Blockchain Protocols

Module 6

Ethereum tokens

- What are tokens?
  - Tokens also referred to as crypto tokens, are essentially units of value that **blockchain** projects build on top of the existing blockchain network. Tokens are a completely different class of digital assets, they don't have a native blockchain.
  - Cryptocurrencies are native to the particular blockchain while tokens are developed by platforms that build on top of these **blockchains**. For example, Ether (ETH) is the native cryptocurrency of the Ethereum blockchain. While Ether belongs to the **Ethereum** platform, there are other blockchains that use Ethereum blockchain.
  - LINK, COMP, and DAI are some examples of crypto tokens built with the Ethereum blockchain.

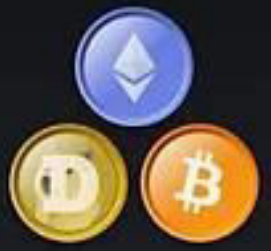
What is tokenization?

- In simple language, tokenization refers to the process of changing an asset or its ownership into special units known as tokens. It is generally used for transforming the ownership and right of assets into a digital form. This process enables converting even physical, indivisible items into tokens.
- For instance, tokens enhance data security of sensitive information by replacing it with unique, non-confidential information. In this case, tokens do not contain the original data but consist of similar characters. To restore and view the actual information, users must access the tokens linked to originals stored elsewhere. Token creation involves various techniques, such as cryptographic functions and randomly-generated numbers, that make them ideal for storing sensitive personal and financial information.

- Many dApps built on Ethereum have their own cryptocurrencies or “tokens.”
- In order to interact with the dApps, users need to purchase the dApp’s native token.
- Generally speaking, a token represents something specific in a given ecosystem.
- This could be could economic value, a dividend, a stake, a voting right… really anything.
- It’s important to understand that a token is not limited to one particular role; it can fulfill various different of roles in its native ecosystem.

If We Have Ether – Why Do We Need Tokens?

- After learning about Ether and how it functions in the Ethereum network – the natural question to ask is why don't we simply use Ether to pay for every transaction within those dApps? Why do we need a native currency for them? The answer to that is very simple, as in the real world there are plenty of places where we use a token over traditional money.
- Here is a simple analogy – a video arcade.
  - If you want to play the games in the arcade – you must first deposit money into a coin machine and get back arcade tokens or credits. Once you have the tokens – then you can play the games.



COINS

VS

TOKENS

A coin is a digital currency similar to physical currency

Coins can operate on their own blockchain with their own protocol

Coins can be used as a source of payments

i.e. Bitcoin and Ethereum

A token is a digital asset issued on a particular project

Tokens don't necessarily operate on their own blockchain

Tokens can be used for payments and signing digital agreements

i.e. Utility and DAO Tokens

The Different Types Of Tokens

- The Ethereum ecosystem is rapidly growing, changing and expanding. New innovations are popping up by the minute. There will be a variety of blockchain-based tokens in the future. But for now, there are three types of blockchain-based tokens that we will discuss:
- **Usage tokens:** A token that is required to use a service.
- **Work tokens:** A token that gives users the right to contribute work to a DAO and earn in exchange for their work
- **Security tokens:** an external, tradable asset that is a representation of value in a system.

Usage Tokens

- These are the tokens function like a currency in their respective dApps. This is generally the most simple and straightforward application of a token. These tokens have monetary value; however, they don't come with any sort of rights or privilege within the particular network. In short, think token as money. Usage tokens are sometimes also referred to as "medium-of-exchange" tokens.
- Examples: Golem, 0x, Civic, Raiden, Basic Attention Token, and more.

Work Tokens

- Work tokens give users rights to contribute work to the organization to help it function. In this model, the user (or service provider) stakes the native token of the network to earn the right to perform work for the network. The cool thing about the work token model is that as demand for the service grows, more revenue will flow to service providers. Given a fixed supply of tokens, service providers will rationally pay more per token for the right to earn part of a growing cash flow stream. We'll dive into the concepts of bonding, calculating valuations, and improving network incentives at a later time. The important thing to understand at this stage is work tokens grant access to the network and provide cash flow potential conditional on the delivery of work with the token.
- Examples: Augur, Keep, Truebit, Gems, and more.

Security Tokens

- Security tokens, also known as tokenized securities or investment tokens, are financial securities compliant with SEC regulations. While this module will not dive into regulation and compliance, the simple thing to understand is that these tokens provide an array of financial rights to the token holder.
- Examples of these financial rights include equity, dividends, profit sharing, voting rights and more. Simply stated, these tokens represent a right to an underlying asset such as a pool of real estate, cash flow, or holdings. What makes security tokens so neat (and potentially revolutionary) is that the rights are written into a smart contract and the tokens are traded on a blockchain-powered exchange.

- **Fungible Tokens**
  - Fungible tokens are interchangeable with one another and have identical properties. Each unit of a fungible token is equivalent to every other unit, making them perfect for representing traditional currencies. The most well-known standard for fungible tokens on Ethereum is ERC-20.
  - Fungible tokens are often used for use cases like stablecoins (e.g., USDT, DAI) and utility tokens within decentralized applications (dApps).
- **Non-Fungible Tokens (NFTs)**
  - Non-fungible tokens are unique and indivisible. Each NFT has distinct characteristics and cannot be exchanged on a one-to-one basis with another NFT. NFTs are widely used for digital art, collectibles, virtual real estate, in-game items, and more.
  - NFTs have gained immense popularity in recent years, with notable sales of digital art and collectibles reaching millions of dollars.

What is ERC for Ethereum?

- ERC expands to Ethereum Request for Comments. It's similar to technical documents that outline research, innovations, and methods that are applicable to developers and users who wish to participate in technical discussions of improvements, fixing errors, defining standards, and more. Sometimes, they either keep or freeze the inclusive to end in an EIP.
- Now, the question is who has the authority to edit or review these ERC documents? Well, anyone including Ethereum smart contract programmers who write these technical details, can review them periodically and add comments for further improvement.

What are ERC token standards?

- ERC token standards specify the interface that supports the smart contract implementing the token. Their purpose is to create wallets or systems that are protocol-agnostic.Initially, most of them were creating their own tokens and custom interfaces. The Ethereum community reviews the rules and updates them periodically. The ERC token standards are inclusive of the same token and the ERC can vary with each one depending on characteristics and purpose.
- Before moving to ERC standards, let's understand what smart contracts are capable of:
  - Programmers create smart contracts by adhering to the rules of the underlying language, such as Solidity, to leverage the potential of the Ethereum network.
  - Smart contract standards include token standards, registry details, library names, and more.

Token Standards

- Token standards are sets of rules and interfaces that ensure tokens on the Ethereum blockchain are compatible with various wallets, exchanges, and dApps.
- These standards provide a common language for different tokens to interact seamlessly within the Ethereum ecosystem.
- **ERC-20**
  - ERC-20 is one of the most popular token standards on Ethereum. It defines a set of functions and events that allow developers to create fungible tokens easily. ERC-20 tokens can be used in various applications, including Initial Coin Offerings (ICOs), decentralized exchanges (DEXs), lending protocols, and more.
  - Key functions in an ERC-20 contract include transferring tokens, approving spending on behalf of another address, and checking balances.

- **ERC-721**
  - ERC-721 is the standard for creating non-fungible tokens. Each token created using this standard is unique and can represent ownership of a specific asset. ERC-721 tokens are widely used for digital collectibles, gaming items, and unique digital assets.
  - ERC-721 introduces functions to track ownership and manage individual tokens, making it suitable for applications where each token represents a distinct item.
- **ERC-777**
  - ERC-777 is a more advanced token standard that builds upon ERC-20 and ERC-223 standards. It introduces features like improved security, backward compatibility with ERC-20 tokens, and enhanced control over token transfers. ERC-777 tokens aim to improve the user experience and simplify token management.
  - Some of the key features of ERC-777 include sending tokens with data, operator management, and customizable hooks for token transfers.

Augur

- Augur is a decentralized oracle network and peer-to-peer powered protocol designed for prediction markets.
- Augur is open source software, licensed under the General Public License (GPL) and Massachusetts Institute of Technology (MIT) licenses.
- Augur is a set of smart contracts developed for use on the Ethereum blockchain.
- The Augur Protocol attempts to solve one of the most difficult problems decentralized app (dApp) developers face when attempting to bridge real-world data sources to blockchain – known as “the oracle problem”.
- The Augur oracle network allows for information to be migrated from real-world data sources to blockchain – without needing to rely on a third party.

What is AUGUR (REP)?

- Launched in 2018, Augur is an open-source, decentralized protocol that allows users to create prediction markets where they can speculate on the outcome of events. Augur also functions as a decentralized oracle by verifying real word events and encoding the outcomes on-chain.
- Augur functions as a set of open-source smart contracts, coded in solidity, that can be deployed by users on the Ethereum blockchain. Interactions with these smart contracts allow users to speculate on real-world events and settle payments for prediction markets in ETH .
- Augur is supported by The Forecast Foundation, a group of developers who contribute to the maintenance and development of the protocol, but do not own or control it. The foundation does not receive fees from the protocol and has no role in the operation of created markets among other restrictions.

How does Augur work?

- Augur contracts use two cryptocurrencies – Ethereum, and Augur's native token REP. Reputation (REP) is a staking token used by reporters on the Augur platform to clarify disputes or outcomes of the prediction market. Reporters report on a market by locking their tokens in escrow, staking the REP tokens on a possible outcome. The consensus of the market's reporters is considered truth and is what allows Augur (REP) to act as a decentralized oracle.
- When a user wants to speculate on the outcome of a real-world event, they will submit a transaction to the Augur smart contracts for the market. The rules for the market of each event are specified as the market is created. Once a market is live, users may trade in the market until the event has occurred. Once the outcome is finalized and determined via Augur's oracle system, traders close out their positions and collect any potential payouts. Augur (REP) uses a complex incentive structure that rewards reporting on correct outcomes, penalizes reporting on incorrect outcomes, and penalizes passive holders who don't stake for disputes and forks.

What Gives Augur (REP) Value?

- Augur is a decentralized oracle and P2P prediction market platform built on top of the Ethereum blockchain. It was one of the first decentralized applications (dApps) developed using Ethereum.
- Users realize value by participating in the markets on the Augur platform. By owning REP and participating in the accurate reporting on the outcomes of each event, users are entitled to a portion of Augur's market fees. Each REP token entitles you to 1/22,000,000 of Augur's total market fees.

Golem

- Renting and paying for computational power has never been easier or more decentralized with one of the first projects on the Ethereum network, Golem. Golem was pitched by Golem Factory in 2016 and launched two years later on the second-largest network to offer an on-demand computational peer-to-peer market. The main purpose of the project is to offer computational power for all sorts of projects to users that don't have enough computing capacity.
  Golem is tapping into the potential of a decentralized P2P market in comparison with centralized models that offer the same or similar services, offering a way to control how we pay, rent, and use computational resources. With blockchain technology, Golem achieves democracy, decentralization and creates an ecosystem where users can buy and sell computing power for all sorts of projects, including artificial intelligence and cryptocurrency mining.

What is Golem (GLM)?

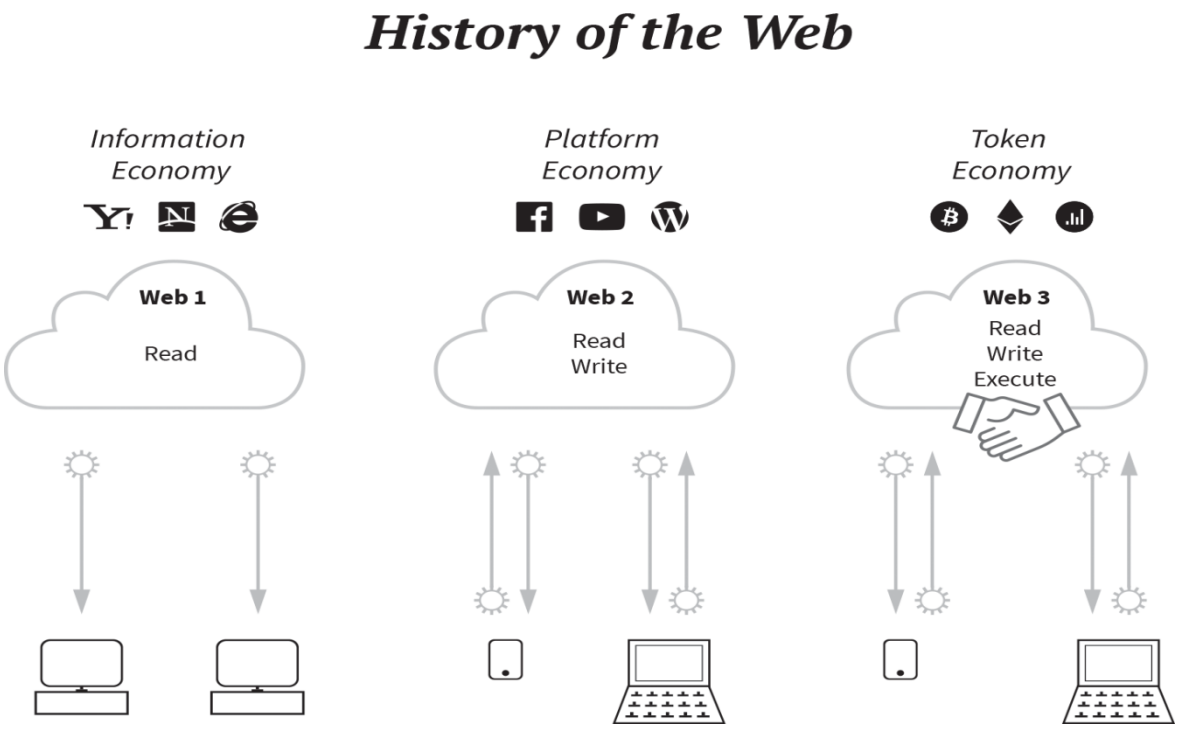
- Golem is a blockchain-based software that allows users to buy and sell computational power for various purposes, including artificial intelligence, cryptocurrency mining, CGI rendering, and other complex computations that demand great computing power. Golem represents a version of traditional services of the same kind that is controlled by users, and thus is decentralized and doesn’t depend on central authorities and third parties.
- Golem allows users to sell their excess computing power to users who lack the resources to work on complex projects that require greater computational power for execution. Users who sell their resources are rewarded with GLM tokens in exchange for their service, paid by buyers on the network. The price depends on the amount of rented computational power.
- Golem effectively provides a P2P market for computing resources by splitting tasks into smaller portions so the system can scale properly and form a unique user-dependent market. GLM is the utility token of the Golem network and it serves as the main store of value on the network. The GLM token incentivizes sellers to rent their computing power in exchange for GLM-based payment provided by buyers.

How Does Golem Work?

- Golem works by processing requests and connecting buyers and sellers based on the request in question. On the Golem's Network, users who buy computing power are known as Requestors. Requestors can create requests that the Golem system then processes, validates, and uses to connect the Requestor with appropriate resources. The system splits the task into smaller fractions of the initial task and rents the computing power from multiple users in portions.
- The Requestor can have Golem complete the work for them, such as rendering CGI elements that require major computational resources. Instead of waiting for the work to be completed by traditional cloud computing service providers that can be rather expensive and slow, Golem splits the task and finishes the work almost instantly with fractions of computational power provided by sellers in the peer-to-peer market.
- The Requestor will use a task template to request resources for computing, with task templates containing all the information the Golem Network needs in order to carry out the requested task. Users can make a request with a pre-existing template or customize their own task template, which will be verified by Golem automatically. Once the Requestor receives the completed work, they make a payment to the Provider (seller) directly into a contract within the Golem system.

Token Economy

- Blockchain technology seems to be the driving force of the next-generation internet, what many refer to as *Web3*.[1] Web3 enables tokenized economic interactions without intermediaries.



- It provides a unique set of data, a universal state layer, also referred to as the ledger, which is collectively managed by a network of untrusted computers.
- This unique state layer allows us to send digital values in the form of tokens entirely peer to peer (P2P), circumventing the *double-spending problem*.
- Sending digital values over the web has therefore become as cheap and easy as sending an email.

What is the token economy

- Tokenomics, also known as tokenomics, is a combination of the words token and economy. This refers to the token economy. And according to the BBVA bank, a token is a cryptographic unit of value issued by a private Blockchain network. To put it simply, tokens are cryptocurrencies. An example is Bitcoin or Ethereum.
- Tokenomics, as defined by these two principles, is how people handle digital assets or tokens within a Blockchain system. However, this concept extends beyond all of this.
- The token economy has brought what banks use as monetary policy to Blockchain networks. Its primary goal is to establish a token-based economic ecosystem. All of the interactions that occur with these tokens sustain this ecosystem.

How does token economy work

- The token economy, also known as tokenomics, aims to create economic ecosystems based on tokens. The users or investors, as well as the project managers, will ensure the stability of this ecosystem.
- Just as mentioned earlier, tokens can represent anything. Tokenomics is now expanding beyond digital assets to include physical aspects as well. Furthermore, the token economy might enable us to decentralize their control.
- Another point to emphasize is that the development of tokenomics depends entirely on the Blockchain. Tokens can exist in this sense, but there are no tokenomics without the Blockchain.
- Tokenomics makes it possible to mark in the depths of the Blockchain the rules governing the maximum quantity, the monetary emission, and the distribution of digital assets (if necessary, specific projects can distribute a particular part of the tokens to a distinct entity, the project development team for example).
- It is with interest that any investor should dwell on these characteristics since they can significantly influence the token's valuation. This is generally detailed in the white papers produced by the development teams on the occasion of ICO (initial coin offering).

- **The total supply**
  - The total supply represents the maximum amount of tokens the Blockchain can issue. In this case, a distinction must be made between available quantity and total quantity.
  - The quantity available represents the number of tokens already issued at a time “t,” which you and I can now buy on an exchange like Binance or FTX. The total quantity represents the maximum quantity the number of tokens in circulation will eventually reach.
  - For example, Bitcoin has 21 million tokens that will be mined on this Blockchain, no more, no less.

- **Token distribution and vesting periods**
  - Detailed token distributions to stakeholders are now the norm in crypto initiatives. To establish product credibility, it is currently common practice to keep a vesting term on tokens granted to venture capitalists or developers.
  - The vesting period locks developers' tokens for a set length of time, protecting investors from perpetrators of pump-and-dump scams.

- **Staking and mining**
  - At present, initial Blockchains such as Bitcoin and Ethereum provide tokens to reward miners for confirming transactions.
  - This is known as proof of work (PoW). Miners must utilize their computational power to create new blocks that are then added to the network.
  - Rewards are given to people who have locked away a particular number of coins in a smart contract on proof-of-stake (PoS) Blockchains that have adopted a staking model for validators. Ethereum is headed toward this architecture with the upgrade to the consensus layer.

- **Tokens burns**
  - To prevent inflation, crypto platforms must burn tokens to remove them from circulation forever. The price is projected to rise as the quantity of tokens in circulation decreases.
  - Binance burns its native coin, BNB, quarterly to limit its overall supply. Stellar destroyed 55 billion XLM coins in November 2019, accounting for over half of its total supply, resulting in a short-term price gain of more than 30%.

What Makes Crypto Tokenomics So Different?

- Crypto tokenomics is different from traditional economics because it's based on a decentralized and trustless system. In traditional economics, central authorities such as banks and governments manage the economy, but in tokenomics, the rules and incentives are enforced by code on the blockchain.
- Tokenomics is also different from traditional economics because it's designed to incentivize particular behaviors within a particular ecosystem or platform. For example, governance tokens are designed to incentivize users to participate in the decision-making process of a particular platform.

Applications of Token Economics

1. Funding for Blockchain Projects

- Token economics can be used to fund blockchain projects through initial coin offerings (ICOs) or initial exchange offerings (IEOs).

2. Incentivizing Participation

- Tokenomics can be used to incentivize users to participate in particular actions such as staking, voting, or contributing to a particular ecosystem.

3. Revenue Sharing

- Token economics can be used to distribute revenue from a particular ecosystem or platform to its users based on their participation or contribution.

How do you create a fair token economy for your blockchain?

1. **Define your goals**
   - The first step to create a fair token economy is to define your goals and vision for your blockchain project. What problem are you solving? Who are your target users? What value proposition do you offer? How do you measure success? Your goals should be clear, specific, and achievable, and they should guide your design decisions and trade-offs.

2. Choose your token model

- The next step is to choose your token model, which is the type and function of your token in your blockchain network. There are different token models, such as utility tokens, governance tokens, security tokens, payment tokens, and hybrid tokens. Each model has its own advantages and disadvantages, and it should match your goals and use cases. For example, if you want to enable users to access and use your network services, you might opt for a utility token. If you want to give users a say in the network decisions, you might opt for a governance token.

3. Design your token distribution

- The third step is to design your token distribution, which is the way and the rate at which you issue and allocate your tokens to your network participants. Your token distribution should be fair, transparent, and inclusive, and it should incentivize the desired behaviors and outcomes. There are different methods of token distribution, such as initial coin offerings (ICOs), airdrops, mining, staking, and rewards. Each method has its own pros and cons, and it should align with your token model and goals. For example, if you want to bootstrap your network and raise funds, you might opt for an ICO. If you want to reward users for contributing to the network security and performance, you might opt for staking.

4. Set your token economics

- The fourth step is to set your token economics, which is the set of rules and parameters that govern the supply and demand of your token in your blockchain network. Your token economics should be sustainable, scalable, and adaptable, and it should ensure the long-term viability and value of your token. There are different aspects of token economics, such as inflation, deflation, burning, minting, halving, and fees. Each aspect has its own impact and implication, and it should balance the needs and interests of all stakeholders. For example, if you want to control the token supply and create scarcity, you might opt for burning. If you want to adjust the token issuance and reward the network growth, you might opt for halving.

5. Test and iterate your token economy

- The fifth step is to test and iterate your token economy, which is the process of validating and improving your token design and implementation in your blockchain network. Your token economy should be tested and iterated regularly, as the blockchain environment and user behavior are dynamic and unpredictable. There are different ways to test and iterate your token economy, such as simulations, experiments, audits, feedback, and data analysis. Each way has its own benefits and limitations, and it should help you identify and solve the potential issues and risks. For example, if you want to simulate the token behavior and outcomes under different scenarios, you might opt for simulations. If you want to collect user feedback and suggestions, you might opt for surveys.

6. Communicate and educate your token economy

- The sixth and final step is to communicate and educate your token economy, which is the act of informing and engaging your network participants and potential users about your token design and value. Your token economy should be communicated and educated clearly, consistently, and honestly, and it should build trust and loyalty among your network community. There are different channels and tools to communicate and educate your token economy, such as whitepapers, websites, blogs, social media, podcasts, webinars, and events. Each channel and tool has its own reach and effectiveness, and it should suit your audience and message. For example, if you want to explain the technical details and logic of your token design, you might opt for a whitepaper. If you want to showcase the use cases and benefits of your token, you might opt for a podcast.

Key Concepts in Token Economy

- **Tokens**: Tokens can be in various forms, such as physical coins, points, or digital representations. They hold value within the token economy system and can be earned, accumulated, and exchanged for rewards.
- **Reinforcement**: Tokens serve as a form of positive reinforcement, strengthening the desired behaviors. By earning tokens for exhibiting desired behaviors, individuals are motivated to continue engaging in those behaviors.
- **Rewards**: Rewards are the incentives individuals can obtain by exchanging their accumulated tokens. These rewards can be predetermined items, privileges, or experiences that hold value and serve as additional reinforcement for the desired behaviors.
- **Contingency**: Token economies operate on a contingency-based system, meaning that tokens are only given when desired behaviors are displayed. This reinforces the connection between the behavior and the reward, increasing the likelihood of continued positive behavior.
- **Monitoring and Evaluation**: The implementation of a token economy requires monitoring and evaluation to ensure effectiveness. This involves tracking behaviors, token earnings, and the delivery of rewards to assess progress and make necessary adjustments.

Advantages

- One of the main benefits of a token economy is that it can provide a more efficient means of exchange within a particular ecosystem. It can also provide incentives for participants to contribute to the ecosystem and can help to align the interests of participants. Additionally, a token economy can provide transparency and security in the exchange process, as all transactions are recorded on a blockchain.

Challenges

- One of the main challenges of a token economy is determining the value of the tokens. The value of the tokens is determined by the market, which can be influenced by various factors such as supply and demand, competition, and regulatory changes. Another challenge is ensuring that the tokens are widely accepted within the ecosystem, which can require significant marketing and outreach efforts.
- Token economies and blockchain technology are still in the early stages of development, and there are several challenges that need to be addressed. First, there is a lack of standardization and regulation in the token economy space, which can lead to confusion and uncertainty for businesses and consumers. Second, there are scalability issues with blockchain technology, which can limit its adoption for large-scale applications. Third, there are concerns around privacy and security, as blockchain technology is not immune to attacks and hacks.

Benefits of Token Economy

- **1. Increased Motivation and Engagement**: One of the primary benefits of a token economy is that it can increase motivation and engagement. By offering tokens as a reward for completing a task or achieving a goal, individuals are more likely to put in the effort required to attain the reward.
- **2. Improved Learning Outcomes**: Token economies can also lead to improved learning outcomes. When tokens are used to reward positive behavior, individuals are more likely to repeat that behavior in the future.
- **3. enhanced Collaboration and teamwork**: Token economies can also enhance collaboration and teamwork. By offering tokens for working together and achieving a common goal, individuals are more likely to work together and support each other. This can be particularly effective in the workplace, where teams are often required to work together to achieve a common objective. By incentivizing collaboration, individuals are more likely to work together and achieve success.
- **4. Improved Patient Outcomes**: Token economies can also be used in healthcare to improve patient outcomes. For example, a hospital may offer tokens to patients who comply with their treatment plan or attend appointments. This can lead to improved patient outcomes and reduce the likelihood of readmissions.
- **5. Increased Customer Loyalty:** Token economies can also be used in business to increase customer loyalty. By offering tokens as a reward for purchasing products or services, customers are more likely to return and make additional purchases.

Challenges

1. Regulatory Challenges

One of the biggest challenges of token economy is the lack of regulatory clarity. As tokens are not yet fully recognized by regulatory authorities, it can be difficult for companies to navigate the legal landscape. This can lead to legal disputes, fines, and reputational damage. To mitigate this risk, companies should seek legal advice and comply with existing regulations where possible.

2. Security Risks

Another challenge of token economy is the security risks associated with it. As tokens are stored on digital wallets, they are vulnerable to hacking and cyber attacks. This can result in the loss of tokens and sensitive data. To mitigate this risk, companies should invest in robust security measures such as multi-factor authentication, encryption, and regular security audits.

3. Volatility

Tokens are subject to market volatility, which can lead to price fluctuations and uncertainty. This can make it difficult for companies to price their products and services and can also affect the value of their tokens. To mitigate this risk, companies can consider using stablecoins or pegged tokens that are backed by fiat currencies or other assets.

4. Adoption

Token economy relies on widespread adoption to be successful. However, adoption can be slow due to lack of awareness, trust, and infrastructure. To mitigate this risk, companies should focus on building trust with their users, educating them about the benefits of token economy, and investing in infrastructure such as wallets, exchanges, and payment gateways.

5. Interoperability

Tokens from different platforms and ecosystems may not be compatible with each other, which can limit their utility and adoption. To mitigate this risk, companies can work on developing interoperable standards and protocols that allow tokens to be transferred and used across different platforms.