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Smart Contracts

Introduction

Smart contracts are programs stored on a blockchain that run when predetermined conditions are met. They are typically used to trigger and automate the execution of an agreement when the relevant conditions are fulfilled. It ensures that all participants can be immediately certain of the outcome. It cuts out any intermediary's involvement or time loss.

A smart contract helps to simplify business and trade between both anonymous and known parties, without the need for a middleman. A smart contract reduces formality and costs associated with traditional methods, without compromising on authenticity and credibility.

A smart contract enables the “transfer” of digital assets and the ability to “read” the account content of token holders. It is possible to create escrow agreements or futures, which are based on the fulfilment of certain conditions, to be released on a given date or event.

They allow people from around the globe to transact with one another without needing an intermediary. Since there is no third party involved, there is no risk of manipulation. Smart contracts can reduce administration, saving time. They offer complete autonomy, and since everything is backed up on to the blockchain, smart contracts are completely safe against loss of data. However smart contracts are irreversible. If the code has bugs, then it could lead to unwanted transactions and there is currently no way to undo them.

The techniques and Costs

Smart contracts exist on the blockchain and they have a state, like RAM in a computer does. This state is shared across the entire network. Each node running this blockchain has a copy of the state of the smart contract that cannot be altered. There are ways to extend them or replace parts — if such action has been foreseen by the developers. It is not possible to covertly manipulate their content without drawing the attention of the network.

A simple smart contract with no complex business logic costs around $7,000. [1]More advanced contracts cost up to $45,000 and more. The smart contracts are written in C# and come with a web-based front end.

Dfinity Foundation and Canisters

The Dfinity foundation aims to build The Internet Computer that would reinvent the Internet as a computer that hosts secure software with superpowers. It involves Canisters that are computational units that include both program and state. A software canister is like a container in that both are deployed as a software unit that contains compiled code and dependencies for an application or service. A canister works like a smart contract because its execution is governed by a secure protocol: The Internet Computer Protocol (ICP). A canister is tamperproof and its state can only be modified through messages included in the blockchain. This is in turn governed by the protocol.

Smart contracts with its programmable logic are enabling blockchain technology across a range of use cases in different industry sectors. Since the execution of canister[2] code is fully identifiable and trackable, a canister’s state can be audited in a cryptographically secure way by inspecting the messages in the blockchain. A canister has all the capabilities of a traditional smart contract. In contrast to smart contracts,

canisters have performance characteristics that makes it possible to use them to build software services that scale. This is an alternate concept we need to keep in mind in the context of smart contracts.

Smart contracts[3] Market

The global Smart Contracts market size is expected to grow at 32% CAGR during the period from 2017 – 2023. The growth would be driven by the increasing adoption of various applications in industries such as supply chain, banking, government, insurance, and real estate. Even government bodies across the world are expected to implement smart contracts that require less human involvement and dramatically reduce the cost of contract handling.

Ethereum is the most advanced technology used for coding and processing smart contracts. Thus, it is expected to hold the largest Smart Contracts market share in this period when compared to Bitcoin, Sidechains and NXT.

Based on technology, the smart contracts market segments are identified as Rootstock (RSK), Ethereum, Ripple, Namecoin, and others.

Smart Contracts and DeFi (Decentralized finance)

DeFi is short for "decentralized finance," and is an umbrella term for different financial applications in cryptocurrency or blockchain geared toward disrupting financial intermediaries. DeFi builds upon blockchain that allows several entities to hold a copy of a history of transactions. DeFi does not rely on central financial intermediaries such as brokerages, exchanges, or banks to offer traditional financial instruments, and instead utilizes smart contracts on blockchains.

Most DeFi applications are built on top of Ethereum, the world's second-largest cryptocurrency platform. Ethereum makes it easier to use and build other types of decentralized applications beyond simple transactions. Ethereum programming languages, such as Solidity, are specifically designed for creating and deploying smart contracts. Using smart contracts dozens of DeFi applications are operating on Ethereum. The total value locked in DeFi contracts is over US$41 billion, as of March 2021.

One area[4] in which in which these decentralized applications (dApps) have made an impact is cryptocurrency trading on decentralized exchanges (dexs) such as Uniswap. DeFi services are used for:

- Borrowing and lending cryptocurrencies to earn interest on platforms such as Compound or Aave.
- Betting on the outcome of events (Augur).
- Creating and exchanging derivatives of real-world assets such as currencies or precious metals-Synthetix.
- Operating a no-loss lottery (PoolTogether), where everyone gets their money back and one lucky participant wins all the accumulated collective interest.
- Buying cryptocurrencies known as stablecoins, which are mapped to the value of a particular currency or commodity such as the DAI and USDT that follow the US dollar.

Smart Contracts for SMEs

Smart contracts find higher level use in banking, supply chain, real estate, government, management, insurance, automobile, and healthcare. They also find use in Supply Chain Management, Financial Data Recording and Clinical Trials.

Small businesses particularly can benefit from smart contracts because they save business owners time, money, and effort while eliminating the need for an intermediary to oversee and enforce agreements, besides earning consumer trust. Smart contracts further eliminate the need for cumbersome manual record keeping, because the agreement is maintained on the blockchain forever without any danger of loss or unintentional alteration.

Some of the other features and possibilities for Smart Contracts are:

- Smart contracts are transparent and immutable, making them perfect for transactions involving digitized or non-digitized assets as well as tangible and intangible goods. They can even be used for service-based contracts — for example, upon the performance of an event, the smart contract could release to the performer a private key or password allowing them to access digitized assets. The technology could also be applied to businesses and agreements related to sharing such as car sharing, apartment/house sharing, and even city-bike sharing.
- The use of blockchain can ensure safe and secure data transactions while smart contracts can optimize supply chains and improve client satisfaction by automating services. SMEs that are looking for trade finance and business opportunities abroad can use smart contracts. The consensus mechanisms in smart contracts save the time, cost and effort in multiple instances of verification and checking.
- The automatic execution and enforcement on pre-agreed terms and conditions eliminates middlemen and labor intensive and expensive business processes.
- The largest opportunity for smart contracts is in enabling single digital records for customs clearance. Smart contracts can represent an invoice, or any similar financial document, and be used as collateral to support a loan. They would help mitigate credit risk, lower fees, and remove barriers to trade.
- The risk of security, transparency, identity theft and fraud could be eliminated with the use of a decentralized identity in smart contracts.
- Smart contracts improve the cash flow as they allow for the automatic and instant payment of invoices once a given transaction has been processed. Improved cash flows and reduced costs are crucial for business competitiveness and this way smart contracts have the potential to bring new business to small business.
- While shipping products to customers, logistics and shipping involves much stress and paperwork. SME find it very hard to monitor the current location of shipments and goods in real-time in most cases, and delays in shipments results in extra costs. With blockchain and smart contracts SME can avoid the typical pitfalls they face in supply chain, logistics and shipping.

Use Cases for different SME[5]

These are some of the specific use cases of smart contracts in the SME space and there are more possibilities being added.

- Smart contracts can improve insurance processes by automating claims when certain events occur. For example: AXA has launched an insurance product Fizzy that uses smart contract technology to deal with flight delay insurance claims. The smart contract is connected to global air traffic databases so that when a delay of over two hours occurs, payment is automatically triggered.

- Smart contracts can ensure the royalties to the desired contributor by recording the ownership and other aspects of digital copyright assets such as digital ID or fingerprint on the blockchain.

- Smart contracts can speed up the process of property ownership. Property ownership change contracts can be programmed and can be executed automatically. For example, once the buyer makes the payment to the seller, the smart contract can automatically change ownership of the asset based on the payment information on the blockchain. For instance, Prophy enabled the world's first property transaction using smart contracts in 2017. Their first transaction was a $60,000 apartment in Ukraine.

- A consultancy firm, event management company or even childcare, can keep everyone on the line clear on what, when and how the promised services will be delivered using Smart Contract services. It can also help as how much and when it will be paid for. A segmentation of the project into separate units can help create a Smart Contract that identifies when the defined terms of the unit meet: to automatically trigger payment. This will help in improving customer experience/satisfaction and cash flow.

- In a real estate business, smart contracts can prove to be a better alternative for improved transaction processes. The complete transaction, from escrow to completion, can be managed without requiring the parties to be present at different steps. Each step of the buying/selling process can be efficiently managed that includes title clearance and registration and closing costs. Once the buyer pays the purchasing prices, either through a mortgage company or in full, he receives the deed.

  Smart contracts also have increased the rise of mortgage companies incorporating Smart Contracts Applications to manage the financing.

- With employment contracts, employees will be aware of what they may get demanded and what compensation they are likely to receive. This increased level of transparency will help keep the employer and staff on the same page. Also, wages can be executed using the contract itself, such as with requirements that certain hours need to be completed in the system before pre-defined funds can get released into an employee's account. The contract can be modified to indicate promotions and alterations in responsibilities. All this can be tracked to monitor an employee's performance and professional growth.

- Smart contracts in supply chain management can enable the SME to communicate and coordinate with suppliers more effectively. When each step is automatic, including payment, and the supplier

uses smart contracts with other suppliers, the entire system becomes smooth and efficient thus, saving time and money for everyone.

[1] https://medium.com/@iolite/problems-costs-of-smart-contract-development-649d88eedd1f
[2] https://medium.com/dfinity/software-canisters-an-evolution-of-smart-contracts-internet-computer-f1f92f1bfffb
[3] https://www.marketresearchfuture.com/reports/smart-contracts-market-4588
[4] https://theconversation.com/what-is-defi-and-why-is-it-the-hottest-ticket-in-cryptocurrencies-144883
[5] https://research.aimultiple.com/smart-contracts/#industry-specific-use-cases