

# Master of Financial Technology

FNT 628

**Blockchain and  
Cryptocurrencies**



# Lecture 10

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Prepared by Dr. Yara Ibrahim

[www.midocean.ae](http://www.midocean.ae)

# Recent Developments in Blockchain and Cryptocurrency

## Introduction to Blockchain

- Blockchain is a distributed digital ledger that records transactions across many computers so that no single entity has control.
- Its immutability ensures that once data is added, it cannot be altered.
- This technology removes the need for intermediaries and creates trust through cryptographic verification.
- Blockchain has evolved into the foundation for digital assets, decentralized applications, and new economic systems.

## What Is Changing in 2024–2025?

- The blockchain landscape is entering a maturation phase.
- Governments are rolling out clearer regulatory frameworks, enterprises are integrating blockchain into real operations, and major technical upgrades like Layer-2 rollups and zero-knowledge proofs are becoming mainstream.
- As the speculative cycle slows, real-world utility and scalable systems take center stage.

## Key Drivers of Recent Blockchain Evolution

- Recent advances are driven by demand for secure digital infrastructure, global digital transformation, and the rise of AI systems that require verifiable data trails.
- Tokenization, cross-border payment modernization, and inflation-driven interest in alternative assets have accelerated blockchain adoption.
- Enterprises now see blockchain as a tool for transparency and efficiency, not just speculation.

## Enterprise Adoption Trends

- Enterprises across finance, manufacturing, and logistics are adopting blockchain to improve transparency, traceability, and automation.
- Large corporations now deploy smart contracts for settlement, inventory tracking, and compliance checks.
- With enterprise-grade platforms and better security frameworks, adoption has moved beyond pilots into full-scale integration.

## Government and Regulatory Shifts

- Governments worldwide are acknowledging the permanence of blockchain and crypto.
- Regulatory clarity is improving with frameworks focused on consumer protection, AML compliance, and stablecoin oversight.
- This shift provides legitimacy for institutional entry and creates safer environments for innovation.

## CBDCs and National Digital Currencies

- Central Bank Digital Currencies (CBDCs) are advancing rapidly, with countries building digital payment systems that reduce settlement time and enhance programmability.
- While CBDCs promise efficiency, concerns around privacy, financial surveillance, and geopolitical influence remain central to public debate.

## Institutional Investment in Crypto

- Institutions are increasingly treating crypto as a long-term asset class.
- The approval of crypto ETFs, expanding custodial services, and investment-grade infrastructure have strengthened market credibility.
- Institutional participation stabilizes markets and contributes to the growing legitimacy of digital assets.

## Tokenization of Real-World Assets

- Tokenization converts physical and financial assets—such as real estate, commodities, and bonds—into digital tokens.
- This enables fractional ownership, increased liquidity, and global market access.
- Tokenized treasury products and money market funds are becoming one of the fastest-growing sectors in blockchain finance.

## Blockchain Scalability Advances

- Modern blockchains are addressing scalability limitations through rollups, sharding, and improved consensus models.
- These upgrades drastically reduce transaction fees while increasing throughput.
- As networks become more efficient, they can support applications with millions of active users.

## Layer-2 Ecosystem Growth

- Layer-2 solutions built on top of existing blockchains offer faster and cheaper transactions.
- They have become vital for mass adoption, enabling decentralized finance, gaming, and micropayments to operate affordably.
- The ecosystem now includes optimistic rollups, zk-rollups, and modular architectures.

## Zero-Knowledge Proof Innovations

- Zero-knowledge proofs (ZKPs) allow one party to prove information without revealing the data itself.
- Beyond privacy, ZKPs enhance scalability and enable secure identity verification.
- New ZK systems like SNARKs and STARKs are making blockchains more secure and efficient.

## Interoperability Protocol Developments

- As multiple blockchains emerge, interoperability has become essential.
- Modern protocols allow assets and data to move safely across networks, reducing fragmentation.
- Improved interoperability is paving the way for a multi-chain future where applications function seamlessly.

## Smart Contract Security Improvements

- Smart contract vulnerabilities remain a major risk, but AI-assisted auditing, formal verification, and real-time monitoring are significantly reducing exploits.
- Security frameworks now include insurance and on-chain alerting systems that protect users and developers.

## Decentralized Identity (DID)

- Decentralized identity solutions give individuals full control over their personal data.
- Users can share only necessary information without exposing their entire identity.
- Governments and enterprises are adopting DID for secure authentication, education credentials, and healthcare verification.

## Privacy-Enhancing Technologies

- Privacy in blockchain is evolving through technologies such as ZKPs, secure multiparty computation, and confidential transactions.
- These solutions offer privacy while meeting regulatory needs, enabling enterprises to use blockchain without exposing sensitive information.

## AI + Blockchain Convergence

- AI systems require trustworthy data, and blockchain provides verifiable records.
- Tokenized AI models, decentralized data marketplaces, and autonomous AI agents interacting with smart contracts are emerging.
- The fusion of AI and blockchain is creating new digital economies.

## Supply Chain Blockchain Adoption

- Blockchain enhances supply chain transparency by recording each step of a product's journey.
- It helps prevent counterfeiting, ensures quality control, and builds trust between suppliers and consumers.
- Major industries like agriculture, pharmaceuticals, and electronics now use blockchain-based tracking.

## Healthcare Data Applications

- Healthcare systems are adopting blockchain to secure patient records, improve data sharing, and enhance consent management.
- Blockchain also helps track pharmaceuticals to prevent fake drugs.
- It offers stronger privacy and interoperability compared to traditional systems.

## Finance and DeFi New Models

- Decentralized finance (DeFi) introduces automated lending, borrowing, and trading without intermediaries.
- This creates open, programmable financial systems that operate globally.
- DeFi is expanding into derivatives, insurance, and institutional partnerships.

## DeFi Regulation and Compliance

- Regulators are requiring DeFi platforms to integrate identity verification and risk monitoring.
- Compliance-focused DeFi platforms now offer KYC, wallet scoring, and on-chain analytics.
- These changes aim to align DeFi with traditional financial rules while preserving decentralization.

## Stablecoin Market Changes

- Stablecoins are increasingly used for payments, settlements, and global remittances.
- Regulated stablecoins backed by real-world reserves are gaining trust.
- Competition between stablecoins and CBDCs is shaping the future of digital payments.

## Crypto Market Infrastructure

- Crypto infrastructure now supports institutional trading with high liquidity, derivatives, and regulated exchanges.
- On-chain order books and automated market makers are evolving into hybrid systems that offer both transparency and speed.

## Custody and Security Innovations

- Secure storage of digital assets is critical.
- Innovations such as multi-party computation (MPC), hardware security modules, and enterprise-grade custodians have improved safety.
- Self-custody tools have also become easier for individuals to use.

## NFT Market Evolution

- NFTs have evolved beyond collectibles into tools for authentication, ticketing, intellectual property, and membership systems.
- Enterprises use NFTs for customer engagement, and industries are exploring their potential for licensing and digital identity.

## Gaming and Web3 Experiences

- Web3 gaming introduces digital ownership of in-game assets, enabling players to trade and use items across different games.
- Major publishers are entering Web3, and on-chain gaming frameworks are reducing costs and improving performance.

## Metaverse + Blockchain Integration

- The metaverse relies on blockchain for identity, ownership, and secure transactions.
- Virtual assets and experiences become tradable across platforms. AR/VR technologies combined with blockchain create persistent, user-owned digital worlds.

## Green Blockchain & Sustainability

- The industry is shifting towards eco-friendly infrastructures, including proof-of-stake networks that use over 99% less energy.
- Blockchain is also used to track carbon credits and verify sustainability claims.

## Energy-Efficient Consensus Models

- Consensus models like Proof-of-Stake (PoS) and Proof-of-Authority reduce energy consumption while increasing speed.
- These models enable large-scale applications without the environmental impact associated with earlier blockchain systems.

## Mining Industry Transformations

- Mining is evolving with renewable energy integration, heat reuse technologies, and relocation to regions with surplus power.
- Some mining operations now support grid stability by adjusting power usage based on demand.

## DAOs: New Governance Models

- Decentralized Autonomous Organizations (DAOs) allow communities to make decisions collectively using token-based voting.
- DAOs manage investments, protocols, and online communities, offering a transparent governance alternative to traditional organizations.

## Legal Frameworks for DAOs

- Legal recognition for DAOs is emerging, with jurisdictions offering DAO LLC structures that define liability and governance rules.
- Clearer legal frameworks encourage responsible management and institutional participation.

## Cross-Border Payments

- Blockchain enables near-instant global transfers with lower fees compared to traditional remittance systems.
- Banks and fintech companies use blockchain to modernize settlement and reduce intermediaries.

## AML & Compliance Technologies

- Regulators use on-chain analytics to monitor transactions, detect suspicious behavior, and track illicit activity.
- These tools improve compliance while supporting legitimate blockchain adoption across financial sectors.

## Blockchain in Voting & Governance

- Blockchain voting provides transparency and tamper resistance, ensuring that ballots cannot be altered.
- Pilot programs in municipalities and universities demonstrate promise, though challenges remain in accessibility and privacy.

## Fraud Prevention & Risk Management

- Blockchain's immutable records help prevent fraud by creating auditable data trails.
- Smart contracts enforce rules automatically, reducing human error and insider manipulation. Businesses use blockchain to enhance accountability.

## Interconnected Global Crypto Policies

- Countries are coordinating to create consistent crypto regulations, improving cross-border compliance and reducing fragmentation.
- Global standards promote safer markets and encourage multinational adoption.

## Taxation Changes

- Governments are introducing clearer taxation rules for crypto transactions, including capital gains reporting tools and automated tax calculation platforms.
- These changes simplify compliance for individuals and businesses.

## User Experience Improvements

- New interfaces make blockchain easier for everyday users.
- Gasless transactions, simple onboarding, and user-friendly wallets remove technical barriers and help blockchain reach mainstream adoption.

## Wallet Technology Innovations

- Modern wallets include automation, identity management, MPC security, and cross-chain functionality.
- Smart wallets perform tasks automatically, improving safety and convenience.

## Future of Blockchain Jobs

- Demand for blockchain professionals is rising in cybersecurity, compliance, smart contract development, and AI integration.
- Cross-disciplinary roles are emerging as blockchain becomes embedded in global digital infrastructure.

## Challenges Facing Blockchain

- Key challenges include regulatory uncertainty, lingering security vulnerabilities, scalability gaps, and public misconceptions.
- Addressing these issues is essential for long-term adoption and trust.

## Opportunities & Conclusion

- Blockchain is transforming finance, governance, and digital infrastructure.
- With improved scalability, clear regulation, and growing institutional use, blockchain is poised to become a foundational layer of the global digital economy.



Thank You