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Literature Review

AGRICROWD

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Content

Özet

AGRICROWD, son dönemde büyük bir ilgi odağı haline gelmiş olan blockchain teknolojisi ile kitlesel fonlama konularını mercek altına almaktadır. Blockchain'ın merkezi olmayan, şeffaf ve güvenli yapısı, kitlesel fonlama alanında büyük bir devrim potansiyeli taşımaktadır. Bu literatür taraması, AGRICROWD platformunu oluşturan bu iki önemli bileşen arasındaki kesişimi keşfetmeyi amaçlamakta, temel eğilimleri, karşılaşılan zorlukları ve sunulan fırsatları derinlemesine incelemektedir. Aynı zamanda, geleneksel kitlesel fonlama çalışmalarının da bu incelemenin kapsamında olduğu unutulmamalıdır. İncelemenin amacı, mevcut araştırmaların eksikliklerini ve fırsatlarını anlamak ve gelecekteki çalışmalara yön verecek öneriler sunmaktır. Blockchain'in kitlesel fonlama verimliliği, yatırımcı koruması ve sınır ötesi işlemler üzerindeki etkisine yoğunlaşmaktadır. Ayrıca, farklı yargı alanlarındaki düzenleyici çerçeveleri ve hukuki konuları araştırarak, bu alandaki mevcut durumu ele almaktadır. Bu kapsamlı derleme, etkili kitlesel fonlama girişimlerinin analizini sunmanın yanı sıra, bu alandaki ilgili araştırmaların ve makalelerin kaynaklarını da sağlamaktadır. Bu inceleme, blockchain tabanlı kitlesel fonlama ve geleneksel kitlesel fonlama alanlarında daha fazla araştırma ve geliştirme için güçlü bir temel sunmaktadır.

Abstract

AGRICROWD examines the intersection of blockchain technology and crowdfunding, which has recently garnered significant attention. The decentralized, transparent, and secure nature of blockchain holds immense potential to revolutionize the crowdfunding landscape. This literature review aims to delve into the synergy between these two pivotal components that constitute the AGRICROWD platform, while thoroughly exploring the fundamental trends, challenges, and opportunities. Additionally, it should be noted that traditional crowdfunding studies are also encompassed within this review. The primary goal of this review is to comprehend the shortcomings and opportunities within existing research, offering recommendations that will guide future studies. The review focuses on the efficiency of blockchain in crowdfunding, investor protection, and its impact on cross-border transactions. It also delves into the examination of regulatory frameworks and legal issues within various jurisdictions. This comprehensive compilation not only presents an analysis of effective crowdfunding initiatives but also provides references to pertinent research and articles within this domain. By doing so, this review establishes a robust foundation for further research and development in both blockchain-based crowdfunding and traditional crowdfunding arenas.

1. Introduction

There are many different forms of crowdfunding, but the main goal is to raise enough money to produce or provide services. The basis of crowdfunding is mutual trust between investors and stakeholders, but the traditional method of crowdfunding involves a certain level of risk as users have no control over the money they invest.

The adoption of blockchain technology in the crowd- funding system will aid in the prevention of fraud, and the improvement of the present crowdfunding systems' transparency and security.[1]

Agriculture is one of the world's most essential industries, and food production is critically important for everyone. However, traditional financing models are inadequate to support this sector. Financing of agricultural projects; It is one of the major challenges faced by farmers, food producers and agricultural entrepreneurs. At this point, AGRICROWD's aim is to create a bridge to finance innovations that shape the future of agriculture. This intersection between agritech and crowdfunding will benefit both farmers and investors. In this context, AGRICROWD has the potential to offer a new perspective on the financing of agricultural projects.

AGRICROWD represents the technological transformation of finance – by combining crowdfunding with blockchain – and could be an indication of the agriculture sector working more closely with technology.

2. Crowdfunding

"Crowdfunding is when a project or company is funded by the "crowd" as opposed to one or two significant investors. You must grab the support of a significant number of backers and persuade them that your project is deserving of their money in order to run a successful crowdfunding campaign."[2]

We can examine crowdfunding applications under four main headings:

2.1. Donation-based crowdfunding

"This model is commonly used by nonprofits, social entrepreneurs, and startups where the "return on investment" is not financial, but a social good or some form of

community benefit. Backers donate money to the project because they believe in the cause, not because they're expecting a financial return. GoFundMe is a well-known platform for donation-based crowdfunding."[3]

2.1.1. Pros of donation-based crowdfunding

- *No repayment or equity exchange*: Backers donate the money to your project or cause, so you don't have to worry about repaying a loan or giving up a share of your business.
- *Support for social causes:* Donation-based crowdfunding is particularly effective for projects or causes that have a social, charitable, or community focus. People are often willing to donate money to support causes they care about.
- *Community engagement*: This form of crowdfunding can be a good way to build a community of supporters who are emotionally invested in your project or cause.

2.1.2. Cons of donation-based crowdfunding

- *Limited appeal*: Donation-based campaigns often rely on the emotional appeal of the project or cause, which might limit their appeal to a wider audience. These campaigns may be less successful for commercial projects.
- *Lack of guaranteed funding*: As with other forms of crowdfunding, there's no guarantee you'll reach your funding goal. And on some platforms, if you don't reach your goal, you won't receive any funds.
- *Public exposure*: As with other forms of crowdfunding, your idea is public, which could lead to someone else replicating it.
- *Platform fees*: While the money you raise doesn't have to be paid back, most platforms charge a fee based on the amount of money you raise.

2.2. Reward-based crowdfunding

"With reward-based crowdfunding, backers contribute funds to your startup in exchange for a "reward," usually a product or service your company offers. This model is typically used by startups that are launching a new product or service and need funding for development or production. Examples of reward-based crowdfunding platforms include Kickstarter and Indiegogo."[3]

Reward-based crowdfunding is a popular method for raising funds, especially for creative projects or new product launches. Below are some of the key pros and cons.

2.2.1. Pros of reward-based crowdfunding

- *No equity sacrificed*: Unlike equity-based crowdfunding, reward-based crowdfunding doesn't involve giving up ownership in your company.
- *Market validation*: Reward-based crowdfunding allows you to assess market interest in your product or service. If your campaign succeeds, it's a good sign that there's a market for what you're selling.
- *Pre-sales and marketing*: Crowdfunding campaigns can also act as a pre-sale of the product, generating publicity and providing an initial customer base.

- *Community building*: Crowdfunding platforms provide a way to communicate and engage with backers. This can help build a community of supporters who might help spread the word about your product or service.

2.2.2. Cons of reward-based crowdfunding

- *All-or-nothing funding*: Many crowdfunding platforms operate on an all-or-nothing basis, which means if you don't hit your funding goal, you don't receive any money. This isn't always true, but it's not uncommon.
- *Fulfilling rewards*: It's important to deliver on promised rewards, which could be more time-consuming or costly than anticipated. Not fulfilling rewards can lead to reputation damage or even give supporters grounds to ask for their funds back.
- *Unpredictable success*: Not all campaigns succeed, even if your idea is good. Success can depend on many factors, including the quality of the campaign, timing, and sheer luck. A startup might invest considerable time launching a campaign only to have it fall flat. Additionally, an unsuccessful campaign might erroneously give founders the impression that their business idea isn't viable or that there isn't strong market demand.
- *Public exposure*: Your idea is shared publicly, which could lead to someone else copying it. You need to balance the need for publicity with the risk of revealing too much.

- *Fees*: Crowdfunding platforms typically charge a percentage of the funds raised as a fee, and there could be additional processing fees.

2.3. Equity-based crowdfunding

"With equity-based crowdfunding, backers receive shares of your company in return for their investment. This form of crowdfunding is used most often by startups with high growth potential, as it allows them to raise larger amounts of money in exchange for a stake in their company's future profits. SeedInvest and CircleUp are popular platforms for equity-based crowdfunding."[3]

2.3.1. Pros of equity-based crowdfunding

- *Larger amounts of capital*: Since investors are purchasing a stake in the future success of the company, they may be willing to contribute larger amounts than in reward-based crowdfunding. This can allow startups to raise significant funds.
- *Long-term investor relationships*: Unlike reward-based crowdfunding, where the relationship typically ends once the reward is delivered, equity crowdfunding can result in long-term relationships with investors who have a vested interest in the ongoing success of the company.
- *Access to expertise and networks*: Investors often bring their own expertise, experience, and networks, which can be valuable resources for early-stage companies.

2.3.2. Cons of equity-based crowdfunding

- *Loss of ownership*: By offering equity in your company, you are giving away a portion of your ownership, which might mean sharing control and decision-making.
- *Regulatory complexity*: Equity-based crowdfunding is subject to more complex laws and regulations than other forms of crowdfunding. This may require legal counsel and can result in substantial legal costs.
- *Increased reporting requirements*: Companies with many shareholders often have to provide regular updates and financial reports to their investors. This can be time-consuming and require additional administrative resources.
- *Pressure for returns*: Unlike reward-based crowdfunding, where backers are happy to receive the product or service, equity investors seek a financial return on their

investment. This can increase the pressure on the company to perform and provide returns.

- *Potential for dilution*: If you raise more equity funding in the future, the percentage of the company owned by earlier investors (including crowdfunding investors) may be diluted. This can lead to dissatisfaction among investors if not handled correctly.

2.4. Debt-based crowdfunding

"Also known as "peer-to-peer lending" or "P2P lending," debt-based crowdfunding is similar to a traditional loan. Instead of getting a loan from a bank, you're getting a loan from a crowd of investors. The startup agrees to pay back the loan with interest over a specified period of time. LendingClub and Prosper are well-known platforms for debt-based crowdfunding."[3]

2.4.1. Pros of debt-based crowdfunding

- *Retention of ownership*: Unlike equity crowdfunding, with debt-based crowdfunding you don't have to give up any ownership stake in your company. Once the loan is repaid, your obligation to your investors ends.
- *Faster process*: The process for securing a loan through debt-based crowdfunding can be faster than through traditional banks. The qualification requirements may also be less strict.
- *Fixed repayment schedule*: You'll have a fixed repayment schedule, which can be easier to plan for than the unpredictable nature of equity investments.
- *Potentially lower costs*: Depending on the interest rate you secure and the length of your loan, debt-based crowdfunding can sometimes be a cheaper form of finance than equity-based crowdfunding or other types of loans.

2.4.2. Cons of debt-based crowdfunding

- *Obligation to repay*: Unlike other forms of crowdfunding, the money you raise through debt-based crowdfunding must be paid back with interest. This is a fixed expense you'll need to plan for, regardless of how well your business is doing.
- *Interest costs*: The cost of the loan includes not just the principal amount you borrow, but also the interest you'll pay over the life of the loan.

- *Risk to credit score*: If you're unable to make your loan repayments, your credit score may be affected, which can impact your ability to secure financing in the future.
- *Secured loans risk*: Some debt-based crowdfunding might require collateral or a personal guarantee. If the loan isn't repaid, you risk losing the assets you've pledged as collateral.

Comparison of popular crowdfunding applications is as follows

Applications → / Features ↓	Agricrowd	Kickstarter	Indiegogo	Patreon	GoFundMe	Ideanest	Arıkovanı
Mutual Financing Reward-Based Crowdfunding	✓	✓	✓	×	×	✓	✓
Locality	✓	×	×	×	×	✓	✓
Ongoing Support	✓	✓	×	✓	✓	×	×
Support Duration Limitatitons	×	×	✓	×	✓	✓	✓
Donation For Personal Purposes and Charties	✓	✓	✓	✓	✓	✓	✓
Project Type Restriction	✓	×	×	×	×	×	×
Fund Approval Tracking	✓	✓	×	×	×	✓	×
Partial Fund Payment	✓	×	×	✓	×	×	×
Vote System	✓	✓	✓	×	×	×	×
Fund Tracking	✓	✓	✓	✓	✓	✓	✓
Need to Achieve Fund Goal	×	✓	×	×	×	✓	×
Debt Based	✓	×	×	×	×	✓	×
Project Filtering System	✓	✓	✓	✓	✓	✓	×

Figure 1 Comparison of popular crowdfunding applications

2.5. Limitations of Crowdfunding

One of the major issues in traditional crowdfunding platforms has been fraud cases, with some claiming that online crowdfunding exposes contributors to fraud because traditional legal and reputation security measures may not work.

- Most of the time, no user verification is required to post a project, and once posted, there are few legal obligations to deliver on the project's promises.[1]
- The platform potentially shutting down without notice, money being held with the platform, rewards at mile- stones being delayed, campaign initiators ceasing communication, the promised product never being delivered, and backers not being fully refunded.[4]
- The conventional method used by crowdfunding websites has a major drawback where contributors do not have any control over the money they have contributed, which often results in frauds and scams.[5]

- Other issues include accountability of funds and copyright issues. Project data privacy is often compromised. Using web scrapers, project ideas from crowdfunding platforms which have not yet collected funds are stolen and implemented by wealthier individuals and institutions.[1]

3. Blockchain

The technology known as the blockchain was first revealed by Satoshi Nakamoto in his paper “Bitcoin: A Peer-to-Peer Electronic Cash System” (https:// bitcoin.org/bitcoin.pdf), which laid out the mathematical foundation for the bitcoin cryptocurrency. Although this was a groundbreaking paper, it was never actually submitted to a traditional peer-reviewed journal, and the author’s true identity is unknown. Blockchain technology is not only at the foundation of all crytocurrencies, but it has found wide application in the more traditional financial industry. It also opened the door to new applications such as smart contracts.[6]

With the invention of bitcoin in 2008 the world was introduced to a new concept that is now likely to revolutionize the whole of society. It's something that has promised to impact every industry including but not limited to finance, government, and media. Some describe it as a revolution whereas another school of thought says that it's going to be an evolution and it will take many years before any practical benefits from blockchain come to fruition. Since we agree that this technology is going to be revolutionary, we also think that the effects of blockchain technology have already begun. Many big companies started to use this technology.

3.1. Advantages of Blockchain Technology

The problem that Nakamoto solved with the blockchain was that of establishing trust in a distributed system. More specifically, the problem of creating a distributed storage of timestamped documents where no party can tamper with the content of the data or the timestamps without detection.

Hence bitcoin and other cryptocurrencies provide a distributed ledger in which every computer involved in the transaction of a specific coin (or fraction of a coin) keeps a copy of the history of that coin’s transactions. The blockchain technology makes sure that no party storing this history can tamper with it without being detected.[6]

3.1.1. Higher Accuracy of Transactions

Because a blockchain transaction must be verified by multiple nodes, this can reduce error. If one node has a mistake in the database, the others would see it's different and catch the error. [8]

3.1.2. No Need for Intermediaries

Using blockchain, two parties in a transaction can confirm and complete something without working through a third party. This saves time as well as the cost of paying for an intermediary like a bank.[8]

3.1.3. Extra Security

Theoretically, a decentralized network, like blockchain, makes it nearly impossible for someone to make fraudulent transactions. To enter in forged transactions, they would need to hack every node and change every ledger. While this isn't necessarily impossible, many cryptocurrency blockchain systems use proof-of-stake or proof-of-work transaction verification methods that make it difficult, as well as not in participants' best interests, to add fraudulent transactions.[8]

3.1.4. More Efficient Transfers

Since blockchains operate 24/7, people can make more efficient financial and asset transfers, especially internationally. They don't need to wait days for a bank or a government agency to manually confirm everything.[8]

3.2. Disadvantages of Blockchain Technology

3.2.1. Limit on Transactions per Second

Given that blockchain depends on a larger network to approve transactions, there's a limit to how quickly it can move. For example, Bitcoin can only process 4.6 transactions per second versus 1,700 per second with Visa. In addition, increasing numbers of transactions can create network speed issues. Until this improves, scalability is a challenge.[8]

3.2.2. High Energy Costs

Having all the nodes working to verify transactions takes significantly more electricity than a single database or spreadsheet. Not only does this make blockchain-based transactions more expensive, but it also creates a large carbon burden on the environment.[8]

3.2.3. Risk of Asset Loss

Some digital assets are secured using a cryptographic key, like cryptocurrency in a blockchain wallet. You need to carefully guard this key. Because the system is decentralized, you can't call a central authority, like your bank, to ask to regain access.[8]

3.2.4. Potential for Illegal Activity

Blockchain's decentralization adds more privacy and confidentiality, which unfortunately makes it appealing to criminals. It's harder to track illicit transactions on blockchain than through bank transactions that are tied to a name. [8]

3.3. Distributed Systems

Understanding distributed systems is essential in order to understand blockchain because basically blockchain at its core is a distributed system. More precisely it is a decentralized distributed system.

Distributed systems are a computing paradigm whereby two or more nodes work with each other in a coordinated fashion in order to achieve a common outcome and it's modeled in such a way that end users see it as a single logical platform.

A node can be defined as an individual player in a distributed system. All nodes are capable of sending and receiving messages to and from each other. Nodes can be honest, faulty, or malicious and have their own memory and processor. A node that can exhibit arbitrary behavior is also known as a Byzantine node. This arbitrary behavior can be intentionally malicious, which is detrimental to the operation of the network. Generally, anyunexpected behavior of a node on the network can be categorized as Byzantine. This term arbitrarily encompasses any behavior that is unexpected or malicious. [7]

3.3.1. CAP Theroem

Distributed systems are so challenging to design that a theorem known as the CAP theorem has been proved and states that a distributed system cannot have all much desired properties simultaneously. That means it is not possible to guarantee all three of the desirable properties – **consistency, availability, and partition tolerance** at the same time in a distributed system.

- **Consistency** is a property that ensures that all nodes in a distributed system have a single latest copy of data.
- **Availability** means that the system is up, accessible for use, and is accepting incoming requests and responding with data without any failures as and when required.
- **Partition tolerance** ensures that if a group of nodes fails the distributed system still continues to operate correctly.

Since a distributed system cannot have all three properties at the same time, blockchain manages to achieve all three of these properties. But how?

In order to achieve fault tolerance, replication is used. This is a common and widely used method to achieve fault tolerance. Consistency is achieved using consensus algorithms to ensure that all nodes have the same copy of data. This is also called state machine replication. Blockchain is basically a method to achieve state machine replication. [7]

3.3.2. Consensus

Consensus is a process of agreement between distrusting nodes on a final state of data. In order to achieve consensus different algorithms can be used. It is easy to reach an agreement between two nodes (for example in client-server systems) but when multiple nodes are participating in a distributed system and they need to agree on a single value it becomes very difficult to achieve consensus. This concept of achieving consensus between multiple nodes is known as distributed consensus.

There are various requirements which must be met in order to provide the desired results in a consensus mechanism. The following are their requirement with brief descriptions:[7]

- **Agreement:** AII honest nodes decide on the same value.
- **Termination:** AII honest nodes terminate execution of the consensus process and eventually reach a decision.
- **Validity:** The value agreed upon by all honest nodes must be the same as the initial value proposed by at least one honest node.
- **Fault Tolerant:** The consensus algorithm should be able to run in the presence of faulty or malicious nodes.
- **Integrity:** This is a requirement where by no node makes the decision more than once. The nodes make decision only once in a single consensus cycle.

3.3.2.1. Proof of Work

This type of consensus mechanism relies on proof that enough computational resources have been spent before proposing a value for acceptance by the network.

3.3.2.2. Proof of Stake

This algorithm works on the idea that a node or user has enough stake in the system; for example the user has invested enough in the system so that any malicious attempt would outweigh the benefits of performing an attack on the system. This idea was first introduced by Peercoin and is going to be used in the Ethereum blockchain. Another important concept in Proof of Stake (POS) is coin age, which is a derived from the amount of time and the number of coins that have not been spent. In this model, the chances of proposing and signing the next block increase with the coin age.

3.3.2.3. Delegated Proof of Stake

Delegated Proof of Stake (DPOS) is an innovation over standard POS whereby each node that has stake in the system can delegate the validation of a transaction to other nodes by voting. This is used in the bitshares blockchain.

3.4. Various Technical Definitions of Blockchain

Blockchain is a data structure; it is basically a linked list that uses hash pointers instead of normal pointers. Hash pointers are used to point to the previous block. The Structure of a generic blockchain can be visualized with the help of the following diagram:

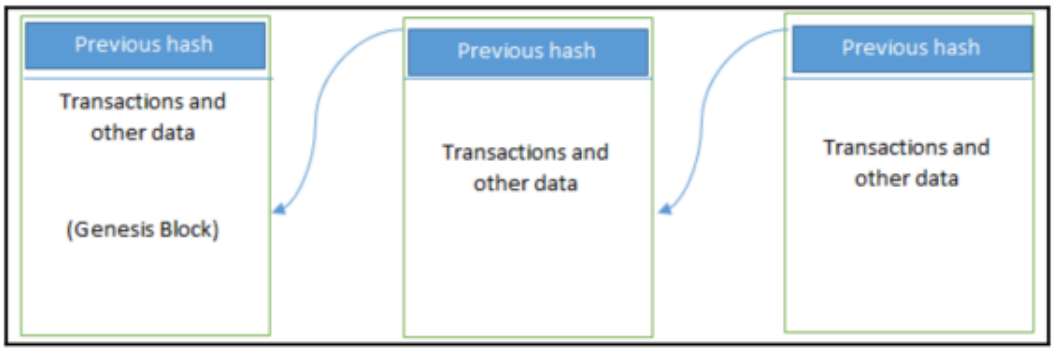

Figure 2Generic structure of a blockchain

Adresses: Addresses are unique identifiers that are used in a transaction on the blockchain to denote senders and recipients. An address is usually a public key or derived from a public key. While addresses can be reused by the same user, addresses themselves are unique. In practice, however, a single user may not use the same address again and generate a new one for each transaction. This newly generated address will be unique.

Transaction: A transaction is the fundamental unit of a blockchain. A transaction represents a transfer of value from one address to another.

Block: A block is composed of multiple transactions and some other elements such as the previous block hash (hash pointer), timestamp, and nonce.

Nonce: Nonce means “number once” in the world of cryptocurrency, and it refers to an arbitrary number that is only used one time in a cryptographic communication. This randomly generated number is designed to keep communications private and protect against replay attacks.

Peer to Peer Network: As the name implies, this is a network topology whereby all peers can communicate with each other and send and receive messages.

Virtual Machine: This is an extension of a transaction script. A virtual machine allows Turing complete code to be run on a blockchain (as smart contracts) whereas a transaction script can be limited in its operation. Virtual machines are not available on all blockchains; however, various blockchains use virtual machines to run programs, for example Ethereum Virtual Machine (EVM) and Chain Virtual Machine (CVM).

Nodes: A node in a blockchain network performs various functions depending on the role it takes. A node can propose and validate transactions and perform mining to facilitate consensus and secure the blockchain. This is done by following a consensus protocol. (Most commonly this is POW.) Nodes can also perform other functions such as simple payment verification (lightweight nodes), validators, and many others functions depending on the type of the blockchain used and the role assigned to the node.

Smart Contracts: These programs run on top of the blockchain and encapsulate the business logic to be executed when certain conditions are met. The smart contract feature is not available in all blockchains but is now becoming a very desirable feature due to the flexibility and power it provides to the blockchain applications.

3.5. Types of Blockchain

3.5.1. Public Blockchains

A public blockchain is one where anyone is free to join and participate in the core activities of the blockchain network. Anyone can read, write, and audit the ongoing activities on a public blockchain network, which helps achieve the self-governed, decentralized nature often touted when blockchain is discussed. [10]

3.5.2. Private Blockchains

Participants can join a private blockchain network only through an invitation where their identity or other required information is authentic and verified. The validation is done by the network operator(s) or by a clearly defined set protocol implemented by the network through smart contracts or other automated approval methods. [10]

3.5.3. Semi-Private Blockchains

Here part of the blockchain is private and part of it is public. The private part is controlled by a group of individuals whereas the public part is open for participation by anyone. [7]

3.5.4. Tokenized Blockchains

These blockchains are standard blockchains that generate cryptocurrency as a result of a consensus process via mining or via initial distribution. [7]

3.6. Blockchain and Smart Contracts

The rise of the blockchain technology in recent years also supports other concepts that have been suggested in literature. Szabo introduced the concept of ‘‘Smart Contracts’’, which combine computer protocols with user interfaces to execute the terms of a contract. Due to the blockchain, Smart Contracts are becoming more popular since they can be utilized more easily by applying blockchains in comparison to the technology available at the time of their invention 20 years ago. This innovative approach might, for example, replace lawyers and banks that have been involved in contracts for asset deals depending on predefined aspects.[9]

Smart Contracts can also be used to control the ownership of properties. These properties might be tangible (e.g., houses, automobiles) or intangible (e.g., shares, access rights). A prominent example for blockchain technology that treats smart contracts as first class citizens is Ethereum, which is a decentralized system originally proposed by Buterin. [9]

The financial industry is even wondering if large parts of their current business might be replaced by the blockchain. This can be illustrated by the payment process. If people pay goods by credit card today, the settlement occurs after a delay of several days. Utilizing the blockchain, this delayed settlement would become redundant since payment can be done in real time by adjusting the ledger.

3.7. Applications of Blockchain and Future Trends

3.7.1. Financial applications

- **Crypto-currencies:** Networks and mediums of exchange using cryptography to secure transactions.
  - Bitcoin
  - Litecoin
  - Ripple
  - Monero

- **Securities issuance, trading and settlement:** Companies going public issue shares directly and without a bank syndicate. Private, less liquid shares can be traded in a blockchain-based secondary market. First projects try to tackle securities settlement.
  - NASDAQ private equity
  - Medici
  - Blockstream
  - Coinsetter

- **Insurance:** Properties (e.g., real estate, automobiles, etc.) might be registered using the blockchain technology. Insurers can check the transaction history.
  - Everledger

3.7.2. Nonfinancial applications

- **Music industry:** Determining music royalties and managing music rights ownership.
  - Imogen heap
- **Decentralized proof of existence of documents:** Storing and validating the signature and timestamp of a document using blockchain.
  - www.proofofexistence.com

- **Decentralized storage:** Sharing documents without the need of a third party by using a peer-topeer distributed cloud storage platform.
  - Storj
- **Anti-counterfeit solutions:** Authenticity of products is verified by the blockchain network consisting of all market participants in electronic commerce (producers, merchants, marketplaces)
  - Blockverify
- **Internet applications:** Instead of governments and corporations, Domain Name Servers (DNS) are controlled by every user in a decentralized way.
  - Namecoin

3.7.3. Future Trends

The application fields for blockchains seem to be manifold, especially in areas that have historically relied on third parties to establish a certain amount of trust. Atzori [11] suggests that politics and the entire society might be restructured by the blockchain. Many functions might become obsolete if people started to organize and protect the society using decentralized platforms. He concludes that ‘‘decentralization of government services through permissioned blockchains is possible and desirable, since it can significantly increase public administration functionality’’. Reorganizing societies is of prime importance in poor countries. Wealth can be protected more effectively using the blockchain. Especially in the third world, landowners have problems to prove the ownership if for example the local government aims to expropriate the population. These existential threats can be controlled by integrating land titles into the blockchain.

4. Blockchain in Crowdfunding Systems

The most fundamental goal of crowdfunding is helping entrepreneurs or start-ups acquire financial resources from many individuals. A peer-to-peer network that allows payments to be transmitted directly from one person to another without the use of a financial institution. Blockchain technology makes the transactions of funds transparent. The Blockchain allows the platform users to see their accounts and payments to the fundraisers. The analysis has shown that the use of blockchain technology in organizations, will make donations not only more effective and reliable, but also more attractive to donors. It will also help to increase revenues. In, blockchain technology was used to create a crowdfunding platform for Russian charities. They mention that due to data storage and transactions in the blockchain being more expensive and slower than traditional methods, most blockchain platforms are not entirely decentralized. They are instead implemented in a hybrid model where only the important data is stored on the blockchain and the unimportant data is generally stored on a cloud storage platform. [1]

4.1. Merits of blockchain based crowdfunding

- The issues pertaining trust, abuse and confidentiality in the traditional crowdfunding platforms can be removed using blockchain technology. The decentralised network removes the possibility of a single point of failure.

- The distributed ledger technology will ensure that an investor's money reaches the intended recipient without the need for any intermediaries.

- With the help of a separate smart contract to handle transactions, has proposed a method that allows contributors to have control over invested money and ensures the project creators can make and reserve funding effectively. The contract holds funds contributed and releases funds to project creators based on the spending request created by them. The contributors vote on whether to accept or reject the spending requests. A similar idea has been proposed in.

- Using a system that maps the addresses to the party involved in the transaction, tracing of the transactions becomes much easier. Blockchain technology helps keeping record of the transactions performed and makes this information readily obtainable. [12]

- To meet the different demands of crowdfunders and supporters, crowdfunding platforms are integrating rewardbased and equity-based crowdfunding. These provide backers the ability to act as both a customer and a shareholder

- Blockchain technology enables us to support transparency of records, decentralisation, and trust, as well as providing a low-cost alternative to a platform for recording business activity

Blockchain technology has a big potential to help donation overcome numerous obstacles. Therefore, some studies have looked into using blockchain as a system for crowdfunding. Following are important features of blockchain[2]:

- **Decentralized:** Blockchain networks are not under the authority of a single entity, preventing a single point of failure and the takeover of the network by a selected few users.
- **Transparency:** Data recorded in a blockchain is accessible to the general public and is visible to all network participants.
- **Immutability:** Data entered into the Blockchain cannot be altered after it has been saved.
- **Security and Privacy:** The cryptographically secure process in the Blockchain is one of its key aspects because it aids in boosting privacy and security.

A public and private key is also used by network users for identification and verification. A user's digital signature makes it simple to verify him throughout a transaction.

5. Web Programming

5.1. What is Web?

The web, known as the "World Wide Web" or simply "Web", is a global network that enables information sharing between computers. The web hosts a variety of content including documents, texts, images, videos, and other types of media. This network, accessed through internet browsers, allows users to access information from around the world quickly and interactively. Developed by Tim Berners-Lee in 1989, the web has gone through different phases over time, evolving from static information presentation to interactive and participatory platforms. This evolution has manifested itself in different stages such as Web1.0, Web2.0, and Web3.0, constantly improving the functionality of the web.

5.2. Web 1.0, Web 2.0 and Web 3.0

5.2.1. Web 1.0

Web 1.0 is a period that represents the first phase of the Internet and is often referred to as the "static web". During this period, websites generally aim to present information and users consume content as passive viewers. Distinctive features of Web 1.0 include one-way communication, limited user participation, and general presentation of information. This period generally covers the late 1990s to the early 2000s.

5.2.2. Web 2.0

Web 2.0 marks a major milestone in the evolution of the internet and delivers a more interactive, user-focused experience. In this era, websites go beyond simply providing information and allow users to create, share, and interact with content. Applications such as social media platforms, blogs, and online communities form the basis of Web 2.0. The ability of users to provide feedback, produce content, and interact with other users makes the dynamic and participatory nature of Web 2.0 evident [1].

Web 2.0 in the Project

The project focuses on establishing a strong interaction with users by using the interactive features offered by Web 2.0. Web 2.0 provides a dynamic experience to our users through various features integrated into our project's website, and thanks to these features, users have more opportunities to understand the basis of our project, participate, and be included in our community.

Our project's website adopts the pioneering principles of Web 2.0 to provide a user-friendly interface and easy usability. Thanks to the website, users can publish agricultural ideas and projects that they want to invest in, and investors can access content and details that interest them.

Tech Stack

In the part of the project to create a website that will interact with the user, some technologies will be used to make it user-friendly, fast, accessible, and efficient. The website basically consists of 2 parts:

a. Frontend part (client-side)
b. Backend part (server-side)

a.Frontend Part (Client-side)

Frontend is a term that defines the part of a web application or website that is visible to the user. Users interact with an application or site through the front end, viewing content and performing actions. This part is a client that usually runs in the browser and plays a fundamental role by rendering the user interface, arranging the content, and enhancing the user's experience.

Frontend includes core technologies such as HTML, CSS, and JavaScript. While HTML is used to create web pages, CSS stylizes and organizes HTML elements. JavaScript is used to add dynamic and interactive features. Apart from these basic components, various tools and libraries are also used to meet the needs of modern web development.

JavaScript libraries and frameworks such as React, Angular, and Vue.js are preferred to manage complex user interfaces more effectively. These tools provide a component-based structure, ensuring that the code is organized and reusable. In addition, more advanced and user-friendly frontends can be created by using elements such as CSS preprocessors (SASS, LESS), tools (Webpack, Babel), and responsive design techniques.

What is React.js

React.js is a JavaScript library for creating user interfaces. Thanks to its component-based architecture, it is ideal for breaking down, developing, and maintaining web applications into modular and reusable parts. React optimizes performance by using virtual DOM and provides an efficient user experience with one-way data flow.

Advantages of React.js

- Maintenance processes can be managed smoothly and effectively.
- It offers fast page load times and impressive performance.
- It provides powerful and reliable development tools.
- Data management and status control are easily achieved with Redux.
- It allows mobile application development with a single code base.
- It offers a stable and organized code structure.
- It is supported by a large developer community.
- JSX allows writing clearer and more readable code.
- The reusability of components makes code more efficient [2].

b.Backend Part (server-side)

Backend is a system that supports basic functionality in the background of a web application or website, with which the user does not directly interact. It manages operations outside the user interface and ensures the smooth operation of the application. This includes a number of tasks such as data processing and storage, business logic management, security, third-party service integration, server management, API provisioning, email sending, etc. The backend is usually developed using server-side languages and frameworks. Technologies such as Node.js, Django, Ruby on Rails, and Laravel are frequently used examples in backend development.

What is Node.js?

Node.js is a JavaScript-based runtime environment and was developed specifically for server-side applications. Node.js is used to create network applications interactively and quickly. It basically works with a single thread and has an event-driven architecture. This makes Node.js high-performance and scalable. Node.js is based on Chrome's V8 JavaScript engine and is optimized for asynchronous I/O operations. In this way, it can quickly process many requests at the same time. Node.js is generally preferred for the development of web servers, APIs, microservices, and real-time applications.

What is Express.js?

Express.js is a lightweight, flexible, and minimalist web application framework used to build Node.js based web applications and APIs. Express.js enables quick and easy development of web applications using the powerful features of Node.js.

Express.js provides basic web application features but does not impose too many restrictions on the user, allowing flexibility and customization to the developer. Thanks to its middleware structure, it provides extensive control over HTTP requests and responses. This framework includes a number of features such as routes, template engines, and static file serving, making it possible to build applications quickly.

When used together, Node.js and Express.js create a powerful combination that enables the development of scalable, fast, and effective web applications.

What is MongoDB?

MongoDB is a documented NoSQL database. Stores data using JSON-like BSON documents. It is particularly suitable for applications working with large data sets and dynamic data models. MongoDB's document-based structure supports flexible and variable data schemas, which enables it to be used in many scenarios, especially cloud-based applications, content management systems, and real-time applications.

MongoDB's compatibility with JavaScript makes it compatible with popular JavaScript frameworks such as Node.js and Express.js. MongoDB drivers offer easy integration to JavaScript developers so that codes related to database operations can be easily written. An ODM (Object Data Modeling) tool like Mongoose makes it even easier to integrate MongoDB into JavaScript-based applications.

5.2.3. Web 3.0

Web 3.0 represents an evolving phase of the internet and aims to deliver a smarter, connected, and semantic web experience. It has features such as semantic links, distributed ledger technologies, machine learning, and artificial intelligence integration. This evolution enables the sharing of more meaningful and relevant information through the ability to understand and relate content.

For agricultural crowdfunding projects, Web 3.0 offers benefits in reaching wider audiences, secure financing, automated transactions, big data analysis, and increasing community engagement. Blockchain technology enables secure and transparent financing, smart contracts facilitate automated transactions, and semantic connections strengthen community participation [3].

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