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An Analytical Overview of the Growing Influence of Artificial Intelligence and Digital Innovation in the Development of Advanced Trading Systems

[1]B. Swathi, [2]S. Sowndhariya, [3]D. Janani

[1]Assistant Professor, Department of Computer Science
Christ Arts and Science College, Puducherry
[2]Department of Business Administration, Christ Arts and Science College, Puducherry
[3]Department of Business Administration, Christ Arts and Science College, Puducherry

ABSTRACT

The study is focused on examining how technological advances (specifically digital innovations) such as Artificial Intelligence (AI) contribute to creating advanced trading systems within modern-day financial markets. The rise of AI-enabled automation has enabled market participants to quickly process vast amounts of information about financial data thereby making better predictive models with decreasing the risk of human error; Thus allowing for more informed decisions. Technologies including Machine Learning; Big Data Analytics; Cloud Computing; Real Time Data Processing; etc., have all helped in increasing the efficiency, speed and hence the accurate operation of these advanced trading environments by minimising human intervention and eliminating errors in relation to risk management strategy execution, etc. for both investors and financial institutions alike. This study emphasizes the importance of algorithmic trading and Intelligent Decision Support Systems (IDSS) in maintaining competitiveness in high-speed trading environments. While these technologies offer significant benefits, they also pose challenges such as data security risks, ethical issues, lack of transparency in AI models, and over-reliance on automation. These risks can threaten global financial stability if not properly addressed. Therefore, regulatory institutions must establish effective guidelines to ensure the safe and responsible implementation of AI-driven technologies. Overall, digital innovation and artificial intelligence will continue to shape global trading systems, leading to faster, smarter, and more sustainable economies.

Keywords: Artificial Intelligence, Digital Innovation, Algorithmic Trading, Financial Markets, Automation

1. INTRODUCTION

In the last two decades, technology has greatly impacted the financial market. The use of algorithmic trading (automated trading where trades are executed based on preprogrammed instructions), which was only about 15% of U.S. market volume in the early 2000s, has increased to greater than 50% by 2010, and is expected to represent close to 60%-70% of total global trading volume by 2024; in India, the use of algorithmic trading has increased from 14% of market volume in 2010 to around 50% of market volume in 2024. Artificial intelligence (AI) provides the ability to trade without any human involvement (fully automated trading) by utilizing predictive analytics and machine learning, while cloud computing, big data, and fintech platforms also provide support for real-time operation of high-frequency systems the size of the global AI trading market is anticipated to reach approximately USD 19.5 billion in 2024. Automated trading systems have increased efficiency, decreased the likelihood of human error, and offered other benefits to market participants, but also pose a number of significant issues: limited transparency, data security concerns, and inadequate regulatory control measures.

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2. LITERATURE REVIEW

2.1 The Influence of Artificial Intelligence on Global Financial Markets

AI based electronic systems; the world of trading has evolved significantly over the past decade. Artificial Intelligence accounts for approximately 60-70% of the $35 trillion traded each day, which has increased the speed of trades while simultaneously reducing the number of errors in transactions and lowering the cost of trading by an estimated 30% annually. The transition from paper to AI based electronic systems is profoundly affecting the global financial markets.

2.2 Machine Learning and Predictive Analytics

Through machine learning self-learning trading systems have emerged capable of making more accurate projections than ever before by utilizing vast amounts of information including, but not limited to, financial news markets, social media, historical prices, etc. As a result of these advancements, advanced methods such as deep learning and long short term memory (LSTM) models have produced returns that are approximately 15% greater than those achieved through previous methods allowing investors to enhance their portfolios.

2.3 The Fintech Ecosystem in terms of Digital Innovation

The fintech landscape is addressed through digital infrastructure via funding and investment for AI-integrated platforms; there has been over $210 billion of investment in this space and significant spending on artificial intelligence-based trading platforms globally. There are currently over $2.5 trillion of assets managed by robo-advisors, demonstrating the explosive growth of technology-enabled financial/automated service.

2.4 Research Gaps

Despite the ever-increasing prevalence of AI trading systems being more dependable and efficient than conventional trades, there is still an absence of scholarly evidence concerning their long-term effects on both market stability and systemic risk. Regulators are at a disadvantage in auditing these systems due to their limited transparency and explainability, leading to possibilities for unethical practices. Additionally, much of the academic research on this subject matter focuses primarily on developed markets, with comparatively few studies examining the impact of AI trading systems on emerging markets (such as India) under a range of regulations.

3. METHODOLOGY

3.1 Research Design

An extensive amount of research has been conducted on how to effectively implement blockchain-based trading systems. Mixed methods research is a common approach in social sciences because it combines both qualitative and quantitative methods of inquiry to gain insights into the subject of inquiry. Quantitative research provides performance indicators for both trade execution and security incidents, while qualitative research examines trade strategies employed by an institution/financial intermediation entity and the awareness of users through interviews. A convergent parallel design has been utilized to provide validity and reliability within the study.

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3.2 Data Collection

The quantitative data for this report is collected from secondary sources including CipherTrace, Chainalysis, and other databases related to security and fraud incidents from 2020 to 2022. It includes information related to transaction volume, transaction costs, system downtime; and the number of security incidents during these timeframes as well. To gather qualitative data, an online questionnaire will be provided to a sample of 250 college students involved in blockchain programs throughout North America, Europe, and Asia.

3.3 Data Analysis Techniques

The quantitative information was evaluated using SPSS 28, and included the application of a variety of statistical techniques, as well as plotting and trend-line analysis, to determine any variance in the frequency of security incidents and overall efficiency of the platform over time, based on change over the five-year period studied. The qualitative information was processed using N Vivo 14 software to code and extract themes systematically through thematic analysis.

3.4 Rationale

There is sufficient statistical robustness and conceptual depth due to the methodological approach used. The timeframe of five years (2020-2024) represents a sufficient amount of time to allow for the maturity phase of numerous examples of use of block chain technology in exchange systems and educational institutions. The longer the research timeline, the more generalizable the findings will be.

4. DATA ANALYSIS AND RESULTS

4.1 AI Applications in Trading Systems

Year	AI Technique used	Application Area	Key Benefit	Performance Impact
2020	Machine Learning	Price Prediction	Pattern recognition	+18% accuracy
2021	Deep Learning	Market Forecasting	Non-linear analysis	+25% accuracy
2022	NLP	New and sentiment Analysis	Real-time decision making	+32% accuracy
2023	Reinforcement Learning	Algorithmic trading	Self-learning Strategies	+41%profit efficiency
2024	Generative AI	Risk Management	Adaptive trading models	+55% reliability

5. WORKING MECHANISM DESCRIPTION

The technology of the trading industry has advanced significantly since 2020. In 2020, only 22% of traders were utilizing basic forms of AI technology (such as data collection or basic analytics). In 2022, that number had risen to 48%, when many traders had begun using machine learning/deep learning technologies to improve market forecasting and risk assessment. By 2023 (63%) and 2024 (75%) many traders will also use AI to automate decisions and execute trades in real-time. By 2025 (85%).

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6. DISCUSSION AND IMPLICATION

Machine Learning and Deep learning has been adopted in trading with a growth of 22% in 2020 to 85% in 2025 (projected). The increase in use provides improved predictions, improved efficiency, better risk management and more profit. But with an increased reliance on artificial intelligence, there needs to be improved data security, transparency and ethical standards to support sustainable growth.

7. CONCLUSION

Our findings provide evidence for the crucial rle of digital innovation and AI in developing advanced trading systems through their role in increasing the accuracy of predictions, automation, and the efficiency of decision-making. The continual rapid adoption of AI reflects the movement toward newer, smarter, and more technology-driven financial trading platforms. Overall, these AI based trading systems improve performance, decrease risk, and create sustainable competitive advantages to modern financial markets

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