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Blockchain for Socio-Economic Impact: Financial inclusion by environment-centric service design

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The blockchain is often viewed as a tech-savvy solution for profit-making businesses. However, it has an immense potential to solve global problems with its core of decentralisation. We wanted to explore a systemic approach to using blockchain as a tool for social, economic and ecological good.

We created a hypothetical company, "Environ," to address blockchain for Socio-Economic Impact. Financial Inclusion, Doughnut Economy, and technology adaptation were the primary issues we targeted to solve. Participatory workshops, design sprints, expert sessions, and user interviews were conducted to structure the brief. A speculative service is designed as a first pilot project on Environ blockchain platform targeting Indian farmers to benefit India's agricultural sector following a bottom-up approach (Human Centric Design).

The system comprises two services. The first service is aimed at providing affordable and accessible financial services to farmers through microfinance and micro-credit systems. The second service is aimed at creating a transparent agricultural supply chain to reduce mediators and supply-demand volatility.

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Thus, we aim to create an inclusive and sustainable economy by solving poverty and climate change in the agricultural sector.

KEYWORDS: financial inclusion, supply chain, agricultural sector, social Impact, blockchain technology, decentralisation, microfinance, micro credits, inclusive economy, human-centric design, accessibility, doughnut economy, service design.

RSD TOPIC(S): Economics & Organizations, Socioecological Design, Sociotechnical Systems

REFLECTION QUESTION: How can we utilise blockchain technology to create a cascading positive Socio-Economic impact?

Presentation summary

We started this project with a curiosity about cryptocurrency. When we dived deep into this topic, we realised that blockchain technology is a bigger world that needs to be explored.

Cryptocurrency is a digital payment system that does not rely on banks to verify transactions. It is a peer-to-peer system that enables anyone to send and receive payments anywhere. Instead of being physical money carried around and exchanged in the real world, cryptocurrency payments exist purely as digital entries to an online database describing specific transactions. The first cryptocurrency was Bitcoin, founded in 2009 and is the best known today.

When a person transfers cryptocurrency funds, the transactions are recorded in a public ledger called the blockchain. A blockchain is a distributed database or ledger that is shared among the nodes of a computer network. As a database, a blockchain stores information electronically in a digital format (Figure 1).

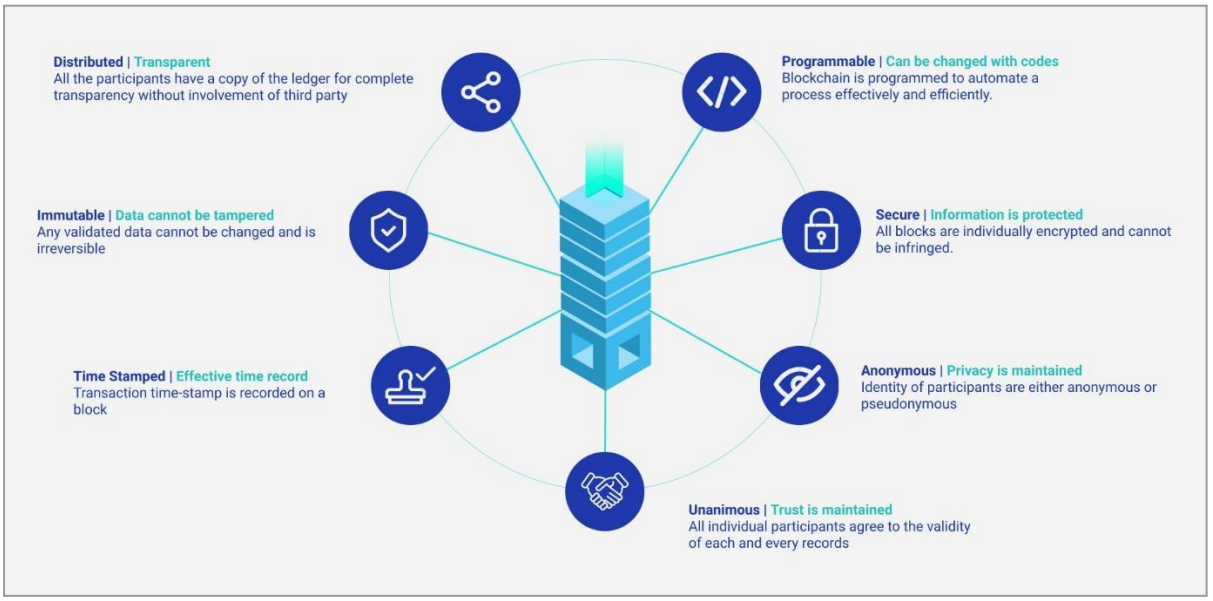


Figure 1. Self-made illustration showing salient features of blockchain technology.

Financial inclusion: the initial cause

Financial Inclusion was our initial cause for systemic intervention. Financial Inclusion means that individuals and businesses have access to valuable and affordable financial products and services that meet their needs—transactions, payments, savings, credit, and insurance delivered responsibly and sustainably.

According to the World Bank Report, globally, 1.7 billion adults are unbanked due to a lack of financial literacy and access to financial services (Figure 2). Nearly half of the unbanked population is distributed in seven economies (China, India, Indonesia, Pakistan, Nigeria, Mexico, and Bangladesh).

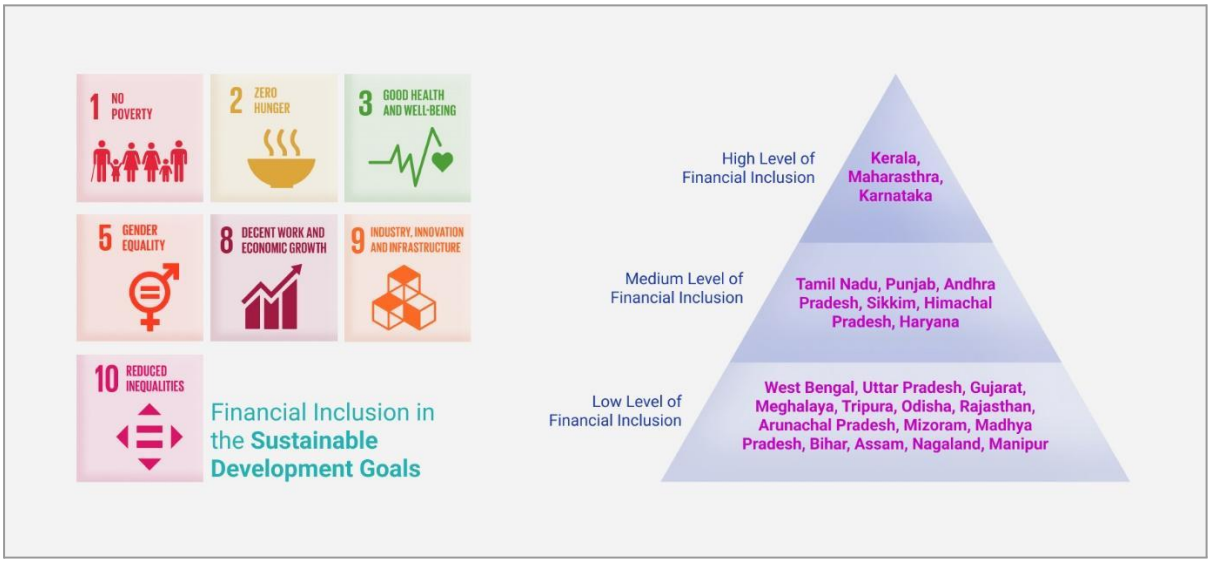
Figure 2. Distribution diagram of the unbanked population of the world. Source: Global Findex Database, World Bank Report.

A glimpse of financial inclusion in India

India accounts for 11% of the unbanked population of the world. One hundred ninety million adults are unbanked in India. Only 27% of Indians are financially literate to access financial services. 23% of the transactions in India are digital. Out of the total accounts, 43% of bank accounts are dormant in India.

Despite multiple Government schemes such as The National Strategy for Financial Inclusion (NSFI), Pradhanmantri Dhan Jan Yojana (PMDJY) and Pradhan Mantri Suraksha Bima Yojana, and Bharat Interface for Money (BHIM), only three states of India have a high level of financial inclusion (Figure 3b) The top-down approach fails to reach the grassroots level. There is a need for systemic intervention at the grassroots level with a human-centric bottom-up design approach.

India is a farming nation, as agriculture contributes to 20% of the nation's GDP. However, 51% of farmer households are excluded from formal/informal sources of the economy. 73% of farmer households are excluded from formal credit activities. Hence for a more significant socio-Economic Impact, we chose to implement financial inclusion in the agricultural sector.



a) b)

Figure 3. a) Sustainable Development Goals (SDGs) linked to financial inclusion, and (b) State-wise level of financial inclusion of India, Source: RBI working paper on Financial Inclusion in India.

Doughnut economy: the road to final cause

To cascade the socioeconomic impact to positive environmental impact, we referred to *doughnut economics* and the visual framework in Figure 4. Doughnut economics' visual framework for sustainable development—shaped like a doughnut or lifebelt—combines the concept of planetary boundaries with the complementary concept of social boundaries.

India is not surpassing the ecological ceiling, but the social foundation is getting depleted. The social needs in India are not fulfilled. Human-centric services need to be designed and then carried forward to environmental-centric design.

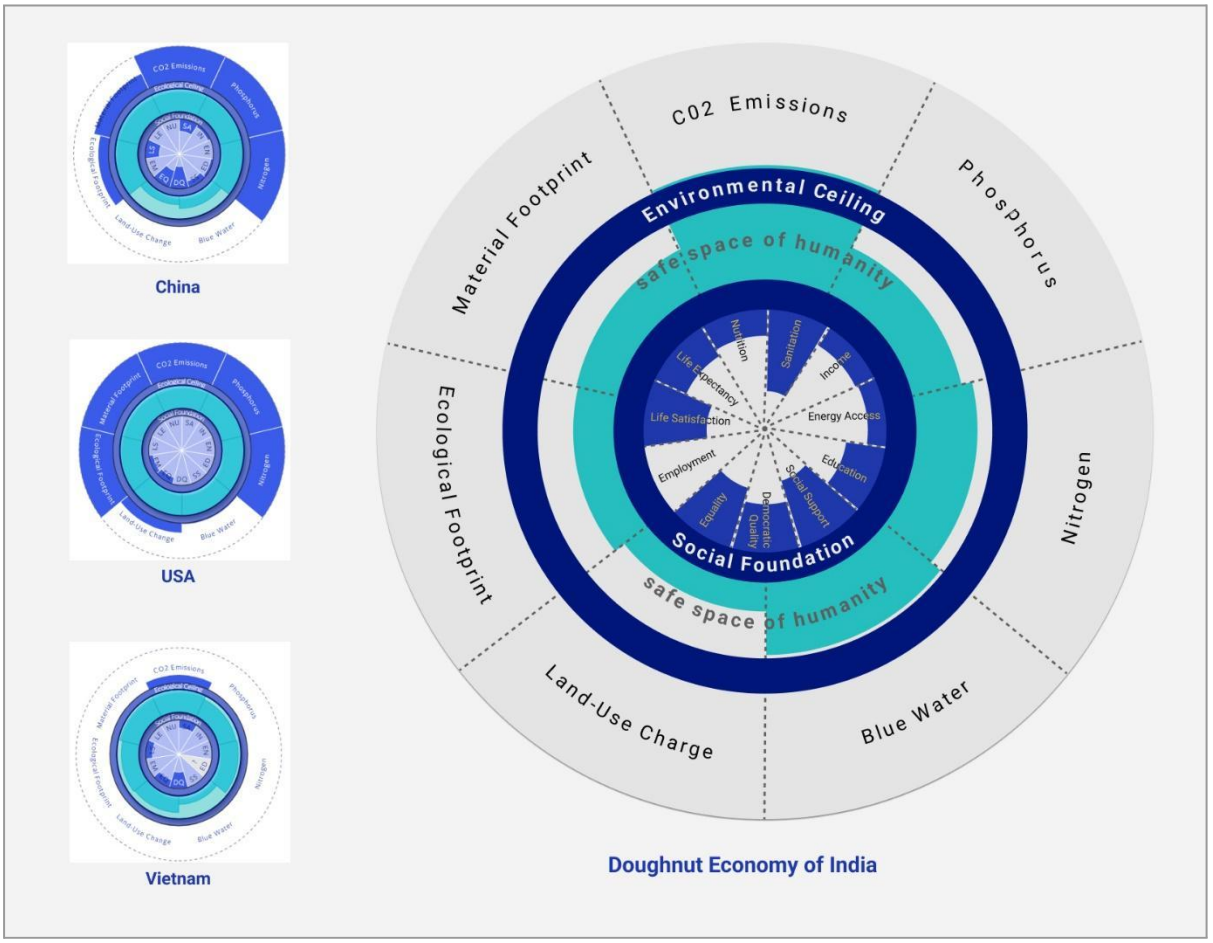


Figure 4. Doughnut Economy of different countries. Source: Good Life for all within Planetary Boundaries by the University of Leeds.

Environment-centred design: systemic evolution

The current model is a user-centred design in the first level, where blockchain technology is used for financial services (cryptocurrency) to a target audience, fulfilling the top two levels of Maslow's hierarchy of needs.

Using blockchain with financial Inclusion leads to the design of financial services for the underbanked and underprivileged community, which will be entirely human-centred. Here, we are developing financial services to involve all the country's citizens in the mainstream economy.

Suppose the positive cascading effect of financial Inclusion is reaching climate change. In that case, we will approach an environment-centred design where all the ecosystem's stakeholders will have an equal role (Figure 5).

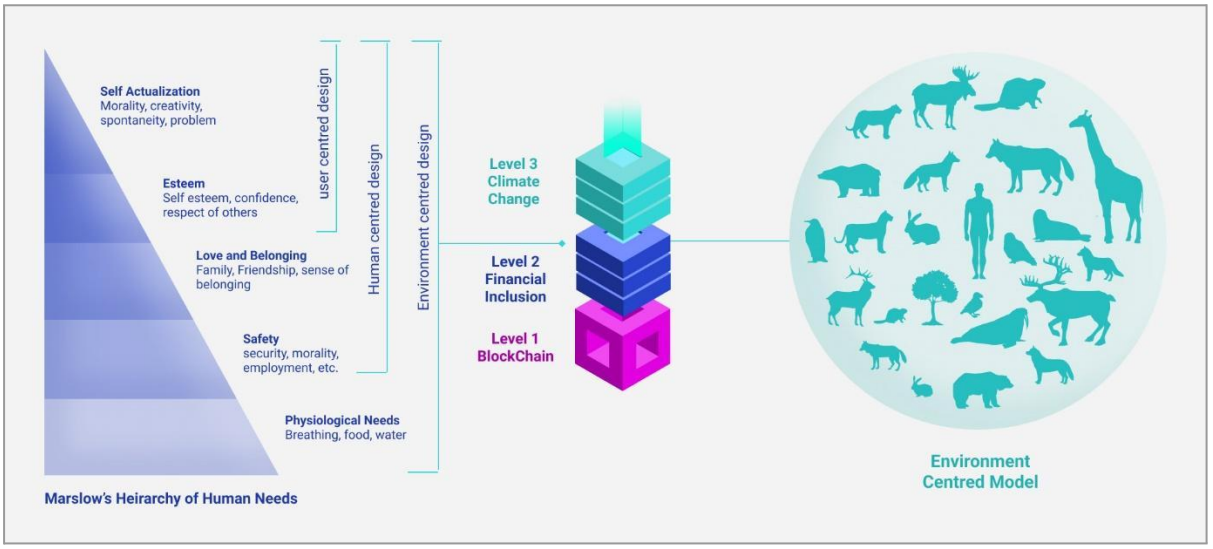


Figure 5. Three-tier design process evolving to an environment-centred model.

Systemic research methodologies

Our research involved expert sessions, design sprint workshops, and one-to-one interviews with the farmers. Our expert sessions were with Dr Tia Kansara (CEO of Replenish Earth), Professor George Alapatt (Cambridge University), Abhinav Gupta (UNCDF), and Sahithi Divi (Director of Mohanam). Through their experiences and stories, we saw the possibility of using blockchain technology in various verticals like decentralised IDs, supply chains, microlending, healthcare, and insurance. We started

our design sprint sessions with a quick awareness presentation of our project, followed by collaborative online activities in Miroboard-like card sorting, clustering, empathetic storyboard, and trigger cards (Figure 6). Through design sprints, we analysed the way people adapt to new unknown technology to solve their daily financial problems. After the interview with the farmers, we arrived at two major reflective questions for our service design research.

1. Why are farmers going to loan sharks and not to banks?
2. Why are farmers going to the mediators (middlemen) while selling the goods, and why are they not directly selling them in the market?

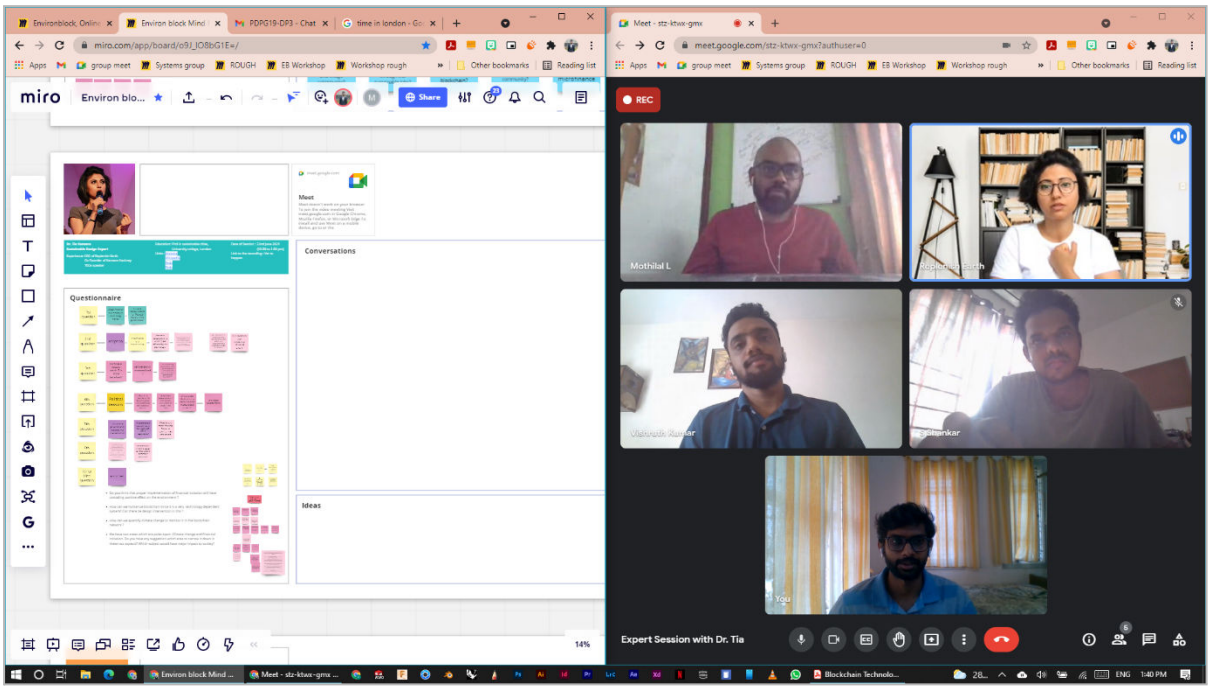


Figure 6. Screenshot of the expert session with Dr Tia Kansara (CEO of Replenish Earth).

Environ: speculative service design

The service design aimed to create a decentralised yet integral community that trusts each other and reduces the mediator's activities.

The microfinance service helps the farmers to create an immutable biometric decentralised ID after the KYC process of land papers, Aadhar cards, and voter ID cards. This identification will be digital, private, and stored in a blockchain network. Governments and banks can access the identity after the farmer's consent for subsidies and credit/non-credit activities.

Further, the service provides accessible financial services in the form of a microcredit system by creating the same money lending system practised by farmers on a blockchain network. Trust is built between the lenders and borrowers by smart contracts building a decentralised community.

The KPI score of lenders and the credit score of borrowers will be linked to their respective decentralised universal ID. This model creates a financial system that is self-regulatory hence removing mediator charges.

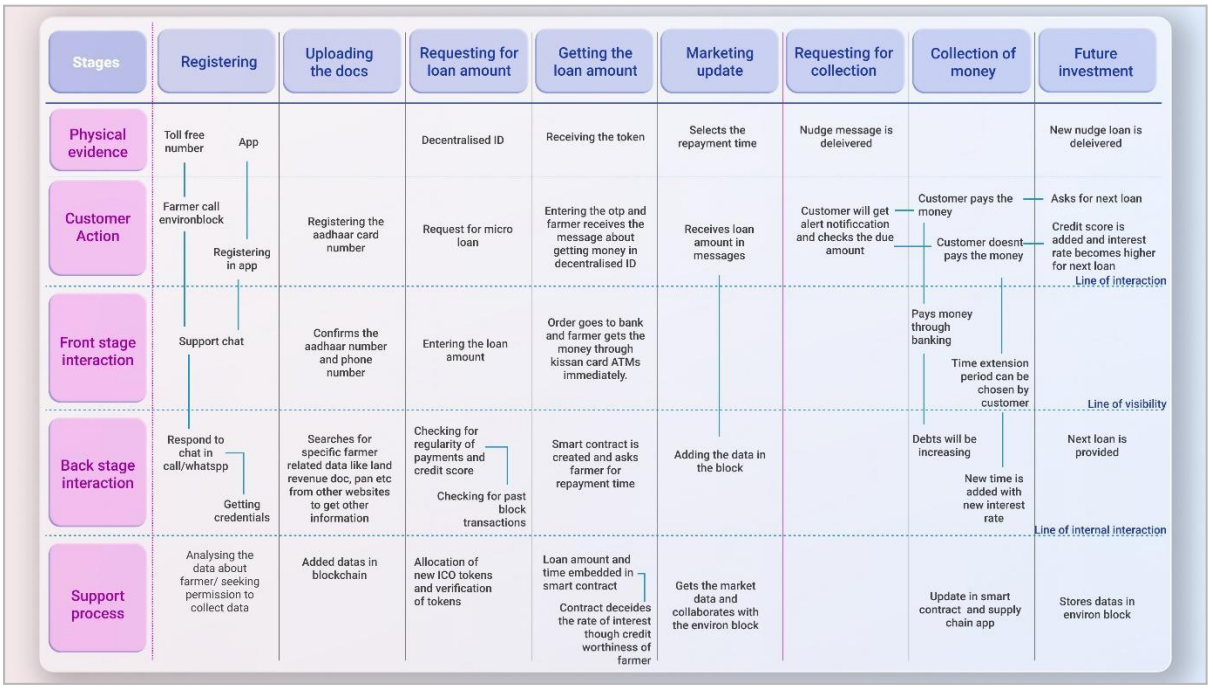


Figure 7. Service design blueprint of blockchain-based microfinance service.

Farmers can set a competitive price for their yield through the transparent supply chain system and create a smart contract between the distributors, wholesalers, and retailers. Mediator's charges are significantly reduced, enabling farmers to bear maximum profits.

Through the transparent supply chain network, the farmers can build a decentralised community for bidding on the prices of the goods. Inventory management of warehouses will be linked to the Environ blockchain network to monitor the condition of the goods using IoT. Compensations will be fairly distributed among the community due to the loss/damage of goods in the supply chain network.

The supply chain service is extended to the retailers to include their inventory management and database in the Environ blockchain network. By increasing transparency, we help retailers to gain customers' trust and loyalty. The supply-demand data is continuously updated and viewed by all stakeholders in the system allowing them to make decisions on the subsequent yield.

Future scope

This speculative service design forms a case study for Governments, organisations, and companies to develop future human-centred services on blockchain technology. We have also created an interactive roadmap tool for companies or organisations planning to implement blockchain in their service. Microfinance running on the blockchain is the evolved version of Grameen Bank, which had a substantial social impact. The Decentralized IDs owned by the farmers will enable them to easily access financial services like loans and crop insurance. Farmers can invest in resources like automation, drones, sensor network, and infrastructure, making way for Agriculture 5.0. The transparent supply chain service will prevent goods damage, inflation, and loss of capital and assets, creating a stabilised, inclusive economy in the agricultural sector.

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