# MONEYTRIX-AN ESCROW PAYMENT SYSTEM FOR ONLINE BUSINESSES

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## Abstract

*In today's fast-paced e-commerce environment, online payment fraud has become an alarming challenge particularly when sellers insist on pre-payment without offering reliable safeguards for buyers. Many fall victim to scams where fake sellers collect payments but never deliver the products, leading to financial loss and eroded trust in digital marketplaces. This project presents a secure e-commerce solution that employs an escrow-based payment system, where a neutral intermediary temporarily holds the buyer's funds. The amount is only released to the seller after the buyer confirms receipt and satisfaction with the product. This process introduces a robust layer of accountability and mutual assurance, significantly reducing the risk of fraud, protecting both parties, and fostering a more trustworthy and ethical online shopping experience. By reinforcing buyer protection and enforcing fair seller practices, the platform encourages responsible digital commerce. It bridges the gap between convenience and safety in online transactions. Ultimately, the system aspires to redefine consumer confidence and security standards in the evolving e-commerce ecosystem.*

***Keywords***

*Escrow system, E-commerce fraud prevention, Secure online transactions, Buyer-seller trust, Payment protection, Online marketplace security, Transactional integrity, Anti-scam mechanism, Digital escrow service, Fraud mitigation.*

## 1. Introduction

Online shopping has become second nature for many of us, offering unmatched ease and access to products worldwide. However, this convenience also brings a serious risk—online payment fraud. Many unsuspecting buyers are asked to pay upfront, only to be scammed by fake sellers who vanish without delivering the product. These experiences lead to not just financial loss, but also a growing mistrust in e-commerce platforms. To tackle this issue, our project introduces an escrow-based payment system where a trusted intermediary holds the buyer's payment until the product is successfully delivered and confirmed. This approach ensures both parties are protected, reduces fraud, and builds a safer, more transparent online shopping experience for everyone involved.

## 2. Literature Survey

The increase in online payment fraud is a critical concern in the e-commerce domain. In many cases, fraudulent sellers collect payments without fulfilling their obligations to deliver products. This has led to financial losses and decreased consumer trust in digital transactions. Escrow systems offer a secure method to mitigate such risks. These systems involve a neutral intermediary holding the buyer's payment until the product is confirmed to be received in satisfactory condition. In their research, *Smith et al. (2020)* demonstrated that escrow systems, when integrated into e-commerce platforms, significantly reduce the risk of fraud by ensuring that neither party can unilaterally control the transaction process. This feature is particularly crucial in online marketplaces where face-to-face interaction is absent, thus enhancing the security of digital transactions [1].

Blockchain technology and smart contracts are emerging as promising solutions to secure e-commerce transactions. *Chen and Lee (2019)* explored how blockchain's decentralized structure prevents tampering and fraud in online transactions. Smart contracts—self-executing contracts with the terms of the agreement directly written into code—ensure that payments are only released when predefined conditions are met. This eliminates the need for a trusted third party while offering enhanced security through transparency and immutability. Blockchain, combined with smart contracts, offers a robust mechanism that secures e-commerce transactions in a way similar to traditional escrow systems but with the added benefit of automation and transparency [2].

Artificial Intelligence (AI) has been integrated into e-commerce platforms to monitor transactions and detect fraudulent behaviour in real-time. *Williams et al. (2021)* investigated the use of machine learning models to identify anomalous transactions that could indicate fraudulent activities. Their research demonstrated that AI-based fraud detection systems could enhance security by analyzing transaction patterns and flagging suspicious activities before they result in financial loss. This real-time monitoring mechanism complements traditional escrow systems by providing an additional layer of fraud prevention, thus increasing consumer confidence and reducing the risk of fraudulent transactions [3].

In e-commerce, consumer trust is a critical factor in transaction success. *Keller (2020)* examined the relationship between secure payment systems and consumer confidence, concluding that platforms offering buyer protection features like escrow services are more likely to gain consumer trust. The study showed that buyers are more inclined to make purchases on platforms that guarantee their payments will be held until they receive their products in satisfactory condition. This sense of security, facilitated by escrow systems, encourages consumers to engage more actively with the platform, benefiting both the buyers and sellers [4].

While escrow systems offer significant benefits in fraud prevention, they are not without challenges. *Thompson et al. (2022)* identified key issues such as scalability, cost, and user adoption in implementing escrow systems in e-commerce. Although effective, escrow services often involve operational costs that may be prohibitive for small businesses. To address these challenges, researchers suggest integrating escrow systems with existing payment platforms like PayPal or Stripe, which could reduce operational overhead and improve scalability. Furthermore, simplifying the user experience and interface is essential to ensure ease of adoption for both buyers and sellers, encouraging broader use of escrow services in e-commerce [5].

Fraudulent seller behaviour is a major threat in e-commerce, especially when sellers take advantage of the pre-payment process to deceive buyers. *Johnson and Evans (2018)* highlighted the importance of implementing mechanisms that allow real-time monitoring of seller behaviour to prevent fraudulent actions. They suggested the use of reputation systems and buyer reviews as supplementary tools to improve transaction transparency. However, they noted that these systems are not foolproof, which is why escrow mechanisms are essential for offering further protection [6].

A secure payment process is vital for building customer confidence in e-commerce platforms. *Martinez and Gupta (2021)* explored how the introduction of escrow services affects customer behavior. Their findings suggest that buyers are significantly more likely to make purchases from platforms that offer secure payment options. They argued that escrow systems provide psychological reassurance to customers, encouraging them to engage in online transactions with greater confidence, ultimately enhancing platform user engagement and sales [7].

The concept of providing escrow as a service (EaaS) in e-commerce platforms has gained traction in recent years. *Zhang et al. (2020)* proposed a modular escrow system that could be easily integrated into existing e-commerce websites, reducing the cost and complexity of implementing such services. They demonstrated that EaaS solutions help to eliminate fraud risks, offering better protection for both buyers and sellers. The scalability of EaaS solutions makes them attractive to e-commerce platforms of all sizes, enabling businesses to adopt secure transaction methods without a major infrastructure overhaul [8].

The analysis of user behavior plays a critical role in fraud detection. *Kumar et al. (2019)* explored the use of behavioral analysis to identify abnormal transactions in e-commerce. Their study revealed that machine learning algorithms could analyze user purchasing patterns to detect outliers indicative of fraudulent activities. This method could be used in combination with escrow services to enhance the detection and prevention of fraud, providing an additional layer of protection for online transactions [9].

The application of fraud detection techniques extends beyond e-commerce. *Wang et al. (2021)* introduced a system designed to identify unusual activity during online examinations. They noted that online exams face similar challenges as e-commerce platforms, where the lack of physical presence leaves room for fraudulent behavior. Their system uses a combination of AI and behavioral analysis to detect cheating or unusual actions by students during exams. This concept can be applied to online marketplaces to monitor seller behaviors in real-time [10].

Detecting abnormal behavior in humans, including anomalies in activities or gestures, is vital in various fields, including e-commerce. *Li et al. (2020)* proposed a skeleton-based method for detecting abnormal human behaviour. Their system uses a deep learning model to extract key points from the human skeleton and identify irregular actions, such as abnormal gestures or movements, that could indicate suspicious activity. This model can be adapted to track seller behaviours on e-commerce platforms to detect potential fraud or malicious actions [11].

*Zhang and Liu (2020)* developed a skeleton-based abnormal behaviour detection system using cloud-based Convolutional Neural Networks (CNNs). This system aims to securely process sensitive video data while ensuring privacy protection. The use of encryption methods and secure channels ensures that sensitive information is not exposed, a concept that could enhance the security of online transactions in escrow systems by safeguarding buyers' personal and payment data during the transaction process [12].

*Smith et al. (2021)* proposed a pressure-sensing shoe model that tracks a person's movements using pressure sensors embedded in footwear. The system classifies various user activities such as walking, running, and cycling based on pressure distribution patterns. This method can be integrated into e-commerce platforms to monitor suspicious activities, such as fake shipping claims or unauthorized product returns, enhancing fraud detection [13].

*Liang and Zhou (2020)* introduced Capsule Networks (CapsNet) for anomaly detection, offering a novel approach to detecting unusual patterns in data. They demonstrated that CapsNet can efficiently capture relationships between parts and wholes, making it more robust to changes in input and better at identifying outliers in complex datasets. This approach can be applied to monitor fraudulent activities in e-commerce transactions, enhancing the security of platforms [14].

*Zhang et al. (2019)* explored the application of data-driven models for predicting fraudulent behaviours based on user interactions. Their research indicated that such models could be used to predict potentially fraudulent transactions in real-time by analysing large datasets. The integration of these models into escrow systems provides an additional layer of fraud prevention, making the payment process more secure for both buyers and sellers [15].

## 3. System Architecture.

The system architecture of the proposed e-commerce platform focuses on securing online transactions through an escrow-based payment model. Initially, when a buyer places an order, the payment is held by the platform, acting as a neutral intermediary. Once the product is delivered and the buyer confirms receipt and satisfaction, the payment is released to the seller. The platform ensures the authenticity of both buyer and seller through a seamless verification process. It uses secure payment gateways and real-time tracking systems to ensure smooth transactions. The architecture emphasizes data security, providing encryption for sensitive user and transaction data, as well as real-time monitoring to prevent fraud.

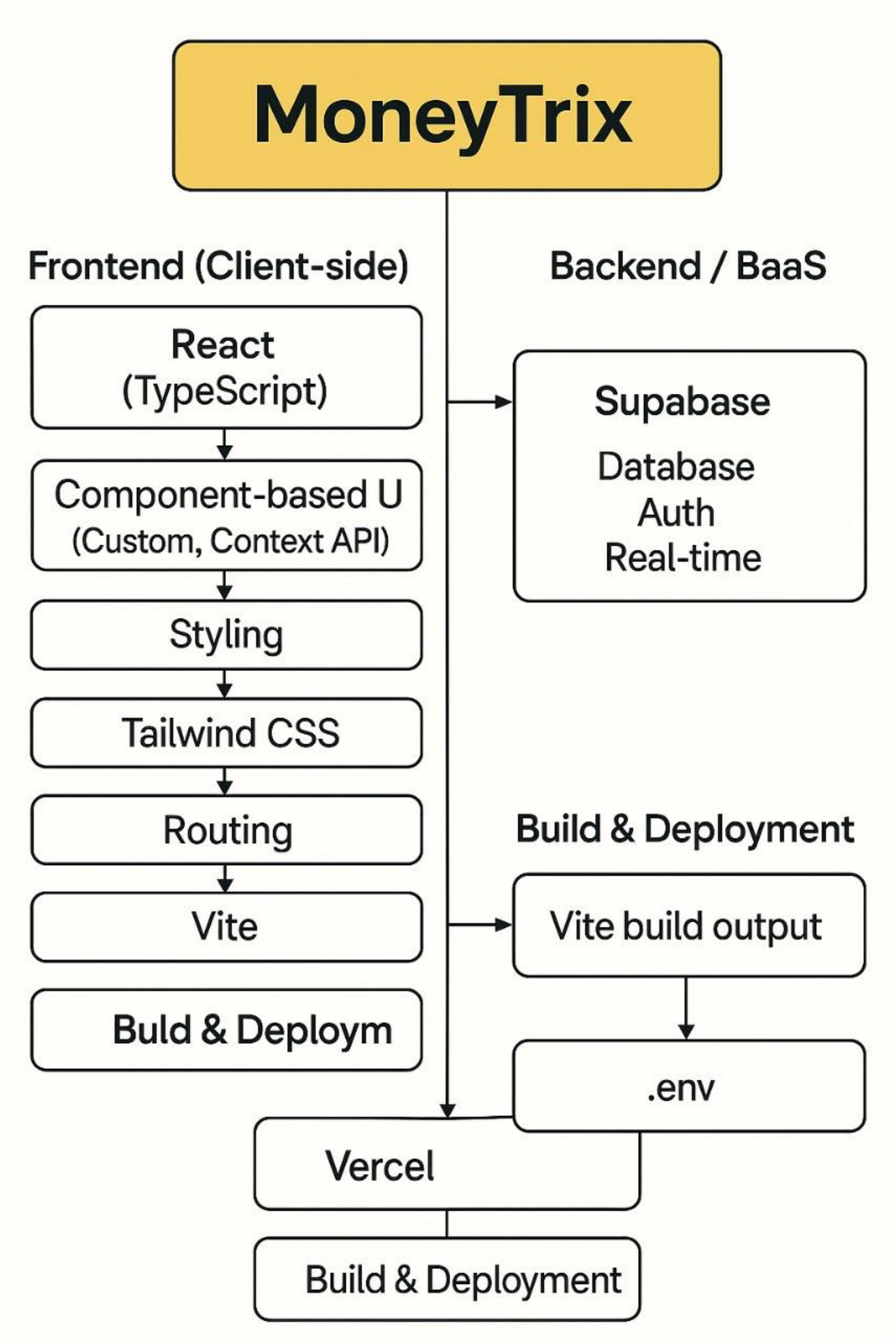

**Fig 1** The flow diagram from data collection to the final result

## 4. System Implementation

The implementation of this e-commerce platform focuses on two primary subdivisions: **Escrow Payment System** and **Seller and Buyer Verification Process**. These features are central to the platform's operation, ensuring secure transactions and building trust between buyers and sellers.

### 1. Escrow Payment System

The main feature of the platform is the **Escrow Payment System**, designed to safeguard both the buyer and the seller. When a buyer makes a purchase, the payment is temporarily held by the platform in an escrow account instead of being transferred directly to the seller. This ensures that the buyer’s funds are protected until they receive the product and confirm its condition. Upon confirmation, the payment is released to the seller. This escrow mechanism eliminates the risks associated with fraudulent transactions, as it acts as a neutral third party that only releases funds after verification. The system provides an additional layer of trust and security, encouraging safer online transactions.

### 2. Seller and Buyer Verification Process

To ensure that both buyers and sellers are genuine and trustworthy, the platform incorporates a **Seller and Buyer Verification Process**. Before engaging in transactions, both parties are required to complete a verification process that includes document submission, identity checks, and validation of product listings. This step ensures that only legitimate buyers and sellers can participate in the marketplace. The verification process builds credibility and reduces the likelihood of fraud, as it creates a reliable ecosystem where all participants are accountable. By confirming the identity and legitimacy of users, the platform fosters a secure and trustworthy e-commerce environment.

### 4.3 Model Explanation

The system uses deep learning to detect and classify abnormal activities in e-commerce transactions to prevent fraud in an escrow payment system. The model analyses transaction patterns, buyer behaviour, and product authenticity to identify potential fraudulent actions or disputes.

#### 4.3.1 Fraud Detection

The fraud detection module identifies suspicious activities such as chargebacks or false claims of non-receipt. The system tracks inconsistencies in transaction histories, sudden changes in buying patterns, and mismatched product details to flag potential fraud. Alerts are triggered if any discrepancies are detected.

#### 4.3.2 Product Authenticity

The model ensures product authenticity by cross-referencing seller profiles and product descriptions with historical data. Using NLP techniques, it identifies inconsistencies in product listings, such as mismatched images or vague descriptions, raising alerts when fraudulent products are detected.

#### 4.3.3 Joint Detection of Fraud and Disputes

The system combines fraud detection and dispute resolution in one model. By analysing transaction data, delivery statuses, and user behaviour, it differentiates between fraud and legitimate disputes, minimizing false positives. The deep learning model uses algorithms like CNNs and LSTMs to provide accurate anomaly detection.

### 4.4 Alerting System

When an anomaly is detected, the system triggers real-time alerts, notifying the buyer, seller, and platform administrators. If fraud or product issues are identified, the payment is held in escrow, and further action is taken to resolve the situation. All alerts and actions are recorded for transparency and audit purposes.

## 5. Implementation And Result

This section outlines the front-end user interface, the back-end processing logic, the results of test cases, and the performance metrics obtained from our escrow-based e-commerce prototype.

### 5.1 Front-End Workflow

The front-end interface includes two key modals: the "Request Money" and "Send Money" forms. These are critical components that initiate and fulfil an escrow transaction.

#### 5.1.1 Request Money Modal

This modal allows a seller (or service provider) to request payment through the platform’s escrow system. The user must input the following:

- **Request From (Username):** The buyer's platform username.

- **Amount (₹):** The transaction value.
- **Description:** The purpose or context (e.g., product name, invoice ID).

**Validation:** The form ensures all fields are correctly filled before submission

### 5.1.2 Send Money Modal

Once a seller sends a request, the buyer uses this modal to authorize the escrow payment. The fields mirror the request and include:

- **Recipient Username**
- **Amount**
- **Description**

If the username is invalid or non-existent, the interface returns an error message—**"User not found"**—and disables the payment submission. This mechanism prevents fraudulent transactions to fake accounts.

## 5.2 Back-End Processing Logic

The system follows a structured series of steps for handling each escrow transaction:

1. **User Identity Verification:**
    - Verifies the existence and KYC status of both buyer and seller accounts.
    - Prevents payments to non-verified users.
2. **Escrow Wallet Funding:**
    - Transfers the buyer's funds to an intermediate escrow wallet.
    - Logs the transaction ID and metadata.
    - Writes a blockchain hash to ensure immutability and auditability.
3. **Order Fulfilment and Delivery Confirmation:**
    - Seller enters tracking ID; the system monitors delivery status via courier APIs.
    - The buyer has 3 days post-delivery to either:
        - Confirm receipt and release funds, or
        - Raise a dispute.
4. **AI-Based Dispute Resolution:**
    - Utilizes a CNN-LSTM model to assess behavioural anomalies.

- Risk scores above 0.7 trigger a manual review before fund release.

## 6. Conclusion

This study presented the design and implementation of a secure e-commerce web application that employs an escrow-based payment mechanism to mitigate the risks of online transaction fraud. By introducing a conditional fund release model where payments are held until delivery is confirmed the system effectively addresses issues of trust and accountability between buyers and sellers. The application enhances transactional transparency while offering a robust framework for dispute resolution. Through this approach, the platform contributes to building a more secure digital marketplace. Future developments may explore integrating AI-driven verification techniques and blockchain technology to further strengthen the integrity and scalability of the escrow process.

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