
RISK MANAGEMENT IN DIGITALIZED EMERGING PAYMENTS THROUGH AI TECHNIQUES

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Abstract- The modern financial ecosystem is characterized by a dynamic and complicated landscape due to emerging payment mechanisms and accompanying hazards. The necessity for comprehensive risk assessment and mitigation procedures becomes more important as traditional payment systems change and alternative payment methods become more popular. This paper explores the intersection of fuzzy logic and artificial intelligence (AI) in addressing the challenges posed by these developments. The amalgamation of fuzzy logic and AI presents a potent paradigm for comprehensively addressing emerging payment methods and associated risks. By harnessing the strengths of both approaches, financial institutions can navigate the complexities of modern payment systems with confidence. This integrated framework not only enhances risk assessment and mitigation but also fosters adaptability in the face of evolving payment landscapes and forecasting. As the financial ecosystem continues to evolve, the symbiosis of fuzzy logic and AI stands poised to play a pivotal role in ensuring the security and efficiency of emerging payment methods.

Keywords: Digitalization, Fuzzy rules, Risk management, Emerging payments Methods.

1 INTRODUCTION

Millions of people now have the option to practice social distancing when making purchases because to the contactless nature of the many digital payment modalities made possible by cutting-edge technologies and legislative flexibility. Many of these new payment habits enable customers to do online or cashless transactions.

The process of transforming an object from a physical to a digital version is referred to as "digitalization." Digitalization aids in increasing business income or process effectiveness. The real purpose of the digitalization process is to make work more efficient, lucrative, and collaborative via new payment technologies. Due to technological innovation, increased internet usage, and consumer adoption of mobile phone online payment methods including NEFT, RTGS, UPI, IMPS, and Wallet. **The number of fraud instances is rising quickly as payment methods move toward being digital and real-time.**

Payments made digitally or online are referred to as digital payments. Banking cards, the Adhar Enabled Payment System, UPI, mobile wallets, POS terminals, Internet banking, mobile banking, and micro ATMs are among the various digital payment options.

(i) Mobile wallets

Banks and financial institutions have adopted extremely secure technologies by using mobile wallets. Retail payments are likely to increase more quickly in the current environment, and

companies are already providing incentives to customers who want to use digital wallets for their payments.

(ii) PoS devices: Businesses who want to see less cash payments utilize Point of Sale devices. Banks adopted PoS equipment because they were less expensive.

2. PAYMENT TYPES AND METHODS

There are numerous business and payment-related interactions and transactions:

Consumer-to-Consumer (C2C):

These are exchanges that take place directly between customers. Peer-to-peer transactions, such as bill sharing or buying things from online stores where people sell to other people, are examples.

Consumer-to-Business (C2B):

Individual customers supply businesses with goods or services through C2B interactions. Freelancers, consultants, and anyone who offer goods or services to businesses online could all fall under this category.

Business-to-Business (B2B):

Transactions between two businesses are involved in this. It comprises corporate alliances, supply chain activities, and wholesale transactions. Suppose a company sold products to a store.

Government to Government (G2G):

Interactions and transactions between various government agencies are referred to as G2G transactions.

Table 1 Payment Types

Payer	Consumer	Business	Government
Consumer	C2C	C2B	C2G
Business	B2C	B2B	B2G
Government	G2C	G2B	G2G

In India customers looked for convenient and contactless payment options, the COVID-19 pandemic hastened India's shift to digital payments. Cash usage significantly decreased as a result, but due to its widespread acceptance, it continued to be the most common in-store payment method.

Table 2 Payment Methods used in India

Payment Methods	2017	2019	2020	2021	2022	2025
E-wallet, Digital/mobile wallet	6%	5%	22%	25%	35%	40%
Cash payments	72%	71%	34%	37%	27%	20%
Debit card	11%	12%	20%	18%	19%	20%
Credit Card	9%	12%	12%	18%	17%	19%
Other	2%	1%	11%	-	2%	1%

Mobile wallets, on the other hand, are predicted to become more and more influential in India's payment system as they have been growing in popularity quickly. Services like Paytm, PhonePe, and Google Pay have already experienced significant growth, and between 2020 and 2025, it is anticipated that they will continue to draw millions of new users. These mobile wallet platforms provide more than just payments; they also help users buy tickets, pay bills, and even access small-scale financial services.

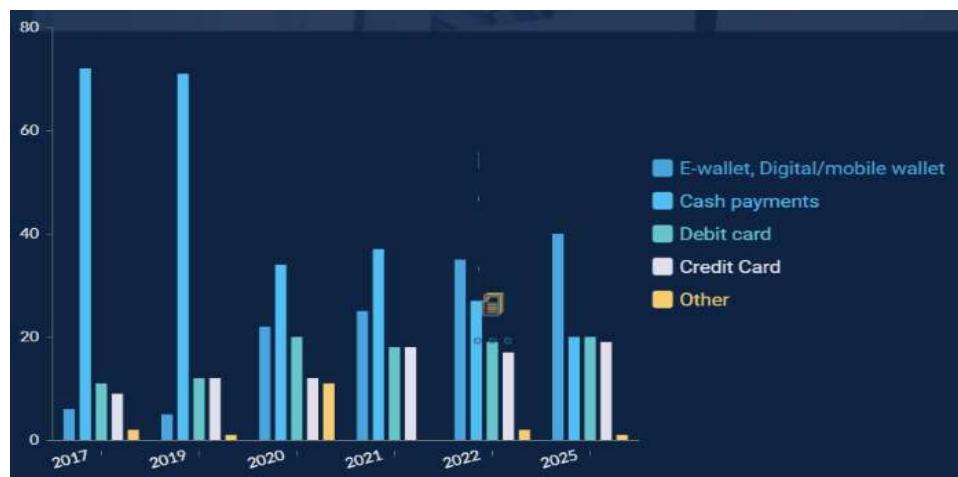


Fig. 1 Payment Methods in India

3. RISK MANAGEMENT BY FUZZY LOGIC AND AI IN EMERGING PAYMENT METHOD

Risk management in emerging payment methods employing fuzzy logic and artificial intelligence (AI) entails utilizing modern technology to identify and reduce risks associated with new and evolving payment systems. Here's an overview of how fuzzy logic and artificial intelligence can be used in this context:

A. Fuzzy Logic in Uncertain Environments:

Handling Ambiguity: Fuzzy logic is ideal for situations involving uncertainty or ambiguity. Traditional risk assessment models may be less successful with developing payment methods due to a lack of historical data to analyze. Fuzzy logic is capable of dealing with imperfect information and making conclusions based on degrees of truth.

Linguistic Variables: Rather than rigid numerical values, fuzzy logic allows the introduction of language variables (e.g., "high risk," "low risk"). This is helpful in risk assessment when the boundaries between risk levels are unclear.

B Predictive Analytics with AI:

Machine learning models: AI systems, particularly machine learning models, can examine enormous amounts of data to detect patterns and trends. This is critical for forecasting potential problems and understanding the behavior of emerging payment systems.

Fraud Detection: Artificial intelligence-powered fraud detection systems may continuously learn from transaction data to identify suspicious behaviors. This is especially crucial in real-time payment processing, when quick decisions are necessary.

C. Real Time Monitoring:

Continuous Assessment: Transactions may be monitored in real time using fuzzy logic and AI. This provides for fast identification and response to potentially dangerous actions, lowering the incidence of incidents. Transactions may be monitored in real time using fuzzy logic and AI. This enables rapid detection and response to potentially risky activity, lowering the possibility of fraudulent transactions. Transactions that are fraudulent.

D. Adaptive Systems:

Dynamic Risk Assessment - When integrated with AI, fuzzy logic allows systems to adapt and evolve as the payment landscape changes. As new threats emerge, the models can be updated to reflect the most recent data and trends.

E. Behaviour Analysis:

Individual user behavior patterns can be analyzed by AI to build a baseline of "normal" behaviour. Deviations from this baseline can set up alarms that require further examination.

F. Analysis of Scenarios:

What-If Analysis: Fuzzy logic and artificial intelligence (AI) can be used to undertake scenario analysis, evaluating the potential impact of various risk factors on the payment system. This assists with proactive risk management.

G: Risk Evaluation on Multiple Levels:

Considering a Variety of Risk Factors: Fuzzy logic and AI can consider a variety of risk factors such as transaction amount, frequency, location, device used, and more. This multifaceted approach provides a thorough picture of risk.

H: Compliance with regulations:

Fuzzy logic and AI systems can be configured to assure payment compliance with regulatory criteria and industry standards.

I: Human Observation:

While automated solutions are powerful, human professionals play an important role in overseeing and fine-tuning risk management processes, particularly in complex and high-stakes scenarios.

Organizations can improve their ability to respond to quickly changing financial environments while successfully minimizing possible hazards associated with developing payment

methods by incorporating fuzzy logic and AI into risk management for emerging payment methods.

4. TYPES OF RISK:

In digitalized emerging payments we consider the three major Risks to be happened at the time of payment transaction.

(i) Operational Risk - The risk resulting from inadequate or failed internal processes, systems, human error, or from external events related to any element of payment, clearing, and settlement systems. The risk of settlement of a payment transaction or the transaction cannot be properly completed due to a defective device or process that precludes the completion of all the steps required in a transaction.

(ii) Fraud- Fraud could be done in digital payments from Buyer side , merchant side and cyber security fraud. Risk of financial loss for one of the parties involved in a payment transaction arising from wrongful or criminal deception. The risk that a transaction cannot be properly completed because the payee does not have a legitimate claim on the payer.

(iii) Legal risk- legal risk could be arises if the rights and obligations of parties involved in a payment are subject to considerable uncertainty.

5 FUZZY MODEL FOR RISK IN PAYMENTS

Fuzzy rule based system could be used to represent the Risk in digital payment process with three inputs as Operational Risk, Fraud and Legal Risk and output could be Risk in Payments.

Fuzzy Rules: So many Fuzzy Rules could be applied for the Risk Management of payment digitalization based on payment methods, some of them are as follows:-

R1: If Operational Risk is Low and Fraud is low and Legal risk is low then Risk in Payment is Low.

R2: If Operational Risk is High and Fraud is low and Legal risk is low then Risk in Payment is Moderate.

R3: If Operational Risk is Low and Fraud is High and Legal risk is low then Risk in Payment is High.

R4: If Operational Risk is High and Fraud is High and Legal risk is High then Risk in Payment is High.

In Fig. 2 shown the surface diagram for Risk in payment with Fraud and Operational risk as inputs.

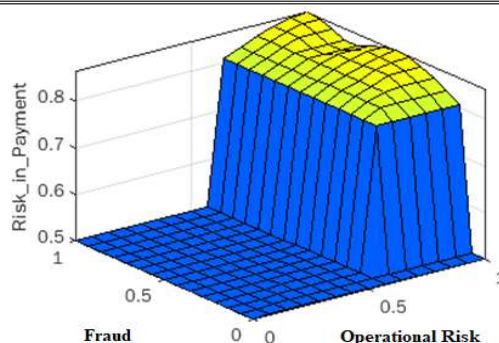


Fig. 2 Surface diagram for Risk in payment with Fraud and operational risk.

In fig. 3 shown the Surface diagram for Risk in payment with Fraud and Legal risk as inputs.

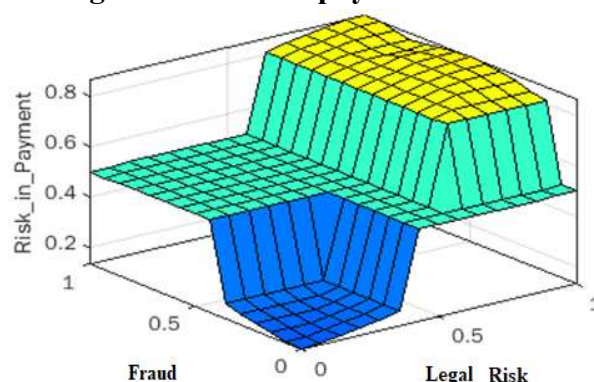


Fig. 3 Surface diagram for Risk in payment with Fraud and Legal risk.

6 CONCLUSION

In conclusion, the combination of artificial intelligence (AI) and fuzzy logic offers a strong and flexible foundation for navigating the world of developing payment systems and related hazards. A strong risk assessment system is produced by the combination of AI's skill in pattern identification and anomaly detection and fuzzy logic's ability to handle ambiguity. This comprehensive strategy not only improves security but also makes dynamic, context-sensitive risk management of different payment methods through digitalization's. The Combination of AI and fuzzy techniques in digitized emerging payments has the potential to drive efficiency, security, and personalization in financial transactions with forecasting the utilizations of payment methods in future also. This framework adapts to the changing nature of payment systems by utilizing linguistic factors and adaptive learning mechanisms, ensuring accurate risk assessment in real-time. The use of explainable AI techniques also promotes transparency and builds confidence in the decision-making process.

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