



Department of Computer Science and Engineering
St. Thomas College of Engineering and Technology
Mattannur

Block Chain Based Income Traceability System for Equitable Welfare Distribution

Authors:

DEVATHMAJ A KALIYATHAN	(STM22CS021)
MUHAMMED JINAS T P	(STM22CS038)
NEVIN R PRADEEP	(STM22CS043)
NIRANJ C N	(STM22CS044)

Supervisor:

Mr. Jithin S
Assistant Professor
Dept. of CSE
St. Thomas College of
Engineering and Technology,
Mattannur

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INTRODUCTION

- Our Vision: To revolutionize welfare distribution in India by establishing a robust, transparent, and accurate income assessment system for daily wage and informal sector workers.
- Core Innovation: Leveraging the inherent security and immutability of Blockchain technology for verifiable income records, complemented by AI/ML for intelligent analysis.
- This enables accurate financial categorization of citizens, helping authorities design welfare schemes tailored to the specific needs of each group.
- Driving Force: Addressing the critical societal challenge of misallocated welfare resources and ensuring benefits reach the truly deserving, fostering social and economic equity.

PROBLEM DEFINITION

- India's informal sector struggles with inequitable welfare and unreliable income assessments due to fragmented methods like government surveys and banking data, resulting in false tax avoidance, inflated welfare claims, and social inequities.
- Our solution uses a private blockchain to create a verifiable digital wage history, providing a solid foundation for accurate income data.
- AI/ML models improve this by estimating income, determining dynamic welfare eligibility (BPL/APL) and offering real-time insights via a privacy-preserving dashboard for policymakers.
- Compared to traditional methods, our system enhances accuracy, adaptability, and fairness in welfare delivery.
- Accurate income traceability ensures proper income tax calculation for individuals, promoting fairness and accountability across the entire workforce, not just the formal sector.

On the Integration of Artificial Intelligence and Blockchain Technology: A Perspective About Security

- The integration of AI and Blockchain boosts security and trust by mitigating the inherent weaknesses of each technology.
- The model facilitates decentralized decision-making by processing secure, digitally signed data directly from a blockchain.
- This integrated approach is applicable in sectors like healthcare, supply chain management, and finance.
- The paper analyzes security threats for both AI (adversarial attacks, data privacy, bias) and blockchain (51% attacks, smart contract bugs), proposing mitigation strategies.
- **Disadvantages:**
 - The framework is theoretical, lacking specific implementation details.
 - There are inherent trade-offs between efficiency, security, and decentralization.
 - AI models are vulnerable to adversarial attacks, where manipulated input data yields incorrect outputs.

Blockchain-Integrated Digital Payment Systems in the Public Sector

- Explores integrating blockchain with public digital payment systems (like UPI) in emerging markets to boost transparency, security, and efficiency.
- This hybrid model improves transparency via immutable records, enhances security by eliminating single points of failure, and increases efficiency by cutting intermediaries and costs.
- Provides actionable policy recommendations, including developing blockchain regulations, establishing a national framework, and running pilot projects.
- Details a framework for integrating blockchain into an existing system (UPI) to solve specific public sector challenges.

Disadvantages:

- Standalone blockchains are inefficient for high-volume transactions due to overhead and server congestion.
- Integrating decentralized blockchain with a centralized system is a major technical hurdle requiring complex APIs and middleware.

Blockchain-Based KYC and Access Verification

- Traditional KYC is manual, costly, and centralized, making it inefficient and prone to breaches.
- Blockchain offers a decentralized, secure, and automated KYC using smart contracts and cryptography.
- Privacy is ensured by storing sensitive data off-chain while keeping its hash on-chain.
- Framework uses DIDs, ZKPs, and smart contracts, allowing users data control and selective sharing.
- **Disadvantages:**
 - Poor interoperability across blockchain platforms.
 - Regulatory issues with GDPR and AML compliance.
 - Limited applicability to specific use cases.

EXISTING SYSTEM

An explainable federated blockchain framework with privacy preserving AI optimization for securing healthcare data

- The PPFBXAIO framework combines Federated Learning (FL), blockchain, and Explainable AI (XAI) to enable secure, private, and transparent model training across institutions without centralizing raw data.
- Blockchain creates a tamper-proof audit trail for model updates, while smart contracts are used to validate and deploy only high-quality models.
- The Levy Grasshopper Optimization Algorithm (LGOA) improves feature selection, and SHAP provides interpretable outputs without exposing sensitive data.
- Experimental results show improved accuracy, precision, recall, and F1 scores, with lower latency and stronger defense against adversarial attacks.

Disadvantages of the Existing System:

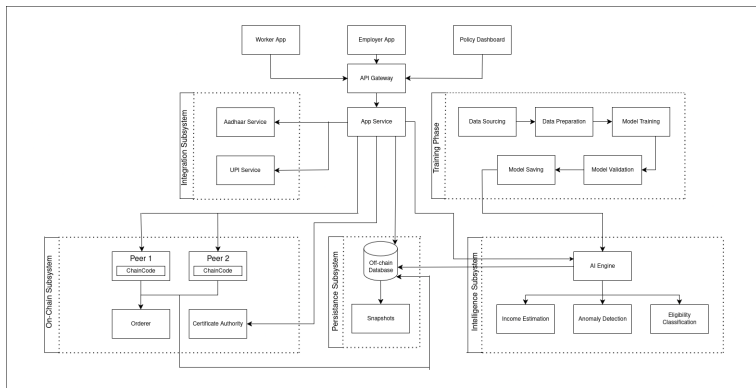
- The framework is limited to healthcare diagnostics and lacks broader applications in areas like wage transparency or tax fairness.
- It remains largely theoretical and institution-specific, without integrating into large-scale public infrastructures like Aadhaar or UPI.
- Its models are static, designed for fixed medical conditions, and do not adapt to dynamic human or socio-economic changes.

PROPOSED SYSTEM

- India's informal sector struggles with inequitable welfare and unreliable income assessments due to fragmented methods like government surveys and banking data, resulting in false tax avoidance, inflated welfare claims, and social inequities.
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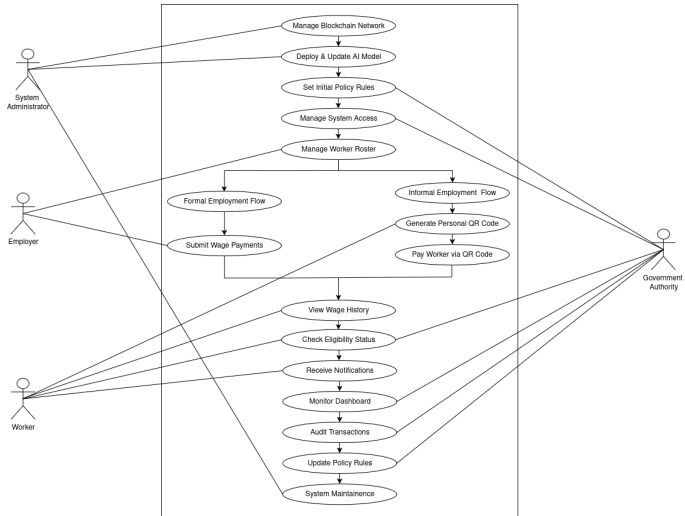
PROPOSED SYSTEM DESIGN

ARCHITECTURE DIAGRAM



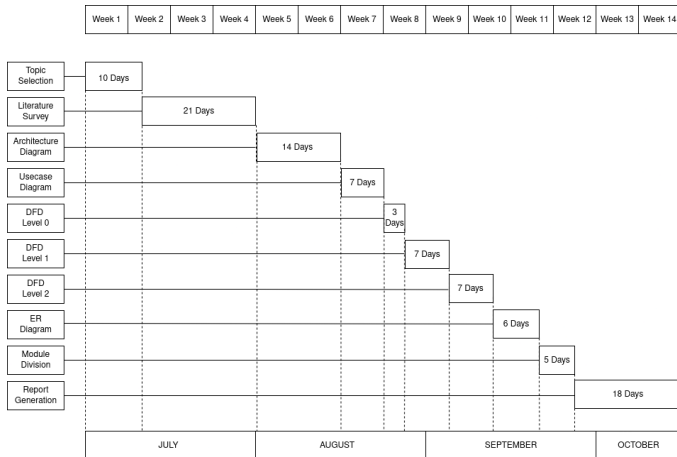
USE CASE DIAGRAM

USECASE DIAGRAM



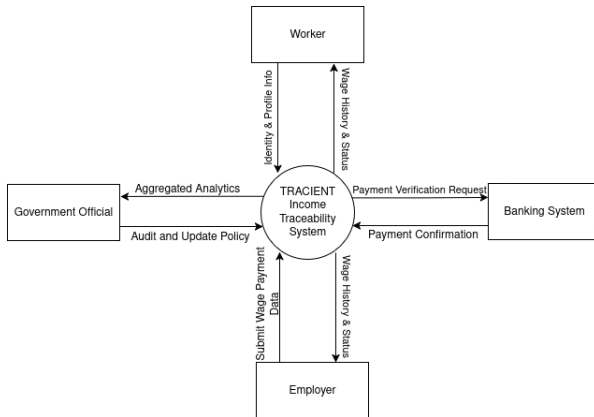
PROPOSED SYSTEM DESIGN

GANTT CHART



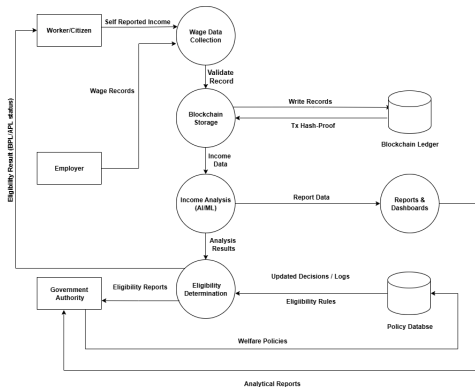
PROPOSED SYSTEM DESIGN

DFD LEVEL 0



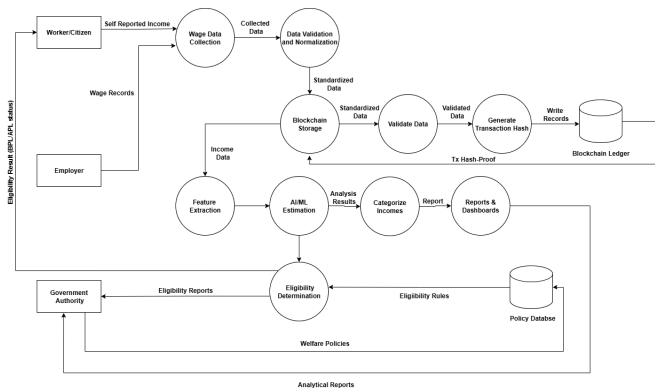
PROPOSED SYSTEM DESIGN

DFD LEVEL 1



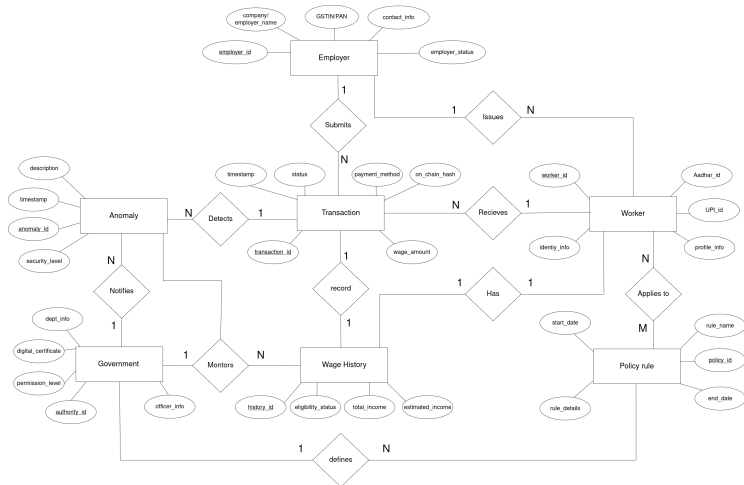
PROPOSED SYSTEM DESIGN

DFD LEVEL 2



PROPOSED SYSTEM DESIGN

ER DIAGRAM



MODULE DIVISION

Module	Member
Blockchain Development and Writing Smart Contracts	Niranj
AI & Backend Development (Training, Validation and Testing)	Devathmaj
Frontend & UI/UX Development	Nevin
Integration, Version Control, Deployment and Documentation	Jinas

CONCLUSION

- Provides a dynamic solution for income assessment in India's informal sector using a private blockchain.
- Offers technical benefits such as transparency, decentralization, real-time tracking, and scalability.
- Creates social benefits including targeted welfare distribution, corruption reduction, and worker empowerment.
- Promotes ethical benefits of equity, fairness, data privacy, and trust-building.

REFERENCES



MAHIPAL, R. *Blockchain Technology as a Catalyst for Sustainable Development: Exploring Economic, Social, and Environmental Synergies*, Academic Journal of Interdisciplinary Studies, Vol. 13, Issue 2, 2024, pp. 151.



ADEFILA, O.O., ONASANYA, O.K. *The Economic Impact Of Financial Inclusion: A Pathway To Reducing Poverty In The Digital Economy*, IOSR Journal of Economics and Finance (IOSR-JEF), Vol. 15, Issue 6, Ser-2, 2024, pp. 58–67.



STANFORD GRADUATE SCHOOL OF BUSINESS, CONSENSYS, WORLD ECONOMIC FORUM. *Study — Blockchain for Social Impact: Moving Beyond the Hype*, 2018.



AL HASSAN, Abdul Naser, et al. *A Survey on Blockchain Technology: Evolution, Architecture and Security*, IEEE Access, Vol. 9, 2021, pp. 47766–47792.



BANK FOR INTERNATIONAL SETTLEMENTS (BIS). *The organisation of digital payments in India - lessons from the Unified Payments Interface (UPI)*, BIS Papers No 152, 2024.

REFERENCES



BHARDWAJ, Tanisha, SUMANGALI, K. *An explainable federated blockchain framework with privacy-preserving AI optimization for securing healthcare data*, [Journal/Conference Name], 2025.



KUZNETSOV, Oleksandr, FRONTONI, Emanuele, SERNANI, Paolo, ROMEO, Luca, MANCINI, Adriano. *On the Integration of Artificial Intelligence and Blockchain Technology: A Perspective About Security*, [Journal/Conference Name], 2025.



TYAGI, Vani, BERI, Yogita. *Blockchain-Integrated Digital Payment Systems in the Public Sector: Innovation, Transparency, and Economic Efficiency in Emerging Markets*, Indian Council of Social Science Research Vasanta College for Women (BHU), 2025.



JOHN, Beauden. *Blockchain-Based KYC and Access Verification for Financial Institutions*, June 2025.