules, but the book identifies several future improvements, including advanced AI integration, mobile application development, expanded external data connections, cloud deployment, predictive analytics, and stronger security. These planned improvements are consistent with current trends in intelligent platform development. As user needs increase, InsightX can evolve from a graduation-project prototype into a more complete analytical ecosystem. The modular design makes this possible because new components can be added without redesigning the entire system from the beginning.

Security and privacy are also central considerations for any platform that handles user data. The marketing module may involve uploaded business datasets, customer information, or campaign results. The trading module may involve user-selected financial assets or analysis preferences. The chatbot may process user questions that reveal interests, strategies, or business concerns. Therefore, the system should apply secure data handling, avoid unnecessary storage of sensitive data, and ensure that API-based services are used responsibly. While the current project focuses primarily on functionality and educational value, future versions should strengthen security through authentication, encryption, access control, and privacy-aware data processing.

From an educational perspective, InsightX contributes to applied learning by connecting theoretical concepts with practical system implementation. Students can learn about artificial intelligence, machine learning, data analysis, trading indicators, marketing KPIs, natural language processing, and software architecture through a single project. This makes the platform valuable not only as a tool but also as a demonstration of interdisciplinary engineering. The project combines communication and electronics engineering knowledge with

programming, web development, data science, and AI integration. Such interdisciplinary systems are increasingly important because modern technology projects rarely belong to one field only.

Overall, the literature indicates that InsightX is aligned with major developments in digital platforms, AI-assisted decision support, financial analysis, explainable AI, marketing analytics, and human-centered system design. The reviewed studies show that users need intelligent tools that are accessible, interpretable, ethical, and capable of integrating multiple data-driven functions. InsightX addresses these needs by combining trading analysis, marketing analytics, and chatbot assistance in one web-based platform. Its main contribution lies in simplifying complex analytical processes for different user groups while maintaining a structure that can be expanded in future work. Based on the literature, the platform is academically and practically relevant because it responds to real challenges in fragmented analytics, user understanding, AI interaction, and data-driven decision-making.

The first reference contributes a theoretical foundation for understanding digital platforms as integrated systems rather than isolated applications. Its main contribution to this project is that it supports the idea of developing InsightX as one unified environment that combines trading analysis, marketing analytics, and AI chatbot assistance. This strengthens the project because InsightX depends on the integration of several services into a single accessible platform.

The second reference contributes a research-based understanding of how digital platforms should be designed, studied, and evaluated. It highlights important platform features such as modularity, scalability, architecture, and future growth. This contribution is useful for InsightX because the platform is designed as a flexible system that can later be expanded with predictive analytics, cloud deployment, mobile access, and stronger AI functions.

The third reference contributes the idea of balancing internal platform control with external contribution. This is important because InsightX must maintain stable internal modules while still allowing possible future connections with external APIs, datasets, and AI services. Its contribution supports the platform's modular structure and explains why each module should be controlled, organized, and connected carefully.

The fourth reference contributes the idea that complex source code becomes valuable only when it produces meaningful analytical outputs. For InsightX, this means that programming functions, data-processing scripts, visualization tools, and chatbot logic should not remain hidden technical components. Their value appears when they generate charts, KPIs, technical indicators, reports, and explanations that users can understand.

The fifth reference contributes an improvement-based approach to software development. It shows that systems can be redesigned, enhanced, and adapted after initial implementation. This supports InsightX because the platform can be improved through interface testing, module refinement, usability feedback, and future feature expansion.

The sixth reference contributes a balanced view of the relationship between artificial intelligence and human intelligence. Its main contribution is that AI can support decision-

**Table 1.** Contribution of the Reviewed References to InsightX

Reference	Main Contribution	Relevance to InsightX
[1]	Explains digital platforms as socio-technical infrastructures that connect users, services, data, and organizational processes.	Supports the design of InsightX as an integrated platform that combines trading analysis, marketing analytics, and chatbot-based assistance within one connected environment.
[2]	Provides a research agenda for studying digital platforms, including architecture, scalability, data-driven design, and industry transformation.	Justifies treating InsightX as a scalable and modular platform that can later be expanded with predictive analytics, cloud deployment, mobile access, and stronger AI integration.
[6]	Introduces the boundary resources model, which explains how platforms balance internal control with external contribution.	Supports the architectural logic of InsightX by showing the importance of organizing internal modules while allowing future integration with APIs, datasets, and external AI services.
[21]	Demonstrates how complex computational systems can transform source code into meaningful scientific outputs.	Supports the idea that InsightX should move beyond technical implementation by producing user-facing insights such as charts, KPIs, explanations, and reports.
[22]	Shows how an existing system can be redesigned, ported, and enhanced for a new platform.	Supports the improvement-oriented development of InsightX, where dashboards, chatbot features, and reporting tools can be refined based on testing and user needs.
[7]	Discusses the relationship between artificial intelligence and human intelligence, emphasizing that AI can support but not fully replace human judgment.	Supports the design of the chatbot as an assistive tool that explains outputs and guides users without replacing their responsibility for final decisions.
[23]	Explains how foundational AI can reshape digital services, productivity, trade processes, and regulatory environments.	Strengthens the motivation for adding AI-based features to InsightX while highlighting the need to consider trust, regulation, and practical consequences.
[24]	Identifies governance risks related to AI use in organizational and labor contexts, including accountability and transparency.	Supports responsible chatbot and analytics design by emphasizing clear limitations, cautious explanations, and user protection.
[25]	Examines ethical questions surrounding AI adoption in automation-based industries.	Supports the ethical foundation of InsightX by emphasizing privacy, transparency, responsible communication, and careful handling of uploaded data.
[16]	Explains that responsible AI design involves trade-offs among usability, fairness, transparency, performance, and organizational constraints.	Supports the need to balance simplicity, analytical accuracy, and chatbot safety in InsightX.
[15]	Compares ethical decision-making between humans and ChatGPT, showing that AI reasoning may differ from human judgment.	Reinforces the decision to present the chatbot as an explanatory assistant rather than an ethical, financial, or strategic authority.
[26]	Highlights the challenge of hallucination mitigation in large language models and the trade-offs that can arise in safety alignment.	Supports careful prompt design, contextual grounding, and limitation statements in the InsightX chatbot.
[5]	Discusses the relationship between explainability, accuracy, and compliance in financial AI systems.	Supports combining visual indicators with cautious explanations to make financial outputs more understandable and responsible.
[13]	Addresses the black-box problem in financial AI by proposing explainable and visual approaches to stock-market prediction.	Supports InsightX's emphasis on explainable trading analysis through charts, technical indicators, and chatbot-assisted interpretation.
[8]	Presents AI-based trading systems as distributed intelligent environments with interacting components.	Supports the modular structure of the InsightX trading module, including data retrieval, indicator processing, visualization, and interface integration.
[3]	Explores the use of large language models in simulated stock-trading environments.	Supports the integration of natural-language interaction into the trading workflow, allowing users to ask questions about indicators, trends, and chart outputs.
[10]	Investigates how generative AI can reduce information gaps among investors.	Supports the educational and accessibility goals of InsightX, especially for students, beginners, and non-specialist users.
[20]	Examines how AI affects real investor behavior using account-level trading data.	Supports a cautious design approach in which InsightX provides analysis without encouraging reckless trading or presenting outputs as guaranteed recommendations.
[12]	Connects AI-based financial management with broader economic and financial indicators.	Supports future expansion of InsightX toward portfolio analysis, macroeconomic context, and deeper financial interpretation.
[18]	Emphasizes machine learning for volatility forecasting, risk mitigation, and strategy optimization in derivatives trading.	Justifies future development of predictive models within InsightX while maintaining clear communication of uncertainty.
[11]	Combines econometric methods with AI-based ensemble learning for forecasting trade volume.	Supports the future use of hybrid analytical models that combine statistical calculations with AI-based prediction.
[27]	Uses AI-guided evolutionary search to explore complex solution spaces in trade mechanisms.	Supports possible future optimization features in InsightX, such as strategy testing, parameter tuning, and feature selection.
[28]	Applies computational reasoning to examine trading behavior under theoretical constraints.	Supports viewing trading analysis in InsightX as a computational decision-support process rather than a purely manual interpretation task.
[29]	Focuses on trading strategies that improve profitability while reducing risk in commodity markets.	Supports risk-aware interpretation in the InsightX trading module by emphasizing both return and uncertainty.
[30]	Presents a blockchain-based trading mechanism for virtual power plants.	Supports future architectural expansion toward secure, structured, and decentralized trading concepts.
[31]	Introduces a blockchain-based peer-to-peer solar power trading system supported by fog AI.	Demonstrates how AI, distributed infrastructure, and trading logic can be combined in a practical platform, which is relevant to future secure data-flow designs in InsightX.

Table 1. Contribution of the Reviewed References to InsightX (continued)

Reference	Main Contribution	Relevance to InsightX
[32]	Proposes an incentive-based model for exchanging knowledge and energy resources in IoT environments.	Supports long-term scalability of InsightX, especially if future versions involve external datasets, user-contributed models, or third-party analytical services.
[9]	Proposes a blockchain-based marketplace for AI models and data contribution valuation.	Supports the future possibility of integrating external AI models, shared datasets, and specialized analytical services into InsightX.
[33]	Examines cyber risks created by digital interconnection and the value of cyber resilience.	Supports the need for secure data handling, API-failure recovery, privacy protection, and cybersecurity improvements in InsightX.
[19]	Develops an ethical framework for AI and machine learning in cryptocurrency trading.	Supports framing InsightX as an educational decision-support platform rather than a source of direct financial advice.
[34]	Focuses on extracting verified and explainable system specifications through interpretable AI methods.	Supports translating InsightX requirements into clear functional tasks such as KPI calculation, indicator generation, chatbot handling, and report creation.
[4]	Examines the trade-off between decision efficiency and user autonomy in AI-assisted shopping.	Supports chatbot design that improves convenience while preserving user control over interpretation and decision-making.
[14]	Explains trade-offs between performance and user preferences in human-AI collaboration.	Supports designing InsightX dashboards and chatbot features as collaborative tools that assist users without removing them from the decision process.
[17]	Examines AI acceptance among foreign trade students and its effect on entrepreneurial intention.	Supports evaluating InsightX in terms of usability, learning value, perceived usefulness, and acceptance among students and non-technical users.
[35]	Shows how digital, IoT, and AI techniques can support trade analysis during disruption.	Supports the broader value of InsightX as a flexible, web-based analytical platform for changing business and market environments.
[36]	Integrates econometric reasoning with AI to analyze complex international trade issues.	Supports future development of InsightX through the combination of econometric methods, machine learning, and dashboard visualization.
[37]	Uses experimental governance as a method for observing, testing, and refining systems.	Supports the testing phase of InsightX, where usability, module interaction, functionality, and user response can be evaluated before improvement.
[38]	Demonstrates how AI-based language analysis can process textual data to identify meaningful patterns.	Supports the chatbot component of InsightX, particularly user-intent recognition and natural-language explanation.
[39]	Connects policy mechanisms, firm behavior, R&D investment, and measurable performance outcomes.	Supports the marketing analytics module by showing how indicators can be used to evaluate performance and behavioral change.
[40]	Identifies practical constraints that affect international trade, such as storage, transport, and cross-border limitations.	Supports the methodological value of identifying limitations, scope, and operational constraints in system design.
[41]	Explains trade-offs between interacting agents under resource constraints.	Supports the platform-design perspective that InsightX must balance usability, performance, automation, explainability, cost, and technical complexity.

making, but it should not fully replace human judgment. This is highly relevant to InsightX because the chatbot is designed to explain and guide, while the user remains responsible for final interpretation.

The seventh reference contributes an understanding of how foundational AI affects trade, productivity, digital services, and regulation. This supports the motivation behind InsightX because the platform uses AI to improve analytical accessibility and decision support. It also shows that AI-based systems must be developed with awareness of practical, economic, and regulatory consequences.

The eighth reference contributes a governance perspective on the risks of using AI in work-related and organizational settings. This is important for InsightX because users may depend on chatbot explanations when interpreting financial or marketing data. Therefore, the system should include clear limitations, cautious wording, and responsible design to reduce the risk of misleading outputs.

The ninth reference contributes an ethical perspective on artificial intelligence adoption. It shows that privacy, transparency, responsibility, and user protection should be considered during the design stage. This supports InsightX because the platform handles uploaded marketing data, financial analy-

sis, and chatbot responses that must be presented safely and responsibly.

The tenth reference contributes the idea that ethical AI design requires balancing several competing priorities. These priorities include usability, accuracy, transparency, fairness, automation, and technical limitations. This is useful for InsightX because the platform must remain simple and accessible while also producing careful and reliable AI-supported explanations.

The eleventh reference contributes insight into the difference between human ethical reasoning and AI-generated reasoning. Its value for InsightX is that it shows why the chatbot should not be treated as a final authority. The chatbot should support explanation and understanding, but final decisions must remain with the user.

The twelfth reference contributes an important warning about hallucination and safety issues in large language models. This matters for InsightX because chatbot responses may affect how users understand trading indicators, marketing metrics, or system outputs. The contribution supports the need for grounded responses, careful prompt design, and clear communication of limitations.

The thirteenth reference contributes a financial AI perspec-

tive on the trade-off between explainability, accuracy, and compliance. This is important because financial tools should not only generate results; they must also explain those results responsibly. For InsightX, this supports the use of transparent explanations and careful financial communication.

The fourteenth reference contributes to the problem of black-box financial AI systems. It shows the importance of making financial predictions and outputs more understandable to users. This supports InsightX because the platform should explain technical indicators, chart behavior, and analytical outputs instead of presenting unexplained numbers.

The fifteenth reference contributes an early model of AI-based trading systems in distributed environments. This supports InsightX because the trading module works as a separate analytical component within a larger platform. It retrieves data, processes indicators, and returns outputs to the main interface.

The sixteenth reference contributes the idea of using large language models in stock-trading environments. This is useful for InsightX because the chatbot allows users to ask natural-language questions about market trends, indicators, and charts. Its contribution supports the connection between financial analysis and conversational AI.

The seventeenth reference contributes to the idea of democratizing trading analysis through AI. This is important because InsightX is intended for students, beginners, and non-specialist users who may not have access to advanced financial tools. The platform makes financial analysis easier by combining visualization, indicators, and plain-language explanation.

The eighteenth reference contributes evidence that AI tools can influence retail investor behavior. This is important for InsightX because users may trust AI-generated explanations when interpreting financial signals. The contribution supports a cautious design approach that avoids presenting trading outputs as guaranteed recommendations.

The nineteenth reference contributes a broader financial-management perspective by connecting AI, portfolio performance, and economic indicators. This supports InsightX because future versions of the platform can move beyond simple stock charts toward deeper portfolio analysis. It also justifies the inclusion of broader financial context in future development.

The twentieth reference contributes the use of AI-powered predictive analytics for derivatives trading, volatility forecasting, and risk mitigation. This supports InsightX as a future development direction. While the current system focuses mainly on descriptive analysis and indicators, future versions could include machine-learning prediction models.

The twenty-first reference contributes a hybrid forecasting approach that combines econometric techniques with artificial intelligence. This is useful for InsightX because future versions can combine traditional statistical methods with AI models. Such an approach would improve the analytical depth of both trading and marketing modules.

The twenty-second reference contributes an AI-guided optimization perspective. It shows how intelligent search methods can be used to explore complex solution spaces. For InsightX, this supports future possibilities such as strategy testing, pa-

rameter tuning, feature selection, and signal optimization.

The twenty-third reference contributes a computational view of trading behavior and market reasoning. This supports InsightX because the trading module treats financial data as input for computational analysis. The platform converts raw market data into structured indicators, visual outputs, and decision-support information.

The twenty-fourth reference contributes a risk-aware view of trading strategy development. Its value for InsightX is that it emphasizes the importance of considering both profitability and risk. This supports the platform's need to present trading outputs responsibly rather than focusing only on positive signals.

The twenty-fifth reference contributes an architectural example of a blockchain-based trading system in virtual power plants. Although the domain is different, its value lies in showing how trading mechanisms can be structured in alternative market environments. This supports future InsightX expansion toward simulated trading, decentralized models, or other asset systems.

The twenty-sixth reference contributes a model that combines blockchain, peer-to-peer trading, and fog AI. Its contribution to InsightX is mainly related to secure data exchange and intelligent distributed infrastructure. It supports future development involving external integrations, secure data flow, and multi-source analytics.

The twenty-seventh reference contributes an incentive-based model for exchanging knowledge and resources in IoT environments. This is useful for InsightX because future versions may involve external datasets, shared models, or third-party analytical services. The contribution supports the need for access control, resource valuation, and organized external participation.

The twenty-eighth reference contributes the concept of a marketplace for AI models and data valuation. This supports the future scalability of InsightX because the platform could later integrate external AI models or specialized analytical tools. Its contribution is most relevant to long-term extensibility and platform ecosystem development.

The twenty-ninth reference contributes a cyber-resilience perspective on AI-driven risks in interconnected systems. This is important for InsightX because the platform depends on web access, APIs, uploaded files, and AI services. The contribution supports the need for security, privacy protection, error handling, and failure recovery.

The thirtieth reference contributes an ethical framework for AI and machine learning in cryptocurrency trading. This is relevant because trading-related AI tools can influence risky financial behavior. For InsightX, the contribution supports the use of warnings, educational framing, and responsible communication of uncertainty.

The thirty-first reference contributes a method for extracting verified and explainable system specifications. This supports InsightX because broad project goals must be translated into clear functional requirements. Examples include data retrieval, KPI calculation, technical indicator generation, report creation, and chatbot streaming.

The thirty-second reference contributes an understanding of

AI-assisted interaction and user autonomy. This is useful for InsightX because the chatbot should make analysis easier without taking control away from the user. The contribution supports the design of the chatbot as a convenience and explanation tool rather than a decision-making authority.

The thirty-third reference contributes a human-AI collaboration perspective. It shows that AI systems must balance performance with user preferences, trust, and usability. This supports InsightX because users must find the platform understandable, useful, and comfortable to interact with.

The thirty-fourth reference contributes an educational perspective on AI acceptance among students. This is relevant because InsightX is intended for students and non-technical users. The contribution supports the need for ease of use, learning value, accessibility, and confidence in AI-supported analytics.

The thirty-fifth reference contributes insight into the role of digital, IoT, and AI technologies during disruption. This supports InsightX because the platform is web-based, flexible, and suitable for remote analytical access. It strengthens the argument that digital analytical tools are valuable in changing business and market conditions.

The thirty-sixth reference contributes a method for combining econometric reasoning with artificial intelligence. This is useful for InsightX because future versions can integrate statistical analysis with AI-based prediction. Such integration would improve the strength of trading forecasts and marketing insights.

The thirty-seventh reference contributes an experimental governance perspective. Its methodological value for InsightX is that systems can be tested, observed, evaluated, and refined through applied experimentation. This supports the platform's testing stage, where usability, functionality, and module interaction can be improved.

The thirty-eighth reference contributes an example of using measurable indicators to evaluate performance and behavioral change. This is useful for InsightX because the marketing analytics module also depends on measurable indicators. Campaign KPIs such as ROI, CTR, CPA, CPC, and conversion rate help convert raw campaign data into useful decision-support information.

The thirty-ninth reference contributes an AI-based language-analysis approach. This is relevant to InsightX because the chatbot depends on understanding user questions and producing meaningful responses. Its contribution supports the use of natural-language processing to identify user intent and connect responses to analytical context.

The fortieth reference contributes a review-based approach for identifying limitations, constraints, and practical barriers. This is useful for InsightX because a good methodology should recognize project scope, operational limits, and possible system restrictions. It supports the idea that limitations must be reviewed rather than ignored.

The forty-first reference contributes a general trade-off perspective under resource constraints. This supports InsightX because platform development requires balancing usability, automation, performance, explainability, cost, and technical complexity. Its main contribution is that no system design decision is isolated; each improvement may create another

technical or practical trade-off.

## 2.1 Digital Platforms and Integrated Analytical Systems

This subsection reviews how digital platforms support the integration of multiple services within a single environment. It can explain how InsightX follows a platform-based design by combining trading analysis, marketing analytics, and chatbot assistance rather than treating them as separate tools.

Figure 1 presents the complete workflow of the InsightX platform and explains how the system operates from the moment the user enters data until the final analytical outputs are displayed. The diagram illustrates InsightX as an integrated web-based platform that combines four major functional areas: trading analysis, marketing analytics, AI chatbot support, and report generation. The main purpose of this workflow is to show that the platform is not a collection of disconnected tools, but rather a unified analytical environment where user inputs, backend processing, external data sources, visualization modules, artificial intelligence services, and final outputs interact together. This makes the platform suitable for users who need to analyze financial-market data, evaluate marketing performance, ask explanatory questions, and generate reports without moving between separate applications.

The workflow begins with the user input stage, which is shown on the left side of the figure. This stage represents the entry point of the platform and describes how users interact with InsightX through a web browser. The user may be a student, researcher, marketer, analyst, or beginner trader who needs an accessible system for understanding financial and business data. The web-based design is important because it removes the need for complex installation and allows users to access the system through a familiar interface. Instead of requiring advanced technical knowledge, the platform allows users to perform analytical tasks through simple inputs such as selecting a stock ticker, choosing a date range, uploading a marketing dataset, or asking the chatbot a question.

The first type of input is related to the trading analysis module. In this case, the user provides a stock ticker symbol and may also select a specific time period for analysis. The ticker symbol acts as an identifier for the financial asset that the user wants to examine. After the ticker is entered, the system uses the backend data layer to request historical stock-market data from an external market-data source. This data may include opening price, closing price, highest price, lowest price, trading volume, and date-based historical records. These values form the foundation of the trading dashboard because they allow the platform to calculate technical indicators and produce market visualizations.

The second type of user input is related to the marketing analytics module. Here, the user uploads a marketing dataset, usually in CSV format. This dataset may contain campaign names, advertising cost, clicks, impressions, conversions, revenue, customer segments, dates, and other performance-related variables. The uploaded dataset is processed by the system so that meaningful marketing indicators can be calculated. This function is important because marketing data often exists in raw tabular form, which can be difficult to interpret without structured analysis. By accepting uploaded files, InsightX allows users to analyze their own marketing campaigns rather than relying only on predefined example

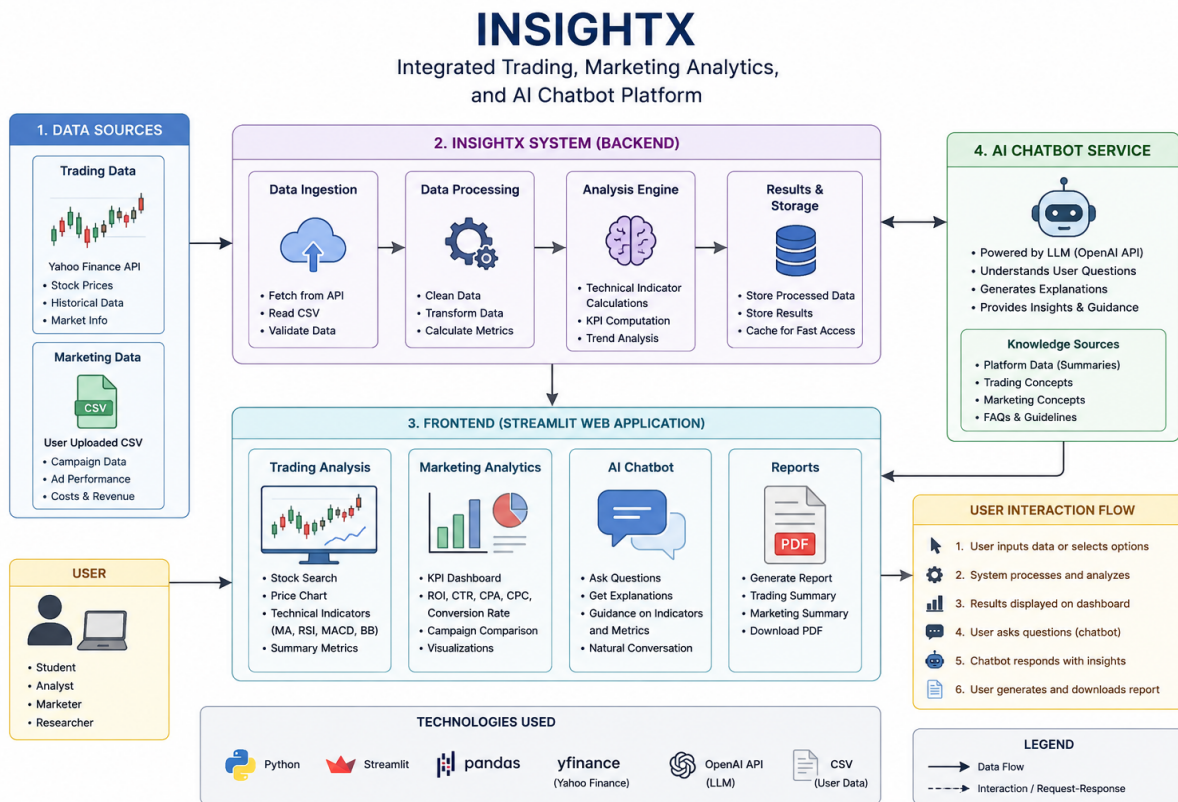


Figure 1. System workflow of the InsightX platform for integrated trading analysis, marketing analytics, AI chatbot assistance, and report generation.

data.

The third type of user input is the natural-language question sent to the chatbot. This feature allows users to ask questions about the system, the displayed results, technical indicators, marketing metrics, or general analytical concepts. For example, a user may ask what RSI means, why a campaign has a high cost per acquisition, how to interpret a moving average crossover, or what a conversion rate indicates. The chatbot input makes the system more interactive because the user does not need to understand every metric independently. Instead, the platform provides an explanatory layer that supports learning and interpretation.

After user input is received, the workflow moves into the main InsightX platform area, which is displayed in the center of the diagram. This central area represents the Streamlit web application and contains the four major modules of the system. These modules are the trading analysis module, the marketing analytics module, the AI chatbot module, and the reporting module. Each module has a specific role, but the diagram shows that they are connected through the same platform environment. This modular structure is important because it improves maintainability and scalability. Each component can be developed, tested, updated, or expanded independently while still remaining part of the full system.

The trading analysis module is responsible for retrieving, processing, and visualizing financial-market information. Once the user enters a stock ticker, the module communicates with the market-data source through the backend layer. The system fetches historical price data and then prepares it for analysis. This preparation may include checking the data structure, handling missing values, organizing dates, and converting numerical columns into a usable format. After the data is

prepared, the module generates visual outputs such as price charts and candlestick charts. These charts help users observe price movement over time and identify general market behavior.

A major part of the trading module is the calculation of technical indicators. Technical indicators are mathematical tools used to analyze price and volume patterns. In the diagram, examples include moving averages, RSI, MACD, and Bollinger Bands. Moving averages help smooth price movement and show the general direction of a trend. RSI provides a momentum-based measure that can help users identify whether an asset may be overbought or oversold. MACD compares moving averages to identify possible trend changes or momentum shifts. Bollinger Bands show volatility by placing upper and lower bands around a moving average. These indicators do not guarantee future price movement, but they help users understand historical behavior and support more informed interpretation.

The trading module also produces summaries and insights. These summaries may describe the overall trend, recent price changes, volatility conditions, or indicator signals. This feature is useful because raw charts can sometimes be difficult for beginners to interpret. By presenting summary metrics and simplified explanations, the system helps users move from raw financial data toward structured understanding. The trading module therefore functions as both an analytical and educational component of the platform.

The marketing analytics module is the second major component shown in the platform. Its purpose is to process uploaded marketing data and calculate performance indicators. After a CSV file is uploaded, the system reads the dataset and begins the data-cleaning and processing stage. This may involve

checking column names, detecting missing values, converting numerical fields, and ensuring that required variables are available. Once the data is prepared, the platform calculates key performance indicators such as return on investment, click-through rate, cost per acquisition, cost per click, conversion rate, and revenue. These indicators help users understand whether a marketing campaign is efficient, profitable, or in need of improvement.

Return on investment is one of the most important marketing indicators because it compares campaign revenue with campaign cost. A positive return indicates that the campaign generated more value than it consumed, while a weak return may suggest that resources were not used effectively. Click-through rate measures how often users click on an advertisement after seeing it. This metric is useful for evaluating ad engagement and message relevance. Cost per click shows how much the advertiser pays for each click, while cost per acquisition shows how much it costs to gain one conversion or customer. Conversion rate measures the percentage of users who completed a desired action. Together, these KPIs give the user a clearer understanding of campaign performance.

The marketing module also generates visualizations and performance insights. Charts may compare campaign revenue, cost, clicks, conversions, and efficiency across different campaigns or time periods. These visualizations help users identify high-performing campaigns, weak campaigns, and possible areas for optimization. Instead of manually calculating values in spreadsheets, the user can view the results directly through the dashboard. This makes the module useful for students learning marketing analytics, small businesses evaluating campaign performance, and researchers studying digital marketing outcomes.

The AI chatbot module is the third major component of the InsightX platform. Its role is to provide natural-language support and explanation. The chatbot receives user questions and sends them, together with relevant platform context, to an AI model service. The phrase “context” is important because the chatbot should not answer in isolation. It should be able to consider the user’s current activity, such as whether they are viewing trading results, marketing KPIs, or report outputs. By using context, the chatbot can produce more relevant explanations. For example, if the user is viewing RSI on the trading dashboard, the chatbot can explain RSI in relation to the current chart. If the user is viewing marketing KPIs, the chatbot can explain what a high CPA or low conversion rate might indicate.

The chatbot module improves the accessibility of the entire platform. Many analytical systems provide dashboards but leave interpretation fully to the user. This can be challenging for beginners who may not understand technical indicators or marketing terms. InsightX reduces this problem by allowing users to ask questions directly. The chatbot can explain concepts, define terms, summarize outputs, and guide the user through platform features. This makes the platform more educational and user-friendly. However, the chatbot should be understood as a support tool rather than a final decision-maker. Its explanations should help the user think more clearly, but the final interpretation and action remain the responsibility of the user.

The reporting module is the fourth major component shown

in the diagram. This module is responsible for compiling key insights and generating downloadable outputs. Reports may include trading summaries, marketing-performance summaries, charts, indicators, KPI results, and chatbot-supported explanations. Report generation is important because users often need to save, share, or present their analytical results. A dashboard is useful during interaction, but a report provides a permanent document that can be submitted, reviewed, or used for decision-making. The diagram indicates that reports can be exported in formats such as CSV or PDF, depending on the system implementation.

The backend and data layer is shown below the main platform modules. This layer supports the system by managing data retrieval, uploaded files, temporary storage, and AI model communication. It acts as the technical foundation behind the user-facing interface. The market data source is one part of this layer. It provides the historical financial data needed by the trading module. When the user requests stock analysis, the platform sends a request to the external data source, receives the data, and passes it into the trading module for processing and visualization. This connection allows the platform to use real market information rather than relying only on static sample data.

The uploaded marketing data source is another part of the backend layer. It represents the CSV file provided by the user. Once uploaded, the file becomes available to the marketing analytics module. The system reads the dataset, processes it, and calculates campaign indicators. This design gives the platform flexibility because users can analyze different marketing datasets according to their own needs. The backend layer must therefore be able to handle files carefully, validate data formats, and avoid processing errors.

The diagram also includes temporary storage or session-state management. This component is important because web applications often need to remember user selections, uploaded data, calculated results, and chatbot context during a session. For example, if a user uploads a dataset and then asks the chatbot about the results, the system needs a way to preserve the current context. Temporary storage allows the platform to maintain continuity while the user navigates between modules. This improves the user experience because the platform does not lose results every time a new interaction occurs.

The AI model service is also shown in the backend layer. This service provides the large language model capability used by the chatbot. When a user asks a question, the chatbot module sends the query and relevant context to the AI service. The service generates a response, and the platform streams or displays that response back to the user. This connection shows that the chatbot is not an isolated static script, but an intelligent service connected to the platform workflow. The quality of the chatbot depends on the quality of the model, the clarity of the user question, and the relevance of the context provided by the system.

On the right side of the diagram, the output-to-user section summarizes the final results generated by the platform. The first output is the trading dashboard, which includes charts and technical indicators. This output helps users understand financial-market behavior visually and numerically. The second output is the marketing dashboard, which includes KPIs and charts. This output helps users evaluate marketing per-

formance and compare campaign results. The third output is chatbot answers and explanations, which provide a conversational interpretation layer. The fourth output is downloadable reports, which allow users to save or export the results for later use.

The overall flow at the bottom of the diagram summarizes the complete system process in a simplified sequence. First, the user inputs data or questions. Second, the system fetches or receives data from the appropriate source. Third, the data is processed in the relevant module. Fourth, AI generates explanations where needed. Fifth, results and insights are displayed to the user. Finally, the user uses these outputs to make more informed decisions. This bottom sequence is useful because it reduces the entire platform workflow into a clear step-by-step process. It shows that InsightX follows a logical pipeline from input to processing, explanation, output, and decision support.

The technologies used in the platform are also shown in the diagram. Python is the main programming language because it provides strong support for data analysis, visualization, web development, and AI integration. Streamlit is used as the web framework because it allows rapid development of interactive dashboards. Pandas and NumPy support data processing, cleaning, and calculation. Plotly and Matplotlib support visualization by generating interactive or static charts. The financial data library is used to retrieve market information from an external source. The AI API supports chatbot responses. Together, these technologies form the technical stack that allows InsightX to operate as an integrated analytical system.

One of the most important strengths of the workflow is its modularity. The trading module, marketing module, chatbot module, and reporting module are separated conceptually, but they are connected through the platform. This means that one module can be updated without destroying the full system. For example, the trading module could later include additional indicators, risk metrics, or machine-learning forecasts. The marketing module could include segmentation, customer clustering, or campaign prediction. The chatbot module could be improved with stronger context retrieval, memory, or more advanced prompt engineering. The reporting module could be expanded with customizable templates and automatic executive summaries. The diagram therefore represents not only the current system, but also a structure that can support future development.

Another important strength is the combination of analysis and explanation. Many analytical platforms focus only on producing charts and numbers. InsightX goes further by adding an AI chatbot that can explain what those outputs mean. This is especially important for educational use because students may see a chart or KPI but still need help understanding its significance. The chatbot creates a bridge between technical output and user comprehension. This makes the platform more inclusive because it supports users with different levels of experience.

The workflow also shows that InsightX is designed around decision support rather than automatic decision-making. The platform provides data, analysis, visualization, explanation, and reports, but the user remains in control. This is a responsible design choice, especially in trading contexts where decisions may involve financial risk. Technical indicators and

AI explanations can support understanding, but they should not be treated as guaranteed predictions or direct financial advice. Similarly, marketing KPIs can show campaign performance, but users must still consider business goals, audience behavior, budget constraints, and strategic context before making decisions.

The figure also highlights the importance of data quality. The quality of the platform's outputs depends on the quality of the input data. If stock data is unavailable or delayed, the trading module may not produce useful results. If the uploaded marketing file contains missing or incorrect values, the marketing dashboard may be inaccurate. If the chatbot receives unclear questions or insufficient context, its responses may be too general. Therefore, a complete implementation of InsightX should include validation steps, error messages, and data-quality checks. This would make the platform more reliable and easier to use.

From a software-engineering perspective, the workflow demonstrates a clear separation between frontend, backend, data sources, AI services, and outputs. The frontend is responsible for user interaction and visualization. The backend manages processing, calculation, and service communication. External data sources provide market data and AI responses. Outputs are delivered through dashboards, explanations, and reports. This separation improves clarity because each part of the system has a defined responsibility. It also makes debugging easier because problems can be traced to a specific layer, such as data retrieval, file upload, indicator calculation, chatbot response, or report export.

In conclusion, Figure 1 provides a complete visual explanation of how InsightX operates as an integrated analytical platform. The system begins with user inputs, processes trading and marketing data through specialized modules, uses AI to generate explanations, and delivers results through dashboards and reports. The diagram shows that the platform is built around integration, modularity, accessibility, visualization, and user support. By combining financial analysis, marketing analytics, chatbot assistance, and report generation, InsightX provides a practical environment for transforming raw data into meaningful insight. Its workflow supports both educational and practical use, and its modular design creates a strong foundation for future expansion.

### 3. DISCUSSION

The development of the InsightX platform demonstrates the importance of integrating multiple analytical services into a single web-based environment. In many existing systems, trading analysis, marketing analytics, and AI-based assistance are treated as separate tools, which forces users to move between different applications and interpret results independently. This separation can reduce efficiency, increase confusion, and make data analysis more difficult for students, researchers, and non-specialist users. InsightX addresses this problem by combining financial analysis, marketing performance evaluation, interactive visualization, and chatbot-based explanation within one unified platform. This integration represents one of the main strengths of the project because it allows users to analyze different types of data while remaining within the same interface.

The trading analysis module provides a practical method for examining financial market behavior. By allowing users to view stock data, historical trends, and technical indicators, the platform supports a clearer understanding of market movements. Indicators such as moving averages, RSI, MACD, and Bollinger Bands help transform raw price data into more meaningful analytical signals. However, these indicators should not be interpreted as guaranteed predictions. Instead, they function as decision-support tools that help users recognize possible trends, momentum changes, and volatility patterns. This is important because financial markets are affected by many uncertain factors, including economic conditions, investor behavior, political events, company performance, and unexpected global changes. Therefore, the value of the trading module lies in improving user understanding rather than replacing professional financial judgment.

The marketing analytics module also plays an important role in the overall platform. Marketing data can often be difficult to interpret when it is presented only as raw tables or unstructured campaign records. InsightX improves this process by calculating key performance indicators such as return on investment, cost per acquisition, cost per click, click-through rate, conversion rate, and total revenue. These measures help users evaluate the effectiveness of marketing campaigns and compare performance across different strategies. This is especially useful for students, small businesses, and marketing beginners who may not have access to advanced commercial analytics tools. By presenting campaign performance through charts and structured metrics, the platform helps users move from simple data observation to practical decision-making.

The AI chatbot module adds another important layer to the system by improving interaction between the user and the platform. Dashboards and charts can provide useful information, but users may still need support in understanding what the results mean. The chatbot helps fill this gap by allowing users to ask questions in natural language and receive explanations about platform features, indicators, and analytical outputs. This makes the system more accessible, especially for users who are not experts in trading, marketing, or data science. The chatbot therefore improves the educational value of the platform by transforming the system from a passive dashboard into an interactive analytical assistant.

A major advantage of InsightX is its user-centered design. The platform was developed using a web-based interface, which makes it easier to access and operate compared with systems that require complex installation or advanced technical knowledge. The use of Python and Streamlit supports rapid development, interactive visualization, and simple navigation. This design decision is suitable for an academic project because it allows the system to demonstrate functional results while remaining understandable and easy to modify. The modular structure of the platform also improves maintainability because each module can be updated or expanded independently without requiring a complete redesign of the whole system.

The project also shows the importance of visualization in modern analytics. Raw financial and marketing data may contain valuable information, but users often cannot understand this value without proper visual representation. Through charts, dashboards, and interactive outputs, InsightX makes

patterns easier to observe and compare. In the trading module, visualization helps users identify price direction, market volatility, and indicator behavior. In the marketing module, visualization helps users compare campaign performance and recognize strong or weak outcomes. This confirms that data visualization is not only a design feature, but also a core analytical method that improves interpretation and decision support.

Despite these strengths, the platform has several limitations that should be considered. First, the accuracy and usefulness of the trading analysis depend heavily on the quality and availability of market data. If the external data source is delayed, incomplete, or unavailable, the trading module may not perform as expected. Second, the technical indicators used in the system are limited in scope and do not fully represent all possible market analysis methods. More advanced financial models, risk measures, sentiment analysis, and machine-learning forecasting techniques could improve future versions of the platform. Third, the chatbot depends on the quality of its prompts, context, and AI model. Although it can provide useful explanations, it may still produce incomplete or overly general responses if the user asks complex or unclear questions.

Another limitation is that the marketing analytics module depends on the structure and quality of the uploaded dataset. If the dataset contains missing values, inconsistent column names, incorrect formatting, or incomplete campaign information, the system may require additional preprocessing before accurate analysis can be performed. Future versions of InsightX could include stronger data-cleaning functions, automatic column detection, error messages, and data-validation tools. These improvements would make the platform more reliable and easier to use for users who do not have strong data-preparation skills.

Security and privacy are also important issues for future development. Since the platform may process uploaded marketing data and user queries, future versions should include stronger privacy controls, secure authentication, protected storage, and responsible API usage. This is especially important if the system is deployed online or used by real businesses. A cloud-based version of the platform would need additional safeguards to protect user data and prevent unauthorized access. Therefore, while the current system is suitable as an academic and prototype-based platform, further development would be necessary before using it in sensitive professional environments.

The overall results of the project indicate that InsightX successfully meets its main objective: creating an integrated analytical platform that supports trading analysis, marketing analytics, and AI-powered explanation. The system demonstrates how multiple technologies can be combined to support data-driven decision-making. It also shows that AI can improve user experience when it is used as an explanatory assistant rather than as a complete decision-maker. The platform is especially valuable in educational contexts because it allows users to interact with financial and marketing concepts in a practical way. Through its modular design, InsightX provides a strong foundation for future development and can be expanded into a more advanced decision-support system.

#### 4. CONCLUSION

This project presented InsightX, a web-based analytical platform designed to combine trading analysis, marketing analytics, and AI chatbot assistance within a single unified environment. The main purpose of the system was to reduce the complexity of data analysis by providing users with interactive dashboards, technical indicators, marketing performance metrics, and natural-language explanations. By integrating these features, the platform supports users in understanding financial and business data more effectively.

The trading analysis module allows users to examine market behavior through historical stock data, charts, and technical indicators. This helps users identify trends, momentum, volatility, and possible market patterns. The marketing analytics module enables users to evaluate campaign performance through important indicators such as ROI, CTR, CPA, CPC, conversion rate, and revenue. The chatbot module improves usability by allowing users to ask questions and receive explanations in natural language. Together, these modules create a practical decision-support environment that is useful for students, researchers, marketing users, and beginner analysts.

The project also highlights the value of modular software design. By separating the system into trading, marketing, chatbot, and reporting components, InsightX becomes easier to maintain, test, and expand. This structure supports future improvements such as predictive analytics, mobile application development, cloud deployment, stronger data security, improved chatbot intelligence, and integration with additional data sources. The system therefore provides not only a working prototype, but also a foundation for continued development.

Although the platform achieved its main objectives, several limitations remain. The system depends on external data quality, the chatbot may require further refinement, and the marketing module can be affected by inconsistent uploaded datasets. In addition, the current version focuses mainly on descriptive and indicator-based analysis rather than advanced prediction. These limitations provide clear directions for future work, including machine-learning forecasting, stronger preprocessing tools, better error handling, user authentication, and enhanced privacy protection.

In conclusion, InsightX demonstrates how artificial intelligence, data visualization, financial analysis, and marketing analytics can be integrated into one accessible web-based system. The platform contributes to the development of practical analytical tools by making complex data easier to explore, understand, and explain. Its main value lies in supporting informed decision-making while maintaining user control and interpretability. As data-driven systems continue to grow in importance, platforms such as InsightX can play an important role in helping users transform raw information into meaningful insight.

#### REFERENCES

- [1] Panos Constantinides, Ola Henfridsson, and Geoffrey G. Parker. Introduction—Platforms and Infrastructures in the Digital Age. *Information Systems Research*, 29(2):381–400, June 2018.
- [2] Mark De Reuver, Carsten Sørensen, and Rahul C. Basole. The Digital Platform: A Research Agenda. *Journal of Information Technology*, 33(2):124–135, June 2018.
- [3] Chong Zhang, Xinyi Liu, Zhongmou Zhang, Mingyu Jin, Lingyao Li, Zhenting Wang, Wenyue Hua, Dong Shu, Suiyuan Zhu, Xiaobo Jin, Sujian Li, Mengnan Du, and Yongfeng Zhang. When AI Meets Finance (Stock-Agent): Large Language Model-based Stock Trading in Simulated Real-world Environments, September 2024. arXiv:2407.18957 [q-fin.TR].
- [4] Alex Mari, Andreina Mandelli, and René Algesheimer. AI-Assisted Shopping on Voice Assistants: The Efficiency–Autonomy Consumer Decision Trade-Off. *Journal of Interactive Marketing*, page 10949968251400616, November 2025.
- [5] Patricia Marcella Evite, Ekaterina Svetlova, and Doina Bucur. Trade-offs in Financial AI: Explainability in a Trilemma with Accuracy and Compliance, February 2026. arXiv:2602.01368 [cs.HC].
- [6] Ahmad Ghazawneh and Ola Henfridsson. Balancing platform control and external contribution in third-party development: the boundary resources model. *Information Systems Journal*, 23(2):173–192, March 2013.
- [7] Vani Aggarwal and Nidhi Karwasra. Artificial intelligence v/s human intelligence: a relationship between digitalization and international trade. *Futur Bus J*, 11(1):16, February 2025.
- [8] A. Puder, S. Markwitz, F. Gudermann, and K. Geihs. AI-based Trading in Open Distributed Environments. In Kerry Raymond and Liz Armstrong, editors, *Open Distributed Processing*, pages 157–169. Springer US, Boston, MA, 1995.
- [9] Lam Duc Nguyen, Shashi Raj Pandey, Soret Beatriz, Arne Broering, and Petar Popovski. A Marketplace for Trading AI Models based on Blockchain and Incentives for IoT Data, December 2021. arXiv:2112.02870 [cs.LG].
- [10] Anne Yanru Chang, Xi Dong, Xiumin Martin, and Changyun Zhou. AI Democratization and Trading Inequality. *J of Accounting Research*, 64(3):1287–1331, June 2026.
- [11] Lean Yu, Shouyang Wang, and Kin Keung Lai. Forecasting China's Foreign Trade Volume with a Kernel-Based Hybrid Econometric-Ai Ensemble Learning Approach. *J. Syst. Sci. Complex.*, 21(1):1–19, March 2008.
- [12] Alexey Mikhaylov and Muhammad Ishaq M. Bhatti. The link between DFA portfolio performance, AI financial management, GDP, government bonds growth and DFA trade volumes. *Qual Quant*, 59(1):339–356, February 2025.
- [13] Devinder Kumar, Graham W. Taylor, and Alexander Wong. Opening the Black Box of Financial AI

- with CLEAR-Trade: A CLass-Enhanced Attentive Response Approach for Explaining and Visualizing Deep Learning-Driven Stock Market Prediction, September 2017. arXiv:1709.01574 [cs.AI].
- [14] Lukas W. Mayer, Sheer Karny, Jackie Ayoub, Miao Song, Danyang Tian, Ehsan Moradi-Pari, and Mark Steyvers. Human-AI collaboration: trade-offs between performance and preferences. *Cogn. Research*, 11(1):18, February 2026.
- [15] Umair Rehman, Farkhund Iqbal, and Muhammad Umair Shah. Exploring differences in ethical decision-making processes between humans and ChatGPT-3 model: a study of trade-offs. *AI Ethics*, 5(1):279–289, February 2025.
- [16] Amelia Katirai and Yusuke Nagato. Addressing trade-offs in co-designing principles for ethical AI: perspectives from an industry-academia collaboration. *AI Ethics*, 5(6):5611–5619, December 2025.
- [17] Sandra Sayonara Solórzano Solórzano, Johanna Micaela Pizarro Romero, Jimmy Gabriel Díaz Cueva, Jorge Eduardo Arias Montero, Michael Andrés Zamora Campoverde, Mariana Malvina Lozzelli Valarezo, Jose Carlos Montes Ninaquispe, Benicio Gonzalo Acosta Enriquez, and Marco Agustín Arbulú Ballesteros. Acceptance of artificial intelligence and its effect on entrepreneurial intention in foreign trade students: a mirror analysis. *J Innov Entrep*, 13(1):59, September 2024.
- [18] Maruthi Rohit Ayyagari, Pavan Punukollu, Sreeharsha Burugu, Raghuvveer Prasad Yerneni, Midhun Punukollu, and Sowmya Gudekota. Developing AI-Powered Predictive Analytics for Derivatives Trading: Machine Learning Models for Market Volatility Forecasting, Risk Mitigation, and Strategy Optimization. *Journal of Artificial Intelligence & Machine Learning Studies*, 7:79–115, 2023.
- [19] Haris Alibašić. Developing an ethical framework for responsible artificial intelligence (AI) and machine learning (ML) applications in cryptocurrency trading: A consequentialism ethics analysis. *FinTech*, 2(3):430–443, 2023.
- [20] Omri Even-Tov, Ben Lourie, Kimberlyn Munevar, and Alex Nekrasov. The Effect of AI on Retail Investor Behavior: Evidence from Account-Level Trading Data. Available at SSRN 5778246, 2025.
- [21] Ignacio Fdez. Galván, Morgane Vacher, Ali Alavi, Celestino Angeli, Francesco Aquilante, Jochen Autschbach, Jie J. Bao, Sergey I. Bokarev, Nikolay A. Bogdanov, Rebecca K. Carlson, Liviu F. Chibotaru, Joel Creutzberg, Nike Dattani, Mickaël G. Delcey, Sijia S. Dong, Andreas Dreuw, Leon Freitag, Luis Manuel Frutos, Laura Gagliardi, Frédéric Gendron, Angelo Giusani, Leticia González, Gilbert Grell, Meiyuan Guo, Chad E. Hoyer, Marcus Johansson, Sebastian Keller, Stefan Knecht, Goran Kovačević, Erik Källman, Giovanni Li Manni, Marcus Lundberg, Yingjin Ma, Sebastian Mai, João Pedro Malhado, Per Åke Malmqvist, Philipp Marquetand, Stefanie A. Mewes, Jesper Norell, Massimo Olivucci, Markus Oppel, Quan Manh Phung, Kristine Pierloot, Felix Plasser, Markus Reiher, Andrew M. Sand, Igor Schapiro, Prachi Sharma, Christopher J. Stein, Lasse Kragh Sørensen, Donald G. Truhlar, Mihkel Ugandi, Liviu Ungur, Alessio Valentini, Steven Vancoillie, Valera Veryazov, Oskar Weser, Tomasz A. Wesolowski, Per-Olof Widmark, Sebastian Wouters, Alexander Zech, J. Patrick Zobel, and Roland Lindh. OpenMolcas: From Source Code to Insight. *J. Chem. Theory Comput.*, 15(11):5925–5964, November 2019.
- [22] Thiago Narak C. De Oliveira and Maria Andréia Formico Rodrigues. Porting and Enhancing a Mental Health Narrative Game for VR: Redesign Insights and New Features for the Meta Quest Platform. In *Symposium on Virtual and Augmented Reality*, pages 96–104, Rio Grande Brazil, November 2023. ACM.
- [23] Joshua P. Meltzer. The Impact of Foundational AI on International Trade, Services and Supply Chains in Asia. *Asian Economic Policy Review*, 19(1):129–147, January 2024.
- [24] Anke Hassel and Didem Özkiziltan. Governing the work-related risks of AI: implications for the German government and trade unions. *Transfer: European Review of Labour and Research*, 29(1):71–86, February 2023.
- [25] Maximilian Braun, Daniel Tigard, Franziska Schönweitz, Laura Lucaj, and Alexander Von Janowski. AI Ethics and the Automation Industry: How Companies Respond to Questions About Ethics at the automatica Trade Fair 2022. *Philos. Technol.*, 35(3):76, September 2022.
- [26] Omar Mahmoud, Ali Khalil, Thommen George Karimpanal, Buddhika Laknath Semage, and Santu Rana. The unintended trade-off of ai alignment: Balancing hallucination mitigation and safety in llms. In *Findings of the Association for Computational Linguistics: EACL 2026*, pages 1017–1037, 2026.
- [27] Yang Cai, Vineet Gupta, Zun Li, and Aranyak Mehta. A New Lower Bound for the Random Offerer Mechanism in Bilateral Trade using AI-Guided Evolutionary Search, March 2026. arXiv:2603.08679 [cs.LG].
- [28] Hanyu Li and Xiaotie Deng. Will AI Trade? A Computational Inversion of the No-Trade Theorem. In Vittorio Bilò, Yang Cai, and Zhiyi Huang, editors, *Web and Internet Economics*, volume 16266, pages 577–592. Springer Nature Switzerland, Cham, 2026. Series Title: Lecture Notes in Computer Science.
- [29] Joyce Efekepogua Fiemotongha, Abbey Ngochindo Igwe, Chikezie Paul-Mikki Ewim, and Ekene Cynthia Onukwulu. Innovative trading strategies for optimizing profitability and reducing risk in global oil and gas markets. *Journal of Advance Multidisciplinary Research*, 2(1):39–56, 2023.
- [30] Shuangrui Yin, Qian Ai, Jiamei Li, Da Li, and Qinglei Guo. Trading mode design for a virtual power plant

- based on main-side consortium blockchains. *Applied Energy*, 325:119932, 2022.
- [31] Guanyu Gao, Chengru Song, TG Thusitha Asela Bandara, Meng Shen, Fan Yang, Wolf Posdorfer, Dacheng Tao, and Yonggang Wen. FogChain: A blockchain-based peer-to-peer solar power trading system powered by fog AI. *IEEE Internet of Things Journal*, 9(7):5200–5215, 2021.
- [32] Xi Lin, Jun Wu, Ali Kashif Bashir, Jianhua Li, Wu Yang, and Md Jalil Piran. Blockchain-based incentive energy-knowledge trading in IoT: Joint power transfer and AI design. *IEEE Internet of Things Journal*, 9(16):14685–14698, 2020.
- [33] Rehab Osman and Sherif El-Gendy. Interconnected and resilient: A CGE analysis of AI-driven cyberattacks in global trade. *Risk Analysis*, 45(4):846–862, April 2025.
- [34] Giacomo Bergami, Oliver Robert Fox, and Graham Morgan. Extracting Specifications Through Verified and Explainable AI: Interpretability, Interoperability, and Trade-Offs. In Nicu Bizon and Bhargav Appasani, editors, *Explainable Artificial Intelligence for Trustworthy Decisions in Smart Applications*, pages 33–64. Springer Nature Switzerland, Cham, 2026.
- [35] Kirti Verma, M. Sundararajan, Adarsh Mangal, Samrat Ray, and Ashok Kumar. The impact of COVID-19 to the trade in India using digital, IoT and AI techniques. In *2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)*, pages 01–05. IEEE, 2022.
- [36] Chansuh Lee, Kyungtae Lim, and Man-Sung Yim. Integrating Econometrics and Artificial Intelligence to Assess the Impact of Trade on Nuclear Proliferation. *Nuclear Technology*, 212(1):198–218, January 2026.
- [37] Antonella Diana. The experimental governing of mobility and trade on the  $C$  hina-  $L$  aos frontier: The  $T$  ai  $L$  ue case. *Singap J Trop Geogr*, 34(1):25–39, March 2013.
- [38] Youngseo Son, Sean AP Clouston, Roman Kotov, Johannes C. Eichstaedt, Evelyn J. Bromet, Benjamin J. Luft, and H. Andrew Schwartz. World Trade Center responders in their own words: predicting PTSD symptom trajectories with AI-based language analyses of interviews. *Psychological medicine*, 53(3):918–926, 2023.
- [39] Jian Yu, Peng Liu, Xunpeng Shi, and Xianneng Ai. China's emissions trading scheme, firms' R&D investment and emissions reduction. *Economic Analysis and Policy*, 80:1021–1037, 2023.
- [40] A Riesenbeck. Review on International Trade with Boar Semen. *Reprod Domestic Animals*, 46(s2):1–3, September 2011.
- [41] Rui Wu Wang, Lei Shi, Shi Meng Ai, and Qi Zheng. Trade-off between reciprocal mutualists: local resource availability-oriented interaction in fig/fig wasp mutualism. *Journal of Animal Ecology*, 77(3):616–623, May 2008.