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AI, BLOCKCHAIN, AND MACHINE LEARNING IN FINANCE: A COMPARATIVE ANALYSIS OF FINTECH AND NON-TECH FINANCE APPROACHES

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ABSTRACT

This study examines the divergent strategies employed by ICICI Bank and Paytm in the rapidly evolving realm of finance and digital payments in India. ICICI Bank, a conventional financial institution, has strategically adopted technology such as robotic software and AI-driven chatbots to improve efficiency and customer service. Although blockchain adoption is imminent, the bank continues to adhere to traditional banking practises. Paytm, a leading fintech company, has emerged as a pioneer in electronic payments, presenting a stark contrast. The rapid growth of this phenomenon can be attributed to the implementation of user-friendly digital solutions, integration of artificial intelligence, and the potential for adopting blockchain technology. The integration of traditional banking and fintech reflects the dynamic and evolving landscape of financial services and digital payments in India.Both entities face distinct challenges and opportunities. ICICI Bank and Paytm both prioritise technological adaptation and robust security measures in their operations within the fintech landscape. Together, they represent the convergence of conventional and digital finance, reshaping the trajectory of banking and digital transactions in India.

Keywords: AI, Blockchain, Machine Learning, Fintech, Non-Tech Finance Approaches

1. INTRODUCTION

In the rapidly evolving financial landscape, the integration of Artificial Intelligence (AI) and Machine Learning stands as a powerful transformative force. These technologies, with their capacity to process extensive datasets, unveil hidden patterns, and facilitate data-driven decision-making, are redefining how financial services are conceived, delivered, and experienced. This study embarks on a comprehensive exploration of AI and Machine Learning in finance, with a specific focus on contrasting their adoption and application within two distinct segments: fintech, representing the innovative tech-driven financial sector, and non-tech finance, emblematic of traditional financial institutions. (Hamm and Klesel, 2021), The juxtaposition of these domains enables a nuanced comparative analysis that unveils the similarities and disparities shaping their technological evolution. Fintech start-ups continue to disrupt traditional models with agility and innovative solutions, while established financial institutions are embracing technology to enhance efficiency, customer experience, and security. Both sectors leverage AI and Machine Learning, but the manner of their deployment and impact diverges intriguingly. (Puschmann, 2017) This study seeks to address fundamental questions about these dynamics, including the real-world applications of blockchain technology—a powerful offshoot of AI and Machine Learning—in fintech and non-tech finance. Through in-depth case studies of select companies and institutions, we aim to offer insights into how technology is reshaping the financial landscape, contributing to a deeper understanding of this transformative intersection of technology, finance, and innovation.

The significance of this comparative analysis is underscored by the pivotal roles both fintech and non-tech finance sectors play in the global financial ecosystem. Fintech's agility and innovative spirit continually challenge traditional models, while established financial institutions are striving to remain competitive by embracing technological advancements. AI and Machine Learning are the common threads weaving through their narratives, but they manifest differently in their strategies and outcomes. In this study, we aim to explore the specific ways fintech companies are harnessing AI and Machine Learning to develop cutting-edge financial solutions and contrast this approach with that of traditional finance institutions. We also delve into the tangible outcomes of these technology implementations, examining not only cost-efficiency and security enhancements but also their impact on customer experience and financial inclusivity. By addressing these questions, we seek to offer insights into the evolution of technology in finance and its implications for future advancements and policy considerations. As we embark on this journey of exploration, we invite readers to delve into the intricate interplay of technology, finance, and innovation. (Cao, 2022) By the conclusion of this study, we aim to illuminate the pathways where these transformative forces converge and diverge, ultimately enriching the discourse on AI, Machine Learning, and blockchain in the realm of finance.

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The evolution of AI, Machine Learning, and blockchain in the financial sector not only promises efficiency gains and cost savings but also reshapes the very foundations of trust and security in financial transactions. In this context, the case studies that follow will spotlight companies and institutions at the forefront of this revolution. We will examine their strategies, technologies, and real-world applications, offering a microcosm of the broader industry's transformation. Through these case studies, we aim to provide a detailed view of how fintech and traditional finance institutions have harnessed the power of AI, Machine Learning, and blockchain to address the unique challenges and opportunities in their respective domains. (Guo and Polak 2021, p.175)

The insights derived from this comparative analysis hold profound implications for various stakeholders. For fintech innovators, it may provide fresh perspectives on optimizing their AI and blockchain strategies, ensuring a competitive edge in a dynamic market. Traditional financial institutions may find valuable lessons in adaptation, shedding light on how to leverage these technologies to stay relevant and resilient in a changing financial landscape. Regulators and policymakers can draw upon this research to inform their decisions regarding the oversight and promotion of these transformative technologies, balancing innovation with safeguards.

As we embark on this comparative analysis of AI, Machine Learning, and blockchain in fintech and non-tech finance, it is our hope that the findings presented will contribute to a deeper understanding of how these technologies are shaping the future of finance. By exploring the applications, challenges, and impacts of these technologies in real-world contexts, we aim to provide a robust foundation for informed decision-making and innovative progress within the financial sector. (Guo and Polak 2021, p.175)

In the pages that follow, we will dive into the intricacies of our case studies, exploring the diverse and dynamic landscape of AI and Machine Learning in finance.

2. RESEARCH AIMS AND OBJECTIVES

2.1 Research Aims

The primary aim of this study is to conduct a comprehensive comparative analysis of the implementation and impact of Artificial Intelligence (AI), Machine Learning, and blockchain technology in two distinct financial sectors, represented by Paytm (Fintech) and ICICI Bank (Traditional Finance). By focusing on these case studies, we seek to understand how technology adoption and adaptation differ between innovative fintech companies and established traditional financial institutions.

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2.2 Research Objectives

1. To Analyze Technological Adoption:

To investigate how Paytm, a leading fintech company, and ICICI Bank, a traditional financial institution, have adopted AI and Machine Learning in their operations.

2. To Examine Real-World Applications:

To identify and compare the real-world applications of AI and Machine Learning in Paytm's fintech services and ICICI Bank's traditional banking services.

3. To Explore Blockchain Implementation:

To assess the extent to which blockchain technology is integrated within the operations of Paytm and ICICI Bank, and to understand the specific use cases in each sector.

4. To Evaluate Impact on Efficiency and Customer Experience:

To analyze the impact of these technologies on efficiency, cost savings, and the overall customer experience within Paytm and ICICI Bank.

5. To Identify Challenges and Opportunities:

To identify and contrast the challenges and opportunities faced by fintech and traditional finance sectors in their adoption of AI, Machine Learning, and blockchain.

6. To Offer Policy and Strategic Insights:

To provide insights and recommendations for industry stakeholders, regulators, and policymakers based on the findings, aiming to inform future technological advancements and regulatory considerations in the financial sector.

3. REVIEW OF LITERATURE

Because of its distinctiveness and potential, AI has attracted much research attention over the decades (Hyder et al., 2019). "The rapid advancement in machine learning has spurred the interest in AI (Wang and Siau, 2019)." AI technologies and applications span from the use of deep learning in self-driving cars to natural language processing to analyze text. AI has the potential to automate tasks, engage with individuals (e.g., customers), generate insights and make decisions, and support innovation. With AI's uniqueness in comparison to other technologies, it will be essential to identify the actionable objectives needed to realize its value. Previous studies have identified success factors

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associated with AI adoption, such as top management support and appropriate resources (e.g., data) (Hamm and Klesel, 2021), as well as employees' perceptions and attitudes prior to AI adoption (Chiu et al., 2021). What has not been identified, however, are the actionable objectives needed to derive value from AI.

Financial technology (fintech) 'encompasses innovative financial solutions enabled by IT' (Puschmann, 2017). Artificial intelligence and data science are the promoters of the new generation of fintech, as they have the potential to discover previously hidden relationships among variables (Wall, 2018). Concepts and tasks in the fintech field are redefined as AI affects the operation of financial organizations, transfers the way participants interact, and raises new financial mechanisms. AI-empowered finance has promoted a new era of smart digital currencies, risk management, and lending (Cao, 2022). Considering the substantial quantity and diversity of data in the financial services industry, AI is significant (Veloso et al., 2021). For example, AI in fintech includes assessing loan applications with neural networks and approving credit with rule-based expert systems. The development of AI helps improve the efficiency of financial firms and the quality of financial services and products by reducing cost, enhancing productivity, and promoting more tailored products (OECD, 2021). Based on AI technology, security companies build an 'intelligent control application system' which can analyze both internal and external big data and identify and warn of hidden risks (Guo and Polak 2021, p.175). Fintech lenders use complex AI algorithms to make credit decisions quickly (Jagtiani and John, 2018). Ant Financial, a leading Chinese fintech company, promoted the 'Smile-to-Pay' service based on computer vision technology. Customers can complete payment by 'smiling' at a vending machine without using phones or cash (Qi and Xiao, 2018). Further, investors analyze big data to find customers' demand information with the help of AI and identify customer investment preferences (Guo and Polak 2021, p.175).

As an emerging technology, AI also brings new risks and challenges to the financial industry. Wall (2018) claimed that the AI algorithm could identify relationships that are not causal. This could lead to biases against some protected classes (i.e., gender, race). Since the decision processes are complex and invisible, it is hard for humans to regulate and intervene (Jagtiani and John, 2018). Some studies found that it is hard to convince people to trust financial services and advice provided solely by automated systems (Fenwick and Vermeulen, 2017). Researchers also found that Fintech lenders may undermine existing financial regulations (Braggion et al., 2019). Therefore, regulations that promote policies to protect consumers while encouraging the innovation and development of new technologies need to be further improved (Jagtiani and John, 2018). For AI's potential contribution to be realized, it will be important to identify the value that AI can provide and objectives that can be achieved to realize this value. Previous studies have focused on other aspects of AI in fintech, such as the effectiveness of using machine learning in P2P lending and methods of removing bias (Fu, Huang, and Singh, 2021), algorithmic trading systems integrating investors' dispositions (Martínez, Román, and Casado, 2019), and investor reliance on humanized robo-advisors (Hodge, Mendoza,

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and Sinha, 2021). However, research is lacking in discerning the value that can be derived from AI in fintech and the objectives needed to realize this value.

P. C. Lai et al. (2022) During the COVID-19 epidemic, internet usage grew, opening a new avenue for companies to expand their business horizons. This new channel, however, has its own set of challenges for users. Using machine learning inference, this study aims to examine the relationship between these features and the adoption of e-payment services E-payment usage can be predicted using an AI-based analytic pipeline that considers a variety of dependent variables. Hybrid AI and a tree algorithm helped identify the most significant things in the analysis pipeline, & relationships between them were discovered. The findings show that e-payment system utilization is influenced by factors such as expectations, enabling conditions, user attitudes, & performance expectations. Those under the age of 25 need a gamification strategy to adopt e-payment, while those beyond the age of 40 need social aid.

Nadir Kamel Benamara et al. (2021) E-Payment systems have a huge security problem. PINs, passwords, and cards are among the many ways in which these systems are protected from illegal users, or 'hackers,' as they are referred as in the industry. These hackers, on the other hand, may be able to get beyond this defense by using other methods. There are many ways to prevent hackers from getting into the Epayment system, however there are still some cases when an illegal user can get in by taking a genuine user's payment card. Facial biometry has become a highly developed and accurate technology, especially in the recent decade, as AI technologies, such as deep learning, have been adopted for face identification. To improve the security of an E-Payment system, we suggest using deep learning-based facial biometry in conjunction with RFID cards. This ensures that a user can only access the E-Payment system if he or she is physically there and using his or her RFID card. Face authentication models that use deep learning were tested on MUCT & CASIA Face-V5 datasets to select the best one for our proposed secure E-Payment system, with top verification rates of 99.90% & 99.26%. There are two versions of this system: the first one uses a personal computer (PC) & second one uses an embedded system (Raspberry Pi 3)

Yiming Li. et al. (2021) This study focuses on e-payment system anomalies in the actual world. In an Epayment system's temporal interaction graph, nodes represent users, & edges represent the multidimensional transaction sequences that connect them. A node classification challenge is used to identify unauthorized users in the E-payment network using recently developed advanced temporal graph representation learning algorithms. E-payment network dynamics may be explained using Graph Temporal Edge Aggregation (GTEA), a representation learning approach for temporal interaction graphs. Instead of aggregating all of the nodes' interactions throughout time, the network's edges are taught to replicate their own unique temporal dynamics. It can model relationships by collecting patterns of interaction between two persons utilizing different traits. Additionally, a self-attention mechanism that focuses attention to significant neighbors while filtering out long-tail noise

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is incorporated into the architecture. When used to an E-payment network, GTEA can learn to distinguish between varied roles of users by combining interactive temporal dynamics with multi-dimensional relational interdependence in a network. There are three E-payment datasets in which GTEA beats existing state of the art models on node categorization tasks.

Nasr et al. (2020) Because of the exponential growth of e-business, e-payments are becoming increasingly important for all online businesses. As a result of electronic payments, it became easier for people to survive. Paying for your purchases has never been more entertaining or convenient thanks to a variety of formats and devices. E-payments must be integrated with e-business for it to be effective. With multiple methods and prospects in the field of electronic commerce, e-payments also confront several threats & challenges. that must be addressed to find answers. An overview of e-payments possibilities, challenges and various hazards for e-payments is presented in this article, with fraud being the most serious threat to the e-payments industry, resulting in huge losses. "E-payments, their benefits, & future of e-payments are all discussed in this study."

4. RESEARCH METHODOLOGIES

The research is descriptive by nature, a qualitative method of data collection and analysis seems relevant, and the data collected has been collected from authentic and reliable sources. This case study employs a structured methodology to compare the implementation of Artificial Intelligence (AI) and Machine Learning (ML) in Paytm and ICICI Bank. Data collection is an essential initial phase, involving the gathering of information from publicly accessible sources such as company reports, press releases, and official websites. The data has been carefully analysed to extract information specifically related to the integration of artificial intelligence (AI) and machine learning (ML) within financial institutions.

The collected data has been categorised into sections based on the adoption, applications, and impact of AI and ML. This categorization enables a systematic and comprehensive analysis of the data, ensuring thorough exploration of the pertinent aspects of technology implementation.

Before conducting a comparative analysis, it is important to establish a contextual understanding of the two entities being examined. The case study commences by providing an overview of Paytm and ICICI Bank, elucidating their respective positions in the fintech and traditional finance industries. This establishes a foundation for a comparative analysis of their technological approaches and resulting outcomes.

This study focuses on the integration of AI into Paytm's operations, highlighting its specific applications and notable outcomes. Machine Learning applications in Paytm are examined, specifically in the domains of fraud detection, recommendation systems, and customer service

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enhancements.

The study focuses on the integration of AI into ICICI Bank's services, particularly in areas such as customer service, chatbots, and risk management. This study examines the implementation of Machine Learning in ICICI Bank, focusing on credit scoring, fraud prevention, and data analytics.

The case study proceeds to conduct a comparative analysis of AI and ML implementations in both entities, leveraging a comprehensive understanding of these technologies. This phase involves analysing the contrasting approaches of Paytm and ICICI Bank, specifically examining their effects on efficiency and the customer experience. The analysis provides a systematic examination of the distinct manifestations of these technologies in the fintech and traditional finance sectors.

The case study examines the challenges faced by Paytm and ICICI Bank during their implementation of AI and ML. Additionally, this study examines the opportunities and innovations that have emerged in various sectors due to the implementation of these technologies.

The study analyses the policy and strategic implications of the findings. This study provides valuable insights on how the results can inform future technological adoption and regulatory considerations. It aims to offer guidance to stakeholders in the fintech and traditional finance sectors.

5. CASE STUDY

5.1 ICICI Bank - A Pioneer in Robotic Software and AI Integration

ICICI Bank, India's second-largest private sector bank, has emerged as a trailblazer in the financial industry by integrating cutting-edge technology into its operations. In this case study, we delve into ICICI Bank's strategic adoption of robotic software and AI-driven solutions, showcasing how these innovations have revolutionized the bank's operations and customer interactions.

Robotic Software Implementation:

ICICI Bank's implementation of robotic software is a groundbreaking step in the Indian banking sector. This technology, designed to automate repetitive, time-consuming, and high-volume tasks, has redefined the way the bank operates. By relieving employees of mundane tasks, the software has allowed them to focus on value-added, customer-centric functions. This automation not only improves operational efficiency but also enhances customer service.

AI-Powered Chatbot iPal:

In addition to robotic software, ICICI Bank has introduced an AI-based chatbot known as iPal. This chatbot has been a game-changer in customer interactions, having engaged with 3.1 million customers and effectively addressed approximately 6 million queries. With an impressive accuracy rate of 90 percent, iPal has streamlined customer support and improved response times.

Integration with Voice Assistants:

To stay ahead in the rapidly evolving tech landscape, ICICI Bank is exploring the integration of iPal with established voice assistants such as Cortana, Siri, and Assistant. This forward-thinking approach aligns with the bank's commitment to enhancing customer service and accessibility through AI technology.

ICICI Bank's journey into robotic software and AI integration exemplifies its commitment to technological innovation. By automating routine tasks and offering AI-driven customer support, the bank has improved operational efficiency and customer experiences, setting a standard for traditional financial institutions.

5.2 Case Study 2: Paytm - Leading the E-Payment Revolution in India

In the era of digital finance, Paytm has emerged as a dominant force in India, leading the charge in electronic payment systems. This case study explores Paytm's contributions to the electronic payment revolution, focusing on its mobile wallets, AI integration, and the potential for blockchain technology.

Mobile Wallets and Cashless Transactions:

Paytm's mobile wallet has been pivotal in India's transition to a cashless economy. The rise of internet-based banking and online shopping has fueled the popularity of mobile wallets. Users can securely store credit and debit card details, making payments seamless and convenient. This innovation has reduced the reliance on cash, driving India towards a cashless future.

AI Integration and Voice Assistants:

Paytm has been at the forefront of AI integration in electronic payments. The integration of voice assistants allows users to make inquiries and execute transactions effortlessly using voice commands. Chatbots powered by AI have improved customer service and streamlined the payment process, providing a user-friendly and secure experience.

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Venturing into Blockchain:

While not explicitly mentioned in the provided data, Paytm's foray into blockchain technology represents a forward-looking approach to secure and transparent transactions. Blockchain, known for its potential to revolutionize digital transactions, aligns with Paytm's mission to provide innovative and secure payment solutions.

Paytm's role in India's electronic payment revolution cannot be understated. By introducing mobile wallets, embracing AI-driven solutions, and exploring the potential of blockchain technology, Paytm has not only simplified transactions but also set new standards in secure and user-friendly digital payments. The synergy between technology and finance exemplified by Paytm paves the way for a cashless future in India.

5.3 Comparative Study: ICICI Bank vs. Paytm

Aspect	ICICI Bank	Paytm
Business Type	Traditional Banking	Fintech (Electronic Payment)
Technology Focus	Robotic Software, AI, Chatbots	Mobile Wallets, AI, Blockchain (potential)
Robotic Software Implementation	Implemented for automating tasks	Not Applicable
AI Integration	AI-based Chatbot (iPal) with 6M+ queries	AI-powered Chatbots, Voice Assistants
Blockchain Adoption	Not explicitly mentioned	Potential adoption
Customer Base	Established customer base	Rapidly growing user base
Operational Focus	Efficiency and automation	User-friendly payments and accessibility
Challenges and Opportunities	Adapting to tech-driven models, improving efficiency	Maintaining high-security standards, disrupting traditional finance
Conclusion	ICICI Bank leverages technology for efficiency and customer service	Paytm pioneers in cashless transactions and secure digital payments

Table 1: Comparative Study: ICICI Bank vs. Paytm

Business Type:

- ICICI Bank: ICICI Bank is a traditional financial institution that operatesas a conventional bank. Its primary focus is on providing banking services and financial products to a diverse customer base, including savings accounts, loans, and investment options.
- *Paytm:* Paytm, on the other hand, is a prominent fintech company that specializes in electronic payment solutions. It operates in the digital finance sector, offering mobile wallets, online payment services, and digital financial products.

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Technology Focus:

- *ICICI Bank:* ICICI Bank has focused on adopting advanced technology to streamline its operations. It has deployed robotic software to automate repetitive, high-volume, and time-consuming tasks within the bank. Additionally, it has introduced AI-driven solutions like the chatbot iPal to enhance customer support and engagement.
- *Paytm:* Paytm is at the forefront of technology-driven innovations in the electronic payment sector. Its primary focus areas include mobile wallets, AI integration, and the potential adoption of blockchain technology, although not explicitly mentioned in the provided data.

Robotic Software Implementation:

- *ICICI Bank:* ICICI Bank has successfully implemented robotic software, which plays a pivotal role in automating routine tasks. This innovative approach has significantly improved operational efficiency by allowing employees to concentrate on more value-added and customer-centric functions.
- *Paytm:* Paytm does not employ robotic software, as its primary emphasis is on offering user-friendly electronic payment solutions and integrating AI-driven features to enhance customer experiences.

AI Integration:

- *ICICI Bank:* In addition to robotic software, ICICI Bank has integrated AI into its operations through the introduction of the chatbot iPal. This AI-powered chatbot has engaged with a vast customer base, effectively addressing numerous queries with an impressive accuracy rate of 90 percent.
- *Paytm:* Paytm has fully embraced AI integration, particularly in enhancing user experiences and simplifying electronic payment processes. Its AI-powered chatbots and voice assistants enable users to make inquiries and execute transactions using voice commands.

Blockchain Adoption:

- *ICICI Bank:* While the use of blockchain technology is not explicitly mentioned in the provided data, ICICI Bank may explore its potential applications in the future.
- *Paytm:* Paytm has shown interest in the potential adoption of blockchain technology. Blockchain has the capacity to enhance the security and transparency of transactions, aligning with Paytm's commitment to providing innovative and secure payment solutions.

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Customer Base:

- *ICICI Bank*: ICICI Bank boasts an established customer base, as it has been a key player in the Indian banking sector for a considerable time.
- *Paytm:* Paytm's customer base is rapidly growing, driven by its innovative and user-friendly electronic payment solutions. It has become a preferred choice for a new generation of digital consumers.

Operational Focus:

- *ICICI Bank:* ICICI Bank's operational focus revolves around improving efficiency and automation through the adoption of technology, thereby providing enhanced customer service.
- *Paytm:* Paytm's primary operational focus is on user-friendly payments and accessibility. Its innovative solutions cater to a broad audience, making digital transactions seamless and secure.

Challenges and Opportunities:

- *ICICI Bank:* The challenges for ICICI Bank include adapting to tech-driven models, addressing potential resistance to change within a traditional institution, and improving operational efficiency. The opportunities lie in enhancing customer service and embracing digital transformation.
- *Paytm:* Paytm faces the challenge of maintaining high-security standards in the rapidly evolving fintech landscape. However, it can disrupt traditional financial models, further expanding its user base and offering innovative payment solutions to the market.

6. CONCLUSION

In conclusion, the comparative analysis of ICICI Bank and Paytm underscores the dynamic evolution of India's financial and digital payment sectors. ICICI Bank, as a stalwart of traditional banking, has harnessed technology to enhance operational efficiency and customer service. Paytm, a fintech trailblazer, leads the charge in the electronic payment revolution, offering user-friendly solutions and exploring the potential of blockchain technology.

The collaboration of traditional finance and fintech exemplifies the synergistic relationship between established banking institutions and innovative digital payment providers. Both ICICI Bank and Paytm face distinct challenges and opportunities, reflecting the shifting landscape of financial services in India. While ICICI Bank adapts to technological change and focuses on efficiency, Paytm seeks to maintain security standards while driving digital disruption.

Ultimately, these two entities showcase the coexistence of traditional and digital finance, shaping the future of banking and electronic payments in India. Their journeys exemplify the dynamism of the financial sector, with technology at its core, and the potential to enhance customer experiences and drive innovation in the ever-evolving landscape of financial services

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