

Cryptocurrencies & Blockchains

Prepared by Dr. Mohamed Sleem

FNT611
Foundations of FinTech

Lecture 5





مجموعة جامعة
الجميع الذكية
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Question-1

In the context of today's 24/7/365, uber-connected business environment, discuss the challenges and implications faced by companies regarding their payment processes. Use the provided data on cash flow forecasting, supplier payment visibility, manual payment handling, and B2B invoice payments as evidence to support your analysis.

- **Challenges in predicting cash flow, causing liquidity problems.**
- **Limited visibility in supplier payments leading to delays and strained relations.**
- **Inefficiency and errors in manual payment processing.**
- **Delays in B2B invoice payments impacting supply chain and business reputation.**
- **Need for automated, transparent, efficient payment systems for better accuracy and trust.**

Question-2:

How can predictive analytics benefit SMEs in terms of decision-making, and what are its impacts on consultants, tax accountants, in-house staff, and banks?

- Predictive analytics can enhance decision-making for SMEs by addressing financial illiteracy, providing clarity on complexities through visualizations, and interfacing with external data sources like macroeconomic data and CRM/ERP/accounting systems. This has repercussions on consultants, tax accountants, and in-house staff by changing the way they approach and manage financial tasks. For banks, it can recalibrate funding instrument pricing and risk assessment.

Question-3:

What are the different types of business models, including B2B, B2C, B2A, C2C, C2B, and C2A, and how do they differ from one another?

- B2B (Business-to-Business) involves transactions between businesses, such as a manufacturer selling to a wholesaler. B2C (Business-to-Consumer) refers to businesses selling directly to end consumers. B2A (Business-to-Administration) covers transactions between businesses and public administrations. C2C (Consumer-to-Consumer) relates to transactions between consumers, often facilitated by platforms like eBay. C2B (Consumer-to-Business) is when consumers offer products or services for businesses to purchase. C2A (Consumer-to-Administration) involves transactions between individuals and public administrations, like paying taxes online. Each model caters to different audiences and has its unique strategies and nuances.

Objectives:

- To explore the integration and impact of cryptocurrency within digital finance and mobile value exchange systems.
- To understand the transformative effects of the "Internet of Money" on traditional and new-age business models.
- To investigate digital asset management practices and their influence on value exchange in the global economic landscape.
- To analyze the development and significance of hybrid digital finance platforms and blockchain technology in creating innovative financial solutions.

Objectives:

- To evaluate the successes and challenges of mobile payment systems like M-Pesa in the broader context of FinTech and digital currency adoption.
- To examine the interoperability challenges in digital finance and identify opportunities for more inclusive financial ecosystems.
- To gain insights into the functionality, implications, and future trends of digital currencies, particularly focusing on Bitcoin and blockchain advancements.
- To assess the role of technology in asset management, focusing on digital currencies, asset registries, and asset-centric technologies.

Blockchain and Crypto-Currencies

- **Historical Curiosity:** The concept of entirely digital money has intrigued economists, computer scientists, and philosophers since the early days of computing.
- **Early Dilemma:** A fundamental issue was the potential for easy replication of digital currency, much like audio duplication on compact discs.
- **Birth of Solutions:** Bitcoin and its descendant digital currencies emerged as solutions to this problem, combining cryptography and decentralized networks.

Blockchain and Crypto-Currencies

- **Cryptography's Role:** Cryptography had already found uses in encoding email, sensitive data, and digital files.
- **Decentralized Networks:** Decentralized, distributed networks, like ARPANET (precursor to the internet), paved the way for the decentralized nature of digital currencies.

How Digital Currency Works

- **Bitcoin's Inception:** In 2009, Bitcoin, created by Satoshi Nakamoto, introduced an innovative system that combines cryptography, competition, and decentralized networks.
- **Mining for Bitcoins:** Bitcoin's network participants compete to solve encrypted puzzles, with the first successful miner winning newly minted bitcoins. This process is known as "mining."
- **Puzzle Difficulty Control:** Bitcoin has a set rule that aims to maintain a 10-minute interval between block creation. If more miners join, the puzzle difficulty increases.
- **Roulette Analogy:** A casino roulette wheel analogy explains the concept, with the casino owner adjusting the wheel size to maintain the desired interval.

How Digital Currency Works

- **Transaction Initiation:** A user initiates a transaction, which could involve cryptocurrencies, contracts, records, or other information.
- **Transaction Representation:** This transaction is represented online as a "block" of data. This block contains important information like transaction details, timestamps, and digital signatures.
- **Verification Process:** The block is broadcast to a network of nodes (computers) for validation. These nodes might involve solving cryptographic puzzles to validate the transaction, a process known as mining in the context of Bitcoin.

How Digital Currency Works

- **Block Addition to Chain:** Once verified, the block is added to the existing blockchain. Each block contains a unique code called a hash, as well as the hash of the previous block, creating a chronological chain of blocks.
- **Update and Distribution:** The updated blockchain, with the new block added, is distributed across the network, ensuring all nodes have the latest, complete version of the ledger.

Bitcoin 2.0 and Future Trends

- **Bitcoin** has been the dominant use case for blockchain technology, primarily based on trust and proof in transactions.
- **Blockchain** is suitable for any transaction requiring trust, as miners validate and confirm transactions while earning rewards.
- Information like ownership titles, deeds, contracts, and notary services can be permanently recorded on the blockchain, eliminating the need for a central authority.

Bitcoin 2.0 and Future Trends

- This shift has far-reaching implications for business transactions, potentially disrupting various sectors, including legal and financial.
- After the initial wave of Bitcoin enthusiasts focused on replacing traditional currencies, the Bitcoin community turned its attention to alternative uses of blockchain technology.
- Bitcoin 2.0 applications are emerging and aim to enhance transaction-based industries.
- Four key categories of blockchain technologies are anticipated to impact the financial sector: digital currencies, asset registries, application stacks, and asset-centric technologies.

Digital Currencies

- There are over 500 alternative altcoins, which are digital currencies similar to Bitcoin, each with unique monetary supply mechanisms and transaction networks.
- The future is likely to see the rise of community-based digital currencies for internal rewards, customer loyalty programs, incentives, and governance schemes.
- These community-based digital currencies can be organized by state institutions or private corporations, issuing their branded "coins."
- Platforms already exist that enable individuals with basic software programming knowledge to create their unique digital currencies with customized rules and usage limits

Digital Currencies

- **Payment networks like Ripple facilitate easy transfer of various digital currencies among users.**
- **In the near future, every smartphone user could have digital wallets for different branded coins, exchangeable for loyalty points, other altcoins, or traditional currencies.**
- **This system operates within a global market with a distributed and decentralized clearing mechanism, enhancing transaction efficiency and the utility of these digital currencies for rewards.**

Asset Registries

- Asset registries involve linking real assets like stocks, bonds, and certificates to digital tokens for exchange among network users.
- Ownership changes of these assets are automatically registered in a multi-asset public ledger, eliminating the need for central authorities or clearing and settlement services.
- Current technology in this area requires refinement due to issues like potential blockchain overload, known as "blockchain bloat," which may lead to scalability problems.

Asset Registries

- Despite challenges, asset registry applications like Mastercoin (now OmniLayer), ColoredCoin, Namecoin, and Counterparty have been introduced to the market.
- The banking industry has not fully harnessed the potential of this technology, but solutions such as sidechains are being developed to address blockchain bloat.
- It is expected that in the near future, asset registry applications will become a common tool in the finance industry, offering more efficient asset management and transfer.

Application stacks

- **Application stacks refer to non-currency blockchain platforms designed for creating and running complete applications on decentralized networks.**
- **These applications encompass Distributed Autonomous Organizations (DAOs), which redefine traditional business organizations by decentralizing and encoding rules for interactions among individuals.**
- **DAOs operate through a network of autonomous agents that follow predefined rules, ensuring transparency and accountability. These agents can include both humans and other DAOs.**

Application stacks

- **DAOs represent the most complex form of decentralized automation, but simpler variations include smart contracts, autonomous agents, decentralized applications, and decentralized organizations.**
- **Current application stacks that facilitate decentralized automation include NXT, Ethereum, and Eris, each with its unique focus and features.**

Asset-Centric Technologies

- **Asset-centric technologies depart from the resource-intensive proof-of-work system used by Bitcoin, introducing a new concept of distributed consensus.**
- **Prominent examples of asset-centric technologies include Stellar, Ripple, Hyperledger, and Namecoin.**

Asset-Centric Technologies

- **These decentralized ledger systems facilitate the exchange of real assets, such as currencies, metals, stocks, and bonds. Some, like Hyperledger, function without requiring a native digital token.**
- **Asset-centric technologies distinguish themselves by serving as distributed exchangers, enabling network users to trade a broad spectrum of real assets among themselves**

Crypto-currency Meets Digital Finance and Mobile Value Exchange:

- **Rapid Growth:** Cryptocurrency has transformed from a hobby project to a multi-billion dollar global digital finance industry in just two years.
- **Diverse Applications:** Beyond simple currency-based payments, cryptocurrency now encompasses value exchange, financial instruments, smart contracts, and blockchain-based distributed ledgers.
- **Bitcoin as a Beginning:** Bitcoin was just the beginning, as new alternatives and technologies have emerged.

The Internet of Money: Transforming Business Models

- **Key Drivers:** Emerging FinTech and digital currency innovations aim to provide secure, frictionless, real-time, and almost free financial services.
- **Incentives for Traditional Providers:** The efficiencies offered by these technologies are compelling for traditional financial services providers.
- **Investment in Crypto-Currency:** Entrepreneurs in the crypto-currency space have attracted over \$1.5 billion in investments.
- **Broader FinTech Sector:** The FinTech sector is projected to reach \$22 billion in 2015.

Crypto-currency Meets Digital Finance and Mobile Value Exchange:

- **Financial Disruption:** Bitcoin, alternative currencies, and digital finance innovations promise to disrupt global finance, coinciding with the rise of mobile payments and digital-value exchange.
- **Mainstream Attention:** Once an outlier technology, Bitcoin and digital money applications now attract attention from major financial institutions, consumer technologies, and regulators worldwide.

Crypto-currency Meets Digital Finance and Mobile Value Exchange:

- **Growing User Base:** Bitcoin has gained millions of users and a significant market capitalization (\$3.7 billion as of July 2015).
- **MtGox and Silk Road:** Notable controversies, like MtGox and Silk Road, have contributed to skepticism among bankers and regulators.
- **Convergence of FinTech Sectors:** The convergence of digital banking, mobile transactions, and cryptocurrency protocols is a key intersection with potential implications, opportunities, and challenges for various stakeholders.

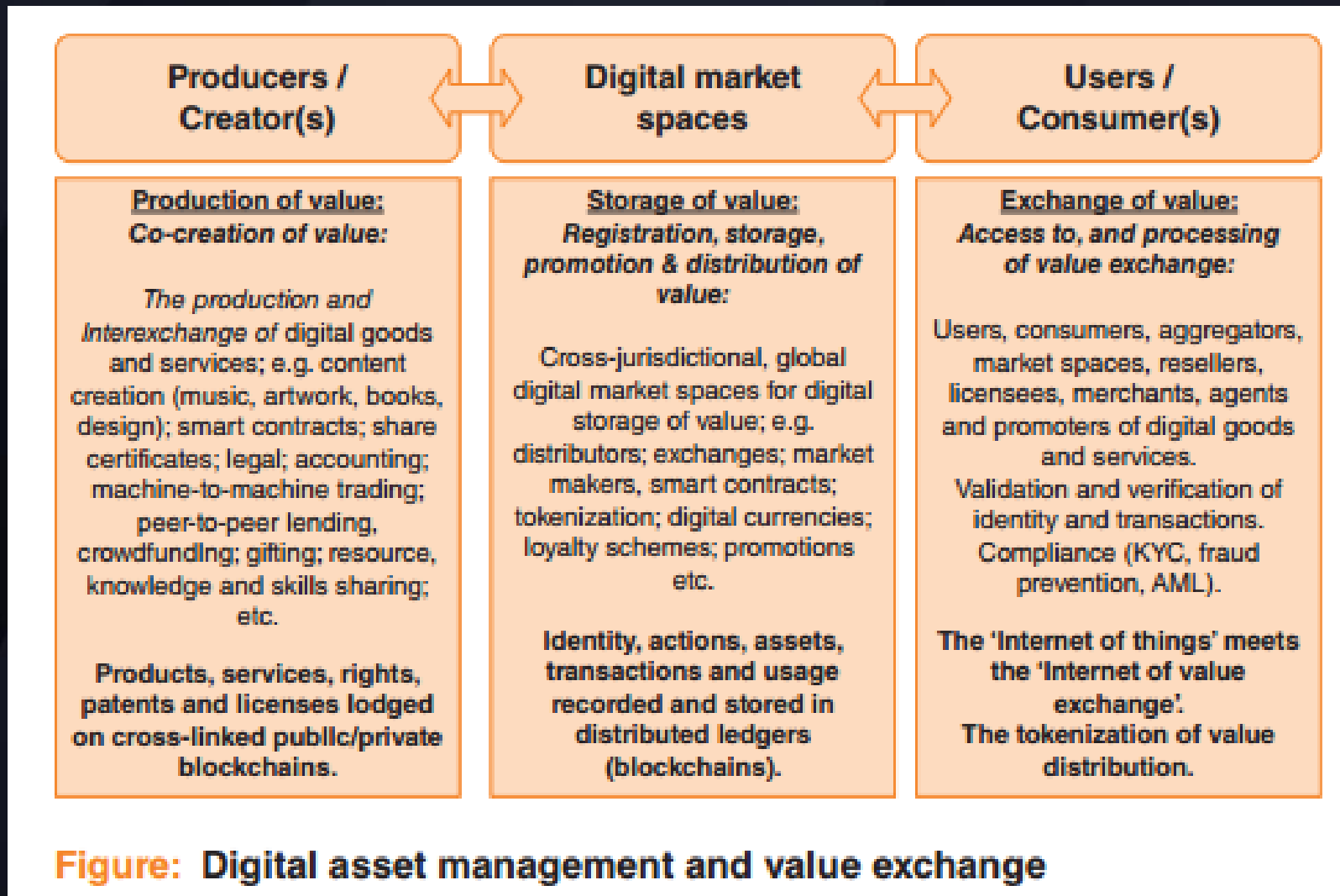
The Internet of Money: Transforming Business Models

- **Adoption Drivers:** The adoption of these technologies is driven by their efficiency and disruptive business opportunities.
- **Customer-Centric Approach:** Customers, consumers, and users are becoming co-creators of value in the financial sector.
- **Value Transfer System:** A value transfer system is needed to reward contributions incrementally and directly, regardless of the services or goods offered globally in real-time.

Digital Asset Management and Value Exchange in the Global Economy

- **Virtual Market Spaces:** Digital asset management and value exchange are emerging virtual marketplaces where global organizations and communities connect to exchange, transact, and interact using various forms of digital value.
- **Key Focus Areas:** As the digital economy goes global, primary focus areas include digital asset management, distribution and logistics, IoT, M2M data, online and mobile payments, and global remittances through smart contracts.

Digital Asset Management and Value Exchange in the Global Economy



Digital Asset Management and Value Exchange in the Global Economy

- **Sectors Addressed:** Distributed ledgers (blockchain), tokenization (digital currencies), and smart contracts will address key sectors, including:
 - **Government-to-government (G2G)** verification and validation for finance, development aid, taxation, anti-money laundering, and trade monitoring.
 - **Government-to-business and business-to-government (G2B2G)** information tracking, auditing, taxation, and foreign trade monitoring.
 - **Government-to-citizen (G2C2G)** services, encompassing registration, passports, voting, and citizen engagement with governments.

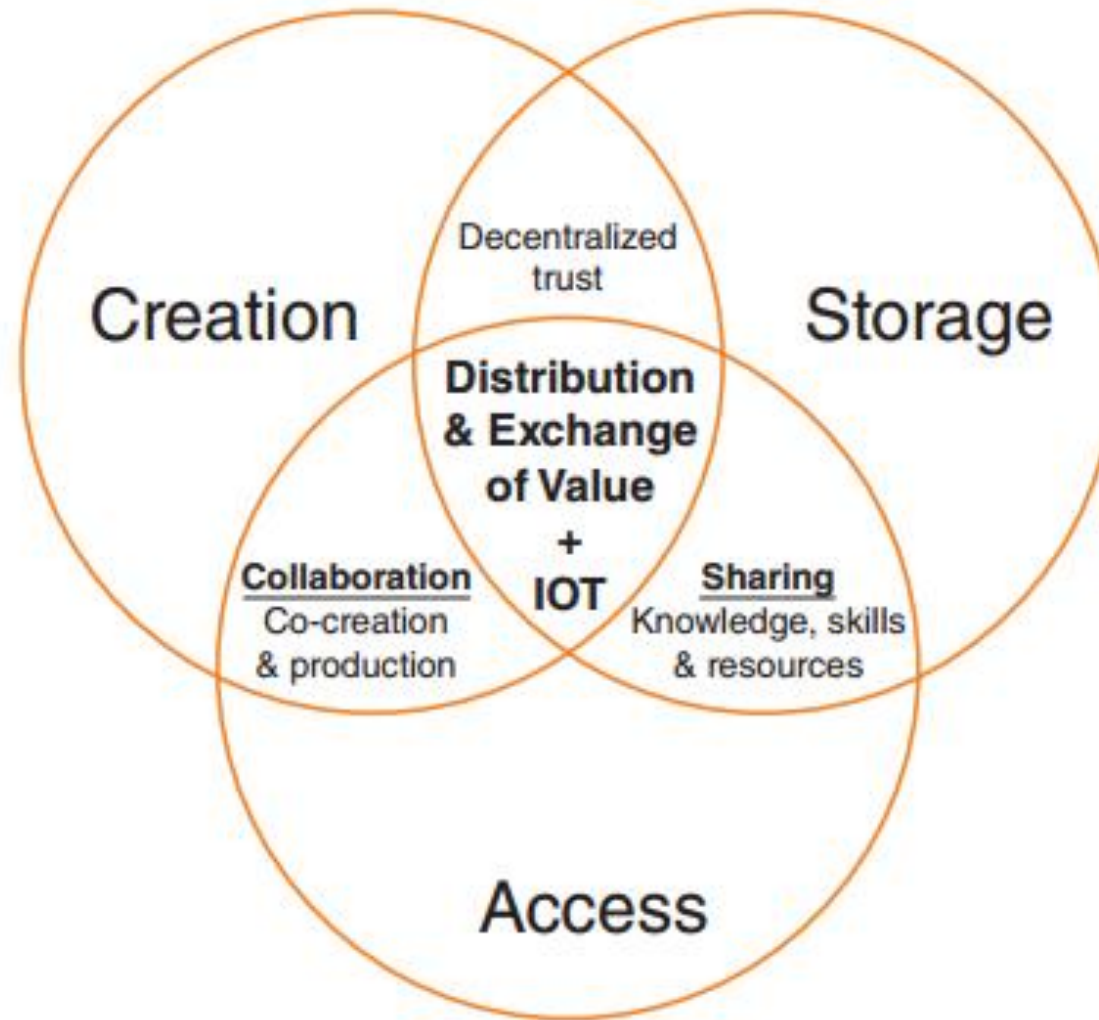


Figure: Value creation and exchange in the digital economy + the Internet of Things

Digital Asset Management and Value Exchange in the Global Economy

- **Business-to-business (B2B)** for inter-business trade, manufacturing, supply chain management, and digital rights.
- **Interactive business-to-consumer (B2C2B)** in retail, online services, and social media-driven economic activities.
- **Citizen-to-citizen (C2C)** engagement in the shared and digital economy, featuring crowdfunding, peer-to-peer lending, informal trade, and barter.

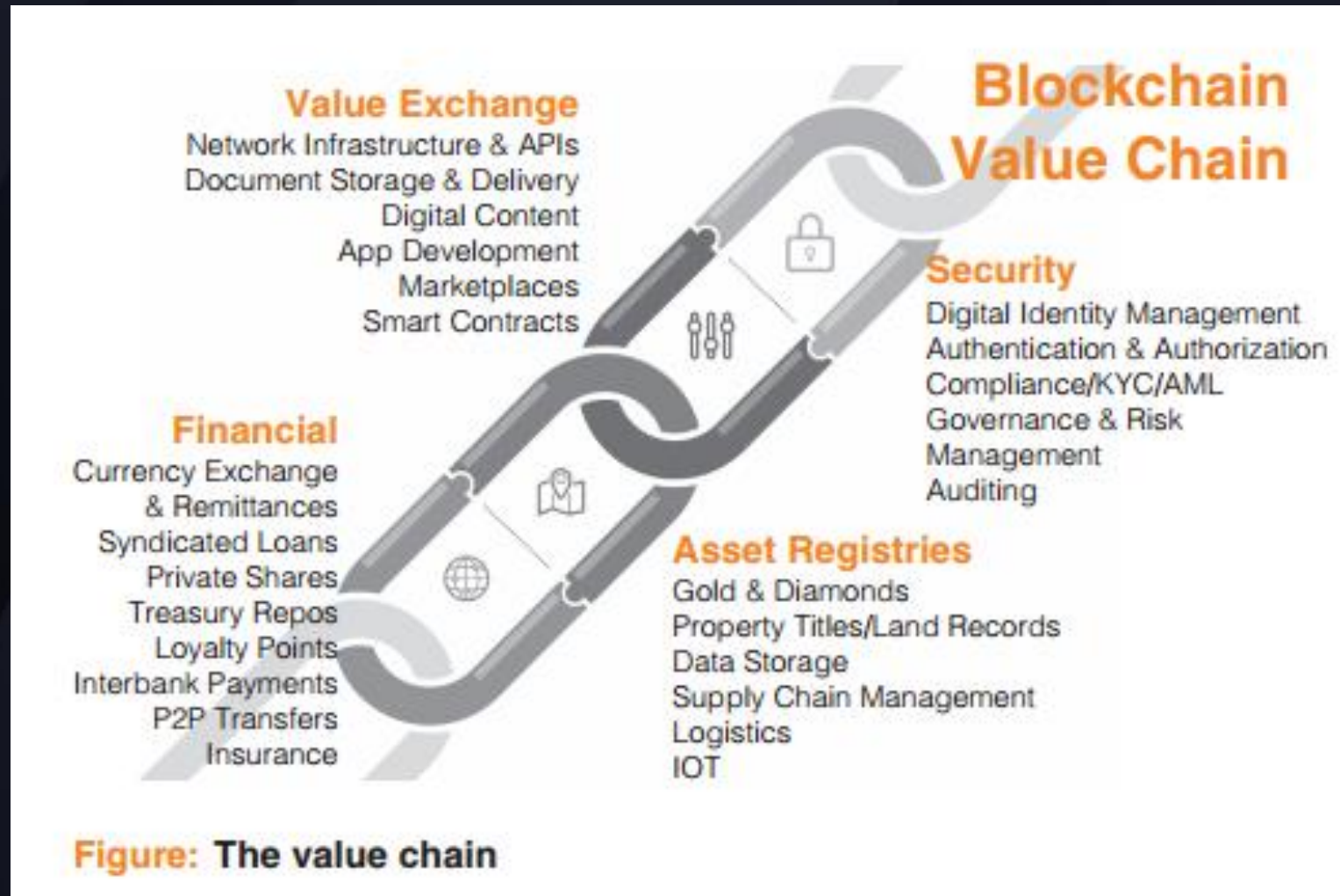
Hybrid Digital Finance Platform Convergence:

- **Convergence of Digital Finance:** Digital finance is evolving by converging digital banking, mobile value exchange, and crypto-currency applications to serve diverse jurisdictions and user needs.
- **The "Internet of Money":** The concept of the "Internet of Money" is emerging, aligning with the "Internet of Value" and the "Internet of Things," fostering a deeper understanding of digital finance and distributed infrastructure development.
- **User-Centric Evolution:** Digital finance is evolving to cater to user needs, emphasizing ease of use, access, stability, security, and the overall user experience.
- **Competitive Landscape:** Delivery platforms from various sectors will compete for a share of the global financial system, addressing both overbanked and underbanked regions.

Hybrid Digital Finance Platform Convergence:

- **Hybridization:** A "hybridization" of digital finance technologies is likely, combining decentralized and centralized platforms and delivery channels.
- **Dual Economy:** A dual economy could emerge, driven by the ease of uniting global consumers and merchants with digital currencies, low transaction costs, consumer openness to innovation, and the influence of technology companies.
- **Future Possibilities:** A hybrid Bitcoin-Fiat future may materialize, where different currencies coexist for various goods and services, fostering internal balance of payments.
- **Multi-Currency Economies:** Multi-currency economies are not uncommon, with the example of the US dollar coexisting with local currencies in various regions.

Blockchain Value Change



M-Pesa and Lessons for Integrated FinTech + Digital Currency Adoption:

- **M-Pesa Success Story:** M-Pesa in Kenya serves as a prime example of successful digital transaction adoption and offers valuable insights.
- **Origin and Purpose :** Originally developed by Safaricom (Vodafone), M-Pesa aimed to facilitate microfinance loan repayments via mobile phones, reducing cash-handling costs and enabling lower interest rates.

M-Pesa and Lessons for Integrated FinTech + Digital Currency Adoption

- **User Onboarding:** Users deposit money into the system by giving cash to one of the 40,000 agents, often street vendors or local shops selling airtime.
- **Expanding Services:** Over time, M-Pesa evolved into a comprehensive money-transfer platform, offering loans, savings, bill payments, and salary transfers.
- **Network Effects:** M-Pesa's success was amplified by network effects, where increased user adoption led to more people finding value in the service, encouraging further sign-ups.

Interoperability in Digital Finance: Challenge and Opportunity

- **Trust Gap:** Emerging financial technologies lack trust and access to established financial institutions, and vice versa. However, strategic partnerships and relationships are being explored.
- **Convergence Ahead:** A large-scale convergence between legacy financial systems and emerging digital finance platforms is on the horizon, with blockchain-based "proof of concepts" emerging.

Interoperability in Digital Finance: Challenge and Opportunity

- **Competitive Advantage:** The true competitive advantage and innovation in digital finance lie in the integration of centralized, cloud-based, and distributed solutions.
- **Diverse Future Currency:** The future digital currency can take various forms, breaking barriers and increasing access across different regions and income levels.
- **Inclusive Financial Models:** Emerging digital finance models and technologies can benefit the "unbanked" and excluded, offering greater access, equality, and efficiency in established markets.
- **Vision of the Future:** The digital finance future aims to be "flexible, frictionless, and almost free" for all.

Summary

- Exploring cryptocurrency's role in digital finance and mobile transactions.
- Understanding the "Internet of Money" and its impact on business models.
- Investigating digital asset management and global economic influence.
- Analyzing hybrid finance platforms and blockchain in financial innovation.
- Evaluating mobile payment systems like M-Pesa in FinTech and digital currency adoption.
- Examining digital finance interoperability and opportunities for inclusive ecosystems.
- Gaining insights into digital currency trends, focusing on Bitcoin and blockchain.
- Assessing technology's role in managing digital currencies and assets.

Discussion

1. How might community-based digital currencies impact loyalty programs and incentives in the future?
2. How do asset registries leverage blockchain technology to link real assets like stocks, bonds, and certificates to digital tokens?
3. Explain the concept of Application Stacks in the blockchain ecosystem and how they relate to the development of Distributed Autonomous Organizations (DAOs).



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